Wateridge Block 105

Site Servicing and Stormwater Management Report

Stantec

Prepared for:
Mattamy (Rockcliffe II) Inc.

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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 Block 105 with a block address of 615 Mikinak Street within the Phase 3 Wateridge Village Subdivision in the City of Ottawa.

The subject site is zoned R4UC [2311] – Residential Fourth Density Zone, Subzone UC, Exception 2311 and is bound by Hemlock Road to the north, Vedette Way to the west, Mikinak Road to the south, and a City of Ottawa servicing block, Alliance Park, and Codd's Road to the east and will be constructed as part of Phase 1A of the Wateridge Subdivision development. The site location is outlined in Figure below.

The proposed 2.18 ha residential development will consist of 10 row townhome blocks, 6 back-to-back townhome blocks, for a total of 111 townhouse units, associated private access roads, and a snow storage area. 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 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 Phase 1A, IBI, January 2016
- 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, First Edition, July 2010, and all subsequent Technical Bulletins
- *City of Ottawa Sewer Design Guidelines*, 2nd Ed., City of Ottawa, October 2012, and all subsequent Technical Bulletins
- *Environmental Compliance Approval No. 0824-A8CR5H*, Ministry of the Environment and Climate Change, April 2016

3 Water Servicing

3.1 Background

The site at Block 105 of the Wateridge Subdivision is within the MONT pressure zone of the City of Ottawa's water distribution network. The existing watermains along the boundaries of the site consist of the 305 mm diameter watermains within Vedette Way, Hemlock Road, and Mikinak Road. The 305 mm mains are supplied by multiple connections to distribution mains within the adjacent phases of the Wateridge subdivision.

3.2 Proposed Watermain Sizing and Layout

The proposed development will be serviced by a looped private watermain network fed by two connections to the existing 305 mm diameter watermain in Vedette Way.

3.2.1 Water Demands

The City of Ottawa Water Distribution Guidelines (July 2010) and ISTB 2021-03 Technical Bulletin were used to determine water demands based on the on projected population densities for the townhouses and associated peaking factors. The population was estimated using an occupancy of 2.7 persons per unit for the townhouses. Based on the site layout, the proposed development is estimated to have a total population of 300 persons.

A daily rate of 280 L/cap/day has been used to estimate average daily (AVDY) potable water demand for the townhouses. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas, while peak hourly (PKHR) demands were determined by multiplying the MXDY by a factor of 2.2 for residential areas. The estimated demand for the proposed development is summarized in **Table 3.1** below and detailed in **Appendix A.1**.

Table 3.1: Estimated Water Demands

Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
300	1.0	2.4	5.3

3.2.2 Fire Flow Demands

The fire flow requirements for the residential properties is determined using the 2020 Fire Underwriters Survey (FUS), in combination with Section 3.1.11.5 of 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.

Based on the FUS calculations, Block 7 as an 8-unit back-to-back townhouse block has the worst-case fire flow demand of 267 L/s (16,000 L/min). All 12-unit back-to back 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.

3.2.3 Boundary Conditions

Boundary conditions were provided for the site development by the City of Ottawa. These are attached in **Appendix A.3** and summarized in **Table 3.2** below.

Table 3.2: Boundary Conditions at Vedette Way

Connection	Connection 1	Connection 2
Min. HGL (m)	143.3	
Max. HGL (m)	143.6	
MXDY+FF (233 L/s) (m)	138.7	138.8
MXDY+FF (267 L/s) (m)	137.5	137.7

3.3 Hydraulic Assessment

A hydraulic model was built by Stantec using the boundary conditions for the connections on Vedette Way to assess the anticipated pressures to meet the minimum servicing requirements. A fire flow analysis was also performed under maximum day conditions.

3.3.1 Model Development

New watermains were added to the hydraulic model to simulate the proposed distribution system. Hazen-Williams coefficients (“C-Factors”) were applied to the new watermain in accordance with the City of Ottawa’s Water Distribution Design Guidelines (**Table 3.3**).

Table 3.3: C-Factors Applied Based on Watermain Diameter

Pipe Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120
> 600	130

3.3.2 Hydraulic Modeling Results

PCSWMM by Computational Hydraulics Inc. (CHI) was used to conduct the watermain hydraulic analysis. The model was tested for AVDY, PKHR and MXDY+FF demands under the boundary conditions provided by the City of Ottawa.

3.3.2.1 Average Day & Peak Hour

The hydraulic model results show that the maximum pressures (ACDY condition) are anticipated to be approximately 543 to 564 kPa (78.7 to 81.8 psi), while minimum pressures during PKHR are anticipated to be approximately 540 to 561 kPa (78.3 to 81.4 psi). These pressures are well above the minimum allowable pressure of 276 kPa (40 psi) and given that a portion of the network pressures exceed the maximum allowable pressure of 552 kPa (80 psi), pressure reducing valves will be required where applicable.

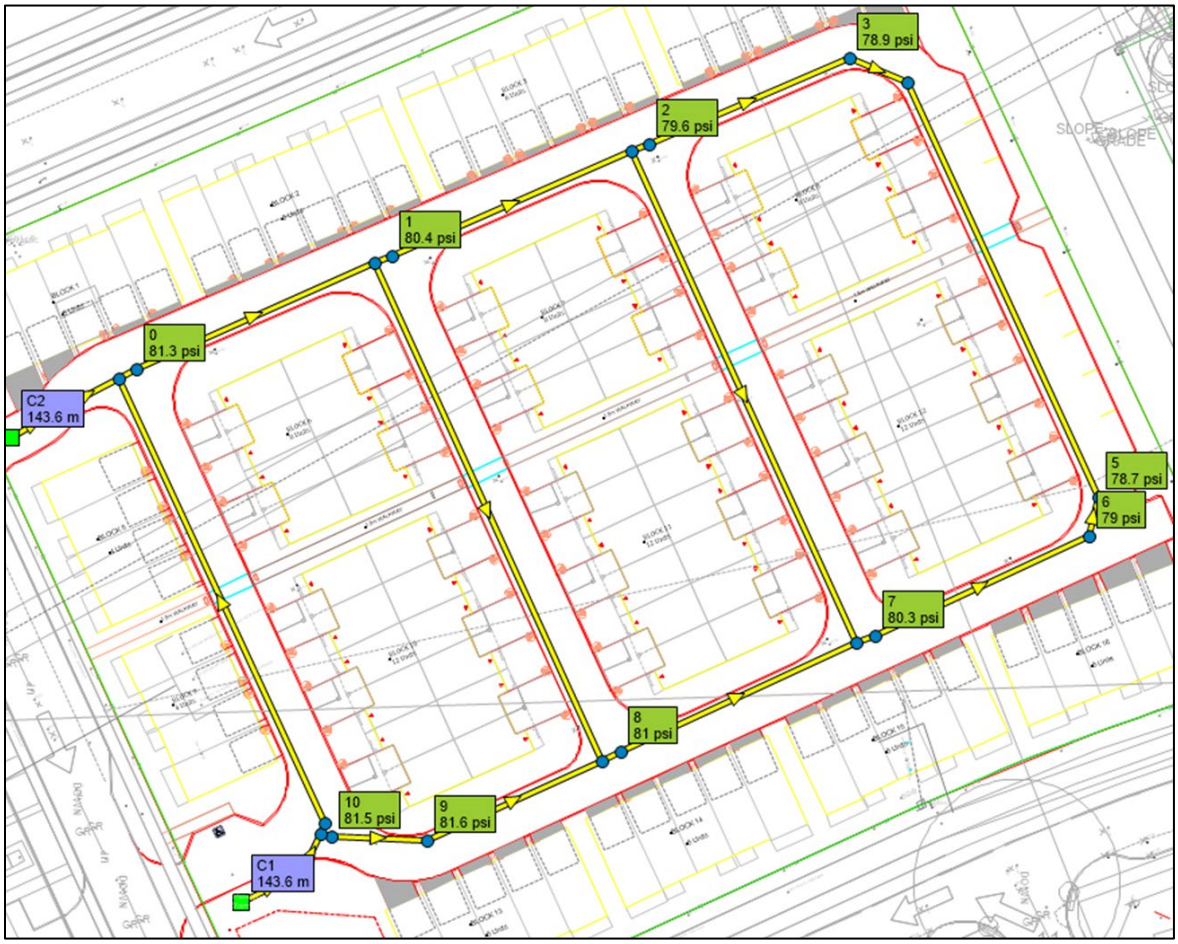


Figure 3.1: Maximum Pressures During AVDY Conditions

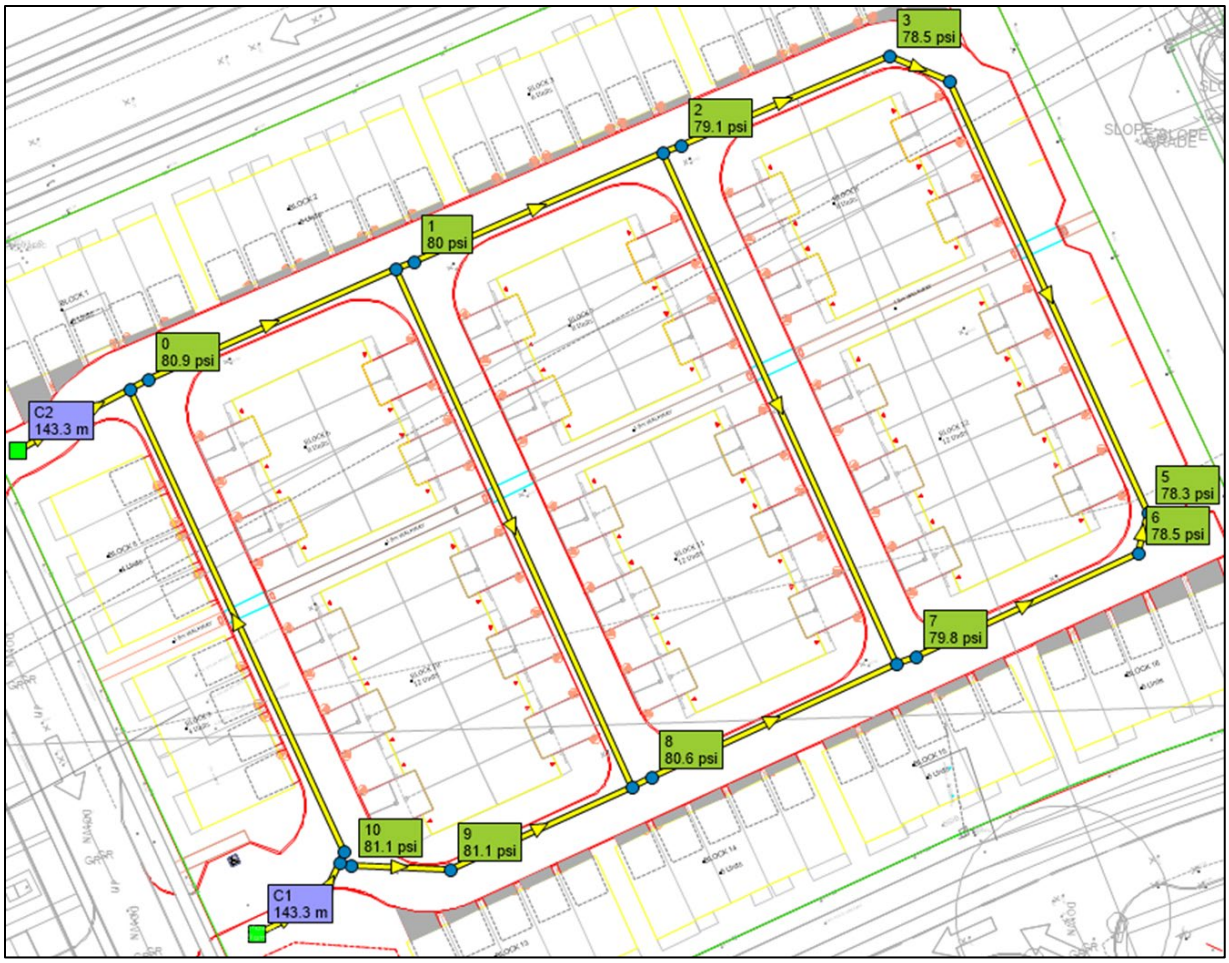


Figure 3.2: Minimum Pressures During PKHR Conditions

3.3.2.2 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 16,000 L/min (267 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). The residual pressures and available flows for the fire flow analysis are demonstrated in. Results of the hydraulic modeling are included in **Appendix A.4**.

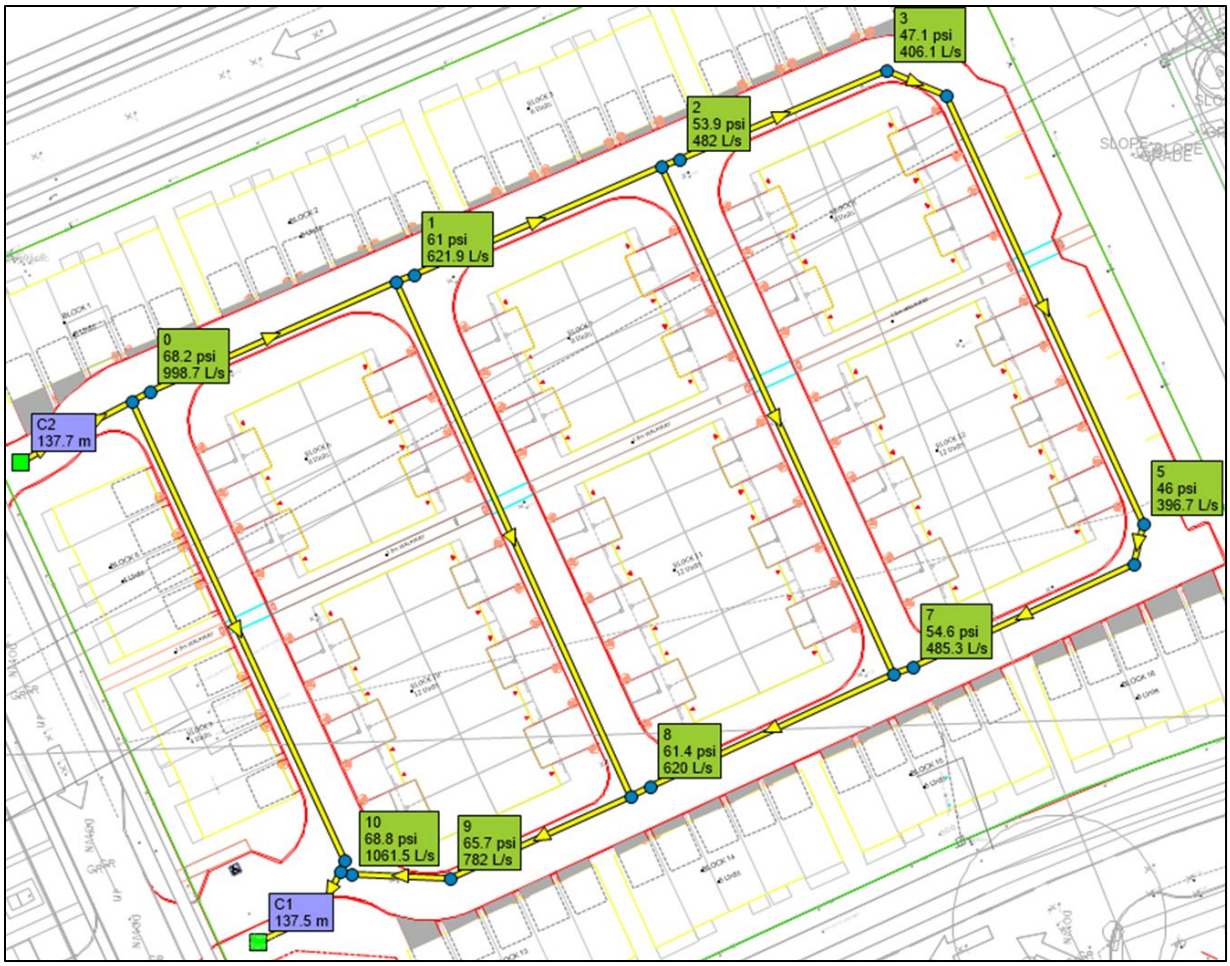


Figure 3.3: Residual Pressures and Available Fire Flows during MXDY Conditions

3.3.2.3 Fire Hydrant Coverage

There are four fire hydrants proposed to deliver fire flow in the site. The full site falls under the coverage of all four 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 all four hydrants to be within 76 m away from Block 7, as such the fire flow demands for Block 7 (267 L/s) can be provided by the four hydrants. See **Appendix A.5** for fire hydrant coverage table calculations, NFPA Table 18.5.4.3, and the fire hydrant coverage figure.

3.4 Summary of Findings

Based on the findings of the hydraulic analysis, the proposed network is capable of servicing the development area and will 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). Pressure reducing valves will be required for the western portion of the development where modeled average day pressures exceed 80 psi.

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. Fire hydrants have been sited to provide the required fire flow.

4 Wastewater Servicing

4.1 Background

The Former CFB Rockcliffe Master Servicing Study (MSS) indicates that wastewater flows from Block 105 are to be directed to the Ottawa Interceptor Trunk Sewer via the Codd's Road Shaft with a connection to the municipal sanitary sewer within Mikinak Street. The MSS Sanitary Drainage Area Plan, Figure 5.2, has been included in **Appendix B.2**. Wastewater flows will be directed east to the Codd's Road Shaft connection to the Ottawa Interceptor Sewer via a connection to the existing 250 mm diameter sanitary sewer at Vedette Way.

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 phase of the 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 – 1.4 to 3.1
- 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 sewer within Vedette Way, which will in turn direct wastewater flows south to Mikinak Way and turn east to the Codd's Road Shaft..

Peak design flows from the site are calculated to be 4.1 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). The MSS 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 Design Brief are included in Appendix.

As detailed in the MSS, minor system flows from the site will be directed to the existing 1500 mm diameter concrete storm sewer flowing west to east on Hemlock Road, ultimately discharging to the Eastern Stormwater Management Facility (Eastern Pond). The major system flows will be directed to the existing drainage channels downstream of the site plan development, namely the existing Aviation Parkway culvert.

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.

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)
- Minor system capture rate from Block 105 up to the 100-year storm is to be restricted to **505 L/s**. (Wateridge Village Phase 1A Design Brief, IBI)
- Where there is footing drainage connected to the storm collection system, separation of at least 0.3 m between the 5-year storm with 100-year boundary conditions 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)

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 and the 219 L/s minor system allowable release rate in the 100-year storm.
- 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.

In keeping with the minor system target peak outflow, quantity underground storage is proposed with an orifice plate at the downstream manhole to limit the discharge to the existing 825 mm diameter storm sewer stub leading to the 1500 mm diameter storm sewer on Vedette Street. Restricted inlet rates to the municipal sewer are necessary to meet the target peak outflows.

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

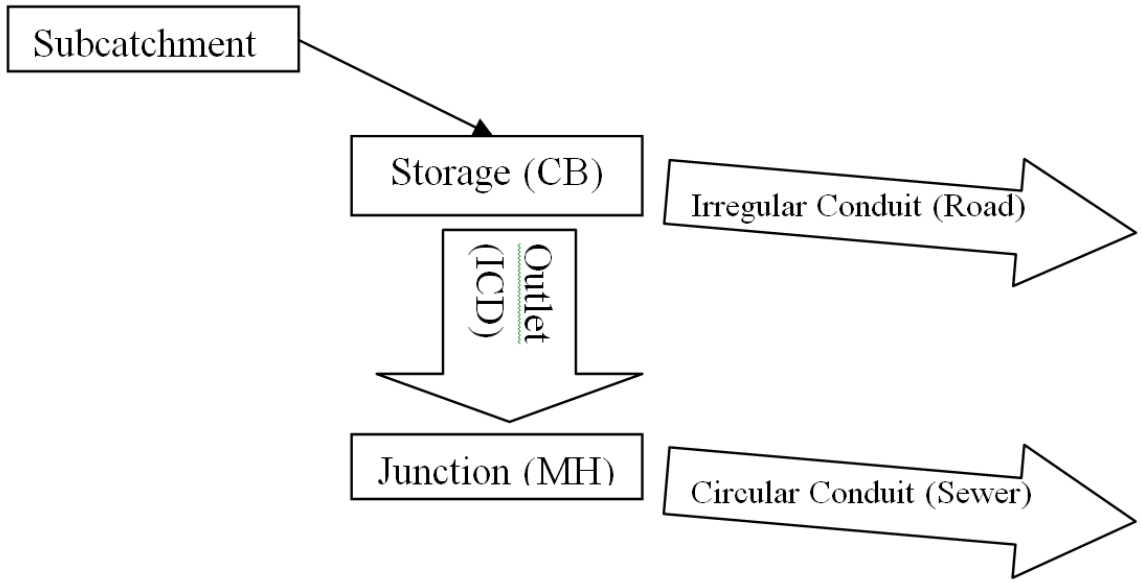
of the systems' response during various storm events. The following assumptions were applied to the detailed model:

- 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.
- Discharge from underground storage restricted with an orifice plate in the downstream manhole to maintain the minor system target peak outflow.
- 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 storage; 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 outlet 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 top of grate elevation of the CB and the rim of the storage node represents the allowable flow depth on the segment. For the purpose of this SWM plan, CB inverts have been set at the top of the CB. An additional depth of 0.15 m 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 weirs that discharge at the spill elevation for each subcatchment area. The widths of each weir were calculated based on the respective elevation across the length of the spill location.

The storage value assigned to the most-downstream storage node represents the available storage volume within the underground storage. The maximum ponding volumes are calculated using the cone equation in the drawing and equivalent surface areas are inputted into the storage curves within PCSWMM using the trapezoidal equation. If the available storage volume in a storage node is exceeded, flows spill to the outfall of the major system.

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 5-year for collector roads.

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.

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
C1003B	0.15	106.5	3.0	92.9	0.85
C1004A	0.10	49.9	3.0	78.6	0.75
C1005A	0.05	19.8	3.0	78.6	0.75
C1006A	0.13	83.0	3.0	80.0	0.76
C1006B	0.09	57.4	3.0	80.0	0.76
C1007A	0.16	85.7	3.0	80.0	0.76
C1007B	0.23	144.9	3.0	78.6	0.75
C1008A	0.06	39.2	3.0	25.7	0.38
C1009A	0.22	143.6	3.0	78.6	0.75
C1009B	0.25	158.1	3.0	78.6	0.75
C1010A	0.21	145.5	3.0	78.6	0.75

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
C1010B	0.26	157.4	3.0	92.9	0.85
SWM	0.06	12.5	3.0	28.6	0.40
UNC-1	0.06	77.2	3.0	50.0	0.55
UNC-2	0.08	160.0	3.0	22.9	0.36
UNC-3	0.07	138.4	3.0	22.9	0.36

Table 5.3 summarizes the storage node parameters used in the model. All catch basins have been modeled as having an outlet invert as depicted on **Drawings SSP-1**. As the catch basins are not equipped with inlet control devices, the top of grate elevation serves as the invert elevation in the model for the catch basins to collect the flow on the major system, while the rim of the storage node represents the maximum allowable flow depth elevation above the storage node, equal to the top of grate of the catch basin plus an additional 0.15 m.

Table 5.3: Storage Node Parameters

Storage Node	Invert Elevation (m)	Rim Elevation (m)	Total Depth (m)
C1003B-S	86.20	86.35	0.15
C1004A-S	86.85	87.00	0.15
C1005A-S	87.56	87.71	0.15
C1006A-S	88.09	88.24	0.15
C1006B-S	88.09	88.24	0.15
C1007A-S1	86.14	86.29	0.15
C1007A-S2	85.88	86.03	0.15
C1007B-S	86.18	86.33	0.15
C1008A-S	85.89	86.04	0.15
C1009A-S	86.24	86.39	0.15
C1009B-S	86.57	86.72	0.15
C1010A-S	86.72	86.87	0.15
C1010B-S	87.10	87.25	0.15
CB1008	85.72	85.87	0.15

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 5.4: 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 presents the parameters for the orifice link objects within the proposed site for restricting discharge from the underground storage into the municipal storm sewer in Vedette Way. It should be noted that the proposed ICDs will consist of slide type vertical circular orifices.

Table 5.5: Orifice Parameters for Proposed Catchments

Orifice Name	Minor System Node	ICD Type
OR1	EXCBMH	395 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 rate at the downstream underground storage to the existing storm sewer stub.

Table 5.6: Proposed Phase Orifice Link Results

Orifice Name	Manhole ID	ICD Type	2yr Flow (L/s)	5yr Flow (L/s)	100yr Flow (L/s)
OR1	EXCBMH	395 mm Orifice	241.3	285.9	370.7

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** below 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 5.7: 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)
1001	84.52	84.01	0.51	84.29	0.28
1002	85.00	84.1	0.90	84.4	0.60
1003	85.11	84.18	0.93	84.52	0.59
1004	85.31	84.3	1.01	84.68	0.63
1005	86.03	84.71	1.32	84.81	1.22
1006	86.18	85.42	0.76	85.46	0.72
1007	84.62	84.05	0.57	84.37	0.25
1008	84.91	84.06	0.85	84.37	0.54
1009	85.10	84.33	0.77	84.71	0.39
1010	86.02	84.98	1.04	85.67	0.35
1011	84.65	84.06	0.59	84.37	0.28

The model results indicate that there is sufficient clearance between the worst-case HGL and the proposed USFs within Block 105. 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 Underground Storage

Table 5.8 presents the maximum total water depths within the proposed underground storage for the 100-year, 3-hr Chicago storm and the ‘climate change’ storm. Based on the model results, the total water depth does not exceed the 1.5 m maximum during the 100-year event. Tables summarizing the total water depths within the underground storage are included in **Appendix C.2**.

Table 5.8: Proposed Storage Depth and Volume

Storage node ID	Structure ID	Structure Height (m)	2-year, 3-hour Chicago		100-year, 3-hour Chicago		100-year, 3-hour Chicago+20%	
			Max Depth (m)	Volume (m^3)	Max Depth (m)	Volume (m^3)	Max Depth (m)	Volume (m^3)
SWM-S	StormTrap	1.5	0.4	125	1.1	347	1.4	424

A StormTrap system was sized based on the minimum required storage size under the 100-year storm event. Based on the model results, a StormTrap SingleTrap system was preliminarily sized to provide around 426.1 m^3 of storage. The sizing report is attached in **Appendix C.3**.

5.6.4 Results

The following section summarizes the key hydrologic and hydraulic model results for the proposed site and demonstrates the proposed stormwater management plan meets target peak rates established in the Wateridge Village Phase 1A Design Brief and MSS. For detailed model results or inputs please refer to the example input file in **Appendix C.2** and the electronic model files.

Table 5.9: Target and Resultant Major and Minor System Release Rates

Storm event	Target Release Rate per Subdivision Design (L/s)	Block 105 Minor System Release Rate (L/s)	Block 105 Uncontrolled Release Rate (L/s)
2-year, 3-hour Chicago	505	241	17
5-year, 3-hour Chicago		286	49
100-year, 3-hour Chicago		371	132
100-year, 3-hour Chicago+20%	N/A	405	172

5.6.5 Low Impact Development (LID) Practices

The infiltration and water quality control targets for the site are proposed to be met via the infiltration openings at the concrete slab for the proposed StormTrap underground storage. Upon collection from the site, the stormwater is directed into the underground storage and allowed to infiltrate into the surrounding soil. In larger storm events, storm flow will be directed to the outlet pipe with flowrates controlled by an ICD at the existing downstream catch basin manhole.

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 for Phase 1A-3.

In the geotechnical investigation, the peak groundwater table at the location for the underground storage tank (borehole BH 2-25) was measured to be at 82.48 m. Accounting for the bottom of the proposed tank having an elevation of 82.8 m, a slab thickness of 280 mm, and a clear stone thickness of 300 mm, the contact area with the native soils is at an elevation of 82.2 m, below the peak groundwater table.

To monitor the long-term groundwater table under the proposed tank and impacts to the infiltration, Paterson has installed data loggers at the monitoring well at BH 2-25. In the interim, an infiltration rate of 10 mm/hr, taken from Table 1 of the Subsoil Infiltration Review for the adjacent 101 Vedette Way site (Paterson, December 2021), was assumed for the silty clay beneath the tank.

In the model, a 4 mm storm event scenario was set up with the outlet from the underground storage having zero discharge to determine the infiltration volume from the tank, which was determined to be around 34 m^3. Through Equation 4.3 from the MECP Stormwater Design Manual and using a porosity of 0.4 for the clear stone layer and a contact surface area of 329.8 m^2, the estimated drawdown time from the tank is around 25.8 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 1500 mm diameter concrete storm sewer flowing west to east on Hemlock Road. The pond will provide an enhanced level of protection.

6 Grading

The proposed Block 105 development site measure approximately 2.18 ha in area. The topography across the site under existing conditions slopes towards the southwest. The objective of the grading design strategy is to satisfy the stormwater management requirements, adhere to permissible grade raise restrictions, and provide for minimum cover requirements for sewers.

The grading plan (**Drawing GP-1**) was prepared considering the grade raise restrictions identified in the geotechnical investigation. Areas where grades are expected to exceed the maximum permissible grade raise will be subject to either a pre-loading/surcharge program, or lightweight fill and/or other approved means outside of the proposed rights-of-way to reduce the risks of unacceptable long-term post-construction differential settlements.

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 drains 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) 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 April 2025. The report summarizes the existing soil conditions within the Block 105 site and construction recommendations. For details which are not summarized below, please see the Paterson report included in the submission package.

Subsurface soil conditions within Block 105 were determined through field investigations conducted on March 10, 2025, in addition to the previous investigations, completed by Paterson on March 26, 2021, in the vicinity of the subject site, and others within the subdivision, between November 2004 and August 2015. In total, five (5) boreholes were drilled in the March 2025 investigation in addition to the six (6) boreholes drilled that were drilled in the March 2021 investigation.

In general, soil stratigraphy consisted of topsoil/fill layer followed by a silty clay and glacial till. Bedrock was estimated to occur between depths of 8.6 to 10 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 82.0 to 84.5 m, though as groundwater levels fluctuate seasonally, they could vary at the time of construction.

Based on the observed soil conditions, a permissible grade raise restriction of 3.0 m above existing grade was recommended. Areas where grades are expected to exceed the maximum permissible grade raise will be subject to either a pre-loading/surcharge program, or lightweight fill and/or other approved means outside of the proposed rights-of-ways to reduce the risks of unacceptable long-term post-construction differential settlements.

For the stormwater storage system, it is recommended that a minimum 75 mm thick lean concrete mud slab be placed on the undisturbed silty clay subgrade shortly after the completion of the excavation, with the purpose of reducing the risk of disturbance of the subgrade under the traffic of workers and equipment.

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

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, pressure reducing valves will be required in all proposed units to meet maximum pressure guidelines as per 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 105 will be serviced by a network of gravity sewers which will direct wastewater flows to Vedette Way. 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 2012 City of Ottawa Sewer Design Guidelines.
- Underground storage is proposed to limit inflow from the site area into the existing municipal storm sewer system to the 5-year storm event based on City of Ottawa IDF curves.
- All dynamic surface water depths are to be less than 0.15 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 Vedette Way and will ultimately discharge into the outlet West Pond.
- The minor system outflow rates are within the Wateridge Village targets (January 2016).

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 105 will be designed by the respective utilities.

Appendices

Appendix A Water Servicing

A.1 Domestic Water Demands

Wateridge Subdivision Block 105 - Domestic Water Demand Estimates

Site Plan provided by Korsiak Urban Planning (2025-03-04)

Project No. 160402127 Designed by: MW

Date: 2025-03-21 Checked by:

Revision: 01

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 2]		Peak Hour Demand [1 2]	
			(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Row	51	138	26.8	0.4	66.9	1.1	147.3	2.5
Back-to-Back	60	162	31.5	0.5	78.8	1.3	173.3	2.9
Total Site:	**111**	**300**	**58.3**	**1.0**	**145.7**	**2.4**	**320.5**	**5.3**

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 #: 160402127
Project Name: Wateridge Block 105
Date: 2025-03-21
Fire Flow Calculation #: 1
Description: Block 2 6-unit row townhouses

Notes: Building footprint of 526 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	-
		526	526									1052	-
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	> 30	0	0	0-20	Type V	NO				0%	4114
		East	3.1 to 10	14	2	21-49	Type V	NO				16%	
		South	10.1 to 20	21	2	41-60	Type V	NO				12%	
		West	3.1 to 10	14	2	21-49	Type V	NO				16%	
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

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402127
Project Name: Wateridge Block 105
Date: 2025-03-21
Fire Flow Calculation #: 2
Description: Block 7 8-unit back-to-back townhouses

Notes: Building footprint of 500 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	-
		500	500	500								1500	-
3	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min										-	13000
4	Determine Occupancy Charge	Limited Combustible										-15%	11050
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	10.1 to 20	21	2	41-60	Type V	NO				12%	4641
		East	20.1 to 30	26	3	61-80	Type V	NO				6%	
		South	3.1 to 10	21	3	61-80	Type V	NO				18%	
		West	20.1 to 30	26	3	61-80	Type V	NO				6%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											16000
		Total Required Fire Flow in L/s											266.7
		Required Duration of Fire Flow (hrs)											3.50
		Required Volume of Fire Flow (m^3)											3360

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402127
Project Name: Wateridge Block 105
Date: 2025-03-21
Fire Flow Calculation #: 6
Description: Block 10 12-unit back-to-back townhouses

Notes: Building footprint of 750 m². Installation of firewall into 8-unit and 4-unit clusters reduces building footprint area to 500 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	-
		500	500	500								1500	-
3	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min										-	13000
4	Determine Occupancy Charge	Limited Combustible										-15%	11050
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	21	3	61-80	Type V	NO				18%	3094
		East	20.1 to 30	26	3	61-80	Type V	NO				6%	
		South	0 to 3	21	3	61-80	Type V	YES				0%	
		West	20.1 to 30	26	2	41-60	Type V	NO				4%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											14000
		Total Required Fire Flow in L/s											233.3
		Required Duration of Fire Flow (hrs)											3.00
		Required Volume of Fire Flow (m^3)											2520

A.3 Hydraulic Boundary Conditions

Wu, Michael

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: April 10, 2025 13:12
To: Wu, Michael
Cc: Moroz, Peter
Subject: RE: City File No. PC2024-0488 - Wateridge Block 105 Boundary Conditions Request

Here you are Michael, as requested:

The following are boundary conditions, HGL, for hydraulic analysis for Wateridge Development Block 105, (zone MONT) assumed to be connected to via two connections to the 305mm watermain on the Vedette Way (See attached PDF for location).

Connection 1
Min HGL= 143.3 m
Max HGL= 143.6 m
Max Day + Fire flow (233.3 L/s)= 138.7 m
Max Day + Fire flow (267.0 L/s)= 137.5 m

Connection 2
Min HGL= 143.3 m
Max HGL= 143.6 m
Max Day + Fire flow (233.3 L/s)= 138.8 m
Max Day + Fire flow (267.0 L/s)= 137.7 m

The maximum pressure is estimated to be more than 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji

Pronouns: he/him | Pronom: il
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Development & Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1
(613) 580 2424 Ext. | Poste 33017
Int. Mail Code | Code de Courrier Interne 01-14
shawn.wessel@ottawa.ca

Please consider the environment before printing this email

*****Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

Une Ville, deux langues
One City, two languages

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From: Wessel, Shawn
Sent: Thursday, April 10, 2025 11:37 AM
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Moroz, Peter <peter.moroz@stantec.com>
Subject: RE: City File No. PC2024-0488 - Wateridge Block 105 Boundary Conditions Request

Good morning, Michael

I sent a reminder msg to our Water Engineer and will get back to you soon.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Pronouns: he/him | Pronom: il
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Development & Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bâtiment (DGSPAB)
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Une Ville, deux langues
One City, two languages

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: Thursday, April 10, 2025 10:37 AM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Moroz, Peter <peter.moroz@stantec.com>
Subject: RE: City File No. PC2024-0488 - Wateridge Block 105 Boundary Conditions Request

Good morning, Shawn, as a quick follow-up, can you provide us a timeline on when we can expect the boundary conditions?

Thanks,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

Stantec

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From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: March 27, 2025 10:57
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Moroz, Peter <peter.moroz@stantec.com>
Subject: RE: City File No. PC2024-0488 - Wateridge Block 105 Boundary Conditions Request

Good morning, Michael

This is confirmation that we received your request and passed on to Water Dept. for comments.

Regards,

Shawn Wessel, A.Sc.T.,rcji
Pronouns: he/him | Pronom: il
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Development & Building Services Department (PDBS) | Direction générale des services de la planification, de l'aménagement et du bàtiment (DGSPAB)
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Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.

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One City, two languages

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From: Wu, Michael <Michael.Wu@stantec.com>
Sent: Wednesday, March 26, 2025 4:35 PM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Moroz, Peter <peter.moroz@stantec.com>
Subject: City File No. PC2024-0488 - Wateridge Block 105 Boundary Conditions Request

Good afternoon, Shawn:

We are requesting hydraulic boundary conditions for the proposed development at Block 105 of the Wateridge Subdivision. The proposed development comprises of 16 townhouse blocks and is projected to service a total population of 300 persons.

The boundary conditions requested are for the watermain on Vedette Way, and the water demands for the proposed development are as follows:

- Average Day Demand: 1.0 L/s (58.3 L/min)
- Maximum Day Demand: 2.4 L/s (145.7 L/min)
- Peak Hour Demand: 5.3 L/s (320.5 L/min)
- For fire flow demands, we are requesting the BCs for fire flows at 233.3 L/s (14,000 L/min) and 267 L/s (16,000 L/min)

Attached are the calculation sheets and the FUS exposure sketch for your reference.

We appreciate your time looking into this for us, and please feel free to reach out if you have any questions or comments.

Thanks,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

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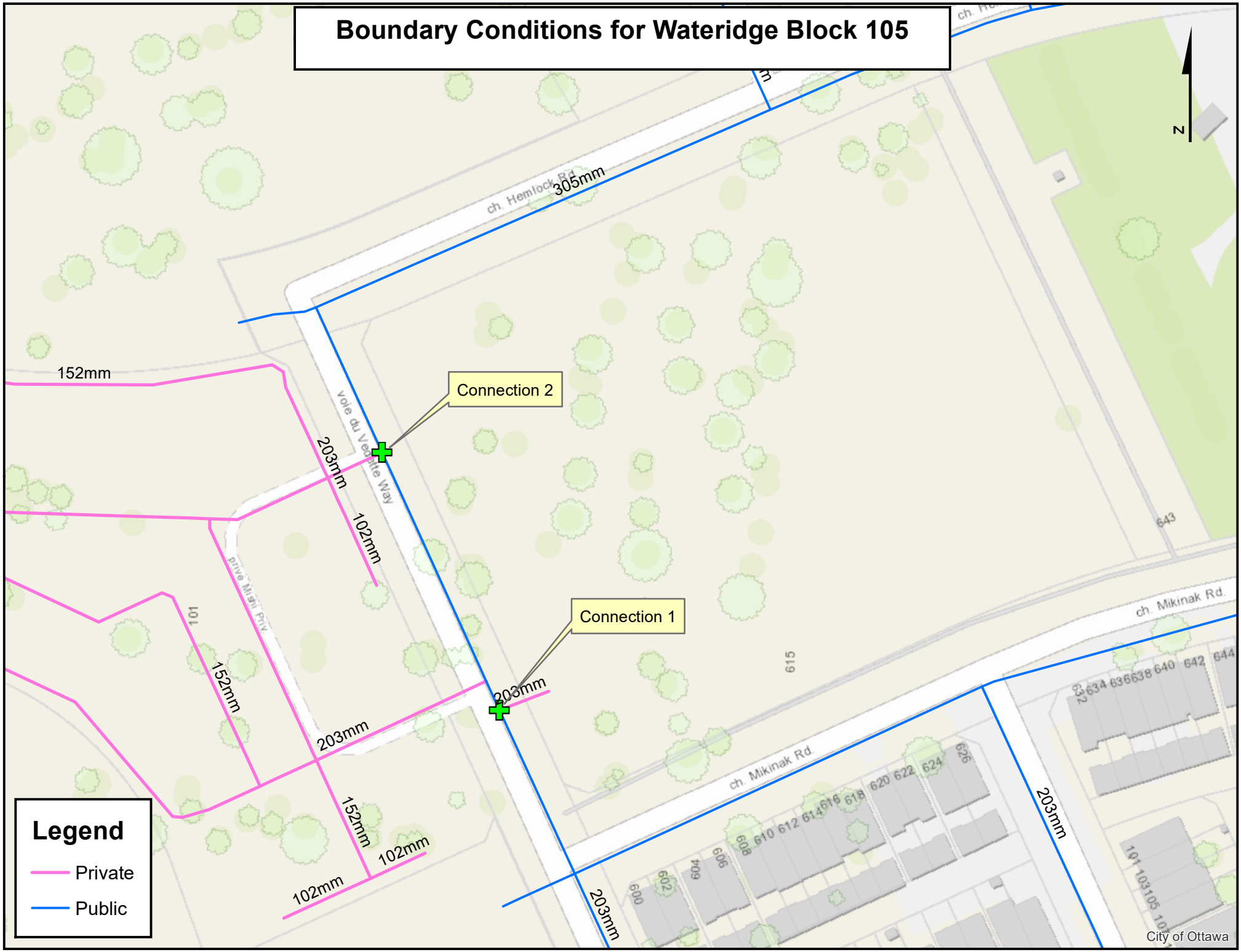
'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

'

Boundary Conditions for Wateridge Block 105



A.4 Hydraulic Analysis

Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
5	0.05	88.25	143.60	55.36	78.71	542.71
4	0.04	88.21	143.60	55.39	78.77	543.09
3	0.05	88.10	143.60	55.50	78.92	544.14
6	0.04	88.07	143.60	55.53	78.96	544.38
2	0.05	87.64	143.60	55.96	79.57	548.63
13	0.07	87.60	143.60	56.00	79.63	549.01
7	0.04	87.15	143.60	56.45	80.28	553.48
12	0.11	87.11	143.60	56.49	80.33	553.85
1	0.05	87.04	143.60	56.56	80.42	554.50
15	0.07	87.04	143.60	56.56	80.43	554.51
8	0.04	86.62	143.60	56.98	81.03	558.65
14	0.11	86.58	143.60	57.02	81.08	559.02
0	0.04	86.42	143.60	57.19	81.32	560.65
16	0.07	86.35	143.60	57.25	81.41	561.29
10	0.00	86.26	143.60	57.34	81.54	562.17
17	0.09	86.25	143.60	57.35	81.55	562.27
9	0.04	86.24	143.60	57.36	81.57	562.38
18	0.00	86.23	143.60	57.37	81.57	562.42
11	0.00	86.22	143.60	57.38	81.59	562.55
20	0.00	86.07	143.60	57.53	81.81	564.06

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
C8	12	7	2.90	204	110	0.128	0.004
C7	12	8	39.40	204	110	-0.224	0.007
1002	3	2	33.12	204	110	-0.092	0.003
1003	4	3	9.44	204	110	-0.042	0.001
1004	5	4	69.62	204	110	-0.002	0.000
1005	6	5	5.98	204	110	0.048	0.001
1006	7	6	35.76	204	110	0.088	0.003
C6	14	8	3.16	204	110	0.264	0.008
C5	9	14	29.18	204	110	0.349	0.011
1009	10	9	14.47	204	110	0.389	0.012
1010	11	10	1.89	204	110	0.389	0.012
1011	13	12	81.88	204	110	0.014	0.000
1012	15	14	82.80	204	110	0.024	0.001
1013	17	16	74.69	204	110	0.013	0.000
C4	11	17	1.60	204	110	0.103	0.003
C3	18	11	6.67	204	110	0.492	0.015
C1	20	C2	7.93	204	110	-0.468	0.014
C2	18	C1	10.09	204	110	-0.492	0.015
C9	2	13	2.87	204	110	-0.142	0.004
C10	13	1	39.63	204	110	-0.226	0.007
C11	1	15	2.87	204	110	-0.276	0.008
C12	15	0	39.51	204	110	-0.371	0.011
C13	0	16	3.11	204	110	-0.411	0.013
C14	16	20	10.65	204	110	-0.468	0.014

Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
5	0.29	88.25	143.30	55.05	78.28	539.73
4	0.19	88.21	143.30	55.09	78.34	540.11
3	0.29	88.10	143.30	55.20	78.49	541.16
6	0.24	88.07	143.30	55.22	78.52	541.40
2	0.29	87.64	143.30	55.66	79.14	545.65
13	0.39	87.60	143.30	55.69	79.20	546.03
7	0.24	87.15	143.30	56.15	79.84	550.50
12	0.58	87.11	143.30	56.19	79.90	550.87
1	0.29	87.04	143.30	56.26	79.99	551.53
15	0.39	87.04	143.30	56.26	79.99	551.54
8	0.24	86.62	143.30	56.68	80.59	555.68
14	0.58	86.58	143.30	56.72	80.65	556.05
0	0.24	86.42	143.30	56.88	80.89	557.70
16	0.39	86.35	143.30	56.95	80.98	558.34
10	0.00	86.26	143.30	57.04	81.11	559.22
17	0.48	86.25	143.30	57.05	81.12	559.32
9	0.24	86.24	143.30	57.06	81.14	559.41
18	0.00	86.23	143.30	57.07	81.14	559.47
11	0.00	86.22	143.30	57.08	81.16	559.60
20	0.00	86.07	143.30	57.23	81.38	561.11

Link Results - Peak Hour

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
C8	12	7	2.90	204	110	0.735	0.022
C7	12	8	39.40	204	110	-1.249	0.038
1002	3	2	33.12	204	110	-0.515	0.016
1003	4	3	9.44	204	110	-0.225	0.007
1004	5	4	69.62	204	110	-0.035	0.001
1005	6	5	5.98	204	110	0.255	0.008
1006	7	6	35.76	204	110	0.495	0.015
C6	14	8	3.16	204	110	1.489	0.046
C5	9	14	29.18	204	110	1.943	0.059
1009	10	9	14.47	204	110	2.183	0.067
1010	11	10	1.89	204	110	2.183	0.067
1011	13	12	81.88	204	110	0.066	0.002
1012	15	14	82.80	204	110	0.126	0.004
1013	17	16	74.69	204	110	0.083	0.003
C4	11	17	1.60	204	110	0.563	0.017
C3	18	11	6.67	204	110	2.746	0.084
C1	20	C2	7.93	204	110	-2.614	0.080
C2	18	C1	10.09	204	110	-2.746	0.084
C9	2	13	2.87	204	110	-0.805	0.025
C10	13	1	39.63	204	110	-1.261	0.039
C11	1	15	2.87	204	110	-1.551	0.047
C12	15	0	39.51	204	110	-2.067	0.063
C13	0	16	3.11	204	110	-2.307	0.071
C14	16	20	10.65	204	110	-2.614	0.080

Fire Flow Results - Max Day + 233 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.11	52.35	74.44	513.24	138.76	233.33	49.81	70.83	1015.13	20
1	0.13	51.70	73.52	506.90	138.75	233.33	45.74	65.03	632.43	20
2	0.13	51.10	72.66	500.98	138.74	233.33	41.71	59.32	490.35	20
3	0.13	50.64	72.01	496.49	138.74	233.33	37.94	53.95	413.23	20
4	0.09	50.53	71.86	495.43	138.74	233.33	37.28	53.02	403.25	20
5	0.13	50.49	71.80	495.04	138.74	233.33	37.28	53.02	403.66	20
6	0.11	50.66	72.04	496.72	138.74	233.33	37.79	53.74	410.39	20
7	0.11	51.59	73.36	505.82	138.74	233.33	42.20	60.00	493.55	20
8	0.11	52.12	74.11	510.96	138.74	233.33	46.05	65.49	630.43	20
9	0.11	52.49	74.64	514.60	138.73	233.33	48.51	68.98	795.03	20
10	0.00	52.46	74.60	514.36	138.72	233.33	50.21	71.40	1079.32	20
11	0.00	52.50	74.66	514.74	138.72	233.33	50.55	71.87	1165.76	20
12	0.26	51.63	73.41	506.18	138.74	233.33	42.67	60.67	506.66	20
13	0.18	51.14	72.72	501.36	138.74	233.33	42.18	59.98	503.33	20
14	0.26	52.15	74.16	511.33	138.74	233.33	46.52	66.15	656.30	20
15	0.18	51.70	73.52	506.91	138.75	233.33	46.13	65.60	656.57	20
16	0.18	52.42	74.53	513.88	138.77	233.33	50.34	71.59	1134.28	20
17	0.22	52.47	74.62	514.46	138.72	233.33	50.30	71.53	1101.56	20
18	0.00	52.48	74.62	514.52	138.71	233.33	51.03	72.56	1364.96	20
20	0.00	52.72	74.96	516.85	138.79	233.33	51.46	73.17	1494.65	20

Fire Flow Results - Max Day + 267 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
0	0.11	51.22	72.83	502.12	137.63	266.67	47.95	68.18	998.66	20
1	0.13	50.55	71.88	495.63	137.60	266.67	42.88	60.98	621.89	20
2	0.13	49.95	71.02	489.68	137.59	266.67	37.88	53.87	482.04	20
3	0.13	49.49	70.37	485.17	137.59	266.67	33.16	47.15	406.13	20
4	0.09	49.38	70.22	484.12	137.59	266.67	32.35	46.00	396.31	20
5	0.13	49.34	70.16	483.72	137.58	266.67	32.36	46.01	396.70	20
6	0.11	49.51	70.40	485.39	137.58	266.67	32.96	46.87	403.35	20
7	0.11	50.44	71.72	494.48	137.58	266.67	38.36	54.55	485.29	20
8	0.11	50.96	72.46	499.60	137.58	266.67	43.17	61.39	620.03	20
9	0.11	51.32	72.98	503.15	137.56	266.67	46.22	65.72	781.99	20
10	0.00	51.29	72.93	502.85	137.55	266.67	48.40	68.82	1061.54	20
11	0.00	51.33	72.99	503.23	137.55	266.67	48.82	69.42	1146.56	20
12	0.26	50.47	71.77	494.84	137.58	266.67	38.96	55.40	498.19	20
13	0.18	49.99	71.08	490.06	137.59	266.67	38.48	54.71	494.80	20
14	0.26	51.00	72.51	499.96	137.58	266.67	43.76	62.22	645.49	20
15	0.18	50.56	71.89	495.65	137.60	266.67	43.40	61.71	645.63	20
16	0.18	51.28	72.92	502.79	137.63	266.67	48.62	69.13	1115.94	20
17	0.22	51.30	72.95	502.96	137.55	266.67	48.52	68.99	1083.42	20
18	0.00	51.30	72.94	502.90	137.53	266.67	49.44	70.30	1342.33	20
20	0.00	51.60	73.38	505.93	137.67	266.67	49.98	71.06	1470.95	20

A.5 Fire Hydrant Coverage

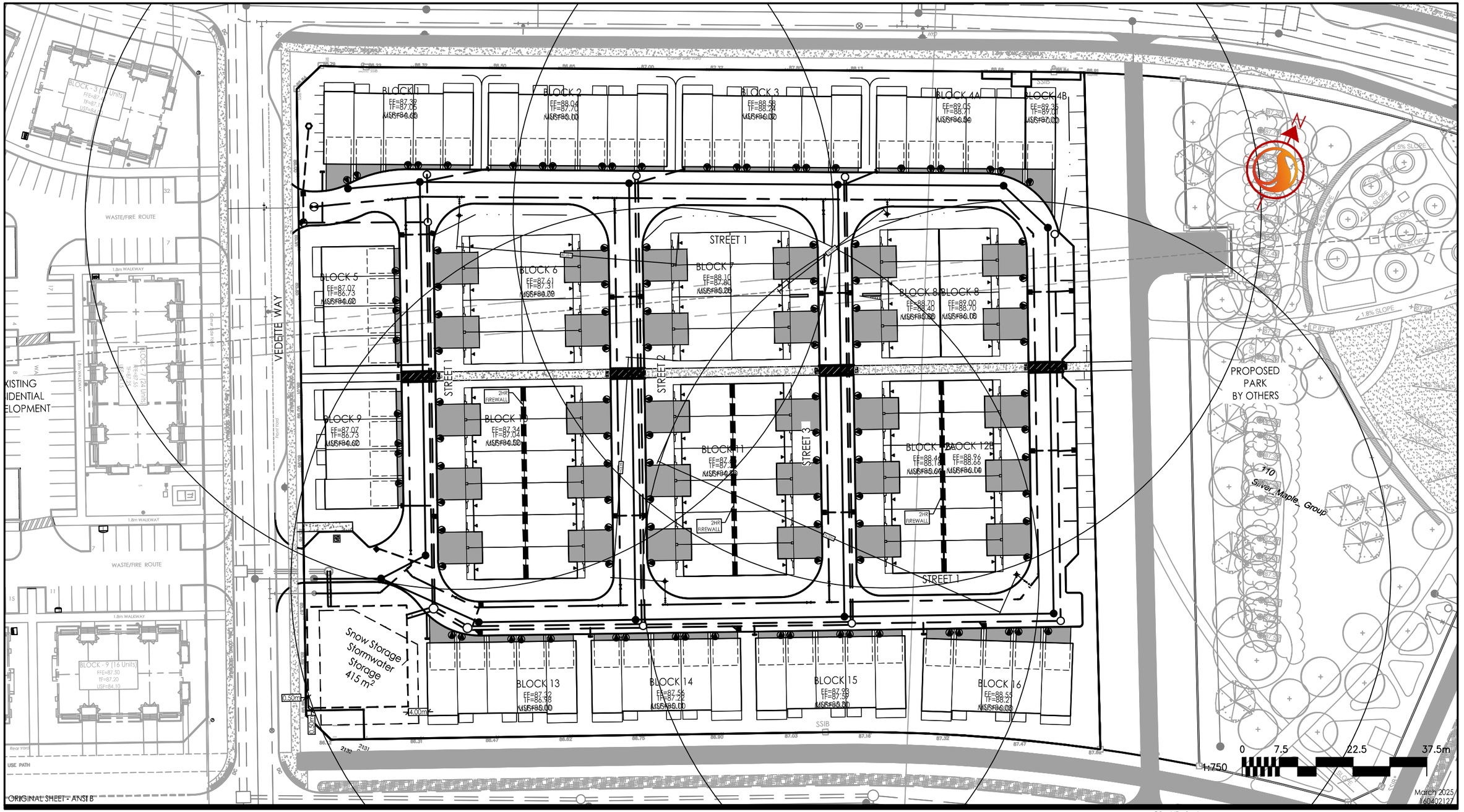
Stantec	Project:	**Wateridge Village Block 105**	160402127
	TABLE 1: FIRE HYDRANT COVERAGE TABLE		
	Revision: 01	Prepared By: MW	
	Revision Date: 2025-04-24	Checked By:	

Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Block 7					
Distance from building (m)	44.9	44.7	27.0	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	5,678	**17,034**	16,000

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.



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2025/04/24 12:39 PM By: Wu, Michael

Stantec

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

Legend

Notes

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Client/Project
MATTAMY HOMES
WATERIDGE VILLAGE
BLOCK 105

Figure No.
1.0

Title
BLOCK 7
FIRE HYDRANT COVERAGE SKETCH

Appendix B Wastewater Servicing

B.1 Sanitary Sewer Design Sheet

Stantec

SUBDIVISION: **Wateridge Block 105**

DATE: 2025-04-24
REVISION: 1
DESIGNED BY: JP
CHECKED BY: MW

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160402127

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)
R112B	112	106	0.05	0	1	0	3	0.05	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	0.05	0.05	0.0	0.0	12.4	200	PVC	SDR 35	0.80	29.9	**0.17%**	0.94
R106A	106	105	0.23	0	10	0	27	0.28	30	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.23	0.28	0.1	0.4	78.4	200	PVC	SDR 35	0.55	24.8	**1.80%**	0.78
R105A	105	104	0.15	0	7	0	19	0.43	49	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	0.15	0.43	0.1	0.7	42.5	200	PVC	SDR 35	2.64	54.4	**1.32%**	1.71
R111B	111	104	0.31	0	20	0	54	0.31	54	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	0.31	0.31	0.1	0.7	87.8	200	PVC	SDR 35	0.40	21.1	**3.50%**	0.67
R104A	104	103	0.13	0	6	0	16	0.87	119	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.87	0.3	1.7	42.4	200	PVC	SDR 35	0.40	21.1	**7.87%**	0.67
R110B	110	103	0.31	0	20	0	54	0.31	54	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	0.31	0.31	0.1	0.7	88.7	200	PVC	SDR 35	0.70	28.0	**2.65%**	0.88
R103A	103	102	0.10	0	5	0	14	1.28	186	3.53	2.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	1.28	0.4	2.6	31.9	200	PVC	SDR 35	0.40	21.1	**12.12%**	0.66
R102A	102	101	0.03	0	2	0	5	1.31	192	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	0.03	1.31	0.4	2.6	21.7	200	PVC	SDR 35	0.40	21.0	**12.46%**	0.66
R112A	112	111	0.10	0	5	0	14	0.10	14	3.72	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.10	0.0	0.2	33.7	200	PVC	SDR 35	0.70	28.0	**0.70%**	0.88
R111A	111	110	0.13	0	7	0	19	0.23	32	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.23	0.1	0.5	42.4	200	PVC	SDR 35	0.70	28.0	**1.65%**	0.88
R110A	110	108	0.13	0	6	0	16	0.36	49	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	0.13	0.36	0.1	0.7	42.5	200	PVC	SDR 35	0.40	21.2	**3.29%**	0.67
R109A	109	108	0.09	0	4	0	11	0.09	11	3.73	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	0.2	14.7	200	PVC	SDR 35	1.00	33.5	**0.48%**	1.05
R108A	108	107	0.34	0	18	0	49	0.79	108	3.59	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.34	0.79	0.3	1.5	75.9	200	PVC	SDR 35	0.50	23.6	**6.41%**	0.74
	107	101	0.00	0	0	0	0	0.79	108	3.59	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.79	0.3	1.5	10.2	200	PVC	SDR 35	0.40	21.1	**7.17%**	0.66
G101A	101	17	0.00	0	0	0	0	2.10	300	3.46	3.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	2.10	0.7	4.1	13.6	200	PVC	SDR 35	0.40	21.1	**19.18%**	0.67
																												200						

B.2 Background Report Excerpts

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

Report
32952-5.2.2

Former CFB Rockcliffe Master Servicing Study

IBI

Prepared for Canada Lands Company
by IBI Group
Revised August 2015
Revised June 2020

5 Wastewater Collection System

5.1 Introduction

The former CFB Rockcliffe combined sewer system has reached its useful life and the redevelopment of the site should include the construction of a new separated sewer system. The new sanitary sewers will be designed to not only collect wastewater from former CFB Rockcliffe but should also be oversized to carry wastewater from several external areas, some of which have previously been identified.

Capacity for wastewater flows from the Montfort Hospital and Thorncliffe Village should be provided in the new wastewater system in Rockcliffe. Combined sewage flows from the NRC Campus presently cross the former CFB Rockcliffe site and connect to the IOS sewer at the NRC Shaft. The existing easements for the NRC combined sewer will be protected as the subject site develops. However, if the NRC should complete its own separated sewer system in the future it is assumed that wastewater flows from the NRC Campus will connect directly to the IOS. No wastewater capacity in the proposed new sanitary sewer system for the former CFB Rockcliffe site will be provided for the NRC lands.

The existing Fairhaven development to the south of former CFB Rockcliffe is presently serviced with well and septic systems. Provision for potential future wastewater flows from that area should also be considered in the redevelopment site infrastructure.

As noted in **Section 2.4.2**, the Foxview development is presently serviced with sanitary sewers which outlet to the south. It is therefore proposed that the wastewater system for the subject redevelopment not provide capacity for Foxview.

Although not located inside the site boundaries, CLC has agreed to provide capacity in the proposed site infrastructure, including wastewater, for a 11.3 ha property located north of Hemlock Road. The site is identified as “Future Museum” on **Figure 1.2**. The property is in federal government ownership, which wishes to retain servicing capacity in the proposed site infrastructure to accommodate the needs of a future museum development. The site is partially located on the northern escarpment where existing ground contours range between 68 m and 86 m. The proposed wastewater collection system along Hemlock Road can partially service the site; however, because of the site topography, it is proposed that a separate sanitary sewer be constructed by the site owner at the time of site development and connect to and outlet at node 253A (City sewer node aw 00200) at an invert elevation of 61.69 m.

5.2 Design Criteria

Most of the existing sewers, both combined and sanitary, will be decommissioned while developing the site in favour of a separated sewer system which would include dedicated sewers for wastewater and storm runoff. The new site sanitary sewer system will be designed in accordance with the City of Ottawa Sewer Design Guidelines. These will include the following parameters:

- Average Residential Per Capital Flow Rate 350 l/c/day
- Residential Peaking Factor Harmon Formula (2.0 to 4.0)
- Average Employment Flow Rate 50,000 l/ha/d
- Average Institutional Flow Rate 50,000 l/ha/d
- ICI Peaking Factor 1.5

BLOCK NO.	UNITS									POPULATION
	SINGLES (3.4PPU)	SEMIS (2.7PPU)	TH FREEHOLD (2.7PPU)	TH STACKED (2.3PPU)	APARTMENTS (1.8PPU)				TOTAL	
					APT	LRA/ MU	MRA/ MU	HRA/ MU		
31							237		237	426.6
32							171		171	307.8
33							214		214	385.2
35							190		190	342.0
36							285		285	513.0
39							191		191	343.8
40				83					83	190.9
41				84					84	193.2
42			39						39	105.3
44						275			275	495.0
46			62						62	167.4
47				35					35	80.5
48				70					70	161.0
50				110					110	253.0
51				158					158	363.4
53				190					190	437.0
55			33						33	89.1
57				41					41	94.3
60								500	500	900.0
Total	**133**	**0**	**324**	**1284**	**0**	**693**	**1892**	**974**	**5300**	**10686.4**

5.3 Proposed Wastewater Plan

The recommended ultimate wastewater plan for former CFB Rockcliffe is included in **Figure 5.1**. Together with that figure, the supporting Sanitary Sewer Design Sheets and **Figure 5.2**, Sanitary Drainage Area Plan, are included in **Appendix D**. For quick reference, reduced copies of these figures are included herein.

The proposed plan indicates that wastewater from the subject site and some adjacent external areas will be directed to one of the proposed connection locations to the IOS. The limits of these sub-drainage areas are also indicated on **Figure 5.2**. The following **Table 5.2** summarizes the wastewater elements for each connection point.

Table 5.2 Proposed Macro Drainage Area Elements

CONNECTION LOCATION IOS SHAFT	FORMER CFB ROCKCLIFFE			EXTERNAL AREAS			TOTAL			TOTAL FLOW (L/S)
	AREA (HA)	POPU-LATION	ICI (HA)	AREA (HA)	POPU-LATION	ICI (HA)	AREA (HA)	POPU-LATION	ICI (HA)	
Peach Tree Lane	19.02	2544.2	0.00	0.0	0.0	19.69	19.02	2544.2	19.69	61.86
Codd's Road	68.28	7374.5	13.69	14.50	2112.2	0.0	82.78	9486.7	13.69	156.25
NRC	16.21	767.7	3.18	0.0	0.0	0.0	16.21	767.7	3.18	49.23
SWM Pond										
Total	**103.51**	**10686.4**	**16.87**	**14.50**	**2112.2**	**19.69**	**118.01**	**12798.6**	**36.56**	**267.34**

A wastewater allowance for 1,574 people covering 5.5 ha is proposed for Thorncliffe Village. The drainage limit is shown on **Figure 5.2** and the population estimate is taken from Drawing No. 12381 S1 prepared by J.L. Richards & Associates Ltd (dated 1991), a copy of which is included in **Appendix D**. Existing wastewater flows from Thorncliffe Village are discharged to an existing 300 mm diameter sewer in the location indicated on **Figure 2.13**. It is proposed to intercept and collect those flows near node 114A and route the proposed site sewers to the Codd's Road Shaft (refer to **Figure 5.1**).

Future external flows from the Fairhaven community are also planned to be routed to the site wastewater system at node 190A. In anticipation of potential urbanization of that development, it is proposed to install a 250 mm diameter sewer under the proposed Southwest Channel terminating at the south limit of the former CFB Rockcliffe site. A wastewater allowance of about 11 l/s will be provided for flows from the Fairhaven development.

Wastewater flows from the Montfort Hospital are currently directed into the Airbase Outlet Sewer located near the west portion of the former CFB Rockcliffe site. It is proposed to continue to accept the hospital wastewater flows in a new sanitary sewer starting at node 261A. Based on an average institutional flow allowance of 50,000 l/day/gross ha, peaked at 1.5, an allowance of about 10 l/s is proposed to be provided for the hospital.

Future wastewater flows from the proposed 11.3 ha museum site located north of Hemlock Road are proposed to be routed to the existing 750 mm diameter Airbase Sewer by the site owner at node 253A (City sewer node aw 00200) where it can connect at the existing elevation of 61.69 m. The minimum sewer size from the museum site will be 250 mm diameter.

The Aviation Museum currently discharges wastewater flows into the RCAF Pump Station which is located north of the Aviation Parkway, and north of former CFB Rockcliffe. The pump station currently delivers flows through a 200 mm diameter forcemain to an existing combined sewer near node 332A (City sewer node rc00900) where it is then routed by gravity through the RCAF Pull-Back Sewer to the IOS trunk sewer at the NRC shaft (node 333A).

Although the RCAF Pump Station has a capacity of about 29 l/s, most of the contributing drainage areas on the subject site above the north escarpment will be redeveloped and future wastewater flows from this area are proposed to be re-routed to the RCAF Pull-Back Sewer. The City of Ottawa has estimated that the RCAF pump station is accepting only about 2 l/s from the Aviation Museum, it is however recommended that capacity in the proposed new site sewers continue to provide an allowance of 29 l/s for the pump station. If things change between the present and the time Phase 3 is designed then the question of the pump station allowance can be revisited in the future.

Combined sewage from the NRC Campus currently connects to the IOS sewer at the NRC Shaft. Combined flows from the NRC Campus are routed to an existing overflow chamber (City sewer node nr00100) through two sewers which are partially located on the former CFB Rockcliffe property. Most of the combined flow from the south portion of the NRC lands are routed to the overflow structure in the future commercial block 56 and the open space block 45 (refer to **Figure 1.3**) via an existing 750 mm diameter sewer. Combined flows from the northern portion of the NRC Campus are routed to the overflow structure in an existing 300 mm diameter sewer. The existing overflow structure is designed to pass dry weather flows directly to the NRC shaft structure (City sewer node oc00100) and wet weather flows to the Ottawa River via a 900 mm diameter overflow pipe.

It is proposed to leave the two existing NRC combined sewers intact until such time that the NRC completes its own separation plan. No allowance will be provided in the proposed site sewers for future wastewater flows from the NRC site. If and when the NRC completes a separation plan, it is assumed that plan will include dedicated sewers within its site including a new direct connection to the NRC Shaft without any impact upon the subject site. At that time, the existing NRC combined sewers, which are located on the subject site, can be decommissioned.

5.4 Proposed Outlets

As shown in **Figure 5.1**, there are three proposed sanitary sewer outlets for the former CFB Rockcliffe redevelopment. It is proposed to construct three separate sanitary sewer networks with connections to either the Airbase Outlet Sewer, the Codd's Road Shaft or the NRC Shaft.

5.4.1 Airbase Outlet Sewer

The Airbase Outlet Sewer is shown on **Figure 2.13**. It consists of a 375 mm/750 mm diameter combined sewer located along the western edge of the former CFB Rockcliffe site. Besides providing an outlet for wastewater flow from the Montfort Hospital, it also collects combined sewage from the former Air Force base in areas west of Codd's Road. The existing sewer directs all flows to an existing overflow structure identified as node 255A (City sewer node aw00100) as indicated on **Figure 5.1**. The manhole structure at node 255A is designed to direct dry weather flows to the 300 mm diameter Airbase Pullback sewer and excess wet weather flows to a 900 mm diameter overflow pipe. Wet weather flows eventually outlet to the Ottawa River.

As part of the wastewater plan for the subject site, it is proposed to replace that portion of the existing Airbase Outlet Sewer that is located on site (i.e. between nodes 261A and 272A) as well as about another 120 m north of the subject site up to node 253A (City node aw00200)as indicated on **Figure 5.1**. The existing sewer between nodes 272A and 253A is at an elevation which is too high to permit a gravity outlet from the redeveloped Rockcliffe site without replacement.

It is proposed to continue to use the existing outlet sewer north of node 253A as shown on **Figure 5.1**. The existing invert at node 253A of the Airbase Outlet Sewer is about 61.89 m which is sufficiently deep to accommodate a gravity connection from the proposed site sanitary sewers. At node 253A, an existing 200 mm diameter combined sewer from Hemlock Road also connects to the Airbase Outlet Sewer. It is recommended that the 200 mm diameter pipe be disconnected and decommissioned from the existing structure. A future connection to node 253A is also proposed to carry wastewater from the 11.3 ha museum site. In a similar manner, it is recommended that the existing 900 mm diameter overflow pipe be disconnected from the node 255A structure and the manhole be re-benched. These latter works will ensure that only wastewater flows from the developed subject site will outlet to the Airbase Pull-Back Sewer.

5.4.2 Airbase Pullback Sewer

The existing Airbase Pullback Sewer is a 300 mm diameter pipe with an estimated full flow capacity of about 84 l/s. The sewer was reconstructed in about 2000 by the former Regional Municipality of Ottawa Carleton as part of the Alvin Heights Pull-Back Sewer Reconstruction. As per the Sanitary Sewer Design Sheet and the Sanitary Sewer Drainage Area Plan, both of which are included in **Appendix D**, an estimated peak wastewater flow of 62 l/s, which also includes an allowance for the future museum site, will be directed to the Airbase Pullback Sewer and eventually to the IOS trunk sewer.

5.4.3 Codd's Road Shaft

The Codd's Road Shaft location is indicated on **Figure 2.13**. This connection to the Interceptor Outfall Sewer was added in 1991 as part of the development of the Thorncliffe Village community. A dedicated sanitary sewer from that development collects wastewater and routes it directly to the IOS without any connections to the other existing sewers on the subject property. **Figure 2.14** provides a schematic of the existing Codd's Road Shaft details. Because the existing connection to this shaft delivers only wastewater flows and not combined sewage, there is no overflow at this shaft.

The connection includes a standard manhole with a 375 mm diameter inlet pipe. However, because the site is about 35 m above the Interceptor sewer, the manhole outlet includes a 300 mm diameter vertical steel casing sewer connecting directly to the Interceptor sewer. The existing manhole base elevation is approximately 83.00 m.

Based on the proposed wastewater plan, two connections to the existing manhole are proposed. However, these will both be lower than the existing manhole bottom so it is proposed to replace

the manhole with a new structure. **Figure 5.3** provides some preliminary details of the proposed new connection at the Codd's Road Shaft. Essentially, the current connection will be lowered as needed to accommodate the two new inlet sewers. The elements of the vertical outlet pipe will remain unchanged but will be adjusted to a lower elevation.

The estimated peak wastewater flow proposed to be connected to the Codd's Road Shaft is about 156 l/s. Based on the Ontario Building Code (Section 7.5.8.4, 2012) the capacity of a 300 mm diameter vertical pipe is 2700 GPM or 170 l/s. The OBC assumes only 29% of the pipe area is used by wastewater. A copy of Table 7.5.8.4 and Figure 13-7 from the OBC is included in **Appendix D**.

5.4.4 NRC Shaft

The third proposed connection to the IOS sewer is at the NRC Shaft where combined flows from the NRC property; wastewater flows from the Aviation Museum and combined flows from the eastern portion of the former airbase site are presently connected. **Figure 2.15** and **Figure 2.16** show the existing connection details.

Flows from the NRC Campus enter an existing overflow manhole structure from two separate combined sewers. The overflow structure is designed to direct dry weather flow to the nearby NRC Shaft drop structure which in turn connects to the IOS sewer. The overflow structure has a 900 mm diameter overflow pipe which directs larger wet weather flows away from the site to the Ottawa River. Besides the dry weather flows from the NRC overflow chamber, the drop manhole also receives flows from the 300 mm diameter RCAF Pullback Sewer. The drop manhole outlets through a vertical drop pipe directly to the Interceptor sewer located about 35 m below the drop manhole.

Both the NRC overflow chamber and adjacent incoming and outgoing overflow pipes are proposed not to be impacted by the proposed site development. The drop manhole is also proposed to remain as-is. Future separated flows from Phase 3 and the RCAF Pump Station are proposed to connect directly to the existing 300 mm diameter RCAF Pullback Sewer at a location about 40 m upstream of the NRC Shaft. The balance of the RCAF Pullback Sewer is proposed to be replaced as part of the future design of Block 44, which is considered the Special Design Area (Block 44, refer to **Figure 1.3**). The pullback sewer is connected to the NRC Shaft at an elevation of about 77.0 m. Existing ground is close to the 84.0 m contour, so the existing infrastructure is sufficiently deep to accept a new connection from the proposed site sanitary sewers.

The City has commented that the existing pullback sewer is located in a forested area. It is likely that every reasonable attempt will be made to retain existing significant vegetation. In that event the pullback sewer, as well as incoming pipes such as the pump station forcemain, may be relocated. Those decisions will be made at the time of final concepts and future design the Special Design Area.

The estimated peak wastewater flow proposed to be connected to the RCAF Pullback Sewer is 49 l/s. This includes an allowance of 29 l/s for the RCAF Pump Station. Based on a measured slope of 0.43%, the existing sewer has a capacity of about 63 l/s.

5.5 Phasing Requirements

Figure 1.6 shows the proposed phasing plan for development of former CFB Rockcliffe. Phase 1 will include about 82 ha of the central and eastern portions of the site and will be sub-phased into phases 1A and 1B. Phase 1A will include Codd's Road up to the Town Centre and most of the low density residential development areas west of Codd's Road; a school site and park. The Phase 1 wastewater sewers will also be sized to accept flows from about 14 ha of the western portion of

Phase 3. Wastewater flow from Blocks 29 to 32 is proposed to be collected and directed towards the Codd's Road Shaft.

Because of the need for multiple access points for watermains, vehicles and utility looping, Phase 1A will also include the extension of both Main Street and Burma Road. However, the latter streets are included in Phase 1A only for infrastructure redundancy. No developments along these streets are proposed until Phase 1B is completed. Phase 1A will also include capacity for potential future urbanization of the Fairhaven community as well as interception and collection of existing sanitary flows from Thorncliffe Village. All wastewater from Phase 1, and a portion of Phase 3, will be directed to the proposed reconstructed Codd's Road Shaft. **Figure 5.4**, which is included in **Appendix D**, shows the proposed wastewater plan for Phase 1A. For quick reference, a reduced copy of this figure is included herein.

The ultimate wastewater servicing plan for the subject site includes sanitary sewers in Burma Road. As part of the Phase 1A development, it is proposed to construct Burma Road from Montreal Road to Hemlock Road, including all proposed infrastructure. The Burma Road sanitary sewers in that portion of Burma Road are proposed to connect at node 108A and ultimately outlet westward to node 114A. However, the single loaded local road containing the 108A to 114A sanitary sewer is not planned for Phase 1A construction. Therefore, until Phase 1B is completed, the Burma Road Phase 1A sanitary sewer will remain out of service. Because this sanitary sewer will not be connected to any developments and therefore will not receive wastewater flows until Phase 1B is constructed, it is probable that it could fill with groundwater. To ensure water levels within this sanitary sewer do not surface, it is proposed to cap the sanitary sewer at the west leg (outlet side) of node 108A and construct a temporary drainage pipe designed to outlet to the new Burma Road SWM Facility. The "dry" sanitary sewers in Main Street will naturally outlet to the Codd's Road sewers at node 155A, thus ensuring they will not flood.

Phase 2 will include development of approximately 24 ha west of Phase 1. Wastewater flows from this phase will be directed to a new outlet sewer which will replace most of the existing 750 mm diameter Airbase Outlet Sewer located near the northwest of the subject site. Sanitary sewers in Phase 2 will also intercept and collect existing flows from the Montfort Hospital. The federal government may develop the museum site. Wastewater flows from that site can be collected and directed to the existing Airbase Outlet Sewer at node 253A as indicated on **Figure 5.1**.

Phase 3 will include development of the north and northeast portions of the site. Part of the wastewater in Phase 3 will be directed to the IOS via the new RCAF Pullback Sewer and the balance towards the Codd's Road Shaft via Phase 1 sewers. Also as stated earlier, a wastewater allowance will also be included for the RCAF Pump Station.

Development of Phase 1A will impact the existing Thorncliffe Village sanitary sewer. It is proposed to intercept that sewer at the new Codd's Road alignment near node 150A and convey flows in the new Phase 1A sanitary sewer to the IOS. The balance of the Thorncliffe Village sanitary sewer can remain active until Phase 1B is developed.

5.6 Ottawa Interceptor Sewer

The Ottawa Interceptor Sewer (IOS) is a 2.4 m diameter trunk sewer which carries combined sewage from a large portion of the City of Ottawa to the sewage treatment facility located several kilometres east of the subject site. The sewer bisects the subject site about 35 m below grade. The sewer has been in operation for about 50 years and the City is presently considering twinning the sewer to provide additional capacity and operational redundancy.

The City has not yet completed an Environmental Assessment for the proposed new trunk sewer. Present options are only preliminary and currently there is no work underway to develop and evaluate potential options. Twinning of the IOS is likely a generation away. Until the City advances

the twinning project, it is unknown if the new trunk sewer will be located below the subject site. The sewer could also be located in corridors either north or south of the former CFB Rockcliffe site. Even if the new sewer is ultimately constructed below the subject site, it will most likely be completed by trenchless technologies at similar elevations as the existing pipe.

The proposed development will commence as soon as the CDP, and supporting technical documents such as this report, are reviewed and approved. It is conceivable that the first development applications will be submitted in mid 2015 with construction of Phase 1A starting in 2015.

Through the development review process, a strata easement will be secured to protect the City's ability to access and maintain the existing IOS tunnel. As the CDP accommodates the existing shafts to the IOS within future City parks, full and final easements will be protected. A new permanent IOS shaft is also needed and is anticipated to be built within one of the proposed parks. This has been taken into account through the strategic location of parks where the additional shaft and associated maintenance staging areas would be required.

From an infrastructure perspective, the preferred location for the new IOS shaft has been identified as Parkette #5 – Centre Parkette (block 22), adjacent to the existing drop shaft. Other possible locations include the eastern edge of Park #4 – East Neighbourhood Park (block 45), west of the existing shaft, and the north-west corner of Park #3 – West Neighbourhood Park (block 10). Construction of the new shaft would last a few months and would require 2,000 – 3000 m^2 of staging area. The staging area would revert to park use upon completion of the shaft construction. Criteria for locating the new shaft will be based on consultation with affected stakeholders. If the new shaft is not located on City owned land, a full and final easement will be required for access to the new shaft.

The existing IOS tunnel will also be twinned with a second sewer tunnel in the future. Subject to the ultimate routing selected for the second tunnel and its associated shaft, a second subsurface strata easement may be required to protect for the possible routing of this second tunnel and for its associated access shaft. It is also anticipated that construction of the second sewer tunnel would take place after development and occupancy of surrounding land. Accordingly, the City will engage with affected stakeholders.

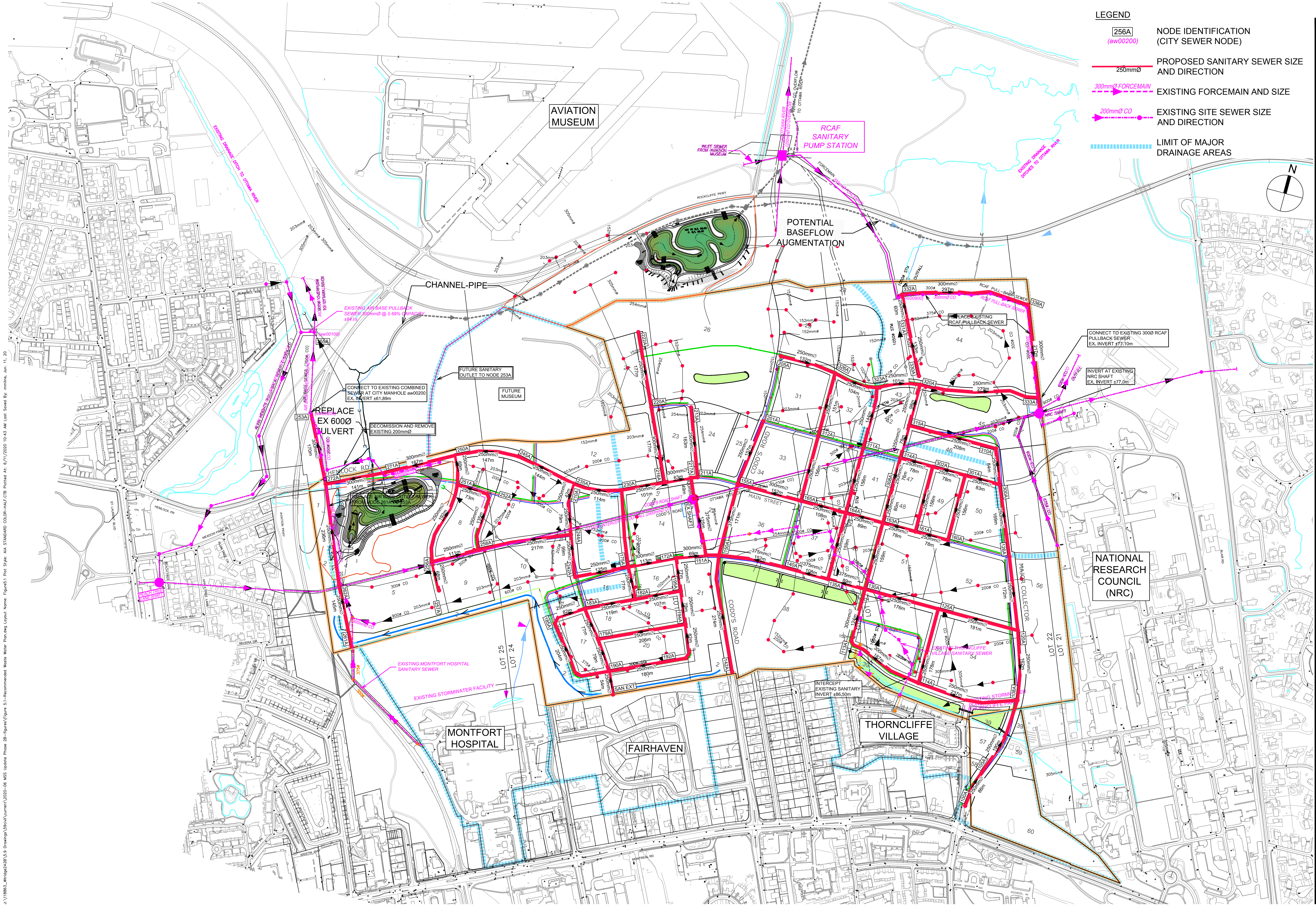
5.7 Cost Estimates

As stated earlier in this report, the proposed wastewater plan for the former CFB Rockcliffe site will make use of three different outlets. This means that the proposed plan will require only nominal size sanitary sewers with no sewer being larger than 375 mm diameter. Therefore, based on the current City of Ottawa's Development Charge By-Law, which only starts to share wastewater sewer costs for sewers sized 450 mm diameter and larger, no proposed sewers will be cost shared by the City. Accordingly, no cost estimates of the proposed wastewater system are provided in this report.

5.8 Conclusions

It is recommended that as part of the development of the former CFB Rockcliffe site that all existing combined sewers be replaced with dedicated wastewater and storm sewers. The new wastewater sewers will be designed using the criteria recommended by the City of Ottawa as noted in its Ottawa Design Guidelines for Sewers.

All wastewater flows from the former CFB Rockcliffe redevelopment will be directed to the Ottawa Interceptor Outfall Sewer (IOS), which is located on the site. Wastewater flows are proposed to be routed to one of the three existing connection shafts located either adjacent to or on the site. Flows from the western portion of the site are recommended to be directed to a new sanitary



IBI

Scale

Project Title

FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY

Drawing Title

RECOMMENDED WASTEWATER PLAN

Sheet No.

FIGURE 5.1

Appendix C Stormwater Management

C.1 Storm Sewer Design Sheet

Stantec

Wateridge Block 105

DATE: 2025-05-06
REVISION: 1
DESIGNED BY: JP
CHECKED BY: MW

FILE NUMBER: **160402127**

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
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min
BEDDING CLASS = B

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)
C1006A, C1006B	1006	1005	0.00	0.22	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.000	0.000	0.165	0.165	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	47.7	78.6	375	375	CIRCULAR	PVC	-	0.80	147.4	**32.39%**	1.40
C1005A	1005	1004	0.00	0.05	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.041	0.206	0.000	0.000	0.000	0.000	11.25	72.32	98.02	114.88	167.89	0.0	0.0	56.0	42.4	375	375	CIRCULAR	PVC	-	1.40	195.0	**28.72%**	1.85
																				11.78																
C1010A, C1010B	1010	1004	0.00	0.47	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.000	0.000	0.379	0.379	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	109.6	90.8	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	**58.29%**	1.15
																				11.48																
C1004A	1004	1003	0.00	0.10	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.075	0.660	0.000	0.000	0.000	0.000	11.78	70.58	95.64	112.07	163.77	0.0	0.0	175.3	42.4	600	600	CIRCULAR	CONCRETE	-	0.70	535.9	**32.71%**	1.84
																				12.29																
C1009B, C1009A	1009	1003	0.00	0.46	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.347	0.347	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	100.5	91.5	600	600	CIRCULAR	CONCRETE	-	0.40	405.1	**24.81%**	1.39
																				11.59																
C1003B	1003	1002	0.00	0.15	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.000	0.000	0.131	1.138	0.000	0.000	0.000	0.000	12.29	68.99	93.46	109.50	160.00	0.0	0.0	295.4	35.7	750	750	CIRCULAR	CONCRETE	-	0.50	821.2	**35.98%**	1.80
	1002	1001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.138	0.000	0.000	0.000	0.000	12.72	67.73	91.73	107.47	157.01	0.0	0.0	290.0	8.0	750	750	CIRCULAR	CONCRETE	-	0.50	821.2	**35.31%**	1.80
																				12.81																
C1008A	1008	1007	0.00	0.06	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.000	0.000	0.021	0.021	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	6.1	25.3	300	300	CIRCULAR	PVC	-	0.50	68.0	**9.02%**	0.97
																				10.86																
	1011	1007	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	9.7	300	300	CIRCULAR	PVC	-	1.00	96.2	**0.00%**	1.37
																				10.00																
C1007B, C1007A	1007	1001	0.00	0.39	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.296	0.317	0.000	0.000	0.000	0.000	10.86	73.66	99.87	117.05	171.09	0.0	0.0	87.9	78.6	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	**46.73%**	1.15
																				12.22																
	1001	1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.455	0.000	0.000	0.000	0.000	12.81	67.46	91.35	107.03	156.36	0.0	0.0	369.2	5.6	750	750	CIRCULAR	CONCRETE	-	0.50	818.0	**45.14%**	1.79
																				12.88									750	750						

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 C20
  WARNING 04: minimum elevation drop used for Conduit C20
  WARNING 03: negative offset ignored for Link C35
  WARNING 03: negative offset ignored for Link C36
  WARNING 03: negative offset ignored for Link C5
  WARNING 03: negative offset ignored for Link C6
  WARNING 03: negative offset ignored for Link C7
  WARNING 03: negative offset ignored for Link OL1

  *************
  Element Count
  *************
  Number of rain gages ...... 5
  Number of subcatchments ... 16
  Number of nodes ........... 51
  Number of links ........... 64
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                    Data       Recording
  Name                 Data Source                  Type       Interval
  ----------------------------------------------------------------------
  002                  CHI_002                      INTENSITY   10 min.
  005                  CHI_005                      INTENSITY   10 min.
  100                  CHI_100                      INTENSITY   10 min.
  120                  CHI_120                      INTENSITY   10 min.
  4_mm                 4_mm                         INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                         Area     Width   %Imperv    %Slope Rain Gage
 Outlet

-------------------------------------------------------------------------------
------------------------
  C1003B                       0.15    106.53     92.86    3.0000 100
 C1003B-S
  C1004A                       0.10     49.87     78.57    3.0000 100
 C1004A-S
  C1005A                       0.05     19.81     78.57    3.0000 100
```

C1005A-S					
C1006A	0.13	83.00	80.00	3.0000	100
C1006A-S					
C1006B	0.09	57.40	80.00	3.0000	100
C1006B-S					
C1007A	0.16	85.70	80.00	3.0000	100
C1007A-S1					
C1007B	0.23	144.90	78.57	3.0000	100
C1007B-S					
C1008A	0.06	39.17	25.71	3.0000	100
C1008A-S					
C1009A	0.22	143.64	78.57	3.0000	100
C1009A-S					
C1009B	0.25	158.10	78.57	3.0000	100
C1009B-S					
C1010A	0.21	145.53	78.57	3.0000	100
C1010A-S					
C1010B	0.26	157.38	92.86	3.0000	100
C1010B-S					
SWM	0.06	12.47	28.57	3.0000	100
SWM-S					
UNC-1	0.06	77.19	50.00	3.0000	100
Vedette_Overland					
UNC-2	0.08	159.96	22.86	3.0000	100
Hemlock					
UNC-3	0.07	138.38	22.86	3.0000	100
Mikinak					

****
Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX128	OUTFALL	81.95	0.82	0.0	
Hemlock	OUTFALL	86.29	0.00	0.0	
Mikinak	OUTFALL	86.14	0.00	0.0	
OF1	OUTFALL	85.71	0.32	0.0	
Vedette_N_Overland	OUTFALL	85.71	0.25	0.0	
Vedette_Overland	OUTFALL	85.55	0.00	0.0	
Vedette_S_Major	OUTFALL	85.55	0.33	0.0	
1001	STORAGE	82.72	3.57	0.0	
1002	STORAGE	82.83	3.41	0.0	
1003	STORAGE	83.09	3.56	0.0	
1004	STORAGE	83.53	3.64	0.0	
1005	STORAGE	84.20	3.74	0.0	
1006	STORAGE	84.89	3.34	0.0	
1007	STORAGE	83.33	2.95	0.0	
1008	STORAGE	83.61	2.73	0.0	

1009	STORAGE	83.45	3.78	0.0
1010	STORAGE	83.90	3.90	0.0
1011	STORAGE	83.58	2.82	0.0
C1003B-S	STORAGE	86.20	0.15	0.0
C1004A-S	STORAGE	86.85	0.15	0.0
C1005A-S	STORAGE	87.56	0.15	0.0
C1006A-S	STORAGE	88.09	0.15	0.0
C1006B-S	STORAGE	88.09	0.15	0.0
C1007A-S1	STORAGE	86.14	0.15	0.0
C1007A-S2	STORAGE	85.88	0.15	0.0
C1007B-S	STORAGE	86.18	0.15	0.0
C1008A-S	STORAGE	85.89	0.15	0.0
C1009A-S	STORAGE	86.24	0.15	0.0
C1009B-S	STORAGE	86.57	0.15	0.0
C1010A-S	STORAGE	86.72	0.15	0.0
C1010B-S	STORAGE	87.10	0.15	0.0
CB1008	STORAGE	85.72	0.15	0.0
EXCB	STORAGE	81.99	3.94	0.0
EXMH	STORAGE	81.99	3.79	0.0
SU1	STORAGE	85.95	0.15	0.0
SU10	STORAGE	88.30	0.15	0.0
SU11	STORAGE	87.47	0.15	0.0
SU12	STORAGE	86.91	0.15	0.0
SU13	STORAGE	87.98	0.15	0.0
SU14	STORAGE	87.11	0.15	0.0
SU15	STORAGE	86.55	0.15	0.0
SU16	STORAGE	86.45	0.18	0.0
SU2	STORAGE	86.27	0.15	0.0
SU3	STORAGE	86.37	0.15	0.0
SU4	STORAGE	88.00	0.15	0.0
SU5	STORAGE	86.64	0.15	0.0
SU6	STORAGE	87.17	0.15	0.0
SU7	STORAGE	88.17	0.15	0.0
SU8	STORAGE	86.26	0.15	0.0
SU9	STORAGE	88.19	0.15	0.0
SWM-S	STORAGE	82.80	3.39	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
1001-SWM-S	1001	SWM-S	CONDUIT	4.6	0.6106	0.0130
1002-1001	1002	1001	CONDUIT	8.0	0.5027	0.0130

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  1003-1002        1003             1002             CONDUIT          35.7
0.4988    0.0130
  1004-1003        1004             1003             CONDUIT          42.4
0.7007    0.0130
  1005-1004        1005             1004             CONDUIT          42.4
1.4000    0.0130
  1006-1005        1006             1005             CONDUIT          78.6
0.8001    0.0130
  1007-1001        1007             1001             CONDUIT          78.6
0.3997    0.0130
  1008-1007        1008             1007             CONDUIT          25.3
0.4987    0.0130
  1009-1003        1009             1003             CONDUIT          91.5
0.4001    0.0130
  1010-1004        1010             1004             CONDUIT          90.8
0.4000    0.0130
  1011-1007        1011             1007             CONDUIT           9.7
1.0033    0.0130
  C1               SU3              C1007A-S1        CONDUIT          27.8
0.8280    0.0130
  C10              SU7              SU4              CONDUIT          12.1
1.4051    0.0130
  C11              SU5              C1009A-S         CONDUIT          30.1
1.3299    0.0130
  C12              SU6              C1010A-S         CONDUIT          29.8
1.5102    0.0130
  C13              SU10             C1006A-S         CONDUIT          18.0
1.1680    0.0130
  C14              C1004A-S         SU15             CONDUIT          21.8
1.3782    0.0130
  C15              C1005A-S         SU14             CONDUIT          29.2
1.5434    0.0130
  C16              C1003B-S         SU8              CONDUIT          11.9
-0.5042    0.0130
  C17              SU8              C1007A-S2        CONDUIT          10.8
3.5371    0.0130
  C18              SU11             SU12             CONDUIT          42.5
1.3184    0.0130
  C19              SU12             SU16             CONDUIT          42.4
1.0847    0.0130
  C2               C1007A-S1        C1007A-S2        CONDUIT          10.9
2.3904    0.0130
  C20              SU10             C1006B-S         CONDUIT          14.3
0.0021    0.0130
  C21              SU11             C1010B-S         CONDUIT          21.1
1.7530    0.0130
  C22              C1010B-S         SU6              CONDUIT          14.7
-0.4752    0.0130
  C23              SU12             C1009B-S         CONDUIT          22.1
1.5359    0.0130
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  C24               C1009B-S          SU5               CONDUIT           14.4
-0.4851    0.0130
  C25               C1006A-S          SU9               CONDUIT           23.5
-0.4252    0.0130
  C26               SU9               C1005A-S          CONDUIT           15.6
4.0340    0.0130
  C27               SU13              C1005A-S          CONDUIT           19.8
2.1206    0.0130
  C28               SWM-S             EXCB              CONDUIT            7.1
1.4164    0.0100
  C29               C1010A-S          SU14              CONDUIT           20.6
-1.8963    0.0130
  C3                SU3               C1007B-S          CONDUIT           30.0
0.6325    0.0130
  C30               SU14              C1004A-S          CONDUIT           20.7
1.2555    0.0130
  C31               EXMH              EX128             CONDUIT           18.0
0.2222    0.0100
  C32               C1009A-S          SU15              CONDUIT           20.5
-1.5124    0.0130
  C33               SU15              C1003B-S          CONDUIT           30.5
1.1484    0.0130
  C34               SU1               Vedette_S_Major   CONDUIT           17.7
2.2630    0.0130
  C35               SU2               CB1008            CONDUIT           15.1
3.6472    0.0130
  C36               CB1008            OF1               CONDUIT            3.1
0.3268    0.0130
  C37               C1007A-S2         SU1               CONDUIT            2.9
-2.4313    0.0130
  C4                C1007B-S          SU16              CONDUIT            9.8
-2.7449    0.0130
  C5                SU16              SU2               CONDUIT            9.0
2.0026    0.0130
  C6                SU2               C1008A-S          CONDUIT           15.1
2.5190    0.0130
  C7                C1008A-S          Vedette_N_Overland CONDUIT             3.1
5.8926    0.0130
  C8                SU4               SU11              CONDUIT           30.8
1.7238    0.0130
  C9                C1006B-S          SU7               CONDUIT           14.4
-0.5556    0.0130
  OR1               EXCB              EXMH              ORIFICE
  W1                SWM-S             EXMH              WEIR
  OL1               C1005A-S          1005              OUTLET
  OL10              C1006B-S          1006              OUTLET
  OL11              C1006A-S          1006              OUTLET
  OL12              C1008A-S          1008              OUTLET
  OL13              CB1008            1008              OUTLET
  OL14              C1007A-S2         1001              OUTLET
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OL2	C1004A-S	1004	OUTLET
OL3	C1003B-S	1002	OUTLET
OL4	C1007A-S1	1001	OUTLET
OL5	C1007B-S	1007	OUTLET
OL6	C1009B-S	1009	OUTLET
OL7	C1009A-S	1009	OUTLET
OL8	C1010B-S	1010	OUTLET
OL9	C1010A-S	1010	OUTLET

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1001-SWM-S	CIRCULAR	0.75	0.44	0.19	0.75	1	869.95
1002-1001	CIRCULAR	0.75	0.44	0.19	0.75	1	789.38
1003-1002	CIRCULAR	0.75	0.44	0.19	0.75	1	786.29
1004-1003	CIRCULAR	0.60	0.28	0.15	0.60	1	514.01
1005-1004	CIRCULAR	0.38	0.11	0.09	0.38	1	207.46
1006-1005	CIRCULAR	0.38	0.11	0.09	0.38	1	156.84
1007-1001	CIRCULAR	0.45	0.16	0.11	0.45	1	180.26
1008-1007	CIRCULAR	0.30	0.07	0.07	0.30	1	68.29
1009-1003	CIRCULAR	0.60	0.28	0.15	0.60	1	388.38
1010-1004	CIRCULAR	0.45	0.16	0.11	0.45	1	180.33
1011-1007	CIRCULAR	0.30	0.07	0.07	0.30	1	96.86
C1	ROW-Narrow	0.37	3.25	0.17	15.35	1	7021.69
C10	ROW-NS	0.34	2.79	0.17	14.20	1	7811.09
C11	ROW-Wide	0.33	2.90	0.14	18.50	1	6859.95
C12	ROW-Wide	0.33	2.90	0.14	18.50	1	7310.27

C13	ROW-East	0.65	8.28	0.26	20.27	1
28146.30						
C14	ROW-NS	0.34	2.79	0.17	14.20	1
7735.90						
C15	ROW-NS	0.34	2.79	0.17	14.20	1
8186.48						
C16	ROW-NS	0.34	2.79	0.17	14.20	1
4679.11						
C17	ROW-NS	0.34	2.79	0.17	14.20	1
12393.16						
C18	ROW-NS	0.34	2.79	0.17	14.20	1
7566.23						
C19	ROW-NS	0.34	2.79	0.17	14.20	1
6863.04						
C2	ROW-Narrow	0.37	3.25	0.17	15.35	1
11930.84						
C20	ROW-East	0.65	8.28	0.26	20.27	1
1202.35						
C21	ROW-Wide	0.33	2.90	0.14	18.50	1
7875.91						
C22	ROW-Wide	0.33	2.90	0.14	18.50	1
4100.72						
C23	ROW-Wide	0.33	2.90	0.14	18.50	1
7372.03						
C24	ROW-Wide	0.33	2.90	0.14	18.50	1
4143.13						
C25	ROW-East	0.65	8.28	0.26	20.27	1
16981.46						
C26	ROW-NS	0.34	2.79	0.17	14.20	1
13235.06						
C27	ROW-NS	0.34	2.79	0.17	14.20	1
9595.99						
C28	CIRCULAR	0.60	0.28	0.15	0.60	1
950.02						
C29	ROW-Wide	0.33	2.90	0.14	18.50	1
8191.52						
C3	ROW-Narrow	0.37	3.25	0.17	15.35	1
6137.17						
C30	ROW-NS	0.34	2.79	0.17	14.20	1
7383.67						
C31	CIRCULAR	0.82	0.53	0.21	0.82	1
879.73						
C32	ROW-Wide	0.33	2.90	0.14	18.50	1
7315.42						
C33	ROW-NS	0.34	2.79	0.17	14.20	1
7061.54						
C34	ROW-Wide	0.33	2.90	0.14	18.50	1
8948.60						
C35	ROW-Northwest-S	0.32	1.41	0.13	9.12	1
5329.31						

C36	ROW-Northwest-S	0.32	1.41	0.13	9.12	1
1595.26						
C37	ROW-NS	0.34	2.79	0.17	14.20	1
10274.85						
C4	ROW-Narrow	0.37	3.25	0.17	15.35	1
12785.06						
C5	ROW-NS	0.34	2.79	0.17	14.20	1
9325.21						
C6	ROW-Northwest-N	0.25	0.83	0.14	6.65	1
2694.84						
C7	ROW-Northwest-N	0.25	0.83	0.14	6.65	1
4121.63						
C8	ROW-NS	0.34	2.79	0.17	14.20	1
8651.80						
C9	ROW-East	0.65	8.28	0.26	20.27	1
19411.48						

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Transect Summary
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Transect ROW-East
Area:

0.0003	0.0014	0.0031	0.0054	0.0085
0.0123	0.0171	0.0232	0.0308	0.0397
0.0499	0.0616	0.0747	0.0892	0.1042
0.1193	0.1346	0.1501	0.1664	0.1835
0.2014	0.2201	0.2397	0.2600	0.2813
0.3033	0.3261	0.3498	0.3743	0.3997
0.4258	0.4528	0.4806	0.5092	0.5386
0.5684	0.5983	0.6283	0.6585	0.6888
0.7193	0.7499	0.7807	0.8116	0.8426
0.8738	0.9051	0.9366	0.9682	1.0000

Hrad:

0.0240	0.0480	0.0721	0.0961	0.1201
0.1441	0.1640	0.1815	0.1991	0.2175
0.2367	0.2568	0.2772	0.2915	0.3372
0.3821	0.4262	0.4694	0.5096	0.5462
0.5795	0.6099	0.6375	0.6626	0.6854
0.7061	0.7250	0.7421	0.7577	0.7719
0.7848	0.7966	0.8073	0.8170	0.8260
0.8355	0.8455	0.8561	0.8670	0.8782
0.8897	0.9015	0.9134	0.9255	0.9377
0.9501	0.9625	0.9749	0.9874	1.0000

Width:

0.0214	0.0428	0.0641	0.0855	0.1069
0.1297	0.1725	0.2153	0.2580	0.3008
0.3435	0.3884	0.4356	0.4684	0.4730
0.4775	0.4820	0.4978	0.5237	0.5496

0.5755 0.6014 0.6273 0.6532 0.6791
0.7050 0.7309 0.7568 0.7827 0.8086
0.8345 0.8604 0.8862 0.9121 0.9323
0.9368 0.9413 0.9458 0.9503 0.9548
0.9594 0.9639 0.9684 0.9729 0.9774
0.9819 0.9865 0.9910 0.9955 1.0000

Transect ROW-Narrow
Area:
0.0006 0.0023 0.0052 0.0092 0.0144
0.0207 0.0282 0.0369 0.0466 0.0576
0.0697 0.0829 0.0973 0.1126 0.1281
0.1435 0.1589 0.1743 0.1897 0.2051
0.2210 0.2381 0.2563 0.2756 0.2961
0.3174 0.3392 0.3616 0.3846 0.4082
0.4324 0.4571 0.4824 0.5082 0.5347
0.5617 0.5893 0.6174 0.6462 0.6755
0.7053 0.7358 0.7668 0.7984 0.8306
0.8633 0.8966 0.9305 0.9650 1.0000
Hrad:
0.0210 0.0420 0.0631 0.0841 0.1051
0.1261 0.1472 0.1682 0.1892 0.2102
0.2312 0.2523 0.2733 0.3068 0.3480
0.3891 0.4300 0.4707 0.5112 0.5516
0.5910 0.6260 0.6568 0.6836 0.7068
0.7279 0.7478 0.7666 0.7843 0.8011
0.8169 0.8319 0.8461 0.8595 0.8722
0.8843 0.8956 0.9064 0.9167 0.9264
0.9356 0.9443 0.9526 0.9605 0.9679
0.9750 0.9818 0.9882 0.9942 1.0000
Width:
0.0326 0.0652 0.0978 0.1304 0.1630
0.1956 0.2282 0.2608 0.2934 0.3261
0.3587 0.3913 0.4239 0.4365 0.4365
0.4365 0.4365 0.4365 0.4365 0.4365
0.4663 0.4988 0.5312 0.5636 0.5945
0.6107 0.6269 0.6431 0.6593 0.6756
0.6918 0.7080 0.7242 0.7405 0.7567
0.7729 0.7891 0.8053 0.8216 0.8378
0.8540 0.8702 0.8864 0.9027 0.9189
0.9351 0.9513 0.9676 0.9838 1.0000

Transect ROW-Northwest-N
Area:
0.0005 0.0020 0.0045 0.0080 0.0125
0.0179 0.0244 0.0319 0.0404 0.0499
0.0603 0.0718 0.0842 0.0977 0.1122
0.1276 0.1441 0.1615 0.1800 0.1994
0.2195 0.2396 0.2597 0.2799 0.3000
0.3201 0.3402 0.3603 0.3805 0.4006

0.4211 0.4426 0.4651 0.4886 0.5131
0.5385 0.5650 0.5925 0.6210 0.6504
0.6809 0.7124 0.7448 0.7783 0.8128
0.8482 0.8847 0.9221 0.9606 1.0000
Hrad:
0.0175 0.0350 0.0526 0.0701 0.0876
0.1051 0.1227 0.1402 0.1577 0.1752
0.1928 0.2103 0.2278 0.2453 0.2629
0.2804 0.2979 0.3154 0.3330 0.3505
0.3819 0.4163 0.4506 0.4848 0.5189
0.5530 0.5869 0.6207 0.6544 0.6880
0.7215 0.7525 0.7811 0.8074 0.8313
0.8531 0.8729 0.8908 0.9070 0.9215
0.9345 0.9460 0.9563 0.9654 0.9734
0.9804 0.9865 0.9917 0.9962 1.0000
Width:
0.0250 0.0499 0.0749 0.0998 0.1248
0.1498 0.1747 0.1997 0.2247 0.2496
0.2746 0.2995 0.3245 0.3495 0.3744
0.3994 0.4244 0.4493 0.4743 0.4992
0.5038 0.5038 0.5038 0.5038 0.5038
0.5038 0.5038 0.5038 0.5038 0.5038
0.5257 0.5507 0.5756 0.6006 0.6256
0.6505 0.6755 0.7005 0.7254 0.7504
0.7753 0.8003 0.8253 0.8502 0.8752
0.9002 0.9251 0.9501 0.9750 1.0000

Transect ROW-Northwest-S
Area:
0.0005 0.0020 0.0044 0.0079 0.0123
0.0177 0.0241 0.0315 0.0399 0.0492
0.0596 0.0709 0.0832 0.0965 0.1108
0.1259 0.1413 0.1566 0.1719 0.1872
0.2025 0.2178 0.2331 0.2487 0.2653
0.2829 0.3014 0.3210 0.3415 0.3630
0.3855 0.4090 0.4334 0.4589 0.4853
0.5127 0.5412 0.5705 0.6009 0.6323
0.6646 0.6979 0.7322 0.7675 0.8038
0.8411 0.8793 0.9186 0.9588 1.0000
Hrad:
0.0241 0.0481 0.0722 0.0963 0.1203
0.1444 0.1685 0.1925 0.2166 0.2407
0.2647 0.2888 0.3129 0.3369 0.3610
0.3953 0.4417 0.4878 0.5335 0.5789
0.6239 0.6686 0.7130 0.7567 0.7963
0.8314 0.8624 0.8896 0.9133 0.9337
0.9512 0.9660 0.9785 0.9889 0.9974
1.0042 1.0095 1.0135 1.0163 1.0180
1.0189 1.0189 1.0183 1.0170 1.0152
1.0129 1.0101 1.0071 1.0037 1.0000

Width:

0.0236	0.0472	0.0708	0.0945	0.1181
0.1417	0.1653	0.1889	0.2125	0.2362
0.2598	0.2834	0.3070	0.3306	0.3542
0.3671	0.3671	0.3671	0.3671	0.3671
0.3671	0.3671	0.3671	0.3860	0.4096
0.4332	0.4568	0.4804	0.5041	0.5277
0.5513	0.5749	0.5985	0.6221	0.6458
0.6694	0.6930	0.7166	0.7402	0.7638
0.7875	0.8111	0.8347	0.8583	0.8819
0.9055	0.9292	0.9528	0.9764	1.0000

Transect ROW-NS

Area:

0.0006	0.0023	0.0051	0.0091	0.0142
0.0205	0.0279	0.0364	0.0461	0.0569
0.0689	0.0820	0.0962	0.1115	0.1279
0.1445	0.1611	0.1777	0.1943	0.2108
0.2274	0.2440	0.2615	0.2801	0.2998
0.3206	0.3424	0.3647	0.3876	0.4111
0.4351	0.4597	0.4849	0.5107	0.5370
0.5639	0.5913	0.6193	0.6479	0.6771
0.7068	0.7371	0.7680	0.7994	0.8314
0.8640	0.8972	0.9309	0.9651	1.0000

Hrad:

0.0196	0.0392	0.0588	0.0783	0.0979
0.1175	0.1371	0.1567	0.1763	0.1959
0.2154	0.2350	0.2546	0.2742	0.3020
0.3405	0.3788	0.4170	0.4550	0.4928
0.5305	0.5682	0.6039	0.6357	0.6638
0.6886	0.7110	0.7323	0.7523	0.7713
0.7893	0.8063	0.8225	0.8378	0.8523
0.8661	0.8791	0.8915	0.9033	0.9145
0.9251	0.9352	0.9448	0.9539	0.9626
0.9708	0.9787	0.9861	0.9932	1.0000

Width:

0.0324	0.0648	0.0972	0.1296	0.1620
0.1944	0.2268	0.2592	0.2915	0.3239
0.3563	0.3887	0.4211	0.4535	0.4718
0.4718	0.4718	0.4718	0.4718	0.4718
0.4718	0.4803	0.5127	0.5451	0.5775
0.6099	0.6275	0.6437	0.6599	0.6761
0.6923	0.7085	0.7246	0.7408	0.7570
0.7732	0.7894	0.8056	0.8218	0.8380
0.8542	0.8704	0.8866	0.9028	0.9190
0.9352	0.9514	0.9676	0.9838	1.0000

Transect ROW-Wide

Area:

0.0005	0.0020	0.0044	0.0079	0.0123

```
            0.0177     0.0241     0.0315     0.0398     0.0492
            0.0595     0.0708     0.0831     0.0964     0.1107
            0.1257     0.1408     0.1560     0.1711     0.1862
            0.2013     0.2164     0.2315     0.2472     0.2639
            0.2815     0.3001     0.3197     0.3403     0.3619
            0.3845     0.4080     0.4325     0.4580     0.4845
            0.5120     0.5405     0.5699     0.6004     0.6318
            0.6642     0.6975     0.7319     0.7673     0.8036
            0.8409     0.8792     0.9185     0.9587     1.0000
Hrad:
            0.0229     0.0459     0.0688     0.0917     0.1147
            0.1376     0.1606     0.1835     0.2064     0.2294
            0.2523     0.2752     0.2982     0.3211     0.3441
            0.3811     0.4261     0.4709     0.5156     0.5601
            0.6044     0.6486     0.6927     0.7355     0.7739
            0.8083     0.8388     0.8657     0.8893     0.9099
            0.9278     0.9432     0.9564     0.9675     0.9770
            0.9848     0.9912     0.9964     1.0004     1.0035
            1.0057     1.0072     1.0079     1.0081     1.0077
            1.0069     1.0057     1.0041     1.0022     1.0000
Width:
            0.0236     0.0471     0.0707     0.0943     0.1178
            0.1414     0.1650     0.1885     0.2121     0.2357
            0.2592     0.2828     0.3064     0.3299     0.3535
            0.3622     0.3622     0.3622     0.3622     0.3622
            0.3622     0.3622     0.3637     0.3872     0.4108
            0.4344     0.4579     0.4815     0.5051     0.5286
            0.5522     0.5758     0.5994     0.6229     0.6465
            0.6701     0.6936     0.7172     0.7408     0.7643
            0.7879     0.8115     0.8350     0.8586     0.8822
            0.9057     0.9293     0.9529     0.9764     1.0000


****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 03/26/2025 00:00:00
Ending Date .............. 03/27/2025 00:00:00
```

```
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 ....... 5.00 sec
Variable Time Step ...... NO
Maximum Trials .......... 8
Number of Threads ....... 16
Head Tolerance .......... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.156	71.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.025	11.413
Surface Runoff	0.129	59.199
Final Storage	0.003	1.164
Continuity Error (%)	-0.153	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.129	1.288
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.124	1.244
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	0.004	0.040
Continuity Error (%)	0.317	

```
************************
Highest Continuity Errors
************************
Node 1010 (2.71%)
```

```
******************************
Highest Flow Instability Indexes
******************************
All links are stable.
```

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


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     5.00 sec
  Average Time Step           :     5.00 sec
  Maximum Time Step           :     5.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.04
  % of Steps Not Converging   :     0.04


  **************************
  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

-------------------------------------------------------------------------------
-----------------------------------------
  C1003B                    71.67       0.00       0.00       3.12      65.20
2.01      67.20        0.10    75.62   0.938
  C1004A                    71.67       0.00       0.00       9.44      55.16
5.94      61.10        0.06    48.05   0.853
  C1005A                    71.67       0.00       0.00       9.46      55.15
5.91      61.07        0.03    25.86   0.852
  C1006A                    71.67       0.00       0.00       8.79      56.17
5.57      61.74        0.08    62.31   0.861
  C1006B                    71.67       0.00       0.00       8.79      56.17
5.57      61.74        0.05    42.15   0.862
  C1007A                    71.67       0.00       0.00       8.80      56.17
5.55      61.72        0.10    79.04   0.861
  C1007B                    71.67       0.00       0.00       9.42      55.17
5.96      61.13        0.14   109.21   0.853
  C1008A                    71.67       0.00       0.00      33.09      18.05
20.20      38.24        0.02    22.03   0.534
```

```
  C1009A                    71.67       0.00       0.00       9.42      55.17
5.96      61.13        0.13   104.32   0.853
  C1009B                    71.67       0.00       0.00       9.42      55.17
5.96      61.13        0.15   117.98   0.853
  C1010A                    71.67       0.00       0.00       9.41      55.17
5.97      61.14        0.13   102.13   0.853
  C1010B                    71.67       0.00       0.00       3.13      65.19
2.01      67.20        0.17   126.72   0.938
  SWM                       71.67       0.00       0.00      32.91      20.06
18.30      38.36        0.02    16.46   0.535
  UNC-1                     71.67       0.00       0.00      21.99      35.09
13.89      48.98        0.03    26.12   0.684
  UNC-2                     71.67       0.00       0.00      33.95      16.03
21.41      37.44        0.03    36.10   0.522
  UNC-3                     71.67       0.00       0.00      33.96      16.03
21.41      37.44        0.03    31.85   0.522


  ******************
  Node Depth Summary
  ******************

  ----------------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max    Reported
                                Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type    Meters   Meters   Meters  days hr:min      Meters
  ----------------------------------------------------------------------------
  EX128                OUTFALL   0.02     0.36    82.31     0  01:15        0.36
  Hemlock              OUTFALL   0.00     0.00    86.29     0  00:00        0.00
  Mikinak              OUTFALL   0.00     0.00    86.14     0  00:00        0.00
  OF1                  OUTFALL   0.00     0.00    85.71     0  00:00        0.00
  Vedette_N_Overland   OUTFALL   0.00     0.03    85.74     0  01:10        0.03
  Vedette_Overland     OUTFALL   0.00     0.00    85.55     0  00:00        0.00
  Vedette_S_Major      OUTFALL   0.00     0.03    85.58     0  01:10        0.03
  1001                 STORAGE   0.33     1.35    84.07     0  01:12        1.35
  1002                 STORAGE   0.32     1.31    84.15     0  01:11        1.31
  1003                 STORAGE   0.27     1.14    84.23     0  01:11        1.13
  1004                 STORAGE   0.17     0.80    84.33     0  01:11        0.80
  1005                 STORAGE   0.31     0.51    84.71     0  01:10        0.51
  1006                 STORAGE   0.29     0.53    85.42     0  01:10        0.53
  1007                 STORAGE   0.31     0.77    84.10     0  01:11        0.76
  1008                 STORAGE   0.30     0.50    84.10     0  01:11        0.49
  1009                 STORAGE   0.31     0.91    84.36     0  01:10        0.91
  1010                 STORAGE   0.31     1.10    85.00     0  01:10        1.09
  1011                 STORAGE   0.29     0.53    84.11     0  01:11        0.52
  C1003B-S             STORAGE   0.00     0.09    86.29     0  01:10        0.09
  C1004A-S             STORAGE   0.00     0.05    86.90     0  01:10        0.05
  C1005A-S             STORAGE   0.00     0.03    87.59     0  01:10        0.03
  C1006A-S             STORAGE   0.00     0.08    88.17     0  01:10        0.08
  C1006B-S             STORAGE   0.00     0.07    88.16     0  01:10        0.07
```

C1007A-S1	STORAGE	0.00	0.05	86.19	0	01:10	0.05
C1007A-S2	STORAGE	0.00	0.10	85.98	0	01:10	0.10
C1007B-S	STORAGE	0.00	0.11	86.29	0	01:10	0.11
C1008A-S	STORAGE	0.00	0.03	85.92	0	01:10	0.03
C1009A-S	STORAGE	0.00	0.13	86.37	0	01:10	0.13
C1009B-S	STORAGE	0.00	0.11	86.68	0	01:10	0.11
C1010A-S	STORAGE	0.00	0.12	86.84	0	01:10	0.12
C1010B-S	STORAGE	0.00	0.11	87.21	0	01:10	0.11
CB1008	STORAGE	0.00	0.00	85.72	0	00:00	0.00
EXCB	STORAGE	0.51	1.99	83.98	0	01:15	1.99
EXMH	STORAGE	0.02	0.37	82.36	0	01:14	0.37
SU1	STORAGE	0.00	0.03	85.98	0	01:10	0.03
SU10	STORAGE	0.00	0.00	88.30	0	00:00	0.00
SU11	STORAGE	0.00	0.00	87.47	0	00:00	0.00
SU12	STORAGE	0.00	0.00	86.91	0	00:00	0.00
SU13	STORAGE	0.00	0.00	87.98	0	00:00	0.00
SU14	STORAGE	0.00	0.02	87.13	0	01:10	0.02
SU15	STORAGE	0.00	0.03	86.58	0	01:10	0.03
SU16	STORAGE	0.00	0.00	86.45	0	00:00	0.00
SU2	STORAGE	0.00	0.00	86.27	0	00:00	0.00
SU3	STORAGE	0.00	0.00	86.37	0	00:00	0.00
SU4	STORAGE	0.00	0.00	88.00	0	00:00	0.00
SU5	STORAGE	0.00	0.03	86.67	0	01:10	0.03
SU6	STORAGE	0.00	0.03	87.20	0	01:10	0.03
SU7	STORAGE	0.00	0.00	88.17	0	00:00	0.00
SU8	STORAGE	0.00	0.03	86.29	0	01:10	0.03
SU9	STORAGE	0.00	0.00	88.19	0	00:00	0.00
SWM-S	STORAGE	0.16	1.19	83.99	0	01:15	1.19

****
Node Inflow Summary
****

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
EX128	OUTFALL	0.00	371.16	0 01:15	0	1.13	0.000

```
  Hemlock              OUTFALL      36.10    36.10     0  01:10       0.031
0.031       0.000
  Mikinak              OUTFALL      31.85    31.85     0  01:10      0.0274
0.0274       0.000
  OF1                  OUTFALL       0.00     0.00     0  00:00           0
  0       0.000 ltr
  Vedette_N_Overland   OUTFALL       0.00    17.76     0  01:10           0
0.0138       0.000
  Vedette_Overland     OUTFALL      26.12    26.12     0  01:10       0.028
0.028       0.000
  Vedette_S_Major      OUTFALL       0.00    19.95     0  01:10           0
0.00906       0.000
  1001                 STORAGE       0.00   777.42     0  01:09           0
1.15      -0.032
  1002                 STORAGE       0.00   614.85     0  01:10           0
0.905      -0.007
  1003                 STORAGE       0.00   561.29     0  01:10           0
0.783      -0.506
  1004                 STORAGE       0.00   356.73     0  01:09           0
0.47      -0.651
  1005                 STORAGE       0.00   109.27     0  01:10           0
0.145       0.513
  1006                 STORAGE       0.00   104.38     0  01:10           0
0.134       0.021
  1007                 STORAGE       0.00   112.85     0  01:09           0
0.147       0.982
  1008                 STORAGE       0.00     7.21     0  01:10           0
0.00772       0.262
  1009                 STORAGE       0.00   243.77     0  01:10           0
0.311       0.216
  1010                 STORAGE       0.00   238.13     0  01:10           0
0.315       2.784
  1011                 STORAGE       0.00     8.44     0  01:07           0
0.00102      -2.112
  C1003B-S             STORAGE      75.62    97.54     0  01:10       0.103
0.127      -0.061
  C1004A-S             STORAGE      48.05    57.29     0  01:10      0.0613
0.0709      -0.078
  C1005A-S             STORAGE      25.86    25.86     0  01:10      0.0332
0.0332      -0.063
  C1006A-S             STORAGE      62.31    62.31     0  01:10      0.0799
0.0799      -0.007
  C1006B-S             STORAGE      42.15    42.15     0  01:10      0.0541
0.0541      -0.017
  C1007A-S1            STORAGE      79.04    79.04     0  01:10       0.102
0.102      -0.067
  C1007A-S2            STORAGE       0.00    86.37     0  01:10           0
0.09       0.059
  C1007B-S             STORAGE     109.21   109.21     0  01:10       0.139
0.139      -0.001
```

```
  C1008A-S             STORAGE      22.03    22.03     0  01:10      0.0213
0.0213       0.002
  C1009A-S             STORAGE     104.32   146.06     0  01:10       0.133
0.168      -0.015
  C1009B-S             STORAGE     117.98   117.98     0  01:10        0.15
0.151      -0.055
  C1010A-S             STORAGE     102.13   133.52     0  01:10        0.13
0.152      -0.010
  C1010B-S             STORAGE     126.72   126.72     0  01:10       0.173
0.174      -0.054
  CB1008               STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  EXCB                 STORAGE       0.00   372.15     0  01:15           0
1.14       0.039
  EXMH                 STORAGE       0.00   371.14     0  01:15           0
1.13       0.011
  SU1                  STORAGE       0.00    19.98     0  01:10           0
0.0091       0.188
  SU10                 STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU11                 STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU12                 STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU13                 STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU14                 STORAGE       0.00    20.63     0  01:10           0
0.0214       0.401
  SU15                 STORAGE       0.00    47.40     0  01:10           0
0.0514       0.215
  SU16                 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
  SU3                  STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU4                  STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU5                  STORAGE       0.00    16.63     0  01:10           0
0.00814       1.544
  SU6                  STORAGE       0.00    20.14     0  01:10           0
0.011       1.036
  SU7                  STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SU8                  STORAGE       0.00    17.04     0  01:10           0
0.00902       0.482
  SU9                  STORAGE       0.00     0.00     0  00:00           0
  0       0.000 ltr
  SWM-S                STORAGE      16.46   785.48     0  01:09      0.0213
1.17       -0.042
```

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

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
1001	0.001	9.2	0.0	0.0	0.002	37.8	0 01:12	769.92
1002	0.001	9.5	0.0	0.0	0.002	38.5	0 01:11	604.58
1003	0.000	7.6	0.0	0.0	0.001	32.0	0 01:11	534.50
1004	0.000	4.8	0.0	0.0	0.001	22.0	0 01:11	333.63
1005	0.000	8.4	0.0	0.0	0.001	13.6	0 01:10	109.25
1006	0.000	8.6	0.0	0.0	0.001	15.9	0 01:10	104.14
1007	0.000	10.4	0.0	0.0	0.001	26.1	0 01:11	105.38
1008	0.000	10.8	0.0	0.0	0.001	18.1	0 01:11	5.08
1009	0.000	8.1	0.0	0.0	0.001	23.9	0 01:10	228.45

1010		0.000	7.9	0.0	0.0	0.001	28.2	0
01:10	237.89							
1011		0.000	10.2	0.0	0.0	0.001	18.7	0
01:11	3.96							
C1003B-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	97.39							
C1004A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	57.19							
C1005A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	25.78							
C1006A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	62.24							
C1006B-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	42.14							
C1007A-S1		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	78.99							
C1007A-S2		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	86.21							
C1007B-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	108.77							
C1008A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	21.97							
C1009A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	142.77							
C1009B-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	117.72							
C1010A-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	131.61							
C1010B-S		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	126.69							
CB1008		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	0.00							
EXCB		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	371.14							
EXMH		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	371.16							
SU1		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	19.95							
SU10		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	0.00							
SU11		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	0.00							
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	0.00							
SU14		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	20.53							
SU15		0.000	0.0	0.0	0.0	0.000	0.0	0
00:00	47.27							

```
  SU16                      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
  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       0.00
  SU5                       0.000    0.0    0.0    0.0       0.000    0.0       0
00:00      16.46
  SU6                       0.000    0.0    0.0    0.0       0.000    0.0       0
00:00      20.12
  SU7                       0.000    0.0    0.0    0.0       0.000    0.0       0
00:00       0.00
  SU8                       0.000    0.0    0.0    0.0       0.000    0.0       0
00:00      17.02
  SU9                       0.000    0.0    0.0    0.0       0.000    0.0       0
00:00       0.00
  SWM-S                     0.044    4.6    0.0    0.0       0.334   35.2       0
01:15     372.15


  ************************
  Outfall Loading Summary
  ************************

  -----------------------------------------------------------
                        Flow       Avg       Max       Total
                        Freq      Flow      Flow      Volume
  Outfall Node           Pcnt       LPS       LPS    10^6 ltr
  -----------------------------------------------------------
  EX128                 43.22     30.37    371.16       1.135
  Hemlock               11.64      3.08     36.10       0.031
  Mikinak               11.64      2.73     31.85       0.027
  OF1                    0.00      0.00      0.00       0.000
  Vedette_N_Overland     7.21      2.20     17.76       0.014
  Vedette_Overland      11.84      2.73     26.12       0.028
  Vedette_S_Major        0.92     11.38     19.95       0.009
  -----------------------------------------------------------
  System                12.35     52.49    465.62       1.244


  ********************
  Link Flow Summary
  ********************

  ------------------------------------------------------------------------------
                                Maximum  Time of Max   Maximum    Max/    Max/
                                 |Flow|   Occurrence   |Veloc|    Full    Full
  Link                 Type         LPS  days hr:min     m/sec    Flow   Depth
```

1001-SWM-S	CONDUIT	769.92	0	01:09	1.87	0.89	1.00
1002-1001	CONDUIT	604.58	0	01:09	1.37	0.77	1.00
1003-1002	CONDUIT	534.50	0	01:10	1.21	0.68	1.00
1004-1003	CONDUIT	333.63	0	01:10	1.61	0.65	1.00
1005-1004	CONDUIT	109.25	0	01:10	1.89	0.53	0.76
1006-1005	CONDUIT	104.14	0	01:10	1.44	0.66	0.62
1007-1001	CONDUIT	98.17	0	01:08	0.97	0.54	1.00
1008-1007	CONDUIT	5.08	0	01:12	0.42	0.07	0.83
1009-1003	CONDUIT	228.45	0	01:09	1.13	0.59	1.00
1010-1004	CONDUIT	237.89	0	01:09	1.53	1.32	1.00
1011-1007	CONDUIT	8.44	0	01:07	0.32	0.09	0.88
C1	CHANNEL	0.00	0	00:00	0.00	0.00	0.06
C10	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C11	CHANNEL	16.46	0	01:10	0.08	0.00	0.25
C12	CHANNEL	20.12	0	01:10	0.11	0.00	0.24
C13	CHANNEL	0.00	0	00:00	0.00	0.00	0.07
C14	CHANNEL	47.40	0	01:10	0.85	0.01	0.12
C15	CHANNEL	20.63	0	01:10	0.72	0.00	0.08
C16	CHANNEL	17.04	0	01:10	0.14	0.00	0.17
C17	CHANNEL	17.02	0	01:10	0.12	0.00	0.19
C18	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C19	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C2	CHANNEL	69.35	0	01:10	0.49	0.01	0.20
C20	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C21	CHANNEL	0.00	0	00:00	0.00	0.00	0.17
C22	CHANNEL	20.14	0	01:10	0.14	0.00	0.22
C23	CHANNEL	0.00	0	00:00	0.00	0.00	0.16
C24	CHANNEL	16.63	0	01:10	0.12	0.00	0.21
C25	CHANNEL	0.00	0	00:00	0.00	0.00	0.07
C26	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
C27	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
C28	CONDUIT	372.15	0	01:15	2.64	0.39	1.00
C29	CHANNEL	11.29	0	01:10	0.07	0.00	0.23
C3	CHANNEL	0.00	0	00:00	0.00	0.00	0.15
C30	CHANNEL	9.24	0	01:10	0.25	0.00	0.10
C31	CONDUIT	371.16	0	01:15	1.63	0.42	0.44
C32	CHANNEL	25.33	0	01:10	0.12	0.00	0.25
C33	CHANNEL	21.94	0	01:10	0.16	0.00	0.19
C34	CHANNEL	19.95	0	01:10	0.68	0.00	0.09
C35	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C36	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C37	CHANNEL	19.98	0	01:10	0.13	0.00	0.19
C4	CHANNEL	0.00	0	00:00	0.00	0.00	0.15
C5	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C6	CHANNEL	0.00	0	00:00	0.00	0.00	0.06
C7	CHANNEL	17.76	0	01:10	1.13	0.00	0.12
C8	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C9	CHANNEL	0.00	0	00:00	0.00	0.00	0.06
OR1	ORIFICE	371.14	0	01:15			1.00

W1	WEIR	0.00	0	00:00	0.00
OL1	DUMMY	5.15	0	01:10	
OL10	DUMMY	42.14	0	01:10	
OL11	DUMMY	62.24	0	01:10	
OL12	DUMMY	4.21	0	01:10	
OL13	DUMMY	0.00	0	00:00	
OL14	DUMMY	66.24	0	01:10	
OL2	DUMMY	9.79	0	01:10	
OL3	DUMMY	80.35	0	01:10	
OL4	DUMMY	9.64	0	01:10	
OL5	DUMMY	108.77	0	01:10	
OL6	DUMMY	101.10	0	01:10	
OL7	DUMMY	142.77	0	01:10	
OL8	DUMMY	106.56	0	01:10	
OL9	DUMMY	131.61	0	01:10	

****
Flow Classification Summary
****

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
1001-SWM-S	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.00	0.00
1002-1001	1.00	0.02	0.00	0.00	0.04	0.00	0.00	0.94	0.00	0.00
1003-1002	1.00	0.02	0.00	0.00	0.04	0.01	0.00	0.93	0.01	0.00
1004-1003	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.96	0.01	0.00
1005-1004	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.97	0.01	0.00
1006-1005	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
1007-1001	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.01	0.00
1008-1007	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
1009-1003	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.01	

0.00
  1010-1004 1.00 0.02 0.00 0.00 0.01 0.00 0.00 0.97 0.00
0.00
  1011-1007 1.00 0.04 0.00 0.00 0.01 0.00 0.00 0.94 0.00
0.00
  C1 1.00 0.77 0.23 0.00 0.00 0.00 0.00 0.00 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 0.02 0.03 0.00 0.95 0.00 0.00 0.00 0.10
0.00
  C12 1.00 0.02 0.03 0.00 0.95 0.00 0.00 0.00 0.96
0.00
  C13 1.00 0.79 0.21 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C14 1.00 0.02 0.78 0.00 0.09 0.12 0.00 0.00 0.87
0.00
  C15 1.00 0.02 0.78 0.00 0.08 0.12 0.00 0.00 0.87
0.00
  C16 1.00 0.02 0.03 0.00 0.96 0.00 0.00 0.00 0.95
0.00
  C17 1.00 0.02 0.02 0.00 0.96 0.00 0.00 0.00 0.96
0.00
  C18 1.00 1.00 0.00 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
  C2 1.00 0.77 0.00 0.00 0.18 0.05 0.00 0.00 0.11
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 0.74 0.26 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C22 1.00 0.02 0.03 0.00 0.96 0.00 0.00 0.00 0.95
0.00
  C23 1.00 0.77 0.23 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C24 1.00 0.02 0.03 0.00 0.96 0.00 0.00 0.00 0.10
0.00
  C25 1.00 0.79 0.21 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C26 1.00 0.80 0.20 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C27 1.00 0.80 0.20 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C28 1.00 0.03 0.00 0.00 0.03 0.00 0.00 0.94 0.00
0.00
  C29 1.00 0.02 0.00 0.00 0.95 0.03 0.00 0.00 0.12
0.00
  C3 1.00 0.77 0.23 0.00 0.00 0.00 0.00 0.00 0.00

0.00
  C30 1.00 0.02 0.00 0.00 0.95 0.03 0.00 0.00 0.12
0.00
  C31 1.00 0.04 0.00 0.00 0.85 0.11 0.00 0.00 0.00
0.00
  C32 1.00 0.02 0.00 0.00 0.94 0.04 0.00 0.00 0.12
0.00
  C33 1.00 0.02 0.00 0.00 0.94 0.04 0.00 0.00 0.12
0.00
  C34 1.00 0.04 0.00 0.00 0.93 0.03 0.00 0.00 0.01
0.00
  C35 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C36 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C37 1.00 0.02 0.02 0.00 0.96 0.00 0.00 0.00 0.95
0.00
  C4 1.00 0.77 0.23 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C5 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C6 1.00 0.87 0.13 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C7 1.00 0.87 0.00 0.00 0.02 0.11 0.00 0.00 0.01
0.00
  C8 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00
  C9 1.00 0.81 0.19 0.00 0.00 0.00 0.00 0.00 0.00
0.00

  ****
  Conduit Surcharge Summary
  ****

                                                    Hours   Hours
                        --------- Hours Full --------   Above Full   Capacity
  Conduit   Both Ends Upstream Dnstream   Normal Flow   Limited
  ----
  1001-SWM-S   0.29   0.38   0.30   0.01   0.20
  1002-1001   0.30   0.31   0.32   0.01   0.12
  1003-1002   0.10   0.10   0.29   0.01   0.01
  1004-1003   0.03   0.03   0.22   0.01   0.01
  1005-1004   0.01   0.01   0.03   0.01   0.01
  1007-1001   0.03   0.03   0.38   0.01   0.01
  1008-1007   0.01   0.01   0.03   0.01   0.01
  1009-1003   0.01   0.01   0.24   0.01   0.01
  1010-1004   0.03   0.13   0.03   0.12   0.03
  1011-1007   0.01   0.01   0.03   0.01   0.01

C28	0.45	0.45	0.52	0.01	0.01

Analysis begun on: Fri May 2 12:02:41 2025
Analysis ended on: Fri May 2 12:02:43 2025
Total elapsed time: 00:00:02

C.3 StormTrap Sizing Report

StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT

SHEET INDEX	
PAGE	DESCRIPTION
0.0	COVER SHEET
1.0	GENERAL NOTES
1.1	SINGLETRAP DESIGN CRITERIA
2.0	SINGLETRAP SYSTEM LAYOUT
2.1	SINGLETRAP FOUNDATION LAYOUT
3.0	SINGLETRAP INSTALLATION SPECIFICATION
3.1	SINGLETRAP INSTALLATION SPECIFICATION
4.0	SINGLETRAP BACKFILL SPECIFICATION
5.0	PIPE/ACCESS OPENING SPECIFICATION
6.0	SINGLETRAP MODULE TYPES

STORMTRAP CONTACT INFORMATION	
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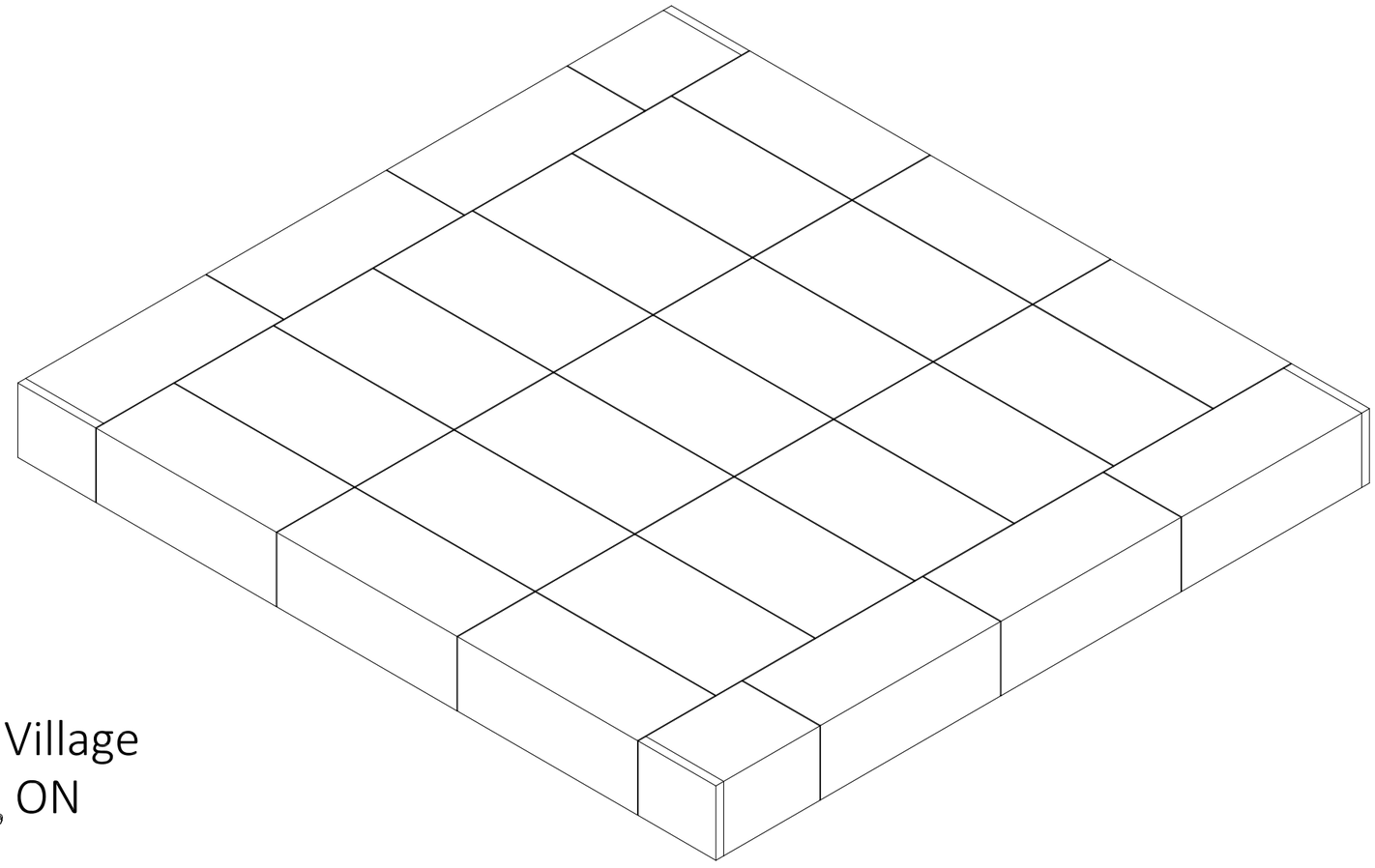
CONTACT NAME:	Jonathan Donaldson
CELL PHONE:	416-262-6265
SALES EMAIL:	jdonaldson@stormtrap.com



Wateridge Village
Ottawa , ON

StormTrap®
PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

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Ottawa, ON
613-722-4420

PROJECT INFORMATION:

Wateridge Village

Ottawa, ON

CURRENT ISSUE DATE:

04/21/2025

ISSUED FOR:

PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
1	04/21/2025	PRELIMINARY	LR

SCALE:

NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

GENERAL NOTES:

1. STRUCTURE PROXIMITY LOADING DISCLAIMER:

STORMTRAP MODULES AND FOUNDATION ARE NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADING FROM ANY NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. EXAMPLES OF NEARBY STRUCTURES MAY INCLUDE BUT ARE NOT LIMITED TO BUILDINGS, FOUNDATION ELEMENTS, RETAINING WALLS, LIGHT POLES, BOLLARDS, SIGNPOSTS, FENCES. ADDITIONALLY, STORMTRAP IS NOT RESPONSIBLE FOR INSTALLATION CONFLICTS ARISING FROM ANY OF THESE NEARBY STRUCTURES. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY. FOR LIGHT POLES SHOWN OVER THE TOP OF THE SYSTEM, STORMTRAP WILL PROVIDE A 1.524m LATERAL DISTANCE CAVITY AROUND THE LIGHT POLE TO ACCOMMODATE IT. THE EOR TO TAKE RESPONSIBILITY FOR ENSURING THE LIGHT POLE IS NOT INFLICTING ANY LOADING ON THE STORMTRAP MODULES AND FOUNDATION.

2. TREE LOADING DISCLAIMER:

THE NUMBER OF TREES OR WEIGHT OF TOTAL PLANT MATERIAL PRESENT ON TOP OF A SINGLE STORMTRAP MODULE SHALL NOT EXCEED 16,000 LBS. THE REQUIREMENTS LISTED HERE APPLY AT BOTH THE TIME OF INSTALLATION AND FOR THE LIFE OF THE TREES AND PLANTS IN QUESTION. THE EOR AND LANDSCAPE ARCHITECT ARE RESPONSIBLE FOR ENSURING THAT TREE AND OTHER PLANT ROOTS DO NOT INTERFERE WITH OR COMPROMISE THE FUNCTIONAL AND STRUCTURAL INTEGRITY OF STORMTRAP'S UNDERGROUND MODULES. APPROPRIATE MEASURES SHOULD BE TAKEN TO PREVENT ROOT GROWTH INTO THE STORMTRAP SYSTEM FROM ADJACENT OR OVERHEAD TREES. FURTHERMORE, THE ROOTS OF THE TREES MUST BE CONTAINED TO PREVENT FUTURE DAMAGE TO THE STORMTRAP SYSTEM. STORMTRAP ACCEPTS NO LIABILITY FOR DAMAGES CAUSED BY TREES OR OTHER VEGETATION PLACED AROUND OR ON TOP OF THE SYSTEM.

3. PRE-TREATMENT/SEDIMENT/FILTER CHAMBER DISCLAIMER:

FOR SYSTEMS CONTAINING PRE-TREATMENT, SEDIMENTATION AND/OR FILTER CHAMBERS; IF REQUIRED TO BE SEALED TO PREVENT SAND AND/OR PRE-TREATED WATER FROM MIGRATING INTO ADJOINING MODULES, IT IS THE SOLE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT THOSE MODULES ARE SEALED.

4. OUTLET CONTROL STRUCTURE DISCLAIMER (IF SHOWN ON THESE PLANS):

IF A WATERTIGHT SOLUTION IS REQUIRED FOR AN OUTLET CONTROL STRUCTURE, ALL EXTERIOR COLD JOINTS, INCLUDING JOINT BETWEEN TOP AND BASE MODULES, BETWEEN TOP AND BASE OF ADJOINING SYMONS WALLS, AND JOINTS BETWEEN MODULE AND ADJACENT END PANELS WILL BE THE SOLE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO PROVIDE AND INSTALL THE WATERTIGHT APPLICATION PER THE EOR'S SPECIFICATION.

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NTS

SHEET TITLE:

GENERAL NOTES

SHEET NUMBER:

1.0

STRUCTURAL DESIGN LOADING CRITERIA

LIVE LOADING:	AASHTO HS-20 HIGHWAY LOADING
ADDITIONAL SURCHARGE LOADING:	PER ASTM C857 (3.83kPa)
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	150 kPa
SOIL DENSITY:	19 kN/m³
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE:	5.5 kPa/m
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE:	3.830 kPa (IF WATER TABLE PRESENT)
APPLICABLE CODES:	ASTM C857, ASTM C858-19, ACI-318, FOR CLEAR COVERS: CSA A23
BACKFILL TYPE:	SEE SHEET 4.0 FOR BACKFILL OPTIONS

STORMTRAP SYSTEM INFORMATION

UNIT HEADROOM:	1.524m SINGLETRAP
TOTAL STORAGE PROV:	426.13 CUBIC METERS

NOTE:
IN ADDITION TO THE DESIGN COVERS LISTED HERE, THE SYSTEM CAN SUPPORT MAX. 4.5m OF PILED SNOW WITH 6.25 kN/m³ MAX DENSITY. LATERAL SURCHARGE LOAD ASSOCIATED WITH THIS MATERIAL NOT TO EXCEED 40% OF THE VERTICAL SURCHARGE PRESSURE. ALL LOADS ASSOCIATED WITH THE PILED SNOW ARE CONSIDERED IN LIEU OF THE DESIGN VEHICLE LOADING.

DESIGN ASSUMPTIONS

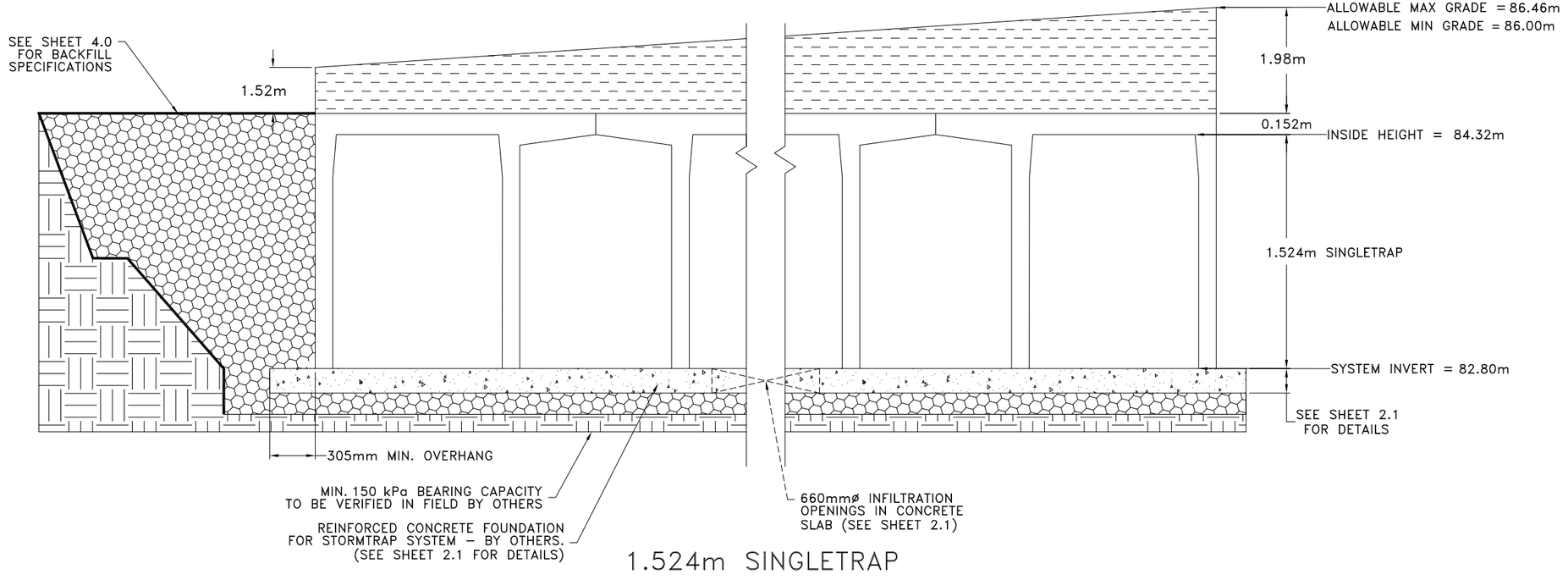
1. ASTM C858-19:
   - 1.1. THE ELASTIC METHOD OF STRUCTURAL DESIGN OR THE STRENGTH DESIGN METHOD FOR REINFORCED CONCRETE OUTLINED IN ACI 318 SHALL BE USED TO DESIGN THE CONCRETE SECTIONS. LOAD COMBINATION FACTORS LISTED BELOW.
     - 1.1.1. DEAD: 1.4
     - 1.1.2. DEAD + LIVE: 1.2 + 1.6
     - 1.1.3. SOIL PRESSURE: 1.6
     - 1.1.4. SOIL SURCHARGE: 1.6

2. ASTM C857:
   - 2.1. LIVE LOAD: PER ASTM C858/C857
     - 2.1.1. AASHTO HS-20 - (71 kN) WHEEL LOAD.
     - 2.1.2. IMPACT LOADING PER ASTM C857 SECTION 4.1.2.2, APPLIED TO ALL LIVE LOAD OPTIONS LISTED ABOVE.
       - 2.1.2.1. 0.152m TO 0.305m COVER RANGE: 30% INCREASE
       - 2.1.2.2. ABOVE 0.306m TO 0.610m COVER RANGE: 20% INCREASE
       - 2.1.2.3. ABOVE 0.611m TO 0.889m COVER RANGE: 10% INCREASE
       - 2.1.2.4. ABOVE 0.890m ONWARDS: NOT APPLIED
   - 2.2. DISTRIBUTION OF WHEEL LOADS THROUGH EARTH FILLS: WHEEL LOADS AT GROUND OR SURFACE SHALL BE DISTRIBUTED USING A WHEEL LOAD AREA REPRESENTED IN FIGURE 2 AND DETAILED IN SECTION 4.1.4 OF ASTM C 857. THE WHEEL LOAD DISTRIBUTION CONSIDERATION IS IRRESPECTIVE OF THE THICKNESS OF SOIL COVER AND IS APPLIED TO ALL SOIL COVER RANGES FROM 0.152m UP TO 3.05m.
   - 2.3. EXTERIOR WALLS SURCHARGE LOADS: EXTERIOR WALLS SURCHARGE LOADS SHALL COMPLY WITH ASTM C 857 SECTION 4.2.1 FOR SURCHARGE PRESSURES, WHICH STATES THAT SURCHARGE PRESSURE SHALL BE NO LESS THAN 0.5% OF THE WHEEL LOAD. IN ADDITION TO THIS THE SURCHARGE PRESSURE CAN BE NEGLECTED WHEN THE DEPTH OF THE SOIL EXCEEDS 2.44m.

3. OTHER STANDARDS:
   - 3.1. FLEXURE DESIGN PER ACI 318.
   - 3.2. SHEAR DESIGN PER ACI 318.
   - 3.3. CLEAR COVERS PER CSA A23.

SITE SPECIFIC DESIGN CRITERIA

1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/ OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.52m MAX. 1.98m CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL CALCULATIONS THE GROUND WATER TABLE IS ASSUMED TO BE BELOW INVERT OF SYSTEM IF WATER TABLE IS DIFFERENT THAN ASSUMED, CONTACT STORMTRAP.



1.524m SINGLETRAP

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SCALE:

NTS

SHEET TITLE:

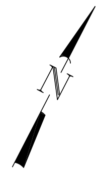
SINGLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.1

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	WEIGHT
15	I	1.524m SINGLETRAP	7028
0	II	1.524m SINGLETRAP	–
10	III	1.524m SINGLETRAP	6991
2	IV	1.524m SINGLETRAP	7538
0	VII	1.524m SINGLETRAP	–
0	VII–1	1.524m SINGLETRAP	–
0	VII–2	1.524m SINGLETRAP	–
0	VII–3	1.524m SINGLETRAP	–
0	VII–4	1.524m SINGLETRAP	–
0	SPIII	1.524m SINGLETRAP	VARIES
2	SPIV	1.524m SINGLETRAP	VARIES
0	T2 PANEL	152mm THICK PANEL	–
4	T4 PANEL	203mm THICK PANEL	1653
0	T7 PANEL	152mm THICK PANEL	–
15	JOINTWRAP	18.29m PER ROLL	
24	JOINTTAPE	4.42m PER ROLL	
3	GALLON(S)	PRIMER FOR JOINT WRAP	
TOTAL PIECES = 29			
TOTAL PANELS = 4			
HEAVIEST PICK WEIGHT = 7,538			

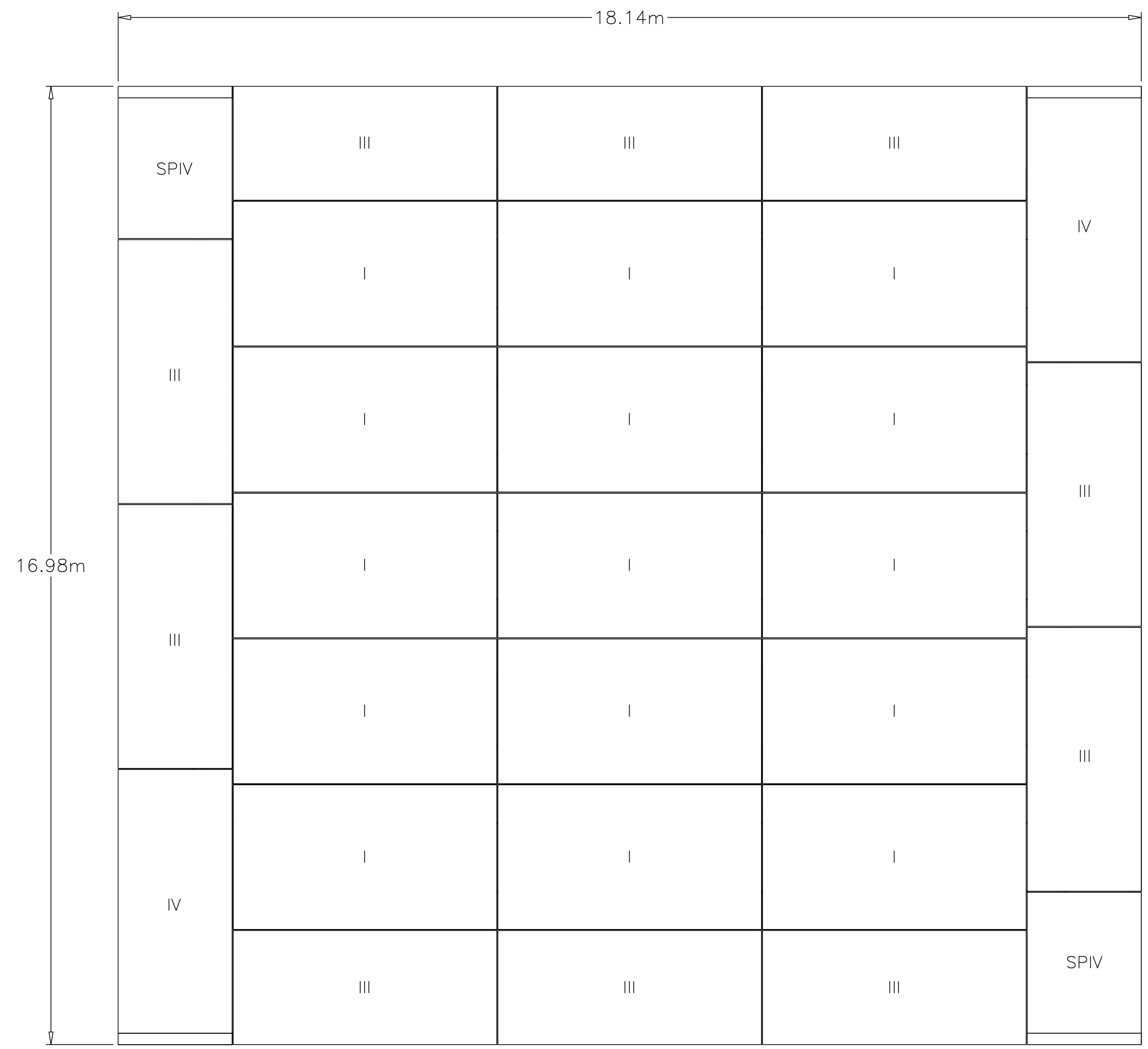


DESIGN CRITERIA

ALLOWABLE MAX GRADE = 86.46m
ALLOWABLE MIN GRADE = 86.00m
INSIDE HEIGHT ELEVATION = 84.32m
SYSTEM INVERT = 82.80m

NOTES:

1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 19mm (3/4") GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP – INDICATES A MODULE WITH MODIFICATIONS.
5. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.
7. IN ORDER FOR STORMTRAP TO GENERATE APPROVAL DRAWINGS, CIVIL ENGINEERING DRAWINGS MUST BE PROVIDED TO STORMTRAP AND SHALL INCLUDE ALL PIPE SIZES, PIPE MATERIAL, PIPE INVERT ELEVATIONS, ACCESS OPENING SIZE AND SHAPE. IN ADDITION, FINAL GRADING PLANS SHALL ALSO INCLUDE MINIMUM AND MAXIMUM GRADES OVER THE TOP OF THE STORMTRAP SYSTEM.



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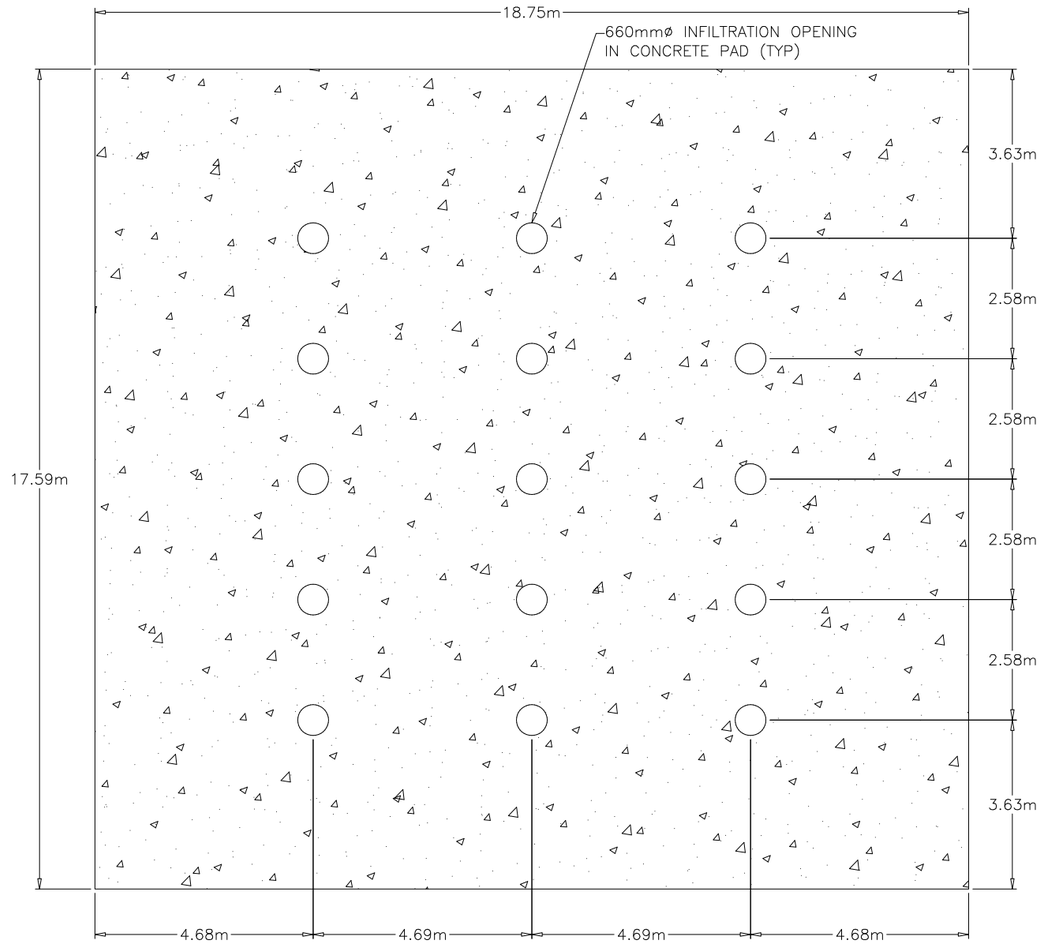
SINGLETRAP SYSTEM LAYOUT

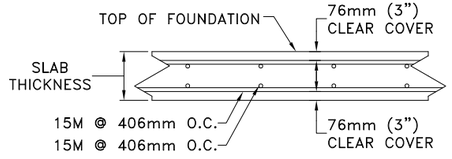
SHEET NUMBER:

2.0



CONCRETE FOUNDATION NOTES:

1. CONCRETE FOUNDATION TO BE SUPPLIED AND INSTALLED BY OTHERS.
2. CONCRETE STRENGTH @ 28 DAYS, 5%–8% ENTRAINED AIR, 76mm–127mm (3"–5") MAX SLUMP.
3. NET ALLOWABLE SOIL PRESSURE AS INDICATED ON SHEET 1.1.
4. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
5. REBAR: ASTM A615 GRADE 60, BLACK BAR.
6. DIMENSION OF FOUNDATION MUST HAVE 305mm (1'–0") OVERHANG BEYOND EXTERNAL FACE OF MODULE.
7. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 19mm (3/4") GAP BETWEEN EACH MODULE.
8. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
9. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.



STORMTRAP FOUNDATION DETAIL

(HS–20, HS–25, CL–625) LOADING				
MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	MIN. BEARING PRESSURE	REINFORCEMENT (BOTH DIRECTIONS)
1.98m	279mm	28 mPa	120 kPa	15M @ 406mm O.C.

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SINGLETRAP FOUNDATION LAYOUT

SHEET NUMBER:

2.1

STORMTRAP INSTALLATION SPECIFICATION

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891 (STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES). THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS ARE PROVIDED FOR EMPHASIS. THE MENTION OF THESE ITEMS DOES NOT PRECLUDE THE INSTALLING CONTRACTOR FROM FOLLOWING ASTM C891 IN ITS ENTIRETY AND IMPLEMENTING ALL APPROPRIATE MEASURES. THE INSTALLING CONTRACTOR OWNS AND IS RESPONSIBLE FOR THE STORMTRAP SYSTEM UPON REMOVAL OF THE MODULES FROM THE DELIVERY TRUCK THROUGH 'FINAL CONSTRUCTION'. FINAL CONSTRUCTION IS ACHIEVED WHEN ALL MODULES ARE SET, FULLY BACKFILLED, AND WHEN FINAL FINISHED GRADES ARE REACHED. THE CONTRACTOR IS RESPONSIBLE FOR ANY COUNTERMEASURES NECESSARY TO RESIST UPLIFT/BUOYANCY BEFORE 'FINAL CONSTRUCTION' IS ACHIEVED.

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES SHALL BE PLACED ON A LEVEL CONCRETE FOUNDATION (SEE SHEET 2.1) WITH A 305mm (1'–0") OVERHANG ON ALL SIDES THAT SHALL BE POURED IN PLACE BY INSTALLING CONTRACTOR. A QUALIFIED GEOTECHNICAL ENGINEER WILL BE EMPLOYED, BY OWNER, TO PROVIDE ASSISTANCE IN EVALUATING THE EXISTING SOIL CONDITIONS TO ENSURE THAT THE SOIL BEARING PRESSURE MEETS OR EXCEEDS THE STRUCTURAL DESIGN LOADING CRITERIA AS SPECIFIED ON SHEET 1.1.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED 19mm ($\frac{3}{4}$") (SEE DETAIL 2). IF THE SPACE EXCEEDS 19mm ($\frac{3}{4}$"), THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. THE PERIMETER HORIZONTAL JOINT BETWEEN THE STORMTRAP MODULES AND THE CONCRETE FOUNDATION SHALL BE SEALED TO THE FOUNDATION WITH PRE–FORMED MASTIC JOINT SEALER ACCORDING TO ASTM C891, 8.8 AND 8.12 (SEE DETAIL 1). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL.

6. ALL EXTERIOR ROOF AND EXTERIOR VERTICAL WALL JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 203mm (8") WIDE PRE–FORMED, COLD–APPLIED, SELF–ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 2, 3, & 4). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

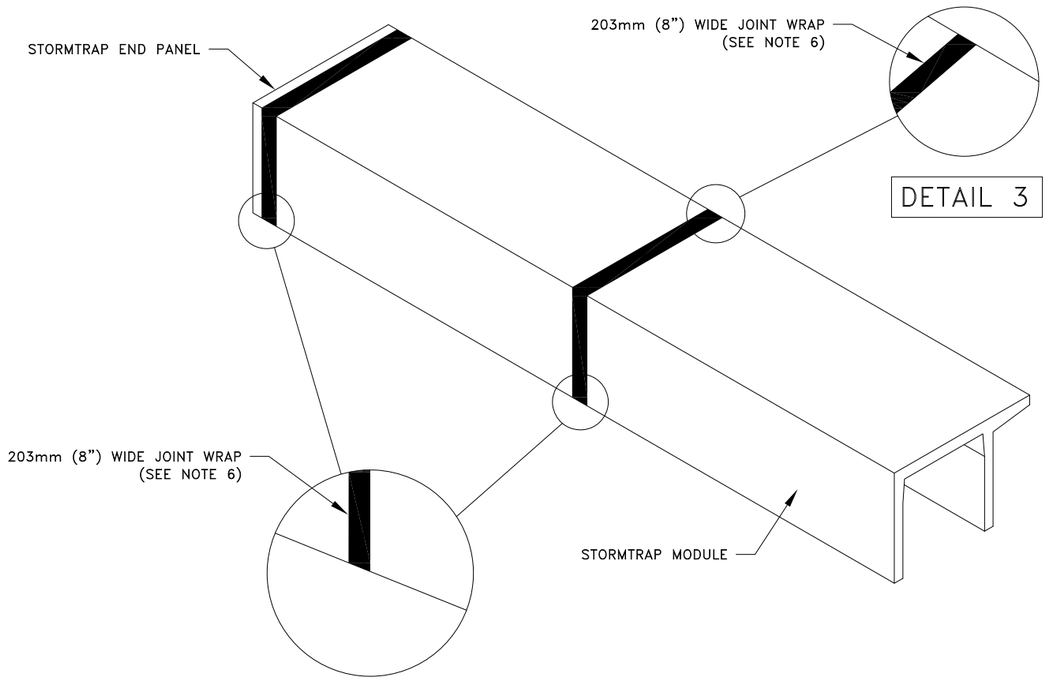
   6.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   6.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

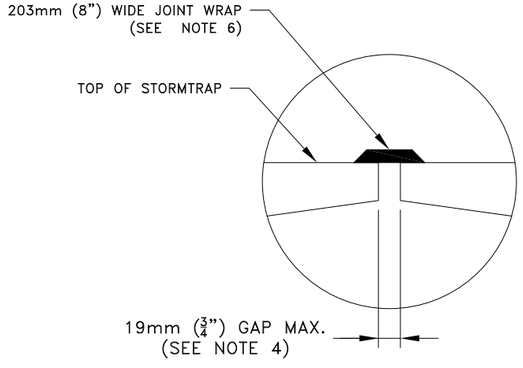
7. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

8. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

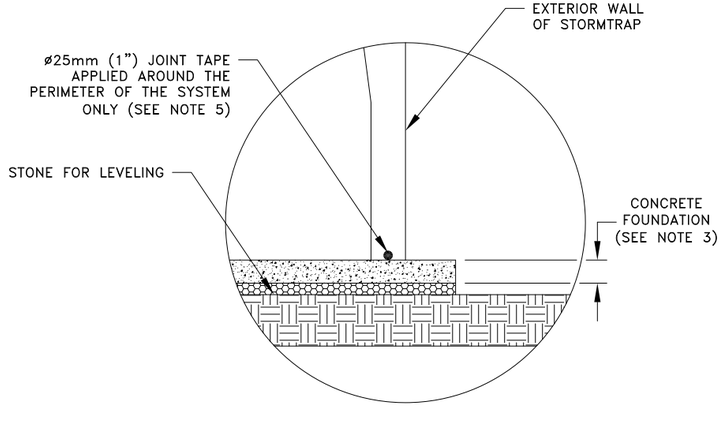
9. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



DETAIL 4



DETAIL 2



DETAIL 1

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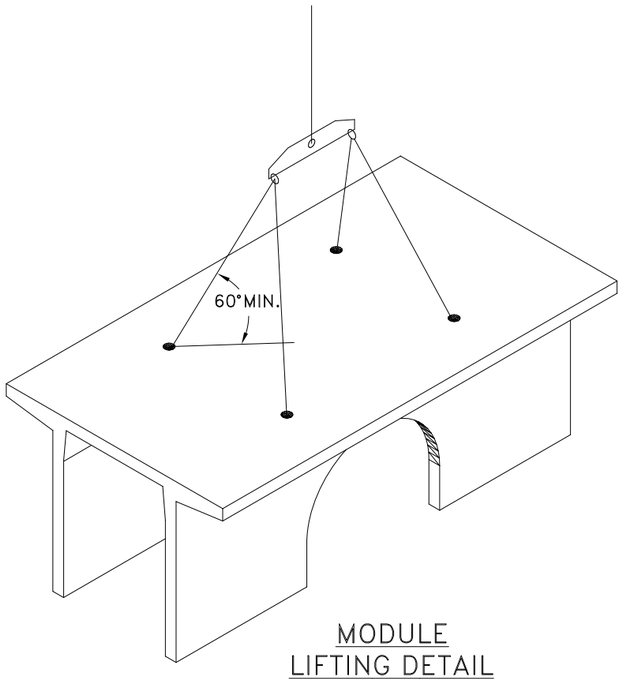
SINGLETRAP INSTALLATION SPECIFICATION

SHEET NUMBER:

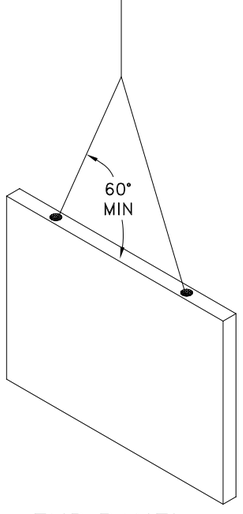
3.0

STORMTRAP MODULE LIFTING SPECIFICATION

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL (4) CHAINS/CABLES ARE SECURED PROPERLY TO THE LIFTING ANCHORS AND IN EQUAL TENSION WHEN LIFTING THE STORMTRAP MODULE.
2. MINIMUM 2134mm (7'FT) CHAIN/CABLE LENGTH TO BE USED TO LIFT STORMTRAP MODULES (SUPPLIED BY CONTRACTOR).
3. CONTRACTOR TO ENSURE MINIMUM LIFTING ANGLE IS 60° FROM TOP SURFACE OF STORMTRAP MODULE. SEE DETAIL.
4. IT IS UNDERSTOOD AND AGREED THAT AT ALL TIMES DURING WHICH HOISTING AND RIGGING EQUIPMENT IS BEING SUPPLIED TO THE PURCHASER, OPERATOR OF SUCH EQUIPMENT SHALL BE IN CHARGE OF HIS ENTIRE EQUIPMENT AND SHALL AT ALL TIMES BE THE JUDGE OF THE SAFETY AND PROPERTY OF ANY SUGGESTION TO HIM FROM THE SELLER, ITS AGENTS OR EMPLOYEES. PURCHASER AGREES TO SAVE, INDEMNIFY AND HOLD HARMLESS SELLER FROM ALL LOSS, CLAIMS, DEMANDS OR CAUSES OF ACTION, WHICH MAY ARISE FROM THE EXISTENCE OR OPERATION OF SAID EQUIPMENT.



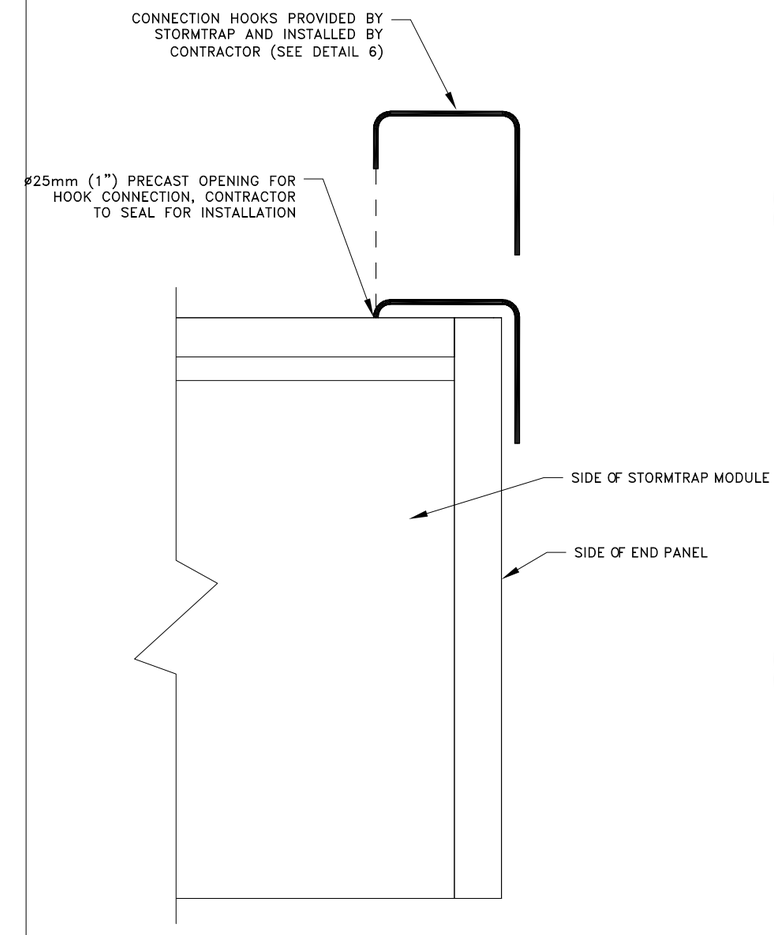
MODULE
LIFTING DETAIL



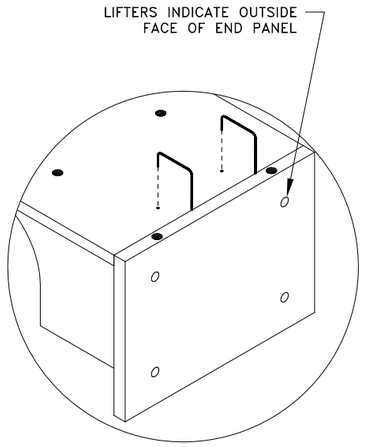
END PANEL
LIFTING DETAIL

END PANEL ERECTION/INSTALLATION SPECIFICATION

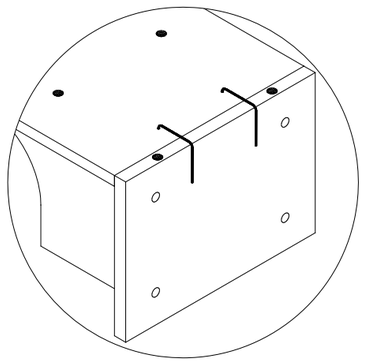
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS). SIDE WITH LIFTERS INDICATES OUTSIDE FACE.
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOK IS ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



PANEL CONNECTION
ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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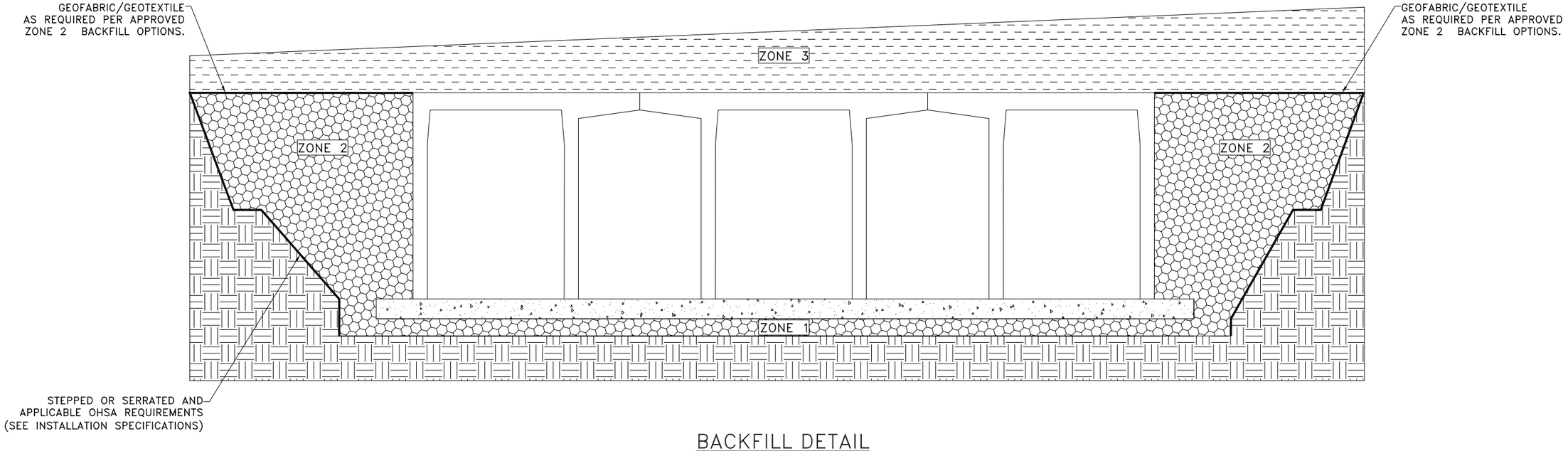
SINGLETRAP
INSTALLATION
SPECIFICATION

SHEET NUMBER:

3.1

ZONE CHART		
ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	ASTM C33 #5 19mm (¾") STONE ANGULAR AGGREGATE (SEE NOTE 4)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 1922 kg/m³

APPROVED ZONE 2 BACKFILL OPTIONS	
OPTION	REMARKS
19mm (¾") STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF CLEAN AND FREE DRAINING ANGULAR MATERIAL. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 25mm SIEVE WITH 0% TO 5% PASSING THE 2.36mm SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL (ASTM SIZE #57) AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
SAND	IMPORTED PURE SAND IS PERMITTED TO BE USED AS BACKFILL IF IT IS CLEAN AND FREE DRAINING. THE SAND USED FOR BACKFILLING SHALL HAVE LESS THAN 40% PASSING 412µm SIEVE AND LESS THAN 5% PASSING 75µm SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE SAND BACKFILL.
CRUSHED CONCRETE AGGREGATE	CLEAN, FREE DRAINING CRUSHED CONCRETE AGGREGATE MATERIAL CAN BE USED AS BACKFILL FOR STORMTRAP'S MODULES. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 25mm SIEVE WITH 0% TO 5% PASSING THE 2.36mm SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL.
ROAD PACK	STONE AGGREGATE 100% PASSING THE 38mm SIEVE WITH LESS THAN 12% PASSING THE 75µm SIEVE (ASTM SIZE #467). GEOFABRIC AS PER GEOTECHNICAL ENGINEER RECOMMENDATION.



BACKFILL DETAIL

STORMTRAP ZONE INSTALLATION SPECIFICATION/PROCEDURE

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST BE DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 610mm (2'-0") HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MUST BE FREE-DRAINING MATERIAL. SEE ZONE 2 BACKFILL CHART ON THIS PAGE FOR APPROVED BACKFILL OPTIONS. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED (PROVIDED BY OTHERS). ALL MODULES MUST BE SET AND ALL SIDES MUST BE FULLY BACKFILLED BEFORE TRAVEL OVERTOP THE SYSTEM IS PERMITTED. SEE NOTE 2 FOR EXCEPTIONS AND LIMITATIONS.
2. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED IN MINIMUM 152mm (6" LIFTS). AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN LIVE LOAD LISTED ON SHEET 1.0 TRAVEL OVERTOP THE SYSTEM. IF TRAVEL OVER THE SYSTEM OCCURS BEFORE THE MINIMUM DESIGN COVER IS ACHIEVED, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. VEHICLES AND MACHINERY USED TO PLACE FILL MATERIAL ON TOP OF THE SYSTEM SHALL TRAVEL PARALLEL TO THE LONGITUDINAL AXIS OF THE STORMTRAP MODULES WHENEVER POSSIBLE.
3. THE VIBRATORY FUNCTION OF ANY ROLLER, COMPACTOR, VEHICLE, ETC. SHALL NOT BE USED OVERTOP THE SYSTEM WITHOUT PRIOR APPROVAL FROM STORMTRAP. IN SOME CASES, HAND COMPACTION MAY BE NECESSARY TO ENSURE THAT THE ALLOWABLE DESIGN LOADING IS NOT EXCEEDED.
4. STONE AGGREGATE FOUNDATION IN ZONE 1 MAY BE REQUIRED FOR THE FOLLOWING:
   - A.) INFILTRATION – IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON 12.5mm SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN 12.5mm AND 25mm, AND ONLY 5% OF MATERIAL PASSING 9.5mm SIEVE.
   - B.) LEVELING – STONE AGGREGATE FOUNDATION IN ZONE 1 IS FOR LEVELING PURPOSES.

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SINGLETRAP BACKFILL SPECIFICATION

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4.0

ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 610mm (2'–0") IN DIAMETER. ACCESS OPENINGS LARGER THAN 1219mm (4'–0") IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 610mm (2'–0") OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED. SEE SHEET 2.0 FOR SIZES AND LOCATIONS.
2. UNLESS OTHERWISE SPECIFIED, PLASTIC COATED STEPS ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 305mm (1'–0") FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED AT A DISTANCE BETWEEN 254mm (10") MIN AND 356mm (14") MAX BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.
3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.
4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.
5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 610mm (2'–0") TO USE PRECAST BARREL OR CONE SECTIONS. (PROVIDED BY OTHERS)

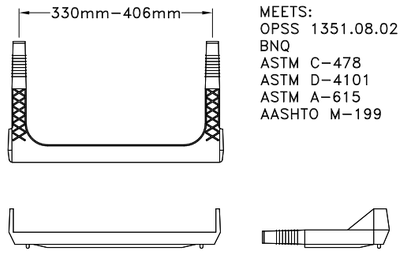
PIPE OPENING SPECIFICATION

1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 305mm (1'–0").
2. CONNECTING PIPES MAY BE INSTALLED WITH A 305mm (1'–0") CONCRETE COLLAR AND AN AGGREGATE CRADLE (AS REQUIRED) FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON–SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 35 mPa MAY BE USED.
3. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON–SHRINK GROUT.

PIPE INSTALLATION INSTRUCTIONS

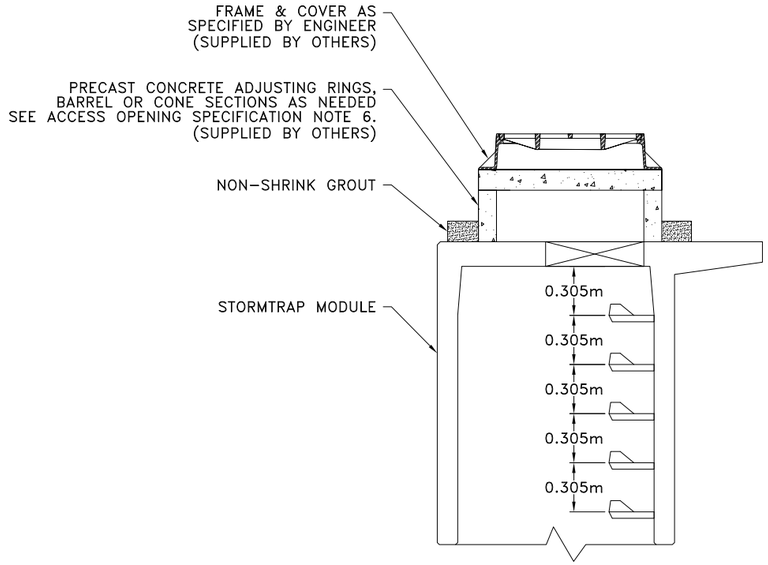
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

NOTE: ALL ANCILLARY PRODUCTS/SPECIFICATIONS RECOMMENDED AND SHOWN ON THIS SHEET INCLUDING BUT NOT LIMITED TO CONCRETE COLLARS, AGGREGATE CRADLES, GRADE RINGS, RISER SECTIONS, ETC., ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR AND/OR PER LOCAL MUNICIPAL CODE/REQUIREMENTS.

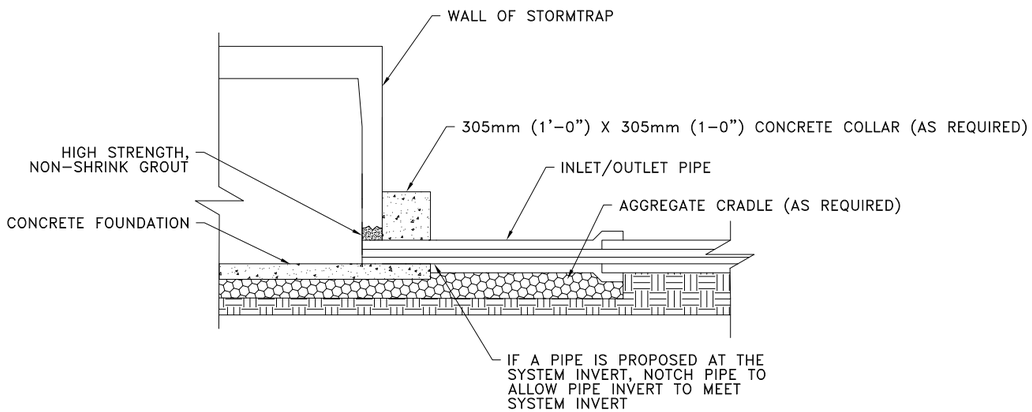


MEETS:
OPSS 1351.08.02
BNQ
ASTM C–478
ASTM D–4101
ASTM A–615
AASHTO M–199

STEP DETAIL



RISER/STAIR DETAIL



NOTCHED PIPE CONNECTION DETAIL
WHEN PIPE INVERT IS AT
INVERT OF STORMTRAP SYSTEM

StormTrap®
PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]
1287 WINDHAM PARKWAY
ROMEOVILLE, IL 60446
P:815–941–4549 / F:331–318–5347

ENGINEER INFORMATION:

Stantec
1331 Clyde Avenue
Suite 300
Ottawa, ON
613–722–4420

PROJECT INFORMATION:

Wateridge Village
Ottawa, ON

CURRENT ISSUE DATE:

04/21/2025

ISSUED FOR:

PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
1	04/21/2025	PRELIMINARY	LR

SCALE:

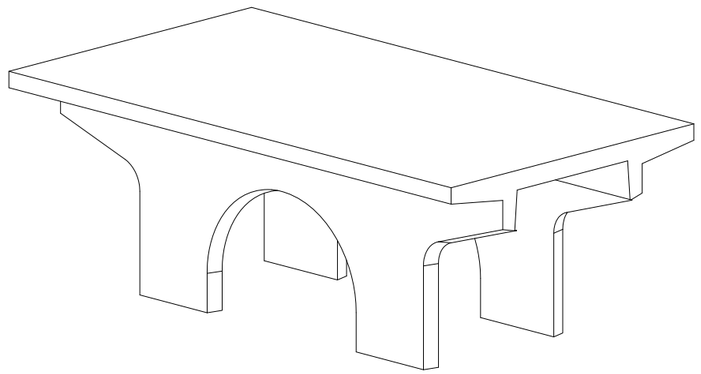
NTS

SHEET TITLE:

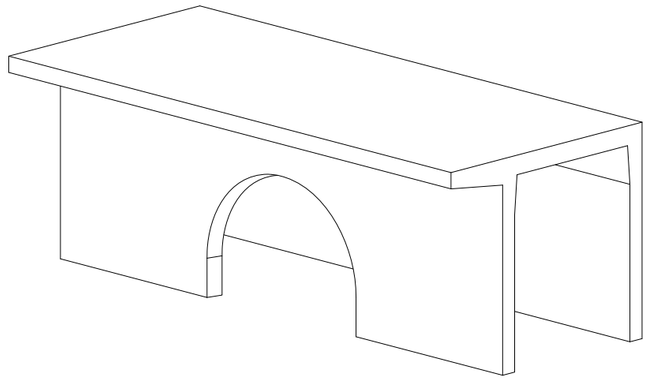
PIPE / ACCESS OPENING SPECIFICATION

SHEET NUMBER:

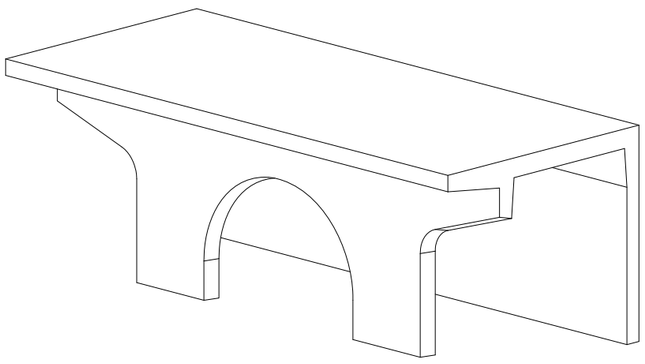
5.0



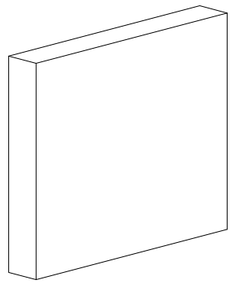
TYPE I



TYPE IV



TYPE III



TYPE IV END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP – INDICATES A MODULE WITH MODIFICATIONS.
3. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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PRELIMINARY

REV.	DATE:	ISSUED FOR:	DWN BY:
1	04/21/2025	PRELIMINARY	LR

SCALE:

NTS

SHEET TITLE:

SINGLETRAP
MODULE TYPES

SHEET NUMBER:

6.0

C.4 Background Report Excerpts

Former CFB Rockcliffe Redevelopment

Stormwater Management Existing Conditions & LID Pilot Project Scoping

Final Report
August 2015

Prepared by:

Aquafor Beech Limited

Mississauga – Guelph - Kingston

Table 35 – LID Design Targets for Former CFB Rockcliffe

Applicable Area	LID Design Targets		
	Infiltration*	Erosion*	Water Quality†
LID Pilot Area (Phase 1A)	LID Infiltration target = 4mm Maintain groundwater recharge per the existing conditions water budget. Groundwater recharge includes hydrological connection and linkages to wetlands, woodlots, streams and other natural features LID lot-level and conveyance controls shall infiltrate an equivalent volume a 4mm event applied to the full catchment area.	LID Erosion Control Target = 4mm LID lot-level and conveyance controls shall match the existing conditions water balance through the application of the infiltration targets in order to reduce or eliminate the effects of hydro-modification (magnitude, duration and frequency) form the contributing drainage area. As such the infiltration targets shall be considered the erosion control targets for LID controls.	Min. Target = 15mm The minimum water quality event for LID lot-level and conveyance controls for the Former CFB Rockcliffe shall be the 15mm event. LID controls shall treat the runoff from a 15mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the minimum 15mm water quality target shall be require to discharge to another LID in the treatment train and or an end-of-pipe pond to achieve the full enhanced level of control per the MOE SWMPD. Enhanced Target = 25mm To achieve the enhanced level of control, per the MSS, the target water quality event for LID lot-level and conveyance controls shall be the 25mm event. LID controls shall treat the runoff from a 25mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the enhanced water quality target do not require treatment in an end-of-pipe facility.
Total Development Area (Phase 1A-3)			

* Catchment Based Target – target applied over the full catchment area.

† Contributing Impervious Area Target – applied to the directly contributing impervious area to the LID control and should focus on the "treatment' of the required event through a combination of filtration, storage and release, evaporation and infiltration. Note: the water quality target shall include the required water balance (infiltration) targets i.e. water quality treatment = 15mm water quality event – 4mm infiltration/ erosion target.

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

REPORT
Project: 38298-5.2.2

DESIGN BRIEF
WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1A

Prepared for CANADA LANDS COMPANY
by IBI GROUP
REVISED NOVEMBER 2015
REVISED JANUARY 2016

5 Stormwater Management

5.1 Background

The subject site is part of the larger development referred to as the Former CFB Rockcliffe. The stormwater management strategy was outlined in the "Former CFB Rockcliffe Master Servicing Study" (MSS) (IBI Group, August 2015). The first phase, Phase 1A is located within the Wateridge Village at Rockcliffe site and includes much of the lower density housing types in the south central portion of the site.

The subject site is part of the drainage area which ultimately discharges into the Eastern SWM Facility. The design of the Eastern SWM Facility has been submitted to the applicable agencies and under review. The facility has been designed to provide an Enhanced Level of Protection according to MOE *Stormwater Management Planning and Design Guidelines* (March 2003). The design of the facility has been optimized to provide some water quantity control as outlined in *Eastern Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1 Report* (IBI, November 2015).

5.2 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, of the Rockcliffe Phase 1A development including the design of a proposed culvert. The evaluation includes assessment of the on-site detention versus cascading major flow, maximum depth and velocity of flow on the street segments, sizing of inlet control devices and hydraulic grade line analysis.
The evaluation and design takes into consideration the "Former CFB Rockcliffe Master Servicing Study" (MSS) (IBI Group, August 2015), the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), and the Technical Bulletin 'ISDTB-2014-01, Revisions to Ottawa Design Guidelines – SEWER dated 2012.

5.3 Stormwater Management Design

5.3.1 Dual Drainage Design

The site was designed with dual drainage features, accommodating minor and major system flow. The majority of the study site consists of continuous grade. A sawtooth design has been applied to portions of the street segments where possible to facilitate ponding in street sags or low points within the major system. Inlet control devices (ICDs) are proposed to minimize the surcharge in the minor system during infrequent storm events and maximize use of available on-site storage. The minor system capture of ICDs is generally based on the 5 year simulated flow for individual catchments. The balance of the surface flow not captured by the minor system will be conveyed via the major system. The dual drainage system has been evaluated using the DDSWMM hydrological model, while the minor system hydraulic grade line analysis has been evaluated using the XPSWMM dynamic model.

5.3.1.1 Major System

The major system analysis was evaluated with DDSWMM and is discussed in **Section 5.4.** Surface runoff in excess of the minor system capture will cascade via street segments and rear yard swales, eventually reaching one of the six (6) outlets noted below and shown in **Drawing 750**.

1. Major flow from the rear yards and the central portion of the subdivision on Street No. 13 drains to the South-West Swale. This swale has been designed to accommodate these

Only major flow from this area was assumed to contribute to the subject site, as per the August 2015 MSS. The area delineation was based on the semi-lumped storm drainage areas presented in the 2015 Rockcliffe MSS and was slightly modified to tie-in with the detail drainage area plan.

The minor system inflow rate for area EXTPRK was based on the 5 year 3 hour Chicago storm event.

Drawing 750 presents the external areas contributing major and minor flow to the subject site including their segment IDs.

5.4.1.12 Summary of Design Parameters

The below **Table 5-1** summarizes the main hydrological parameters used in the DDSWM model. The storm drainage area plan (**Drawing 750**) is provided within **Appendix E**, along with the rational method storm sewer design sheet and model output files.

Table 5-1: Hydrological Parameters and Modeling Results

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Generated Flow (l/s)*	Minor Flow Restriction (l/s)†
Segment ID	Area (ha)										
Street Segments											
S100A	0.25	S108A	S100	76	64	128	20	PA100	12	49	49.00
S100B	0.05	S108A	S100	76	28	28	20			10	8.80
S108A	0.19	S108B	S108	76	65	102	20	PA108A	13	37	47.26+
S108B	0.13	S111	S108	76	65	130	20			27	15.20
S111	0.22	S113A	S111	76	98	196	20			43	35.40
S113A	0.24	S113B	S113	76	80	80	20			44	44.00
S102B	0.09	S102A	S102	76	75	75	20			18	11.30
S102A	0.31	S119A	S102	76	83	166	20			60	37.40
S119A	0.22	S118A	S119	76	60	120	20			42	42.00
S118A	0.06	S118B	S118	76	59	59	20			11	12.00
S119B	0.18	S118B	S119	76	54	119	20			36	22.40
S109	0.10	S118C	S109	76	65	65	20			20	12.10
S118C	0.15	S118B	S118	76	83	83	20			28	25.30
S118B	0.12	S115	S118	76	44	88	20			21	21.00
S101	0.23	S104B	S101	76	119	130	20			46	22.40
S104B	0.06	S103	S104	76	25	25	9			10	10.00
S103	0.18	S122	S103	76	92	92	20			33	28.40
S105	0.08	S122	S105	76	75	75	20			16	10.40
S122	0.34	S120	S122	76	77	155	20			59	56.10
S121A	0.08	S120	S121	76	52	52	20			16	10.30
S120	0.23	S116	S120	76	73	73	20			40	40.00
S116	0.22	S115	S116	76	79	149	20	PA116	10	39	144.48+
S115	0.15	S113B	S115	76	45	90	20	PA115	10	26	140.90+
S113B	0.24	SWLw	S113	76	83	165	20	PA113B	3	44	110.77+

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Generated Flow (l/s)*	Minor Flow Restriction (l/s)†
Segment ID	Area (ha)										
S167B	0.13	DUMMY	S167	76	50	50	26	PA167B	2	25	25.00
S167C	0.02	S168	S167	76	20	20	26			4	3.30
S152	0.23	S150	S152	76	100	100	26	PA152	7	45	51.41+
S150	0.20	S149	S150	76	97	97	26	PA150	1	39	46.59+
S151	0.02	S150	S151	76	15	15	26			4	3.60
S149	0.15	S148	S149	76	80	80	26			30	15.50
S148	0.12	SWMBRM	S148	76	65	65	26	PA148	8	22	49.06+
Sclv	0.13	SWMBRM	clv	76	37	37	26	PAclv	14	24	24.00
										Total Flow for Street Segments to Minor System (l/s)	**2899.89**
Rear Yard Segments											
R100B	0.18	SWSUS	S100	51	54	54	N/A			24	24.00
R100A	0.22	SWSUS	S100	51	20	20	N/A			25	25.00
R108B	0.12	SWLS	S108	51	20	20	N/A			15	15.00
R108A	0.09	SWLS	S108	51	20	20	N/A			11	11.00
R109B	0.09	SWLS	S109	51	20	20	N/A			11	11.00
R102	0.35	R119	S102	51	86	171	N/A			48	48.00
R119	0.19	R109A	S119	51	50	100	N/A			26	26.00
R109A	0.18	S119B	S109	51	44	88	N/A			25	25.00
R122	0.28	S122	S122	51	65	130	N/A			38	38.00
R120	0.25	S120	S120	51	63	126	N/A			34	34.00
P116	0.40	S116	S116	14	59	90	N/A		1000¥	16	16.00
R112	0.11	R113	S112	76	57	114	N/A			23	23.00
R113	0.20	R115B	S113	51	48	96	N/A			27	27.00
R115B	0.10	S115	S115	51	25	50	N/A			14	14.00
R115A	0.17	S115	S115	51	22	22	N/A			20	20.00
SC128	2.50	S127	S128	86	135	563	N/A		1000¥	505	505.00
P141	0.86	N/A	S141	14	138	194	N/A		1000¥	35	35.00
P139	6.09	N/A	S139	14	275	1370	N/A		100000¥	240	952.00
										Total Flow for Rear Yard Segments to Minor System (l/s)	**1849.00**
										Total Flow from Street and Rear Year Segments to Minor System (l/s)	**4748.89**
External Areas											
EXTFRV	6.09	SWLS	NA	21	233	1370	N/A			345	345.00
EX180	0.54	EX190B	S180	86	63	126	N/A			110	51.90
EX190B	1.08	EX191	S190	86	109	218	N/A			210	89.00
EX190A	2.01	EX191	S190	86	188	376	N/A			396	89.00
EX191	2.19	SWME	S191	59	165	330	N/A			288	89.00
EX182	0.95	OUTW	S182	86	115	115	N/A			174	174.00

The results indicate that during the 100 year Chicago design storm event, peak flows onveyed by the Burma Rd culvert crossing are approximately 9.61 cms.

Analysis of the culvert was completed using XPSWMM hydraulic model to confirm capacity of the culvert and resulting hydraulic grade line. Discussion and results of the XPSWMM model are provided in **Section 5.5.1**.

5.5 Hydraulic Analysis

The hydraulic grade line (HGL) was evaluated using the XPSWMM hydraulic model. A model was created for the detail design of the laterals and storm trunk within the subject site terminating at the Eastern SWMF. Hydrographs from the study site were exported into the XPSWMM model from the major system analysis in DDSWMM. The minor system hydrographs for the remainder of the Rockcliffe Development Area, tributary to Eastern SWM Facility, were developed in the MSS study (IBI Group, August 2015). In addition to the MSS hydrographs discussed in **Section 5.4.4, r**elevant hydrographs developed in the MSS study were also downloaded into the XPSWMM model to account for the future phase 3 flows. Locations of the imported hydrographs are indicated in XPSWMM schematic provided within **Appendix E**.

XPSWMM simulations were conducted for the 100 year 3 hour Chicago storm to ensure that the HGL is at least 0.3m below the underside of footing elevations. A sensitivity analysis was also performed using the 100 year Chicago storm with a 20% increase in intensity and the July 1 1979 historical storm to ensure that there would be no severe flooding to properties. Hydraulic grade line values for the various storms are presented in **Table 5-7** below, along with a comparison of under-side of footing (USF) elevations.

The XPSWMM model schematic and model files are provided within **Appendix E**. Minor system losses were accounted for in accordance with Appendix 6-B of the City of Ottawa Sewer Design Guidelines (October, 2012).

Table 5-7: Summary of Hydraulic Grade Line Analysis

XP-SWMM NODE ID	MH NO.	USF (M)	100 YEAR 3 HOUR CHICAGO†		100 YEAR 24 HOUR SCS (103.2MM)‡		JULY 1, 1979¥		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%£	
			HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*
Wateridge Village Phase 1A (subject site)										
S153	147	N/A	89.39	N/A	89.39	N/A	89.39	N/A	89.39	N/A
S160	160	N/A	89.01	N/A	89.01	N/A	89.01	N/A	89.01	N/A
S161	161	N/A	88.74	N/A	88.74	N/A	88.74	N/A	88.74	N/A
S162	162	N/A	88.25	N/A	88.24	N/A	88.24	N/A	88.25	N/A
S163	163	N/A	87.67	N/A	87.67	N/A	87.67	N/A	87.67	N/A
S164	164	N/A	87.00	N/A	86.99	N/A	86.99	N/A	87.00	N/A
S165B	165	N/A	86.44	N/A	86.43	N/A	86.43	N/A	86.44	N/A
S165	165	N/A	85.21	N/A	85.08	N/A	85.17	N/A	85.33	N/A
S166	166	N/A	84.53	N/A	84.30	N/A	84.45	N/A	84.72	N/A
S167	167	N/A	84.32	N/A	84.05	N/A	84.22	N/A	84.52	N/A
S168	168	N/A	84.15	N/A	83.87	N/A	84.05	N/A	84.35	N/A

XP-SWMM NODE ID	MH NO.	USF (M)	100 YEAR 3 HOUR CHICAGO†		100 YEAR 24 HOUR SCS (103.2MM)‡		JULY 1, 1979¥		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%£	
			HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*
S128	128	N/A	81.82	N/A	81.77	N/A	81.78	N/A	81.92	N/A
S107	107	N/A	85.29	N/A	85.28	N/A	85.28	N/A	85.29	N/A
S106	106	85.61	83.72	1.89	83.68	1.93	83.68	N/A	83.73	N/A
S124	124	85.69	83.94	1.75	83.93	1.76	83.93	N/A	83.94	N/A
S125	125	85.34	83.37	1.97	83.34	2.00	83.34	N/A	83.38	N/A
S126	126	84.96	82.85	2.11	82.82	2.14	82.81	N/A	82.86	N/A
S182	182	N/A	81.62	N/A	81.55	N/A	81.56	N/A	81.76	N/A
S181	181	N/A	81.48	N/A	81.38	N/A	81.40	N/A	81.65	N/A
S110	110	85.56	83.59	1.97	83.59	1.97	83.59	N/A	83.59	N/A
S111	111	84.96	83.59	1.37	83.58	1.38	83.58	N/A	83.59	N/A
S112	112	84.91	83.23	1.68	83.22	1.69	83.22	N/A	83.23	N/A
S113	113	84.51	83.07	1.44	83.05	1.46	83.05	N/A	83.07	N/A
S114	114	83.91	82.49	1.42	82.48	1.43	82.48	N/A	82.49	N/A
S115	115	83.56	82.44	1.12	82.43	1.13	82.43	N/A	82.44	N/A
S116	116	83.71	82.14	1.57	82.10	1.61	82.11	N/A	82.19	N/A
S120	120	83.96	82.10	1.86	82.06	1.90	82.08	N/A	82.15	N/A

Notes:
* The free board is the USF minus the HGL (USF – HGL).
† HGL results for the 100 year 3 hour Chicago storm event were taken from the results of the XPSWMM model entitled "38298-ph1A-100ch.xp/out" and presented on the CD in **Appendix E**.
‡ HGL results for the 100 year 24 hour SCS Type II storm event were taken from the results of the XPSWMM model entitled "38298- ph1A-100SCS.xp/out" and presented on the CD in **Appendix E**.
¥ HGL results for the July 1, 1979 historical storm were taken from the results of the XPSWMM model entitled "38298-ph1A-JUL79.xp/out" and presented on the CD in **Appendix E**.
£ HGL results for the 100 year 3 hour Chicago storm event increased by 20% were taken from the results of the XPSWMM model entitled "38298- ph1A-120CH.xp/out" and presented on the CD in **Appendix E**.

The results indicate that the minimum 0.3 m clearance between the USF and HGL is maintained across the proposed Phase 1A site during the 100 year 3 hour Chicago design storm event. The results of the sensitivity analysis show that the minimum 0.3 m clearance is maintained across the site and there would be no severe flooding to properties during the 100 year Chicago storm with a 20% increase in intensity or the July 1, 1979 historical storm.

5.5.1 Culvert Analysis

Analysis of the Burma Rd culvert crossing was completed using XPSWMM hydraulic model to confirm capacity of the culvert and resulting hydraulic grade line. The capacity of the culvert is adequate as there are no residential service connections tied to this system and flows up to the 100 year Chicago plus 20% design storm event can be effectively conveyed.

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed _____

Date _____ 2015

Plan Number _____

LEGEND:

- DRAINAGE BOUNDARIES
- PHASE 1A DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- S401A / 0.32 / 0.65 — AREA ID, AREA (ha), Imp.(%)/Tp.(hr)
- MAJOR FLOW
- MH136 MANHOLE ID

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	REVISED PER CITY COMMENTS	P.S.	2016:01:27
2	REVISED PER CITY COMMENTS	P.S.	2015:11:30
1	SUBMISSION No.1 FOR CITY REVIEW	P.S.	2015:06:30

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613 998 7777

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

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1A

2016/01/27

Drawing Title

DDSWMM MODEL SCHEMATIC

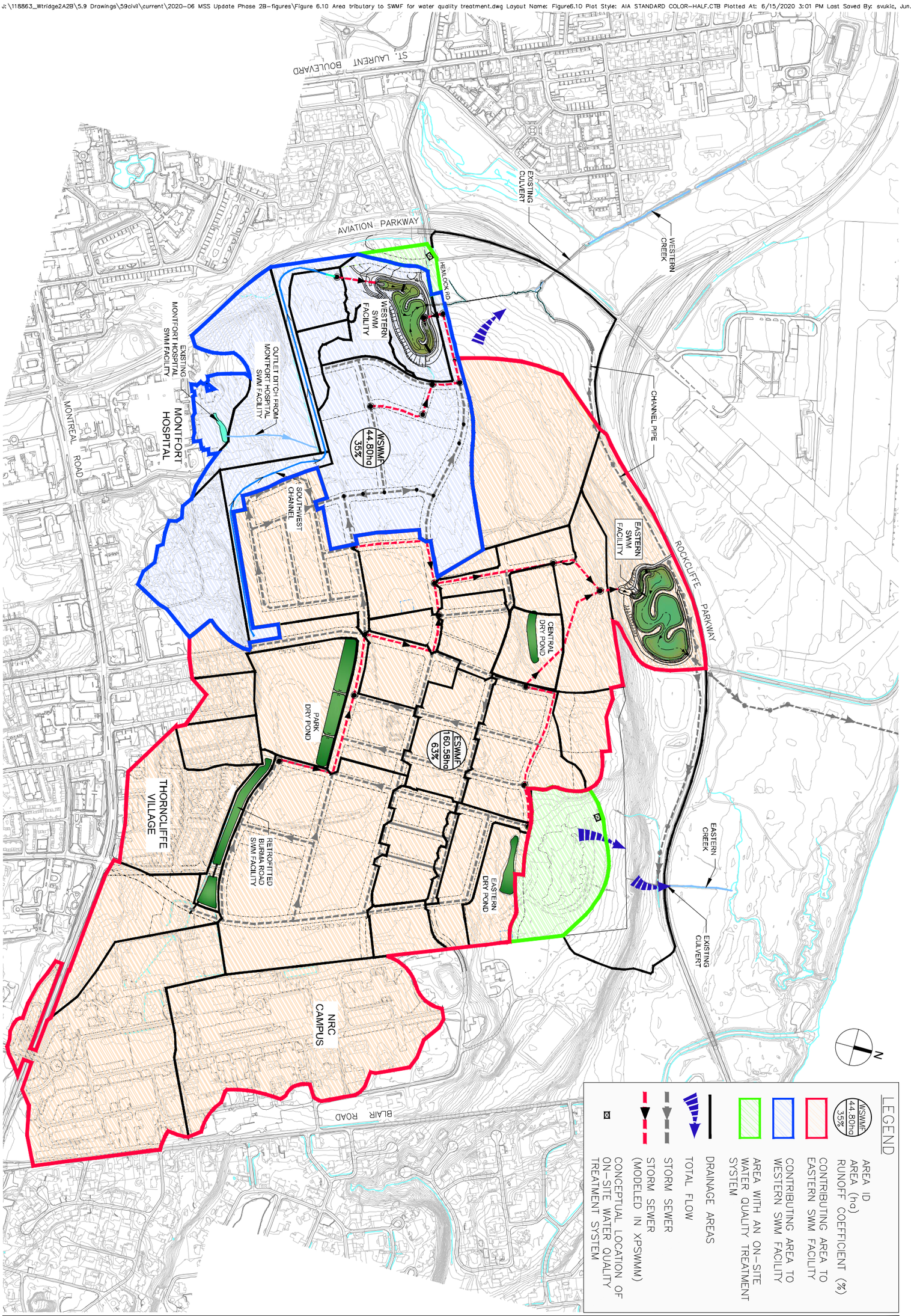
Scale: 1:2000

Design	Scale
P.S.	JUNE 2015
Drawn: S.V.	Checked: P.S.
Project No.: 38298	Drawing No.: 750

D07-16-15-0003

#17063

J:\118863_Wtridge2A2B\5.9 Drawings\59civil\current\2020-06 MSS Update Phase 2B-figures\Figure 6.10 Area tributary to SWMF for water quality treatment.dwg Layout Name: Figure6.10 Plot Style: AIA STANDARD COLOR-HALF.CTB Plotted At: 6/15/2020 3:01 PM Last Saved By: svukic, Jun. 15, 20



Sheet No.

FIGURE 6.10

Drawing Title

AREA TRIBUTARY TO SWM FACILITIES FOR WATER QUALITY TREATMENT

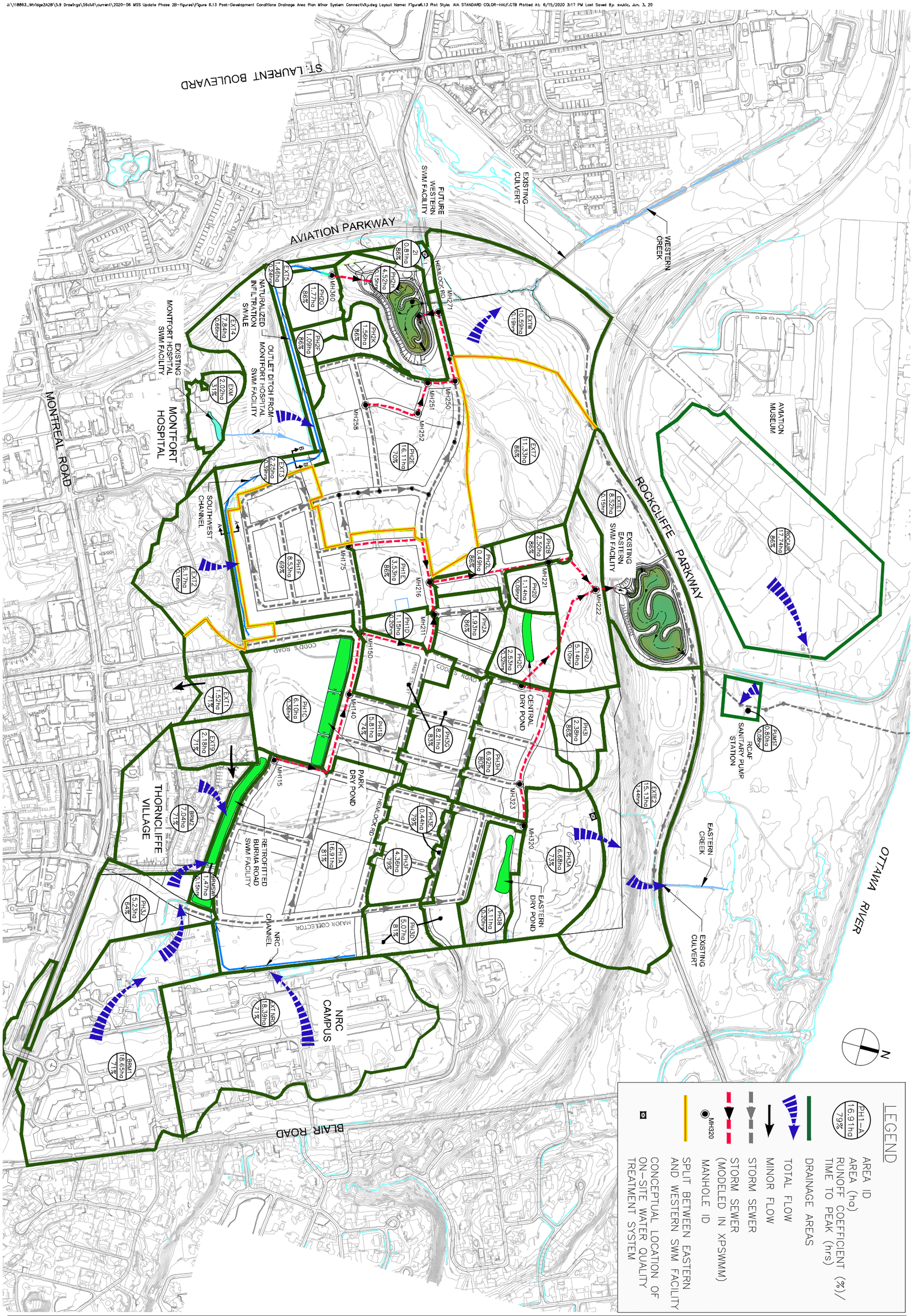
Project Title

FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY

Scale

0 100 200

IBI



Sheet No.

Drawing Title

FIGURE 6.13

POST-DEVELOPMENT CONDITIONS
DRAINAGE AREA PLAN
MINOR SYSTEM CONNECTIVITY

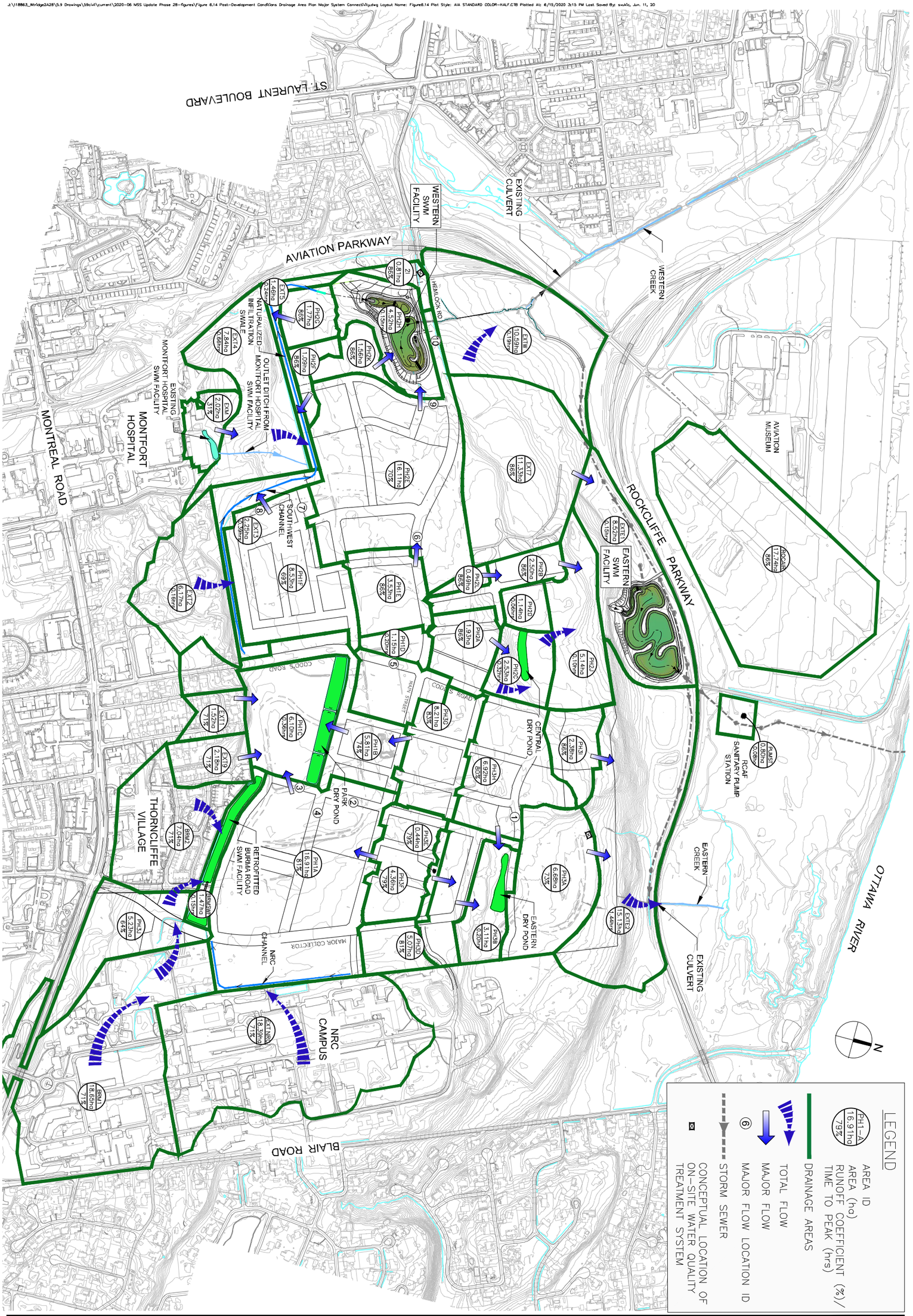
Project Title

FORMER CFB ROCKCLIFFE
MASTER SERVICING STUDY

Scale

0 100 200

IBI



Sheet No.

Drawing Title

FIGURE 6.14

POST-DEVELOPMENT CONDITIONS
DRAINAGE AREA PLAN
MAJOR SYSTEM CONNECTIVITY

Project Title

FORMER CFB ROCKCLIFFE
MASTER SERVICING STUDY

Scale

0 100 200

IBI

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 0824-A8CR5H
Issue Date: April 12, 2016

Canada Lands Company CLC Limited
30 Metcalfe Street, Suite 601
Ottawa, Ontario
K1P 5L4

Site Location: Wateridge Village at Rockcliffe
Lot 21, 22, 23, 24 and 25, Concession 1 (Ottawa Front)
City of Ottawa

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

establishment of a stormwater management facility for the collection, treatment and disposal of stormwater run-off from an area of approximately 161.5 hectares including part of the Wateridge Village at Rockcliffe residential subdivision development on the former CFB Rockcliffe site in the City of Ottawa, providing Enhanced Level water quality control and erosion protection with an outfall directly to the Ottawa River, consisting of the following:

stormwater management facility (Eastern SWM Facility - catchment area 161.5 hectares): - one (1) wet pond with a stilling basin and sediment forebay, located on the south side of Sir Charles Etienne Cartier Parkway, east of Aviation Parkway and west of Blair Road, having a permanent pool volume of 29,500 m 3 , an extended detention volume of 39,200 m 3 , and a total storage volume for the 100-year storm event of approximately 68,700 m 3 , including the permanent pool volume, at a total depth of approximately 4.26 m, receiving inflow from the eastern and central portions of the Rockcliffe development lands via a waterfall discharging to the stilling basin and discharging via an outlet structure and 2400 mm diameter outfall sewer to the Ottawa River, identified below, and a 200 mm diameter baseflow augmentation pipe, identified below;

outfall sewer (Eastern SWM Facility Outlet Pipe): - approximately 609 m of 2400 mm diameter storm sewer and 3000 mm by 1200 mm outfall storm sewer receiving inflow from the Eastern SWM Facility and from the Western SWM Facility Overflow Pipe, identified below, discharging to the Ottawa River;

outfall sewer (Western SWM Facility Overflow Pipe): - approximately 288 m of 1200 mm diameter outfall storm sewer along the north side of the Eastern SWM Facility designed to receive inflow from the future Western SWM Facility and discharge to the Eastern SWM Facility Outlet Pipe, identified above;

baseflow augmentation pipe: - approximately 591 m of 200 mm diameter storm sewer along the south side of Sir Charles Etienne Cartier Parkway, receiving inflow from the Eastern SWM Facility and

discharging eastward to Eastern Creek and the Ottawa River;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document including the application and any supporting documents listed in any schedules in this Approval;

"Director" means a person appointed by the Minister pursuant to section 5 of the Environmental Protection Act for the purposes of Part II.1 of the Environmental Protection Act;

"Ministry" means the ministry of the government of Ontario responsible for the Environmental Protection Act and the Ontario Water Resources Act and includes all officials, employees or other persons acting on its behalf;

"Owner" means Canada Lands Company CLC Limited and includes their successors and assignees;

"Works" means the sewage works described in the Owner's application(s) and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the Conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) The designation of the City of Ottawa as the operating authority of the site on the application for approval of the Works does not relieve the Owner from the responsibility of complying with any and all of the Conditions of this Approval.

(3) Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(4) Where there is a conflict between a provision of any submitted document referred to in this Approval and the Conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(5) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(6) The Conditions of this Approval are severable. If any Condition of this Approval, or the application

of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such Condition to other circumstances and the remainder of this Approval shall not be affected thereby.

(7) The issuance of, and compliance with the Conditions of this Approval does not:

(a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority necessary to construct or operate the sewage Works; or

(b) limit in any way the authority of the Ministry to require certain steps be taken to require the Owner to furnish any further information related to compliance with this Approval.

(8) This Approval includes the treatment and disposal of stormwater run-off draining to the Eastern SWM Facility for a total catchment area of approximately 161.5 hectares, assuming an average imperviousness of approximately 63%. Any changes within the drainage areas that might increase the required storage volumes or increase the flows to or from the stormwater management facility or any structural/physical changes to the stormwater management facility, including the inlets or outlets, will require an amendment to this Approval.

2. EXPIRY OF APPROVAL

(1) This Approval will cease to apply to those parts of the new Works which have not been constructed within **five (5) years** of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the Director, in writing, of any of the following changes within **thirty (30) days** of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act , R.S.O. 1990, c. B17 shall be included in the notification to the Director;

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act , R.S.O. 1990, c. C39 shall be included in the notification to the Director.

4. OPERATION AND MAINTENANCE

(1) The Owner shall inspect the Works at least **once a year** and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments and/or vegetation.

(2) The Owner shall maintain a record the results of these inspections and any cleaning and maintenance operations undertaken. The record shall include the following:

(a) the name of the Works; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. MONITORING AND REPORTING

(1) The Owner shall carry out a monitoring program and evaluate the performance of the stormwater management Works commencing at the initial completion of construction of the Works and continuing for a minimum of **five (5) years** .

(2) The monitoring program shall include obtaining grab samples at the outlet structure from the outfall headwall of the 3000 mm by 1200 mm outfall pipe from the stormwater management facility (Eastern SWM Facility) to the Ottawa River for at least three (3) rainfall wet events per year (a wet event is defined as a minimum of 15 mm of rain in the previous 24 hours). Two (2) of the events must occur within the May to September time period.

(3) Samples should be tested for Total Suspended Solids (mg/L) and results recorded.

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)", as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions.

(5) The Owner shall prepare a Performance Report, **every five (5) years** , a Performance Assessment Report, addressing the following:

(a) a description of any operating problems encountered and corrective actions taken during the reporting period and the need for further investigations in the following reporting period for system refinements or ways of improving the performance of the Works;

(b) measurement of the mass of accumulated sediment removed when undertaking maintenance of the Works as per the Operations and Maintenance Conditions, above;

(6) The Owner shall maintain a record of all test results and all reports related to the sampling, monitoring and maintenance program for the Works, and shall make the information available to the Ministry, upon request.

(7) The measurement frequency specified in Condition 5, Subsections (1) and (2), above, and reporting frequency specified in Condition 5, Subsection (5), above, may, **after five (5) years** of monitoring in accordance with this Condition, be modified by the MOECC District Manager of the Ottawa office in writing from time to time.

6. TEMPORARY EROSION AND SEDIMENT CONTROL

(1) The Owner shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every **two (2) weeks** and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue

until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly .

(2) The Owner shall maintain records of inspections and maintenance which shall be made available for inspection by the Ministry, upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the temporary sediment and erosion control measures.

7. RECORD KEEPING

The Owner shall retain for a minimum of **five (5) years** from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this Approval.

Schedule "A"

1. Application for Environmental Compliance Approval , dated December 2, 2015 and received on February 8, 2016, submitted by the City of Ottawa;

2. Eastern Stormwater Management Facility Design Wateridge Village at Rickcliffe, Phase 1A , dated February 2016, prepared by IBI Group;

3. Set of Engineering Drawings (13 drawings) for Eastern Stormwater Management Facility Phase 1A, Wateridge Village at Rockcliffe, dated February 1, 2016, prepared by IBI Group;

4. Geotechnical Investigation Phase 1A Development - Site Servicing Former CFB Rockcliffe Development Ottawa, Ontario , dated February 1, 2016, prepared by DST Consulting Engineers Inc.;

5. Letter from Shagha Attar of IBI Group to the Ministry, date March 29, 2016;

6. E-mail from Peter Spal of IBI Group to the Ministry, dated April 7, 2016; and

7. E-mail from Shagha Attar of IBI Group to the Ministry, dated April 11, 2016.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This Condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved Works and to ensure that any subsequent Owner of the Works is made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to require that the Works be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to enable the Owner to evaluate and demonstrate the performance of the Works on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives specified in the Approval and that the Works do not cause any

impairment of the receiving watercourse.

6. Condition 6 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction, until they are no longer required.

7. Condition 7 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 12th day of April, 2016

Gregory Zimmer, P.Eng.
Director
appointed for the purposes of Part II.1 of

the *Environmental Protection Act*

DC/
c: District Manager, MOECC Ottawa office
Peter Spal, IBI Group

Appendix D External Report Excerpts

PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

Wateridge Block 105 – Mikinak Road & Vedette Way
Ottawa, Ontario

Prepared for Mattamy Homes

Report PG7353-1 Revision 1 dated April 30, 2025

4.0 Observations

4.1 Surface Conditions

The subject site is currently vacant and grass covered. The ground surface across the subject site slopes gently downward from east to west at approximate elevations of 88.5 to 86.55

The site is bordered by a park block to the east, Hemlock Road to the north, Vedette Way to the west and Mikinak Road to the south.

However, 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 majority of the subject site was previously occupied by single family dwellings, local roadways and car parking areas in addition to some landscaped areas. By 2013, all structures within the subject section of the site were demolished. Historical aerial photographs of the subject site and its surroundings are provided in Figures 2, 3, and 4 - Aerial Photographs, in Appendix 2.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the subject site consists of topsoil and/or fill underlain by silty clay and glacial till. Fill material was encountered at all test holes with the exception of BH 1-21, BH 6-21, BH 14-30, BH 13-01, BH 13-02, and extended to depths ranging from 0.2 to 2.7 m below existing grade. The fill was noted to consist of brown silty clay and/or silty sand with gravel, crushed stone, organics, bricks.

A layer of compact brown sand with silt, clay and trace gravel was encountered at boreholes BH 14-30, BH 13-01 and BH 13-02 and was noted to extend to approximate depths ranging from 0.2 to 0.6 m.

A hard to stiff brown silty clay crust was encountered below the fill and/or topsoil at all test holes with the exception of BH 4-25, BH 15-13 and TP 13-19, where fill material was noted to extend to the underlying glacial till layer, or the refusal depth of the test holes. The silty clay was noted to transition from brown to grey in colour varying depths below ground surface.

Where encountered, the glacial till layer was noted to consist of a compact brown to grey, silty sand to silty clay with gravel cobbles and boulders.

Practical refusal to the DCPT was encountered in boreholes BH 2-25 and BH 4-21 at approximate depths of 6.3 and 6.4 m, respectively.

Bedrock

The bedrock was cored at boreholes BH 15-12, BH 15-13, BH 15-15 and BH 15-18 by others, and was noted to consist of poor to excellent quality grey to dark grey limestone bedrock. At borehole BH 15-18, shale bedrock was encountered underlying the limestone bedrock at an approximate depth of 8.6 m below the existing ground surface. The bedrock was cored to a maximum depth of 10 m below the existing ground surface.

Based on available geological mapping, the bedrock in the area of the subject site generally consists of interbedded limestone and dolomite of the Gull River Formation. The overburden drift thickness is estimated to be between 2 to 5 m depth.

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

Grain Size Distribution and Hydrometer Testing

Two (2) sieve analyses were completed during a previous investigation by Paterson to further classify selected soil samples. The results are summarized in Table 1 below and are presented in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-25	SS5	0.0	1.7	32.8	65.5
BH 2-25	SS5	0.0	1.0	36.5	62.5
BH 3-25	SS3	0.0	2.5	38.0	59.5
BH 2-21	SS5	0	1.1	98.9	
BH 5-21	SS4	0	0.8	99.2	

Table 3 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-25	86.69	Dry	-	March 21, 2025
		Dry	-	April 24, 2025
BH 2-25*	86.42	3.94	82.48	March 21, 2025
		4.11	82.31	April 24, 2025
BH 3-25	87.36	Dry	-	March 21, 2025
		4.90	82.46	April 24, 2025
BH 4-25	88.46	Dry	-	March 21, 2025
		3.26	85.2	April 24, 2025
BH 5-25	87.58	4.54	-	March 21, 2025
		4.14	83.44	April 24, 2025
BH 1-21	83.87	1.62	82.25	April 5, 2021
BH 2-21	83.33	0.53	82.80	April 5, 2021
BH 3-21	83.52	1.17	82.35	April 5, 2021
BH 4-21	85.28	Dry	-	April 5, 2021
BH 5-21	85.75	1.75	84.00	April 5, 2021
BH 6-21	84.93	0.51	84.42	April 5, 2021
BH 15-15	87.76	3.27	84.50	October 1, 2015
BH 15-16	85.24	3.34	81.90	October 1, 2015
BH 15-31	85.51	3.04	82.50	October 1, 2015
BH 14-30*	85.85	3.13	82.72	-
BH 13-02*	87.08	2.97	84.11	August 7, 2013

Notes:
- Ground surface elevations at test hole locations are referenced to a geodetic datum.
- '*' Denotes monitoring well

Long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, the groundwater table can be expected at an approximate geodetic elevation of **82.0 to 84.5 m**.

It should be noted that surface water can be perched within the open holes which may be interpreted as shallow groundwater in some of the borehole locations. The recorded groundwater levels are also provided on the applicable Soil Profile and Test Data sheets presented in Appendix 1.

It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential development. It is recommended that the proposed residential buildings be founded on conventional spread footings placed on an undisturbed, hard to stiff brown silty clay, compact silty sandy, compact glacial till or engineered fill placed over the hard to stiff silty clay, compact silty sand and/or compact glacial till.

It is further expected that the proposed stormwater storage system will be founded on a raft foundation bearing on the undisturbed hard to stiff silty clay.

It is anticipated that some bedrock removal may be required for building construction and servicing installation. Therefore, the contractor should be prepared for bedrock removal.

Due to the presence of a silty clay deposit, the subject site will be subjected to permissible grade raise restrictions.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic or deleterious materials, should be stripped from under the proposed buildings and other settlement sensitive structures.

If encountered, 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.

Bedrock Removal

Bedrock removal may be required at the subject site and can be accomplished by hoe ramming where the bedrock is weathered, and/or where only small quantities need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the propose buildings should be compacted to a minimum 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

Protection of Subgrade (Raft Foundation) – Stormwater Storage System

Since the subgrade material will consist of a silty clay deposit, it is recommended that a minimum 75 mm thick lean concrete mud slab be placed on the undisturbed silty clay subgrade shortly after the completion of the excavation. The main purpose of the mudslab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment.

The final excavation to the raft bearing surface level and the placing of the mud slab should be done in smaller sections to avoid exposing large areas of the silty clay to potential disturbance due to drying.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, hard to stiff silty clay, or on engineered fill placed directly over the undisturbed hard to stiff silty clay bearing surface, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was incorporated in calculating the bearing resistance values at ULS.

Footings placed on an undisturbed, compact silty sand, glacial till, or on engineered fill placed directly over the undisturbed silty sand or glacial bearing surface, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was incorporated in calculating the bearing resistance values at ULS.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings placed on a soil bearing surface and designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

Footings supported directly on clean, surface-sounded bedrock, or on lean concrete which is placed directly over clean, surface sounded bedrock, can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **500 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings supported directly on clean, surface sounded bedrock and design for the bearing resistance values provided above will be subject to negligible post-construction total and differential settlements.

Raft Foundation – Stormwater Storage System

It is understood that the proposed below-grade stormwater storage system will be founded on a raft foundation located approximately 4 m below the existing ground surface.

The amount of settlement of the raft slab will be dependent on the sustained raft contact pressure. The loading conditions for the contact pressure are based on sustained loads, that are generally taken to be 100% Dead Load and 50% Live Load. The contact pressure provided considers the stress relief associated with the soil removal required for construction of the system.

A bearing resistance value at SLS (contact pressure) of **150 kPa** will be considered acceptable for a raft supported on the undisturbed, hard to stiff silty clay. The factored bearing resistance (contact pressure) at ULS can be taken as **225 kPa**. For this case, the modulus of subgrade reaction was calculated to be **6 MPa/m** for a contact pressure of **150 kPa**.

The raft foundation design is required to consider the relative stiffness of the reinforced concrete slab and the supporting bearing medium.

Permissible Grade Raise Recommendations

Due to the presence of the silty clay deposit at the site, a permissible grade raise restriction of **3.0 m** is recommended.

If a higher permissible grade raise is required, preloading with or without surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction and differential settlements.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A soil bearing medium or a heavily fractured, weathered bedrock will require a lateral support zone of 1H:1V (or flatter).

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended at the soil/bedrock and bedrock/soil transitions that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material, see below. The width of the sub-excavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab.

5.6 Pavement Design

For preliminary design purposes, the following pavement structures, presented in Tables 4 and 5, are recommended for car parking areas and access lanes.

Table 4 – Recommended Asphalt Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Table 5 – Recommended Asphalt Pavement Structure – Local roadways

Thickness (mm)	Material Description
40	**Wear Course** – Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
400	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

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.

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 compaction equipment.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ 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 determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

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.

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

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 Mattamy Homes, 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.

Mrunmayi Anvekar, M.Eng. Kevin Pickard, P.Eng.

Report Distribution:

- ❑ Mattamy Homes (email copy)
- ❑ Paterson Group (1 copy)

patersongroup **memorandum**

consulting engineers

re: **Subsoil Infiltration Review**
Proposed Infiltration Systems
Wateridge Residential Development - Phase 3A
101 Vedette Way - Ottawa

to: Mattamy Homes - **Conor Sutherland** - conor.sutherland@mattamycorp.com

date: December 20, 2021

file: PG5756-MEMO.01R

Paterson Group (Paterson) has prepared the current memorandum report to provide anticipated infiltration rates to be encountered within the subsoils below the proposed infiltration systems based on Paterson's geotechnical investigation for the subject site.

Background Information

At the time of report preparation, it is understood that the proposed development will consist of a series of townhouses and stacked units. It is also understood that at-grade asphalt covered car parking, access lanes and landscaped areas are also anticipated as part of the proposed development. Furthermore, it is expected that the site will be municipally serviced.

As part of the stormwater management strategy for the proposed development, consideration is currently being given to providing infiltration beneath the parking areas and amenity space with connections from municipal catch basin inlets. It is also expected that amended topsoil will be added to landscaped areas to further reduce runoff from precipitation events.

The results of the geotechnical investigation indicated that, in general, the subsurface profile at the test hole locations within proximity of the proposed infiltration measures consisted of a thin layer of topsoil/fill overlying a deposit of silty clay. The above noted material is periodically underlain by a glacial till comprised of a silty clay matrix with varying amounts of sand, gravel, cobbles and boulders. Bedrock was not conclusively encountered at the time of the geotechnical field investigation. However, practical refusal to augering was observed at depths ranging from 2.7 to 6.5 m below ground surface (bgs).

Based on the assessment of recovered soil samples for parameters such as moisture levels, colouring and consistency, the long-term groundwater level is expected to range from 3 to 4 m bgs. Groundwater levels are subject to seasonal fluctuations and could vary at the time of construction.

Subsoil Infiltration Values

Based on discussions with the design team, the invert elevations for the proposed infiltration systems are currently unknown. However based on the observed thickness of the silty clay deposit at the site, it is anticipated that the subsoil below the proposed infiltration systems will consist of either silty clay or glacial till. It is recommended the infiltration system be placed a minimum of 1 m above the long-term groundwater level to comply with current regulations and provide optimal conditions for water infiltration to the subsoils.

Hydraulic conductivity testing was not completed as part of the geotechnical investigation for the proposed development. However, based upon previous experience with similar soils within earlier phases of the development located adjacent to the site and typical published values, hydraulic conductivity values and infiltration rates for the subsoils have been estimated and summarized in Table 1. It should be noted that a safety correction factor was not applied to the above noted infiltration rates for calculating the design infiltration rates.

Table 1 - Estimated Hydraulic Conductivity and Infiltration Rates

Soil Type	K (m/sec)	Infiltration Rate (mm/hr)
Brown Silty Clay	1.00E-09 to 1.00E-07	7 to 26
Glacial Till	1.00E-08 to 1.00E-06	14 to 45

To determine site specific design infiltration rates, it is recommended to complete a series of permeameter tests at the invert elevations of the proposed infiltration systems prior to finalizing the design.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Michael Laflamme, P.Geo.

Paterson Group Inc.

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