

Trails Edge West Block 121

Site Servicing and Stormwater Management Report



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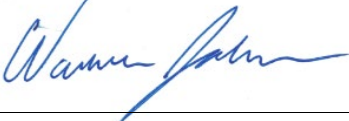
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1 Introduction

Richcraft Homes Ltd. has commissioned Stantec Consulting Ltd. to prepare this Servicing and Stormwater Management Report for their development site identified as Block 121. The block maintains a municipal address of 6273 Renaud Road within the Trails Edge West Subdivision in the City of Ottawa.

The subject site is zoned DR – Development Reserved and I1A – Institutional (now INZ under 2026 zoning by-law), and is bound by Mud Creek to the north, Melodie Street to the west, Renaud Road to the south, and Compass Street to the east. The site location is outlined in **Figure 1** below.

The proposed 1.33 ha residential development will consist of 7 back-to-back townhome blocks for a total of 76 townhouse units, associated private access roads, and an amenity area facing the creek. 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**. Refer to **Appendix E.1** for the Phase 1 Pre-consultation Feedback form for the proposed development and **Appendix E.2** for correspondence with the City of Ottawa regarding the permitted right-of-way service connection locations.

Figure 1: Site Location



2 References

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

- *City of Ottawa Design Guidelines – Water Distribution*, Infrastructure Services Department, City of Ottawa, Second Edition, November 2025
- *City of Ottawa Sewer Design Guidelines*, 4th Ed., City of Ottawa, November 2025
- *Trails Edge West Design Brief*, Revision 3, David Schaeffer Engineering Ltd. (DSEL), January 2015
- *Geotechnical Investigation – Trailsedge West – Block 121*, Revision 3, Paterson Group, June 2025
- *Design Brief Minto Trailsedge Phase II*, IBI Group, February 2015
- *Stormwater Management Report for the Trails Edge West Subdivision*, JFSA, January 2015



3 Water Servicing

3.1 Background

The site at Block 121 of the Trails Edge West Subdivision is within the 2E 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 Renaud Road and Compass Street. The 305 mm mains are supplied by multiple connections to distribution mains within the adjacent phases of the Trails Edge West subdivision.

3.2 Design Criteria

3.2.1 Water Demand and Allowable Pressure

The domestic water demand and allowable water pressure are assessed using the City of Ottawa Water Distribution Guidelines (2025) as amended, the ISTB 2021-03 Technical Bulletin, and Table 3-3 of the MECP Water Design Guidelines.

Residential Apartment Population Rate

Townhouse	2.7 persons / unit
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Residential Apartment Demand

Average Daily (AVDY)	280 L/cap/day
Maximum Daily (MXDY)	4.4 × AVDY
Peak Hour (PKHR)	6.7 × AVDY

Allowable Water Pressure

MXDY Flow	345 kPa (50 psi) to 552 kPa (80 psi)
PKHR Flow Minimum	276 kPa (40 psi)
MXDY + Fire Flow	140 kPa (20 psi)
Maximum Allowable for Occupied Area	552 kPa (80 psi)

3.2.2 Fire Flow and Hydrant Capacity

Detailed fire flow requirements are assessed using the Fire Underwriters Survey (FUS) methodology (2020). Site specific criteria considered are noted in **Section 3.3.2**.

Fire hydrant capacity in relation to estimated fire flow requirements is assessed based on Table 18.5.4.3 of the National Fire Protection Agency (NFPA) Fire Code document. A hydrant situated less than 76 m



away from a building can supply a maximum capacity of 5,678 L/min, and a hydrant 76 to less than 152 m away can supply a maximum capacity of 3,785 L/min.

3.3 Proposed Watermain Sizing and Layout

The proposed development will be serviced by a looped private watermain network fed by two connections to existing watermains: one to the 305 mm diameter watermain in Renaud Road, and a second to the existing 305 mm diameter watermain in Compass Street.

3.3.1 Water Demands

Based on the site layout, the proposed development is estimated to have a total population of 205 persons. The estimated demand for the proposed development is summarized in **Table 3.1** and detailed in **Appendix A.1**.

Table 3.1: Estimated Water Demands

Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
205	0.7	2.9	4.4

3.3.2 Fire Flow Demands

The fire flow requirements for the residential properties are 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 m² to suit Part 9 of the code. 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 m² cap in building area.

Based on the FUS calculations, Block 4 as an 8-unit back-to-back townhouse block has the worst-case fire flow demand of 233 L/s (14,000 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 into two 6-unit clusters to comply with OBC Div. B, Subsection 3.1.10.

3.3.3 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**.



Table 3.2: Boundary Conditions

Scenario	Renaud Road	Compass Street
Minimum HGL (m)	127.4	127.4
Maximum HGL (m)	130.8	130.8
MXDY + FF (233 L/s) (m)	124.5	125.5
MXDY + FF (250 L/s) (m)	123.9	125.1

3.4 Hydraulic Assessment

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

3.4.1 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

3.4.2 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.

3.4.2.1 Average Day & Peak Hour

The hydraulic model results show that the maximum pressures (AVDY condition) are anticipated to be approximately 427 to 429 kPa (61.9 to 62.2 psi), while minimum pressures during PKHR are anticipated to be approximately 394 to 395 kPa (57.1 to 57.3 psi). These pressures are well above the minimum allowable pressure of 276 kPa (40 psi).



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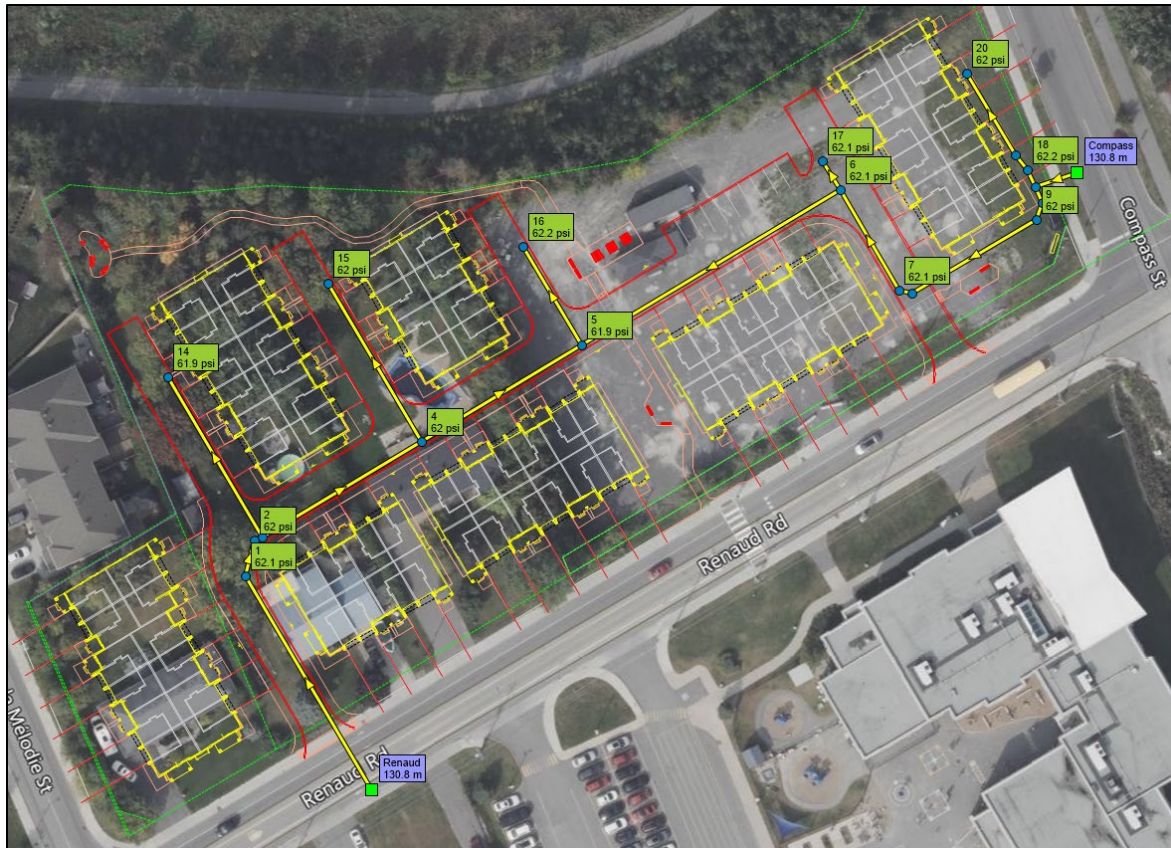


Figure 3.1: Maximum Pressures During AVDY Conditions



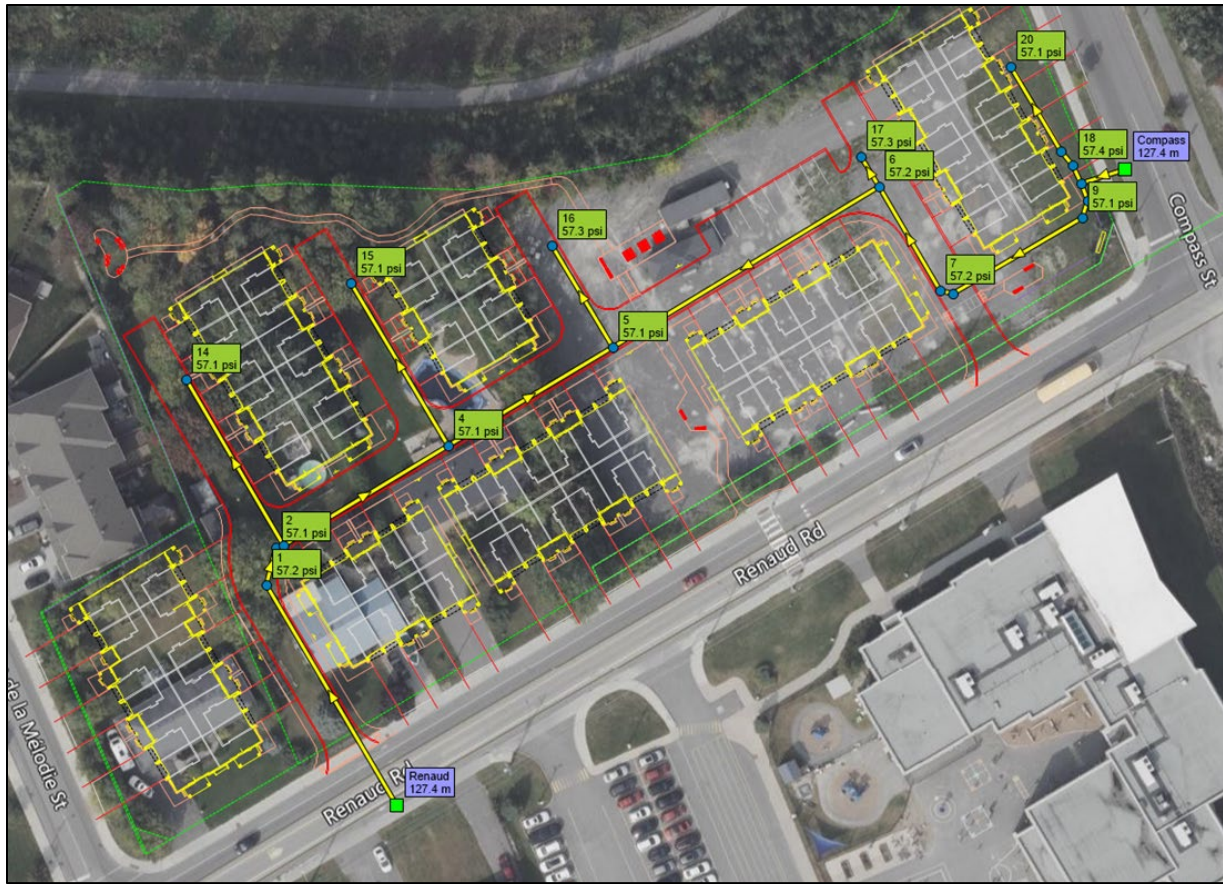


Figure 3.2: Minimum Pressures During PKHR Conditions

3.4.2.2 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 14,000 L/min (233 L/s) at watermain locations feeding proposed hydrants. 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 in the main 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 in the main and the static pressures in the dead-end mains are demonstrated in **Figure 3.3**. Results of the hydraulic modeling are included in **Appendix A.4**.



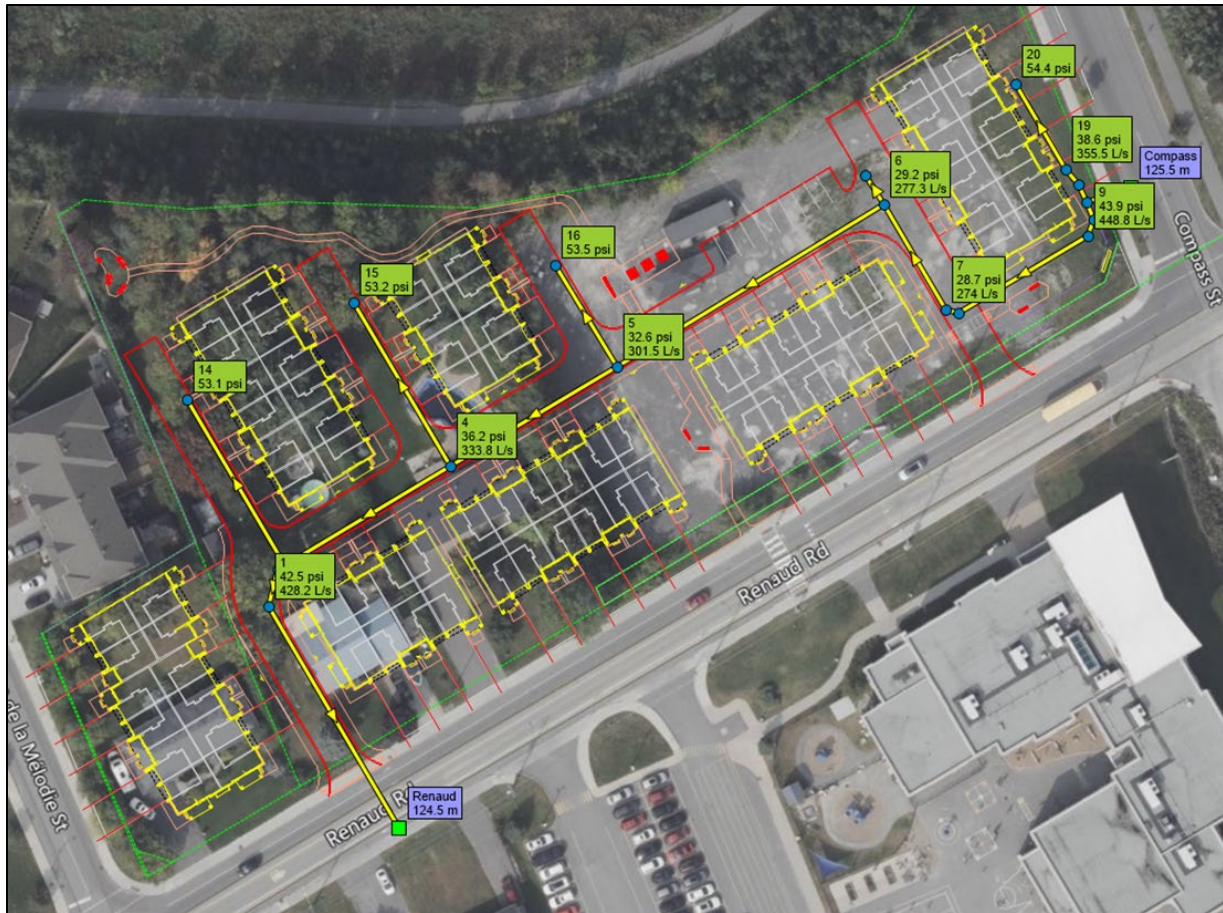


Figure 3.3: Residual Pressures and Available Fire Flows during MXDY Conditions

3.4.2.3 Fire Hydrant Coverage

There are three fire hydrants proposed to deliver fire flows within the site. Additionally, three existing hydrants within Renaud, Melodie, and Compass Street lie within proximity to the development. 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 on-site buildings to be within the 76m coverage range from at least two on-site hydrants, with 2-3 other hydrants within 152m. As such, the fire flow demands for each on-site townhome block are well served by the proposed layout. See **Appendix A.5** for fire hydrant coverage table calculations.



3.5 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).

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 m² in area to meet OBC requirements for buildings under Part 9. Three proposed fire hydrants have been situated to provide the required fire flow for the development.



4 Wastewater Servicing

4.1 Background

The existing sanitary sewers adjacent to the block comprise of the 200 mm diameter municipal sanitary sewers in Melodie Street and Renaud Road and the 750 mm diameter municipal sanitary sewer in Compass Street. An existing 200 mm service stub has been provided from the 750mm Compass Street sewer to facilitate site development. The sanitary service laterals servicing the three existing residential dwellings at the west boundary of the site are expected to be abandoned and removed prior to construction. In the 2015 IBI Design Brief for the Trailsedge West subdivision, the site area falls under Areas 413A and 206. The two areas are to contribute a total of 1.2 L/s of sanitary peak flow based on an assumed total population of 34 persons in Area 413A and institutional usage in Area 206 with a combined area of 1.15 ha. The drainage area from the Design Brief is attached in **Appendix B**.

4.2 Design Criteria

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

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

4.3 Proposed Servicing

As shown on **Drawing SA-1** and detailed in the sanitary sewer design sheet attached in **Appendix B**, the development will be serviced by a network of 200 mm diameter sanitary sewers discharging to the existing 200mm diameter sanitary sewer within Renaud Road and the existing 200 mm diameter sanitary stub to the Compass Street sewer.

Peak design flows from the site are calculated to be 2.6 L/s. Details of the peak flow calculations are included in the sanitary sewer design sheet attached in **Appendix B**. 6 units at the west side of Block 7 will be serviced from the 200 mm diameter sanitary sewer within Melodie Street.

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 Background

Stormwater generated on the site is subject to the requirements outlined in the *Design Brief Minto Trailsedge Phase II* (IBI Group, February 2015) and the *Stormwater Management Report for the Trails Edge West Subdivision* (JFSA, January 2015). The background reports outline that portions of stormwater from the proposed site are to be directed east to an existing 1500mm dia. storm sewer within the Compass Street ROW, south to an existing 525mm dia. storm sewer within the Renaud Road ROW, and west to an existing 375mm dia. storm sewer and rear yard catch basin network within the Melodie Street ROW. Minor system contributions are to be restricted to 175 L/s to the Compass Street storm sewer and 110 L/s to the Renaud Road storm sewer. The stormwater contributions assumed to be directed to the Melodie Street storm sewer in the background studies will be matched. Runoff in excess of the minor system capture rate is to be directed overland through the downstream street segments ultimately discharging to either Mud Creek directly or via the downstream EUC Pond 1. Existing Renaud Road sewers adjacent to the westerly half of the development discharge to the downstream EUC Pond 3. Quality control is to be provided through the downstream SWM facilities. Drainage area plans and excerpts from background reports are included in **Appendix C.3**. Additional SWM criteria outlined in the background reports are listed in the subsequent sections.

Under existing conditions, the site contains several residential buildings, construction trailers, asphalt driveways, and gravel parking areas. The majority of the drainage from the site currently sheet flows overland to adjacent ROWs and Mud Creek to the north.

5.3 Design 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, background studies (refer to **Appendix C.3**), and correspondence with the City of Ottawa (refer to **Appendix E.3**).

General

- Application of the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1967 to 1997, as described in the City of Ottawa's Sewer Design Guidelines.



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- Minimum time of concentration values applied for each subcatchment cannot be less than 10 minutes (City of Ottawa).
- 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 under worst-case conditions using the dual drainage principle. (City of Ottawa SDG)
- Quality control has been provided for the site via the existing downstream SWM facilities.

Storm Sewer & Inlet Controls

- Minor system capture rate from the proposed site up to the 100-year storm to the Compass Street storm sewer (EUC Pond 1) is to be restricted to **175 L/s**. (*Design Brief Minto Trailsedge Phase II*, IBI Group)
- Minor system capture rate from the proposed site up to the 100-year storm to the Renaud Road storm sewer (EUC Pond 3) is to be restricted to **110 L/s**. (*Design Brief Minto Trailsedge Phase II*, IBI Group)
- Discharge from the proposed site to the Melodie Street ROW is to be restricted to the previously assumed contributions for the area as per the background studies (reference from *Design Brief Minto Trailsedge Phase II*, IBI Group to Phase 1 of the same)
- Size storm sewers to convey the 2-year storm event under free-flow conditions using 2025 City of Ottawa IDF parameters. (City of Ottawa).
- Ensure that the resulting 100-year hydraulic grade line does not encroach within 0.30 m of the proposed underside of footings (USF) for the proposed units where there is footing drainage connected to the storm collection system (City of Ottawa).
- Ensure that the resulting 'climate change' hydraulic grade line does not encroach on the proposed underside of footings (USF) for the proposed units where there is footing drainage connected to the storm collection system (City of Ottawa).

Surface Storage & Overland Flow

- Runoff in excess of the minor system capture rate is to be directed overland over the downstream street segments ultimately discharging to either Mud Creek directly, or via EUC Pond 1 (*Design Brief Minto Trailsedge Phase II*, IBI Group)
- No surface ponding is permitted within the site during the 2-year storm event (City of Ottawa).
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35 m for design storm events (i.e., up to 100-year storm) (City of Ottawa).
- Minimum clearance depth of 0.30 m to be provided from spill elevations to building envelopes in proximity of overland flow routes or ponding areas on private sites (City of Ottawa).
- Dynamic flow must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year storm + 20%) (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).



5.4 Post-Development Modeling

5.4.1 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 allowable minor system allowable release rate in the 100-year storm as described in the background reports.
- Ensure that total dynamic and static surface ponding depths do not exceed 0.35 m during the 100-year storm scenario.
- Confirm that climate change storm simulation does not result in flooding of properties.

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

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

5.4.2 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. 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 to determine inlet capture rates for the different catchments.
- Minor and major system response assessed for the 100-year using the 3-hour Chicago Storm Distribution with fixed water levels in the receiving sewers.
- 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 representative catchments and converted to equivalent runoff coefficient using the relationship $C = (\text{Imp.} \times 0.7) + 0.2$.
- Subcatchment areas are defined from high-point to high-point where sags occur.



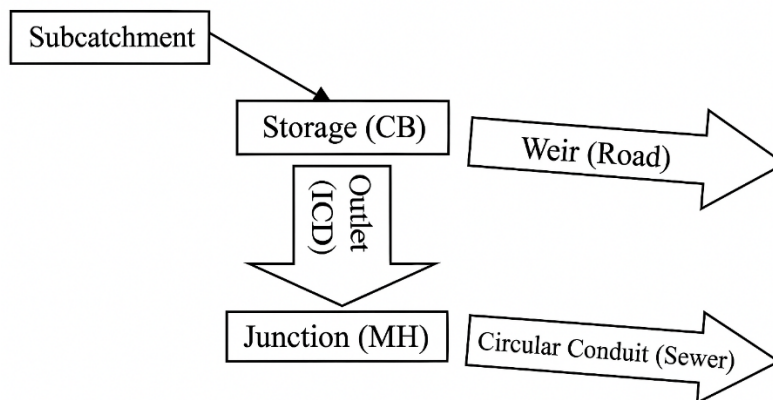
- Width parameter was taken as twice the length of the street/swale segment for two-sided catchments and as the length of the street/swale segment for one-sided catchments. Irregular shaped catchments were calculated by measuring the flow length on the drawing and the width parameter was calculated respectively or alternatively set at 225 x subcatchment area per recommendations of the OSDG.
- Catch basin inflow restricted with inlet-control devices (ICDs) as per City guidelines.
- Surface ponding in sag storage calculated based on grading plans (**Drawing GP-1**).
- Inlet control devices (ICDs) to have a minimum orifice diameter of 83 mm.

In keeping with the 2-year inlet restriction criterion, inlet control devices (ICDs) or orifice plates are specified for all catch basins to limit the inflow to the minor system. Restricted inlet rates to the sewer are necessary to prevent the hydraulic grade line from surcharging storm sewers into basements during major storms. **Drawing SD-1** outlines the proposed storm sewer alignment and drainage divides.

5.4.3 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; 2) weirs have been added at the spill grade elevation of each catch basin to direct major system overflows to the next downstream catch basin, while storage nodes have been used to represent catch basins. The dual drainage systems are connected via orifice link objects from storage node (i.e., CB) to storage node (i.e., MH) and represent inlet control devices (ICDs). Subcatchments are linked to the storage node (CB) on the surface so that generated hydrographs are directed there firstly.

Figure 5.1: Schematic Representing Model Object Roles



For storage nodes representing low point catch basins (CB's), the invert of the storage node represents the invert of the catch basin, and the rim of the storage node represents the maximum allowable flow



depth elevation above the storage node. Additional depth has been added to rim elevations to allow for dynamic routing from one surface storage to the next. Sag storage within irregular parking areas has been represented with a stage-area curve in the storage node as per **Drawing GP-1**. If the available storage volume in a storage node is exceeded, flows spill above the storage node and through a wide weir (representing the spill grade elevation) that directs overflows towards the downstream catch basin and continue routing through the system until ultimately flows either re-enter the minor system or reach the outfall of the major system. Weirs representing high points are assigned an invert elevation equal to the spill elevation at the edge of pavement and a rim elevation equal to the maximum allowable flow depth elevation above the storage node. In this manner, storage will accumulate according to the actual ponding depths before spilling along the overflow weir, and to the next downstream catch basin.

Inlet control devices, as represented by orifice links, use a user-specified diameter and a discharge coefficient of 0.572. LMF inlet control devices, as represented by outlet links, use a discharge coefficient and exponent as per manufacturers specifications. A minimum orifice diameter of 83 mm has been specified.

5.4.4 Boundary Conditions

Static hydraulic grade lines (HGLs) were obtained from the *Design Brief Minto Trailsedge Phase II* (IBI Group, February 2015) to use as boundary conditions at the existing storm maintenance holes STM 404 and STM 406 on Compass Street. HGL information for the existing storm sewers on Renaud Road between STM 410C and the intersection with Glenlivet Avenue was not available at the time of writing, and so was assumed to be at the obvert of the pipe. The HGL at the proposed site connections has been interpolated based on these assumptions. The following table summarizes the high-water levels (HWL) used as boundary conditions for the different storm events.

Table 5.1: Stormwater Boundary Conditions

Storm Event	STM 404 HGL (m)	Interpolated Site HGL	STM 406 HGL (m)
5-year, 3hr Chicago	83.79	83.72	83.68
100-year, 3hr Chicago	84.38	84.23	84.16
100-year, 3hr Chicago+20%	84.89	84.62	84.49

The detailed PCSWMM hydrology, and the proposed storm sewers within the proposed development were used to assess the peak inflows and hydraulic grade line (HGL) in the proposed development.

5.4.5 Hydrologic Parameters

Drawing SD-1 summarizes the discretized subcatchments used in the analysis of the proposed development and outlines the major overland flow paths.

Key parameters for the subject area are summarized below, while an example input file is provided for the 100-year, 3hr Chicago storm which indicates all other parameters (see **Appendix C.2**). For all other input



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files and results from storm scenarios, please examine the electronic modeling files included in the digital submission. **Table 5.2** presents the general subcatchment parameters used:

Table 5.2: 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
Zero Imperv (%)	0

Table 5.3 presents the individual parameters that vary for each of the proposed subcatchments.

Table 5.3: Proposed Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	Imperviousness (%)	Runoff Coefficient
COMP-1	0.09	72.0	6.0	61.43	0.63
L101A	0.07	28.0	6.0	88.57	0.82
L102A	0.05	22.0	5.0	68.57	0.68
L103A	0.12	50.0	4.0	77.14	0.74
L104A	0.08	27.0	5.0	77.14	0.74
L105A	0.09	44.0	5.0	90.00	0.83
L106A	0.11	66.0	5.0	94.29	0.86
L201A	0.10	36.0	3.0	84.29	0.79
L203A	0.09	36.0	5.0	87.14	0.81
L204A	0.07	32.0	5.0	82.86	0.78
MEL-1	0.06	41.0	6.0	80.00	0.76
NORTH-1	0.09	68.0	3.0	11.43	0.28
NORTH-2	0.08	91.0	6.5	0.00	0.20
REN-1	0.11	93.0	3.0	64.29	0.65
REN-2	0.13	102.0	3.0	61.43	0.63
WEST-1	0.02	91.0	30.0	0.00	0.20

Please note that runoff from areas several areas at the boundaries of the site (COMP-1, MEL-1, NORTH-1, NORTH-2, REN-1, REN-2, WEST-1) cannot be captured into the minor system due to grading



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constraints and have been modeled to sheet flow uncontrolled towards the adjacent ROWs and Mud Creek. **Table 5.4** summarizes the storage node parameters used in the model.

Table 5.4: Storage Node Parameters

Storage Node	Invert Elev. (m)	Rim Elev.* (m)	Depth (m)
C101A-1	85.62	87.25	1.63
C102A-1	85.67	87.30	1.63
C103A-1	85.72	87.35	1.63
C104A-1	85.62	87.23	1.61
C105A-1	85.62	87.25	1.63
C106A-1	85.65	87.28	1.63
C201A-1	85.69	87.32	1.63
C203A-1	85.69	87.32	1.63
C204A-1	85.65	87.28	1.63
* Rim elevations shown above are above the proposed grade elevation to account for dynamic flow routing			

The proposed site will be developed with a mixture of amenity areas, back-to-back townhouse blocks, and associated access roads and parking areas. Runoff coefficients have been calculated for the proposed subcatchments based on actual hard and soft surface areas shown on the architectural site plan. Runoff Coefficient values of 0.90 were used for hard areas and 0.20 for soft areas. **Table 5.5** summarizes the runoff coefficient calculations.

Table 5.5: Runoff Coefficient Calculations

Area ID	Total Area (m ²)	Hard Area (m ²)	Soft Area (m ²)	Runoff Coefficient (C)
COMP-1	865	529	336	0.63
L101A	742	657	85	0.82
L102A	498	339	159	0.68
L103A	1247	965	282	0.74
L104A	781	599	182	0.74
L105A	894	804	90	0.83
L106A	1078	1014	64	0.86
L107A	735	606	129	0.78
L108A	876	758	118	0.81
L110A	1038	872	166	0.79
MEL-1	639	512	127	0.76
NORTH-1	915	111	804	0.28
NORTH-2	813	0	813	0.20
REN-1	1094	696	398	0.65



REN-2	1280	793	487	0.63
WEST-1	175	0	175	0.20

5.4.6 Hydraulic Parameters

As per the OSDG 2025, Manning’s roughness values of 0.013 were used for sewer modeling and overland flow corridors representing roadways.

Storm sewers were modeled to confirm conveyance capacities and assess hydraulic grade lines (HGLs). The detailed storm sewer design sheet is included in **Appendix C.1**.

The table below presents the parameters for the orifice link objects within the proposed development which represent ICDs. A coefficient of 0.572 was applied when using circular orifices and specific head/discharge curve parameters were applied to correspond to manufacturer specified discharge curve when using LMF orifices.

Table 5.6: Orifice Parameters for Proposed Catchments

Orifice Name	CB ID	Tributary Area ID	Minor System Node	ICD Type	Inlet Elev. (m)	Discharge Coeff.
C101A-1IC	C101A-1	C101A	101	CIRCULAR (83mm ORIFICE)	85.62	0.572
C103A-1IC	C103A-1	C103A	103	CIRCULAR (94mm ORIFICE)	85.72	0.572
C104A-1IC	C104A-1	C104A	104	CIRCULAR (83mm ORIFICE)	85.62	0.572
C105A-1IC	C105A-1	C105A	105	CIRCULAR (83mm ORIFICE)	85.62	0.572
C106A-1IC	C106A-1	C106A	106	CIRCULAR (94mm ORIFICE)	85.65	0.572
C201A-1IC	C201A-1	C201A	201	CIRCULAR (94mm ORIFICE)	85.69	0.572
C203A-1IC	C203A-1	C203A	203	CIRCULAR (83mm ORIFICE)	85.69	0.572
C204A-1IC	C204A-1	C204A	204	CIRCULAR (83mm ORIFICE)	85.65	0.572
C102A-1IC	C102A-1	C102A	102	IPEX TEMPEST LMF80	85.67	*

*Denotes specific head/discharge curve to correspond to manufacturer specified discharge.

5.5 Model Results and Discussion

The following sections summarize the key hydrologic and hydraulic model results for the proposed development. For detailed model results or inputs please refer to the example output file in **Appendix C.2** and the electronic model files included in the digital submission.

5.5.1 Proposed ICD Schedule

The site requires quantity control measures to meet the restrictive stormwater release criteria. The use of surface and subsurface storage is proposed to reduce site peak outflows to the allowable target release



rate. It is proposed to detain stormwater on the surface in parking lot areas using inlet control devices (ICDs) in associated catch basins. ICD's have been sized to ensure meet target release rates for the site set out in the background studies.

Table 5.7 summarizes the orifice link maximum flow rates and heads across the proposed development.

Table 5.7: Proposed Orifice and Outlet Link Results

SCHEDULE OF INLET CONTROL DEVICES								
Orifice Name	Tributary Area ID	ICD Type	2yr Head (m)	2yr Flow (L/s)	5yr Head (m)	5yr Flow (L/s)	100yr Head (m)	100yr Flow (L/s)
C101A-1IC	C101A	CIRCULAR (83mm ORIFICE)	1.05	13.78	1.47	16.36	1.59	17.05
C103A-1IC	C103A	CIRCULAR (94mm ORIFICE)	1.38	20.29	1.50	21.18	1.57	21.69
C104A-1IC	C104A	CIRCULAR (83mm ORIFICE)	0.90	12.69	1.44	16.21	1.57	16.98
C105A-1IC	C105A	CIRCULAR (83mm ORIFICE)	1.41	16.03	1.49	16.52	1.60	17.13
C106A-1IC	C106A	CIRCULAR (94mm ORIFICE)	1.41	20.54	1.50	21.20	1.57	21.73
C201A-1IC	C201A	CIRCULAR (94mm ORIFICE)	1.15	18.46	1.48	21.08	1.56	21.66
C203A-1IC	C203A	CIRCULAR (83mm ORIFICE)	1.38	15.85	1.48	16.43	1.56	16.89
C204A-1IC	C204A	CIRCULAR (83mm ORIFICE)	0.92	12.84	1.44	16.23	1.59	17.06
C102A-1IC	C102A	IPEX TEMPEST LMF80	1.19	6.25	1.49	6.97	1.55	7.12

5.5.2 Hydraulic Grade Line Analysis

The hydraulic grade line (HGL) elevation across the proposed development was estimated using the HGLs from the *Design Brief Minto Trailsedge Phase II* (IBI Group, February 2015) at the existing storm maintenance holes STM 404 and STM 406 on Compass Street. HGL information for the existing storm sewers on Renaud Road between STM 410C and the intersection with Glenlivet Avenue was not available at the time of writing this report so the HGL was assumed to be at the obvert of the pipe. The 'climate change' scenario required by the City of Ottawa Sewer Design Guidelines (2025), where 100-year intensities are increased by 20% was also assessed.

Table 5.8 below presents the clearance between the proposed storm sewer HGL and the proposed under side of footings (USFs).

Table 5.8: Proposed Development Hydraulic Grade Line Results

Manhole ID	USF Elevation	Worst Case 100-year HGL (m)	Prop. USF – HGL Clearance	100-Year 3-hour Chicago +20%	Prop. USF – HGL Clearance
100	N/A	84.29	-	84.68	-
100A	N/A	84.26	-	84.65	-



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101	85.15	84.35	0.80	84.73	0.42
102	85.15	84.35	0.80	84.73	0.42
103	85.38	84.53	0.85	84.89	0.49
104	85.20	84.54	0.66	84.90	0.30
105	85.38	84.61	0.77	84.94	0.44
106	85.20	84.75	0.45	84.97	0.23
201	85.33	84.55	0.78	84.55	0.78
202	85.33	84.58	0.75	84.58	0.75
203	85.30	84.74	0.56	84.74	0.56
204	85.29	84.69	0.60	84.69	0.60
409	N/A	84.25	-	84.64	-

Storm services with gravity connections are provided from each building for the foundation drains complete with full port backwater valves.

5.5.3 Overland Flow

Drawings SD-1 and GP-1 show the proposed emergency overland flow route from the site.

Table 5.9 presents the total surface water depths (static ponding depth + dynamic flow) above the top-of-grate of the proposed street catch basins for the 2-year storm, 5-year storm, 100-year 3-hr Chicago storm, and the 'climate change' storm. Based on the model results, minor surface ponding occurs at C105A and C106A within the 2-year event, however, it is less than 1 m³ of storage and ponds only during the peak of the storm event. As such, it is not anticipated to negatively impact the proposed development and is in line with the intent of the criteria set out in the OSDG. The total ponding depth (static + dynamic) does not exceed 0.35 m during the 100-year event or encroach on the lowest building opening during the 'climate change' event.

Table 5.9: Proposed Development – Maximum Static and Dynamic Surface Water Depths

Drainage Area ID	Storage node ID	Top of Grate Elevation (m)	Lowest Adjacent Building Opening (m)	Max. 2 yr HGL (m)	Total Surface Ponding Depth (m)	Max. 5 yr HGL (m)	Total Surface Ponding Depth (m)	Max. 100 yr HGL (m)	Total Surface Ponding Depth (m)	Max. 100 yr + 20% HGL (m)	Total Surface Ponding Depth (m)
L101A	C101A-1	87.00	87.50	86.67	0.00	87.16	0.16	87.21	0.21	87.22	0.22
L102A	C102A-1	87.05	87.50	86.86	0.00	87.22	0.17	87.22	0.17	87.23	0.18
L103A	C103A-1	87.10	87.58	87.10	0.00	87.06	0.00	87.29	0.19	87.30	0.20
L104A	C104A-1	87.00	87.45	86.52	0.00	87.11	0.11	87.19	0.19	87.22	0.22
L105A	C105A-1	87.00	87.50	87.03	0.03	87.15	0.15	87.22	0.22	87.25	0.25
L106A	C106A-1	87.03	87.50	87.06	0.03	87.17	0.14	87.22	0.19	87.25	0.22
L201A	C201A-1	87.03	87.54	86.84	0.00	87.17	0.14	87.25	0.22	87.27	0.24



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L203A	C203A-1	87.07	87.55	87.07	0.00	87.09	0.02	87.25	0.18	87.27	0.20
L204A	C204A-1	87.07	87.58	86.57	0.00	0.00	0.00	87.24	0.17	87.26	0.19

5.5.4 Uncontrolled Areas

Due to grading constraints, seven subcatchments cannot drain to the site's storm sewer system and will instead sheet-flow uncontrolled to surrounding areas.

- Area COMP-1 consists of proposed building frontage and driveways and drains to the Compass Street ROW. The flows up to the 5-year event will be captured by the existing street catch basins while flows from the major events will spill overland to Mud Creek based on existing roadway grading.
- Areas MEL-1 and WEST-1 consist of proposed building frontage, driveways, and landscaped transitional grading and drain to the Melodie Street ROW via surface drainage and rear yard infrastructure.
- Areas NORTH-1 and NORTH-2 consist of mostly landscaped areas, existing trees, and a proposed walkway. The areas sheet flow overland to the north into Mud Creek.
- Area REN-1 consists of proposed building frontage and driveways and drains to the Renaud Road ROW. The flows up to the 5-year event will be captured by the existing street catch basins directed to the western Renaud Road storm sewers while flows from the major events will spill overland per existing roadway drainage paths.
- Area REN-2 consists of proposed building frontage and driveways and drains to the Renaud Road ROW. The flows up to the 5-year event will be captured by the existing street catch basins directed to the eastern Renaud Road storm sewers while flows from the major events will spill overland ultimately discharging to Mud Creek.

The background studies have assumed that major system discharge from the development would be directed to Mud Creek. No adverse impacts are anticipated for the proposed uncontrolled drainage directed to Mud Creek (NORTH-1 and NORTH-2) in conjunction with major system flows from the 100-year storm event.

A comparison between the post-development uncontrolled flows and those assumed in the background studies for areas draining to the Melodie Street ROW (MEL-1, WEST-1) was undertaken to confirm that there would be no adverse impact on downstream stormwater infrastructure.

5.5.4.1 Melodie Street Background Study to Post-development Comparison

An AxC comparison was employed to assess the rate of runoff generated from the assumed site areas (A045NE, A043SE, and A034R4) in the *Stormwater Management Report for the Trails Edge West Subdivision* (JFSA, January 2015) and from uncontrolled subcatchments discharging to the Melodie



Street ROW (MEL-1 and WEST-1) under post development conditions. **Drawings SD-1** and **EXSD-1** outline the proposed and previously assumed drainage divides respectively.

Table 5.10 summarizes the AxC comparison from the development, with direct correlation to anticipated runoff. An overall reduction in peak flows directed to the Melodie Street ROW under post-development conditions is expected based on lower anticipated AxC from background studies, and so no negative impacts on the downstream system are anticipated.

Table 5.10: Melodie Street AxC Comparison

	Drainage Area ID	Area (ha)	Runoff Coefficient (C)	AxC
JFSA 2015 (Background Study)	A045NE	0.05	0.76	0.04
	A043SE	0.02	0.65	0.01
	A034R4	0.07	0.42	0.03
	Total	0.14	0.57	0.08
Proposed development	MEL-1	0.06	0.76	0.05
	WEST-1	0.02	0.20	0.00
	Total	0.08	0.62	0.05

5.5.4.2 Impacts to the Trailsedge West Subdivision

The Trailsedge West subdivision model (*Design Brief Minto Trailsedge Phase II*, IBI Group, February 2015) has been reviewed to determine impacts to the downstream infrastructure from overland discharges from uncontrolled areas from the proposed development (areas COMP-1 and REN-2). ICDs within downstream sections of the sewer along Compass Street have been sized to ensure full capture of the 5-year event runoff, with runoff above the 5-year return period progressing overland to a surface outfall immediately north of the development directly to Mud Creek. As the development is proposed to direct additional surface outflow to controlled catch basins, existing ICDs adjacent to areas COMP-1 and REN-2 are to be upsized to capture uncontrolled runoff from the 5-year storm event from these additional areas. The remainder of runoff can be conveyed to Mud Creek via the existing surface outfall. Street segments adjacent to COMP-1 and REN-2 convey minimal roadway discharge per the approved DDSWMM models for Trailsedge West, and so should have ample capacity for conveyance of the minor increase in major system runoff during the 100-year storm event.

5.5.5 Overall Release Rates

The allowable minor system release rates from the proposed development to the existing storm sewers on Compass Street and Renaud Road as obtained from the *Design Brief Minto Trailsedge Phase II* (IBI Group, February 2015) are 175 L/s and 110 L/s respectively. The uncontrolled areas discharging offsite towards Mud Creek (NORTH-1 and NORTH-2) have not been considered when comparing the proposed release rate to the allowable release rate since these areas are not directed to the storm sewer systems



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in the ROW's and major system discharge has been accounted for separately in the relevant background studies. The uncontrolled areas discharging offsite to Compass Street and Renaud Road (COMP-1, REN-1) have been assumed to be captured within the existing street catch basins and directed to the minor system up to the 5-year event. The major events beyond the 5-year storm are assumed to discharge overland and ultimately outlet to Mud Creek. As the approved model for Trailsedge West Phase II assumed major system runoff from the entirety of the development to be directed to Mud Creek without any flow storage, proposed major system runoff to Mud Creek is expected to be well below that originally anticipated by background reports. **Table 5.11** summarizes the overall site allowable release rates and the proposed development discharges.

Table 5.11: Proposed Development – Peak Outflows

Location	Contributing Drainage Area ID's	Discharge Location	Storm Event			
			2-Year 3hr Chicago (L/s)	5-Year 3hr Chicago (L/s)	100-Year 3hr Chicago (L/s)	100-Year, 3hr Chicago +20% (L/s)
409A	L101A, L102A, L103A, L104A, L105A, L106A	Compass Street	88.6	98.2	101.4	101.8
COMPASS	COMP-1	Compass Street	11.8	23.0	25.8*	25.8*
RENAUD-E	REN-2	Renaud Road (east)	17.2	33.2	37.2*	37.2*
Total Discharge to Compass Sewer			117.6	154.3	164.4	164.8
Compass Street Minor System Target			175.0			N/A
*Minor system inflow restricted by existing roadway ICDs @ 5-year event +12% to account for additional head.						
200	L201A, L203A, L204A	Renaud Road (west)	46.9	53.7	55.6	56.0
RENAUD-W	REN-1	Renaud Road (west)	15.4	28.9	52.4	63.4
Total Discharge to Renaud Sewer			62.3	82.6	108.0	119.4
Renaud Road Minor System Target			110.0			N/A
MELODIE	MEL-1, WEST-1	Melodie Street	12.0	22.0	39.0	47.2
Melodie Street Minor System Target			Refer to Section 5.5.4.1			



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CREEK	NORTH-1, NORTH-2	Mud Creek	3.1	31.2	73.8	92.4
OF1	L101A, L102A, L103A	Mud Creek	0.0	0.0	81.8	130.5
OF2	L104A, L105A, L106A, L107A, L108A, L110A	Mud Creek	0.0	0.0	69.3	96.4
Additional Compass Major System		Mud Creek	0.0	0.0	39.5	61.0
Total Major System Flow to Mud Creek			3.1	31.2	264.4	380.3

As can be seen in the above table, the allowable release rates for both the major and minor systems have been met.

5.6 Quality Control Requirements

Quality control requirements established for the Trailsedge West Subdivision have been satisfied through the overall subdivision design through downstream SWM facilities (refer to revised SWM criteria confirmations through correspondence with the City of Ottawa in **Appendix E.3**). As a result, no further quality control requirements were placed on the proposed site.



6 Grading

The proposed Block 121 development site measures approximately 1.33 ha in area. The topography across the site under existing conditions slopes generally to the north to existing Mud Creek. 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 East Urban Community Page Road Stormwater Management Pond 1 (ECA No. 0849-9KPPEJ), and that the proposed works are anticipated to be under single ownership and discharging to a municipal separated storm sewer system.

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 June 2025 and a slope stability analysis in March 2009. The report summarizes the existing soil conditions within the Block 121 site and construction recommendations. For details which are not summarized below, please see the Paterson report and memo included in the submission package.

Subsurface soil conditions within Block 121 were determined through field investigations conducted on July 12, 2024, in addition to the previous investigations, completed by Paterson on October 3, 2022, in the vicinity of the subject site, and an initial investigation in August 2006. In total, three (3) boreholes were drilled in the July 2024 investigation in addition to the four (4) boreholes drilled that were drilled in the October 2022 investigation.

In general, soil stratigraphy consisted of topsoil/fill layer followed by a silty sand and deep silty clay deposit. Bedrock was estimated to occur between depths of 25 to 50 m. Based on moisture levels and colour of the recovered soil samples, the long-term groundwater table is expected to be at 2 to 3 m below ground surface, 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 1.0 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.

The recommended rigid pavement structure is further presented in the table 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	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, sufficient pressures exist within surrounding existing watermains to provide an adequate source of domestic supply for the development per City of Ottawa standards.

Analysis 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 121 will be serviced by a network of gravity sewers which will direct wastewater flows to Compass Street. 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 requirements outlined in the background studies, the City of Ottawa Sewer Design Guidelines, and the Ontario Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual.

Minor system peak flows will be directed to the existing 1500 mm diameter storm sewer on Compass Street and the existing 525 mm diameter storm sewer on Renaud Road. Inlet control devices were defined for each subcatchment to restrict minor system peak flows rates to 175 L/s to the Compass Street storm sewers and to 110 L/s to the Renaud Road storm sewers as per background study design criteria.

Major system runoff has been directed to the fullest extent possible to Mud Creek as per background documents.

Quality control (80% TSS removal) of stormwater runoff will be provided through the existing downstream SWM facilities.

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 Trails Edge West subdivision development and has been designed by their respective utility providers to service the site plan blocks. Private utility servicing for Block 121 will be designed by the respective utilities.



Appendices



Appendix A Water Servicing

A.1 Domestic Water Demands



Trailsedge Block 121, Ottawa, ON - Domestic Water Demand Estimates

Site Plan Provided by M.David Blakely Architect Inc. 2026-01-27

Project No. 160401760

Designed by: ZW

Date 2026-02-10

Checked by: MW

Population densities per Table 4.1 City of Ottawa Water Design Guidelines (2025):		
Townhomes	2.7	ppu
Demand conversion factors per Table 4.2 of the City of Ottawa Water Design Guidelines (2025):		
Residential	280	L/cap/day



Type of Unit	No. of Units	Population	Avg Day Demand		Max Day Demand ¹		Max Hour Demand ¹	
			(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Townhouse								
Block 1	12	32	6.3	0.11	27.9	0.46	42.0	0.70
Block 2	12	32	6.3	0.11	27.9	0.46	42.0	0.70
Block 3	12	32	6.3	0.11	27.9	0.46	42.0	0.70
Block 4	8	22	4.2	0.07	18.6	0.31	28.0	0.47
Block 5	8	22	4.2	0.07	18.6	0.31	28.0	0.47
Block 6	12	32	6.3	0.11	27.9	0.46	42.0	0.70
Block 7	12	32	6.3	0.11	27.9	0.46	42.0	0.70
Total Site :	76	205	39.9	0.67	176.4	2.94	265.9	4.43

Notes:

¹ As per Table 3-3 from the MECP Water Distribution Guidelines, the peaking factors used to estimate peak demand rates for residential areas are interpolated as follows:

Maximum daily demand rate = 4.4 × Average day demand rate

Peak hour demand rate = 6.7 × Average day demand rate

Population	MXDY	PKHR
150	4.9	7.4
300	3.6	5.4
205	4.4216	6.664

A.2 Fire Flow Demands (2020 FUS)





FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401760
 Project Name: Trailsedge Block 121
 Date: 2026-02-10

Fire Flow Calculation #: 1
 Description: 8-unit back-to-back townhouse

Notes: Building footprint of 434 m², per site plan provided by M.David Blakely Architect Inc., Rev 15, dated Jan 19, 2026

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	-	-						
		434 434 434	1302	-						
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min	-	12000						
4	Determine Occupancy Charge	Limited Combustible	-15%	10200						
5	Determine Sprinkler Reduction	None	0%	0						
		Non-Standard Water Supply or N/A	0%							
		Not Fully Supervised or N/A	0%							
		% Coverage of Sprinkler System	0%							
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-
		North	10.1 to 20	25	3	61-80	Type V	NO	13%	4284
		East	3.1 to 10	20	3	41-60	Type V	NO	17%	
		South	> 30	0	0	0-20	Type V	NO	0%	
		West	10.1 to 20	20	3	41-60	Type V	NO	12%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							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	



FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401760
 Project Name: Trailsedge Block 121
 Date: 2026-02-10

Fire Flow Calculation #: 12
 Description: 12-unit back-to-back townhouse

Notes: Building footprint of 648 m², per site plan provided by M.David Blakely Architect Inc., Rev 15, dated Jan 19, 2026. 2-hour firewall proposed to split block into two 6-unit clusters and reduce building footprint to 324 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	-	-						
		324 324 324	972	-						
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min	-	10000						
4	Determine Occupancy Charge	Limited Combustible	-15%	8500						
5	Determine Sprinkler Reduction	None	0%	0						
		Non-Standard Water Supply or N/A	0%							
		Not Fully Supervised or N/A	0%							
		% Coverage of Sprinkler System	0%							
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-
		North	0 to 3	20	3	41-60	Type V	YES	0%	2975
		East	10.1 to 20	19	3	41-60	Type V	NO	12%	
		South	10.1 to 20	20	3	41-60	Type V	NO	12%	
		West	10.1 to 20	19	2	21-49	Type V	NO	11%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							11000	
		Total Required Fire Flow in L/s							183.3	
		Required Duration of Fire Flow (hrs)							2.00	
		Required Volume of Fire Flow (m ³)							1320	

A.3 Hydraulic Boundary Conditions

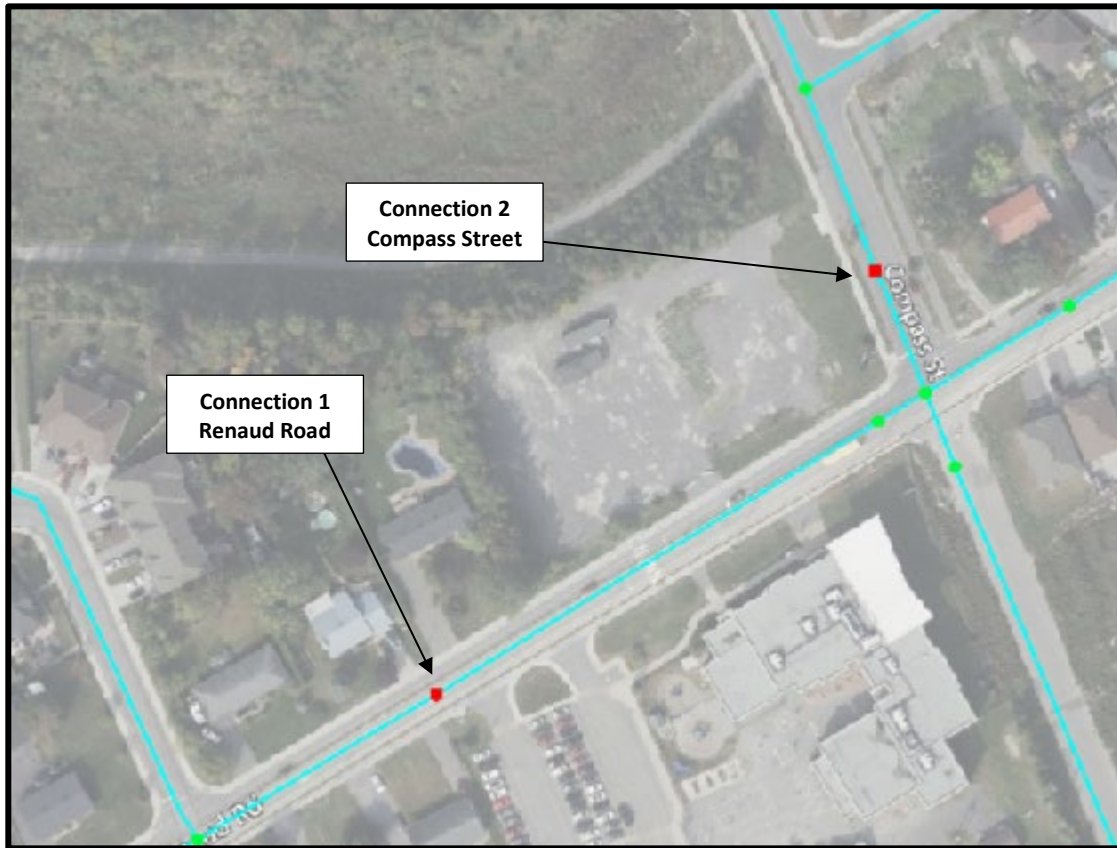


Boundary Conditions Trailledge – Block 121 – Update 2026

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	40.2	0.67
Maximum Daily Demand	176.4	2.94
Peak Hour	265.8	4.43
Fire Flow Demand #1	14,000.0	233.33
Fire Flow Demand #2	15,000.0	250.00

Location



Results

Connection 1 – Renaud Road

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.8	62.3
Peak Hour	127.4	57.5
Max Day plus Fire Flow #1	124.5	53.3
Max Day plus Fire Flow #2	123.9	52.5

¹ Ground Elevation = 87.4 m

Connection 2 – Compass Street

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.8	62.3
Peak Hour	127.4	57.5
Max Day plus Fire Flow #1	125.5	54.9
Max Day plus Fire Flow #2	125.1	54.3

¹ Ground Elevation = 86.8 m

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

A.4 Hydraulic Analysis



Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
14	0.05	87.26	130.80	43.54	61.91	426.87
5	0.05	87.25	130.80	43.55	61.92	426.95
9	0.00	87.23	130.80	43.57	61.95	427.14
20	0.05	87.23	130.80	43.57	61.95	427.16
3	0.00	87.23	130.80	43.57	61.96	427.17
15	0.09	87.23	130.80	43.57	61.96	427.20
4	0.05	87.22	130.80	43.58	61.97	427.24
2	0.04	87.22	130.80	43.58	61.97	427.25
10	0.00	87.15	130.80	43.65	62.06	427.92
6	0.00	87.15	130.80	43.65	62.07	427.97
8	0.00	87.15	130.80	43.65	62.07	427.98
7	0.00	87.15	130.80	43.65	62.07	427.99
1	0.05	87.14	130.80	43.66	62.09	428.08
11	0.00	87.13	130.80	43.67	62.10	428.16
19	0.00	87.13	130.80	43.68	62.10	428.20
17	0.05	87.10	130.80	43.70	62.14	428.46
16	0.04	87.07	130.80	43.73	62.18	428.70
18	0.00	87.07	130.80	43.73	62.19	428.76

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	1	Renaud	44.35	204	110	-0.300	0.009
1001	2	1	6.64	204	110	-0.250	0.008
1002	3	2	1.50	204	110	-0.210	0.006
1003	4	3	33.47	204	110	-0.160	0.005
1004	5	4	33.47	204	110	-0.020	0.001
1005	6	5	53.99	204	110	0.070	0.002
1006	7	6	20.72	150	100	0.120	0.007
1007	8	7	2.33	150	100	0.120	0.007
1008	9	8	26.06	150	100	0.120	0.007
1009	10	9	2.82	150	100	0.120	0.007
1010	11	10	3.38	150	100	0.120	0.007
1012	14	3	32.99	150	100	-0.050	0.003
1013	4	15	32.99	150	100	0.090	0.005
1014	16	5	20.70	150	100	-0.040	0.002
1015	17	6	6.20	150	100	-0.050	0.003
1016	11	18	3.29	150	100	0.050	0.003
1017	19	18	3.05	150	100	-0.050	0.003
1018	20	19	17.12	150	100	-0.050	0.003
1011	11	Compass	7.79	204	110	-0.170	0.005

Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
14	0.35	87.26	127.40	40.14	57.08	393.52
5	0.35	87.25	127.40	40.15	57.09	393.60
9	0.00	87.23	127.40	40.17	57.12	393.80
3	0.00	87.23	127.40	40.17	57.12	393.81
20	0.35	87.23	127.40	40.17	57.12	393.82
15	0.58	87.23	127.40	40.17	57.12	393.83
4	0.35	87.22	127.40	40.18	57.13	393.89
2	0.23	87.22	127.40	40.18	57.13	393.90
10	0.00	87.15	127.40	40.25	57.23	394.59
6	0.00	87.15	127.40	40.25	57.23	394.62
8	0.00	87.15	127.40	40.25	57.24	394.64
7	0.00	87.15	127.40	40.25	57.24	394.65
1	0.35	87.14	127.40	40.26	57.25	394.72
11	0.00	87.13	127.40	40.27	57.26	394.82
19	0.00	87.13	127.40	40.28	57.27	394.86
17	0.35	87.10	127.40	40.30	57.31	395.11
16	0.23	87.07	127.40	40.32	57.34	395.33
18	0.00	87.07	127.40	40.33	57.35	395.43

Link Results - Peak Hour

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	1	Renaud	44.35	204	110	-1.992	0.061
1001	2	1	6.64	204	110	-1.642	0.050
1002	3	2	1.50	204	110	-1.412	0.043
1003	4	3	33.47	204	110	-1.062	0.032
1004	5	4	33.47	204	110	-0.132	0.004
1005	6	5	53.99	204	110	0.448	0.014
1006	7	6	20.72	150	100	0.798	0.045
1007	8	7	2.33	150	100	0.798	0.045
1008	9	8	26.06	150	100	0.798	0.045
1009	10	9	2.82	150	100	0.798	0.045
1010	11	10	3.38	150	100	0.798	0.045
1012	14	3	32.99	150	100	-0.350	0.020
1013	4	15	32.99	150	100	0.580	0.033
1014	16	5	20.70	150	100	-0.230	0.013
1015	17	6	6.20	150	100	-0.350	0.020
1016	11	18	3.29	150	100	0.350	0.020
1017	19	18	3.05	150	100	-0.350	0.020
1018	20	19	17.12	150	100	-0.350	0.020
1011	11	Compass	7.79	204	110	-1.148	0.035

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)
1	0.23	37.44	53.24	367.08	124.58	233.33	29.90	42.51	428.18	20
2	0.15	37.37	53.14	366.37	124.59	233.33	28.99	41.23	404.24	20
3	0.00	37.36	53.13	366.31	124.59	233.33	28.81	40.96	399.59	20
4	0.23	37.44	53.23	367.02	124.66	233.33	25.42	36.15	333.84	20
5	0.23	37.47	53.29	367.39	124.73	233.33	22.92	32.59	301.46	20
6	0.00	37.69	53.60	369.54	124.84	233.33	20.53	29.20	277.31	20
7	0.00	37.94	53.94	371.92	125.08	233.33	20.19	28.70	274.00	20
8	0.00	37.96	53.98	372.17	125.11	233.33	20.53	29.19	276.87	20
9	0.00	38.18	54.29	374.30	125.41	233.33	30.89	43.93	448.83	20
10	0.00	38.29	54.45	375.40	125.44	233.33	33.18	47.19	547.36	20
11	0.00	38.35	54.54	376.03	125.48	233.33	36.48	51.87	957.77	20
14	0.23	37.33	53.09	366.02	124.59	233.33	-19.74	-28.08	143.83	20
15	0.39	37.43	53.22	366.96	124.66	233.33	-23.17	-32.94	139.50	20
16	0.15	37.65	53.54	369.14	124.73	233.33	-7.33	-10.42	164.73	20
17	0.23	37.74	53.67	370.03	124.84	233.33	11.46	16.30	220.56	20
18	0.00	38.42	54.63	376.64	125.48	233.33	31.70	45.08	470.90	20
19	0.00	38.36	54.54	376.07	125.48	233.33	27.15	38.61	355.48	20
20	0.23	38.25	54.39	375.03	125.48	233.33	1.86	2.65	186.91	20

A.5 Fire Hydrant Coverage





Project: **Trails Edge West Block 121** 160401760

**TABLE 1:
FIRE HYDRANT COVERAGE TABLE**

Revision: 01 Prepared By: MW
Revision Date: 2026-03-16 Checked By:

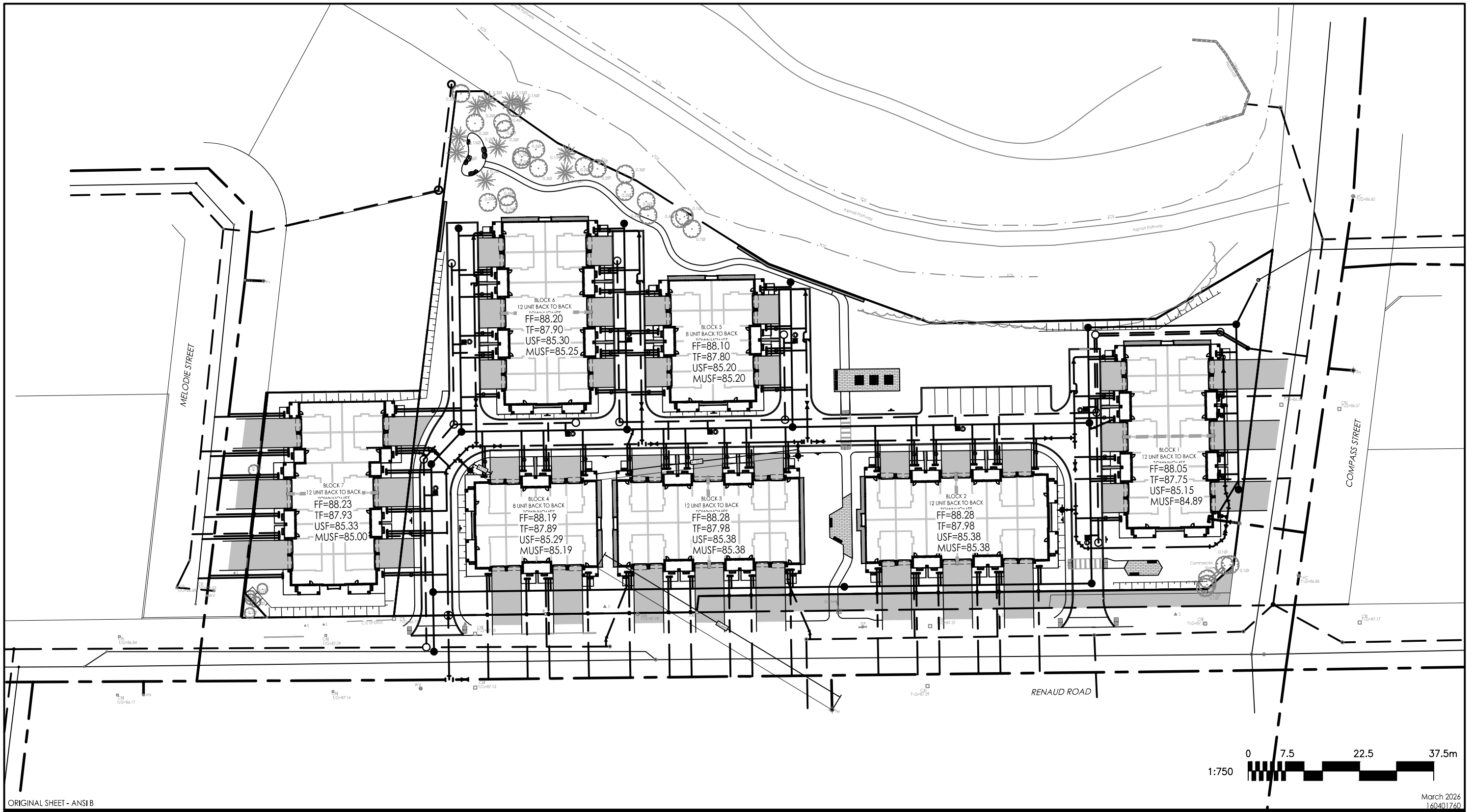
Description	Hydrants ¹			Total Available Fire Flow (L/min)	Total Required Fire Flow ² (L/min)
	HYD-01	HYD-02	HYD-03		
Block 4					
Distance from building (m)	4.0	41.0	55.6	-	-
Maximum fire flow capacity ³ (L/min)	5,678	5,678	5,678	17,034	14,000

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

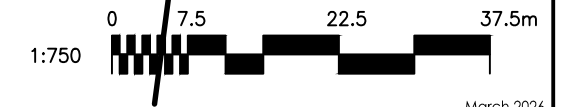
Notes:

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 maximum fire flow capacity of hydrants by distance to building.

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2026/03/16 9:50 AM By: Wu, Michael



ORIGINAL SHEET - ANSI B



March 2026
160401760



Stantec Consulting Ltd.
300 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

Notes

Client/Project
RICHCRAFT HOMES LTD.
TRAILS EDGE WEST
BLOCK 121
Figure No.
1.0
Title
FIRE HYDRANT COVERAGE SKETCH
Block 4

A.6 Background Report Excerpts





REPORT
PROJECT: 31855-5.2.2

DESIGN BRIEF MINTO TRAILSEDGE PHASE II



Prepared for MINTO COMMUNITIES INC.
by IBI GROUP

REVISED FEB 2015

2 WATER SUPPLY

2.1 Existing Conditions

As noted in the 'Gloucester East Urban Community (EUC) Infrastructure Servicing Update' (Stantec, 2006), the TrailsEdge subdivision lies within the water distribution pressure zone 2E. Existing 300mm diameter watermain along Renaud Road is within close proximity to the site. The Serviceability Study (DSEL, 2014) prepared for the TrailsEdge subdivision discusses the requirement for additional feeds to the EUC as development progresses. The inclusion of a new 400 mm watermain on the Belcourt Boulevard extension will form part of the infrastructure works for this development.

2.2 Master Servicing Study and Boundary Conditions

The most recent servicing study for the TrailsEdge development is the "Servicing Report for TrailsEdge and Orleans Business Park", which was completed in March 2014 by DSEL Ltd. The report includes recommended watermain sizes for the entire development which are based on results from the model analysis of the system. As the subject site is the initial phase of development, boundary conditions have been requested and provided by the City of Ottawa. The interim criteria includes boundary conditions for connections to the existing Renaud Road watermain, but prior to full completion of the Belcourt extension.

A full list of the applicable boundary conditions supplied by the City of Ottawa is included in Appendix A.

2.3 Design Criteria

In order to determine the water plan needed to adequately service the subject site, a hydraulic model was prepared using H2O MAP software by MWH Soft Inc. As mentioned above, the site was modelled under boundary conditions prior to full build out. The City of Ottawa supplied boundary conditions for the current 2E pressure zone near the intersections of Renaud Road and Compass Street and Pin Cherry Grove, respectively as well as Belcourt Boulevard. The specific boundary conditions are:

2E Zone Condition (Connection 1)

Max Day and Fire Flow = 116.9 m (Fire Flow = 167 l/s)

Minimum HGL = 127.3 m

Maximum Pressure Check = 134.7 m

2E Zone Condition (Connection 2)

Max Day and Fire Flow = 115.8 m (Fire Flow = 167 l/s)

Minimum HGL = 127.3 m

Maximum Pressure Check = 134.7 m

2E Zone Condition (Connection 3)

Max Day and Fire Flow	= 114.7 m (Fire Flow = 167 l/s)
Minimum HGL	= 127.3 m
Maximum Pressure Check	= 134.7 m

The following parameters were also used in the analysis of the subject residential site:

Average Daily Demand (ADD)	= 350 l/cap/day
Maximum Daily Demand (MDD) = 2.5 x ADD	= 875 l/cap/day
Peak Hourly Demand = 2.2 x MDD	= 1925 l/cap/day

A copy of the hydraulic analysis report and details on boundary conditions are included in Appendix A.

2.3.1 Fire Flows

Changes to the methodology involved in calculating fire flows have been introduced recently by the City of Ottawa in the form of Technical Bulletin ISDTB-2014-02. The bulletin specifies in Section 3 that the FUS long method for calculating fire flows be used for single family homes (wood frame construction) not exceeding 2 stories in height, separated at less than 3.0 meters. This situation applies to all units within the proposed site.

However, the Technical Bulletin also allows for a maximum cap of 10,000 l/min, provided that the backs of adjacent units are separated by a minimum of 10 meters (refer to ISDTB-2014-02 Section 4.1).

Based on the long form FUS calculation (included in Appendix A), the required fire flow works out to 10,000 l/min, which is the value that has been carried in the hydraulic model.

Since the required fire flow is not more than 10,000 l/min, there is no need to apply the maximum cap.

2.4 Proposed Water Plan

2.4.1 Phasing

The Owner is intending to construct the proposed subdivision in two residential phases, known as Phase 2A and Phase 2B. Phase 2A will include the 16 units fronting Renaud Road, Enclave Walk and Pin Cherry Grove. Compass Street will also be constructed to the Phase 2A limit.

As part of the Phase 2A works, three watermain connections will be required, connecting to the existing 300 mm diameter Renaud Road watermain. Please refer to Figure 1 on the following page for the layout of the proposed watermains for Phase 2A.

Phase 2B includes the balance of the site, namely Yellow Birch Street and Locust Ridge. The Phase 2B works will also include the completion of Compass Street (by others) and the completion of Belcourt Boulevard, including watermains, to the site limits. Beyond the extent of the proposed site, stubs will be left for future connections by adjacent land owners. Please refer to Figure 1 for the layout of the proposed watermains for both Phase 2A and 2B.

Both of the above scenarios were modeled using the H2O Map software program to verify that the proposed system meets all City of Ottawa and fire flow requirements. The results are included in Appendix A.

2.5 Results

Based on the hydraulic modeling data, the following objectives were met, based on the requirements of the City of Ottawa water distribution guidelines:

Pressures > 276 kPa during maximum hourly conditions.

Pressures > 140 kPa during periods of maximum day and fire demands.

Pressures < 552 kPa in occupied areas.

The above noted conditions are met in both the interim Phase 2A scenario, as well as the ultimate Phase 2A and 2B buildout scenario.



IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : TRAILSEDGE II
LOCATION : CITY OF OTTAWA
DEVELOPER : MINTO COMMUNITIES INC.

FILE: 31855.5.7
DATE: 2014-07-24
DESIGN: RPK
PAGE: 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL		AVERAGE DAILY DEMAND (l/s)		MAXIMUM DAILY DEMAND (l/s)		MAXIMUM HOURLY DEMAND (l/s)		FIRE DEMAND (l/s)			
	UNITS	TH	APT	GROSS RES. (Ha)	POPIN	COM (Ha)	IND (Ha)	INS (Ha)	Res.	Non-res.	Total	Res.		Non-res.	Total	
1000					0				0.00			0.00			0.00	n/a
2000					0				0.00			0.00			0.00	n/a
3000					0				0.00			0.00			0.00	n/a
4000					0				0.00			0.00			0.00	n/a
5000					0				0.00			0.00			0.00	n/a
10					0			0.63	0.00	0.11	0.11	0.00	0.16	0.30	0.30	167
20	2				7				0.03	0.03	0.06	0.07		0.15	0.15	167
40	4				14				0.06	0.11	0.14	0.14		0.30	0.30	167
50	8				27				0.11	0.17	0.28	0.28		0.61	0.61	167
60	12				41				0.17	0.17	0.41	0.41		0.91	0.91	167
70	13				44				0.18	0.18	0.45	0.45		0.98	0.98	167
80	15				51				0.21	0.21	0.52	0.52		1.14	1.14	167
90	11				37				0.15	0.15	0.38	0.38		0.83	0.83	167
100	8				27				0.11	0.11	0.28	0.28		0.61	0.61	167
110	6				20				0.08	0.08	0.21	0.21		0.45	0.45	167
120	10				34				0.14	0.14	0.34	0.34		0.76	0.76	167
180	4				14				0.06	0.06	0.14	0.14		0.30	0.30	167
190					0				0.00	0.00	0.00	0.00		0.00	0.00	167
TOTALS	93				316						1.39				7.34	

PHASE 2A ONLY

ASSUMPTIONS

RESIDENTIAL DENSITIES

- Single Family (SF) 3.4 p/p/u
- Semi Detached (SD) 2.7 p/p/u
- Townhouse (TH) 2.7 p/p/u
- Apartment (APT) 1.8 p/p/u

AVERAGE DAILY DEMAND

- Residential 350 l/cap/day
- Commercial 60,000 l/ha/day
- Industrial 20,000 l/ha/day
- Institutional 15,000 l/ha/day

MAXIMUM DAILY DEMAND

- Residential 875 l/cap/day
- Commercial 90,000 l/ha/day
- Industrial 30,000 l/ha/day
- Institutional 22,500 l/ha/day

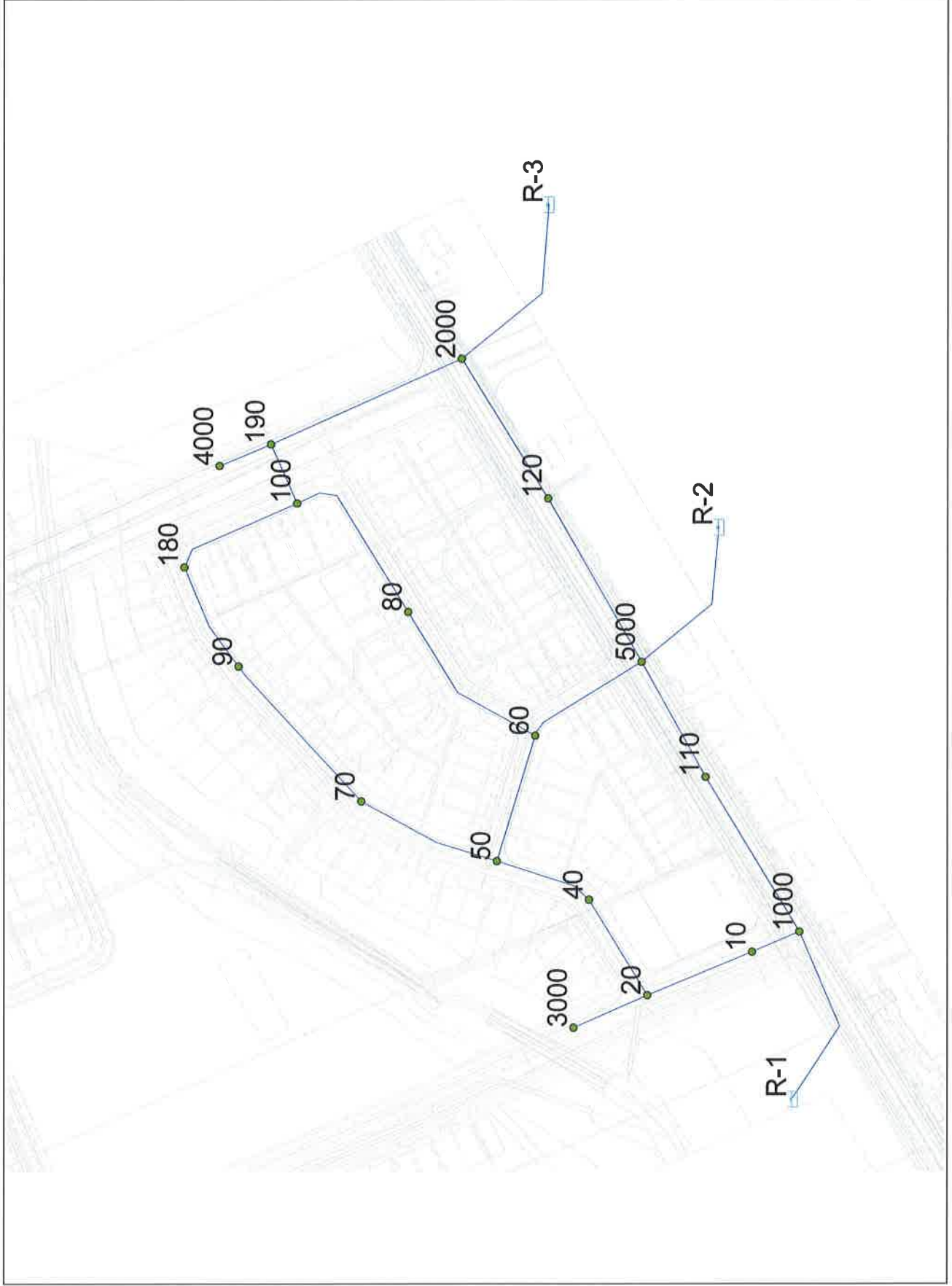
MAXIMUM HOURLY DEMAND

- Residential 1,925 l/cap/day
- Commercial 162,000 l/ha/day
- Industrial 54,000 l/ha/day
- Institutional 40,500 l/ha/day

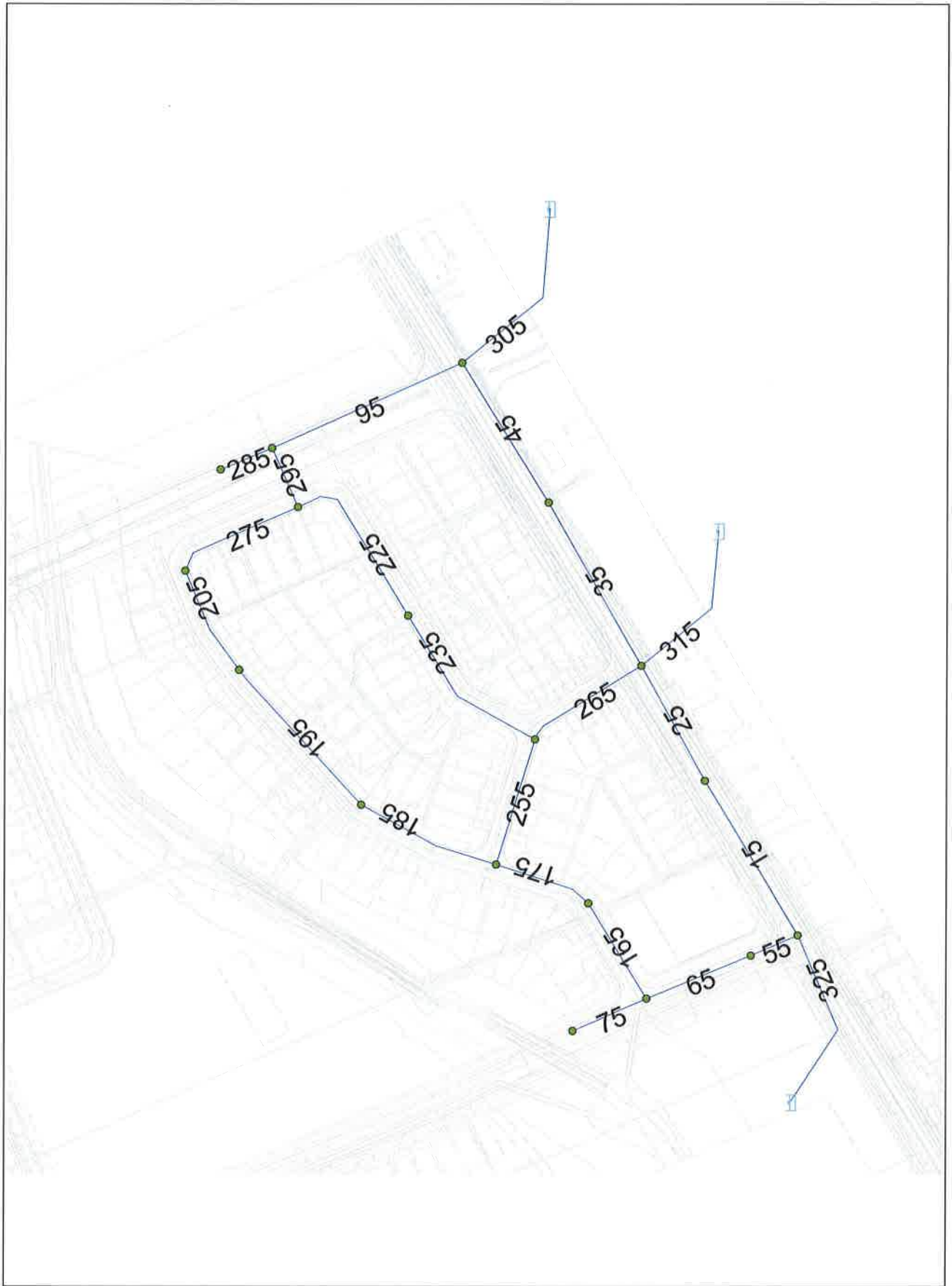
FIRE DEMANDS

- SF 167 l/s
- SD 167 l/s
- TH 167 l/s
- APT 170 l/s
- ICI 250 l/s

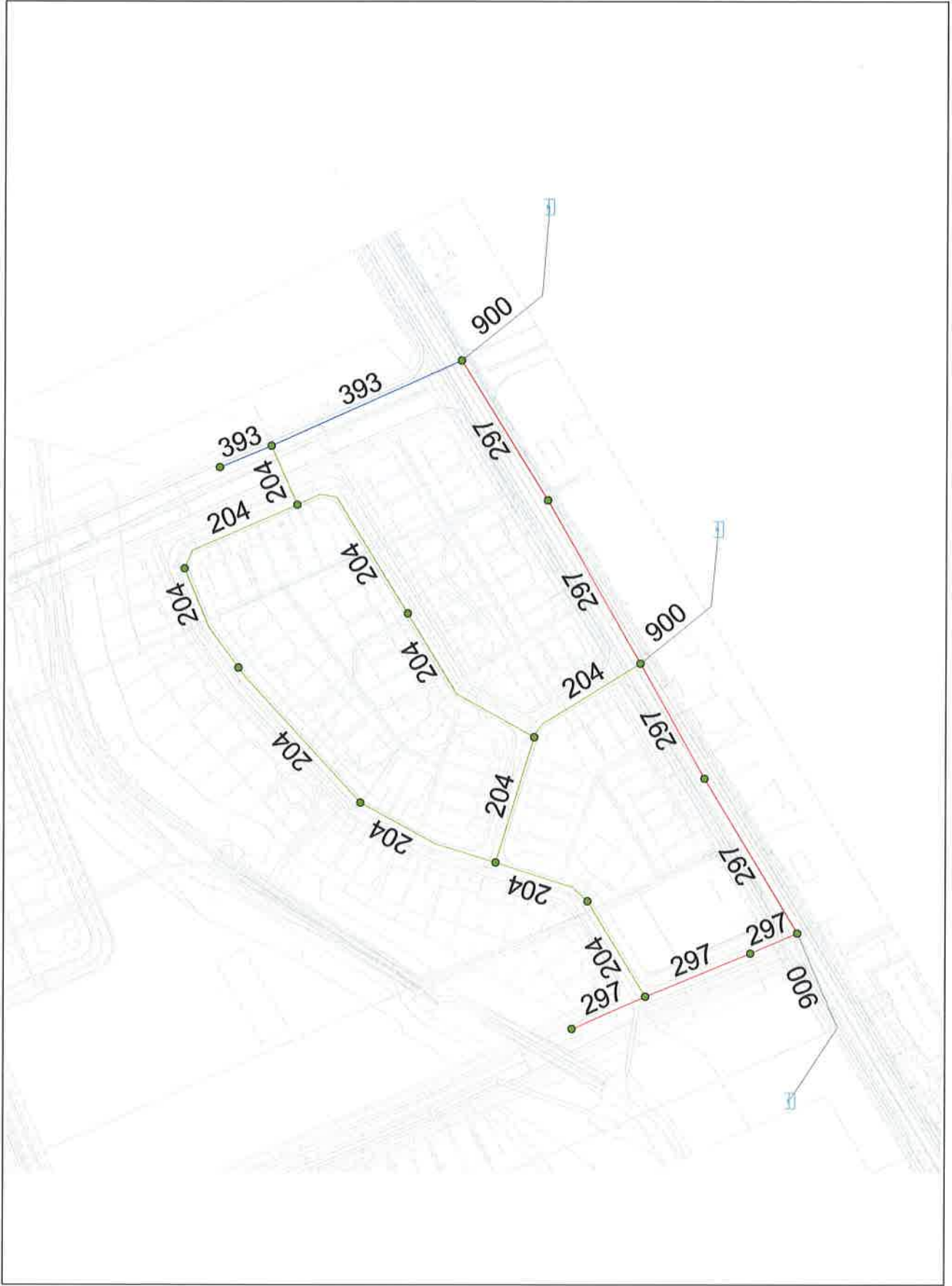
TRAILSEGE II - Phase 2A - Node ID's



TRAILSEGE II - Phase 2A - Pipe ID's



TRAILSEGE II - Phase 2A - Pipe Sizes



Phase 2A - Junction Report - High Pressure Check (HGL = 134.7m)

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	10	0.11	87.23	134.70	465.17
2	100	0.11	87.60	134.70	461.54
3	1000	0.00	87.43	134.70	463.21
4	110	0.08	87.25	134.70	464.97
5	120	0.14	87.53	134.70	462.23
6	180	0.06	87.55	134.70	462.03
7	190	0.00	87.25	134.70	464.97
8	20	0.03	87.34	134.70	464.09
9	2000	0.00	87.69	134.70	460.66
10	3000	0.00	87.38	134.70	463.70
11	40	0.06	87.30	134.70	464.48
12	4000	0.00	87.46	134.70	462.91
13	50	0.11	87.35	134.70	463.99
14	5000	0.00	87.28	134.70	464.68
15	60	0.17	87.43	134.70	463.21
16	70	0.18	87.37	134.70	463.80
17	80	0.21	87.39	134.70	463.60
18	90	0.15	87.50	134.70	462.52

Phase 2A - Pipe Report - High Pressure Check (HGL = 134.7m)

	ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
1	15	1000	110	86.75	297.00	120.00	0.03	0.000	0.00	0.00
2	165	20	40	53.61	204.00	110.00	0.27	0.01	0.0000	0.00
3	175	40	50	48.89	204.00	110.00	0.21	0.01	0.0000	0.000
4	185	50	70	71.41	204.00	110.00	0.19	0.01	0.0000	0.000
5	195	70	90	87.50	204.00	110.00	0.01	0.000	0.00	0.00
6	205	90	180	54.62	204.00	110.00	-0.14	0.00	0.0000	0.000
7	225	100	80	85.59	204.00	110.00	0.13	0.00	0.0000	0.000
8	235	60	80	88.03	204.00	110.00	0.08	0.00	0.00000	0.000
9	25	110	5000	63.21	297.00	120.00	-0.05	0.000	0.00	0.00
10	255	50	60	62.91	204.00	110.00	-0.08	0.00	0.00000	0.000
11	265	60	5000	62.86	204.00	110.00	-0.34	0.01	0.0000	0.00
12	275	180	100	64.35	204.00	110.00	-0.20	0.01	0.0000	0.000
13	285	190	4000	26.83	393.00	120.00	0.00	0.00	0.00	0.00
14	295	190	100	30.96	204.00	110.00	0.44	0.01	0.0000	0.00
15	305	R-3	2000	0.10	900.00	130.00	0.51	0.000	0.00	0.00
16	315	R-2	5000	0.10	900.00	130.00	0.45	0.000	0.00	0.00
17	325	R-1	1000	90.47	900.00	130.00	0.44	0.000	0.00	0.00
18	35	5000	120	90.18	297.00	120.00	0.07	0.000	0.00	0.00
19	45	120	2000	78.85	297.00	120.00	-0.07	0.00	0.00	0.00
20	55	1000	10	24.60	297.00	120.00	0.41	0.01	0.00000	0.000
21	65	10	20	54.42	297.00	120.00	0.30	0.00	0.00000	0.000
22	75	20	3000	38.71	297.00	120.00	0.00	0.00	0.00	0.00
23	95	2000	190	100.01	393.00	120.00	0.44	0.00	0.00000	0.0000

Phase 2A - Max Day + F/F - Fireflow Report (HGL = 116.9m, 115.8m, 114.7m)

	ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critical Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1	10	167.16	100	269.00	114.68	4,838.33	1,180.72	10	139.98	101.51	1,180.78	1,180.78
2	100	167.28	100	249.95	113.11	455.27	455.30	100	139.96	101.88	455.31	455.27
3	110	167.21	100	269.45	114.75	95,819.49	1,151.69	110	139.98	101.53	1,151.75	1,151.75
4	120	167.34	120	265.38	114.61	1,017.51	1,017.46	120	139.97	101.81	1,017.51	1,017.51
5	180	167.14	180	216.66	109.66	266.73	266.73	180	139.96	101.83	266.73	266.73
6	20	167.07	100	267.68	114.66	2,781.61	691.11	20	139.97	101.62	691.12	691.12
7	40	167.14	40	249.99	112.81	378.73	378.72	40	139.96	101.58	378.73	378.73
8	50	167.28	50	250.40	112.90	398.86	398.86	50	139.96	101.63	398.86	398.86
9	60	167.41	60	253.79	113.33	452.39	452.39	60	139.96	101.71	452.39	452.39
10	70	167.45	70	215.30	109.34	258.49	258.49	70	139.96	101.65	258.49	258.49
11	80	167.52	80	227.85	110.64	296.41	296.41	80	139.96	101.67	296.41	296.41
12	90	167.38	90	206.22	108.54	242.06	242.06	90	139.96	101.78	242.06	242.06

Phase 2A - Peak Hour - Junction Report - (HGL = 127.3m)

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	10	0.30	87.23	127.30	392.65
2	100	0.61	87.60	127.30	389.01
3	1000	0.00	87.43	127.30	390.69
4	110	0.45	87.25	127.30	392.46
5	120	0.76	87.53	127.30	389.71
6	180	0.30	87.55	127.30	389.49
7	190	0.00	87.25	127.30	392.46
8	20	0.15	87.34	127.30	391.57
9	2000	0.00	87.69	127.30	388.15
10	3000	0.00	87.38	127.30	391.18
11	40	0.30	87.30	127.30	391.95
12	4000	0.00	87.46	127.30	390.40
13	50	0.61	87.35	127.30	391.46
14	5000	0.00	87.28	127.30	392.16
15	60	0.91	87.43	127.30	390.67
16	70	0.98	87.37	127.30	391.25
17	80	1.14	87.39	127.30	391.06
18	90	0.83	87.50	127.30	389.98

H₂O MAP Hydraulic Analysis

Phase 2A and 2B



IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : TRAILSEDGE II
LOCATION : CITY OF OTTAWA
DEVELOPER : MINTO COMMUNITIES INC.

FILE: 31855.5.7
DATE: 2014-07-24
DESIGN: RPK
PAGE: 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL		AVERAGE DAILY DEMAND (l/s)		MAXIMUM DAILY DEMAND (l/s)		MAXIMUM HOURLY DEMAND (l/s)		FIRE DEMAND (l/s)	
	UNITS				COM (Ha)	IND (Ha)	INS (Ha)	Res.	Non-res.	Total	Res.	Non-res.		Total
	SF	SD	TH	APT										
1000								0.00	0.00	0.00	0.00	0.00	n/a	
2000								0.00	0.00	0.00	0.00	0.00	n/a	
3000								0.00	0.00	0.00	0.00	0.00	n/a	
4000								0.00	0.00	0.00	0.00	0.00	n/a	
5000								0.00	0.00	0.00	0.00	0.00	n/a	
10							0.63	0.00	0.11	0.11	0.16	0.30	167	
20	2							0.03	0.03	0.07	0.07	0.15	167	
30	9							0.12	0.12	0.31	0.31	0.68	167	
40	4							0.06	0.06	0.14	0.14	0.30	167	
50	8							0.11	0.11	0.28	0.28	0.61	167	
60	12							0.17	0.17	0.41	0.41	0.91	167	
70	13							0.18	0.18	0.45	0.45	0.98	167	
80	15							0.21	0.21	0.52	0.52	1.14	167	
90	11							0.15	0.15	0.38	0.38	0.83	167	
100	8							0.11	0.11	0.28	0.28	0.61	167	
110	6							0.08	0.08	0.21	0.21	0.45	167	
120	10							0.14	0.14	0.34	0.34	0.76	167	
130	7							0.10	0.10	0.24	0.24	0.53	167	
140	20							0.28	0.28	0.69	0.69	1.52	167	
150	4							0.06	0.06	0.14	0.14	0.30	167	
160	5							0.07	0.07	0.17	0.17	0.38	167	
180	4							0.06	0.06	0.14	0.14	0.30	167	
190								0.00	0.00	0.00	0.00	0.00	167	
200	2							0.03	0.03	0.07	0.07	0.15	167	
TOTALS	140								2.04		4.98	10.90		

Phase 2A and 2B

ASSUMPTIONS

RESIDENTIAL DENSITIES
 - Single Family (SF) 3.4 p/p/u
 - Semi Detached (SD) 2.7 p/p/u
 - Townhouse (TH) 2.7 p/p/u
 - Apartment (APT) 1.8 p/p/u

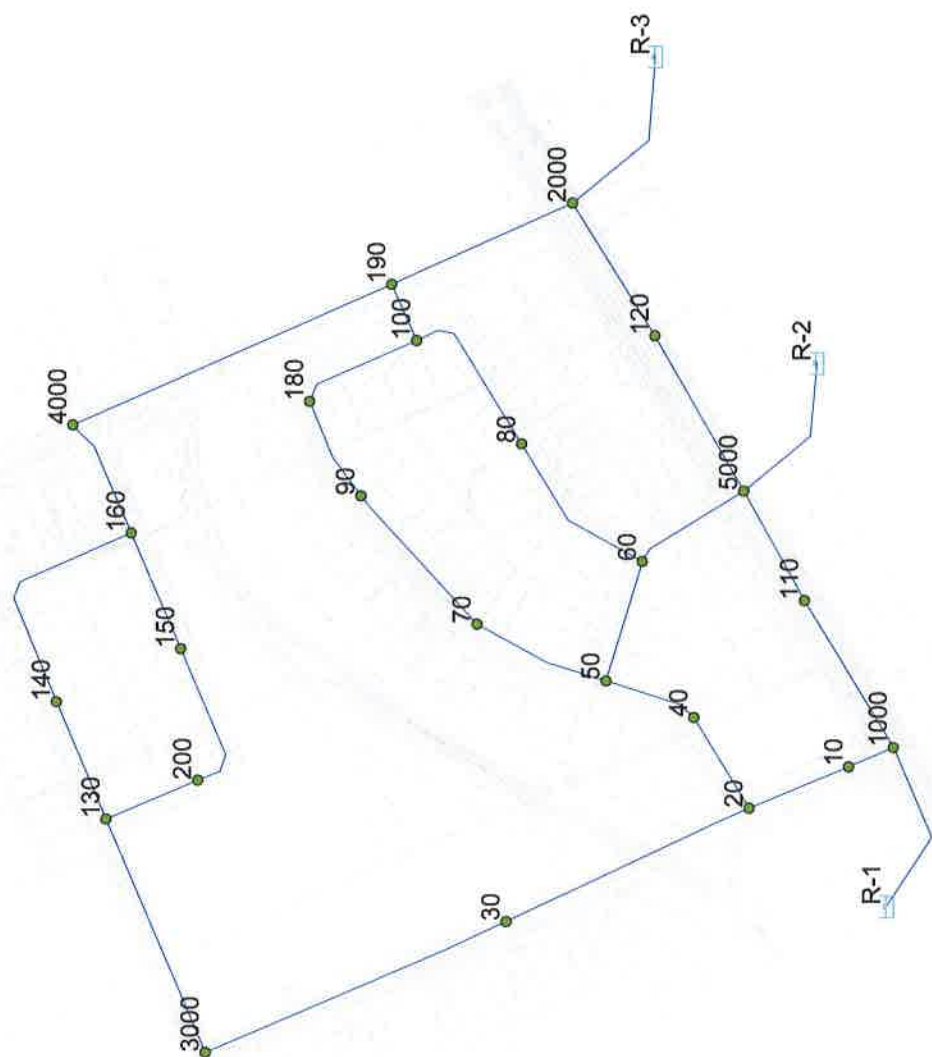
AVERAGE DAILY DEMAND
 - Residential 350 l/cap/day
 - Commercial 60,000 l/ha/day
 - Industrial 20,000 l/ha/day
 - Institutional 15,000 l/ha/day

MAXIMUM DAILY DEMAND
 - Residential 875 l/cap/day
 - Commercial 90,000 l/ha/day
 - Industrial 30,000 l/ha/day
 - Institutional 22,500 l/ha/day

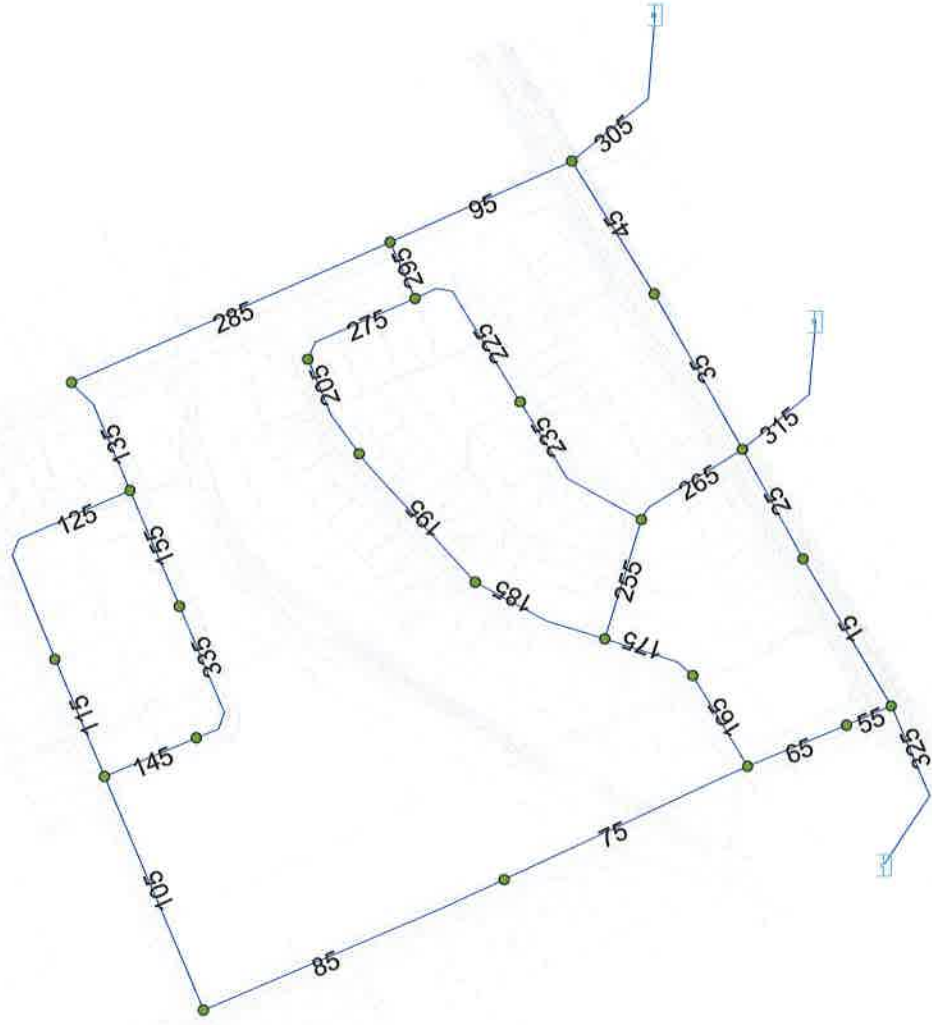
MAXIMUM HOURLY DEMAND
 - Residential 1,925 l/cap/day
 - Commercial 162,000 l/ha/day
 - Industrial 54,000 l/ha/day
 - Institutional 40,500 l/ha/day

FIRE DEMANDS
 - SF 167 l/s
 - SD 167 l/s
 - TH 167 l/s
 - APT 170 l/s
 - ICI 250 l/s

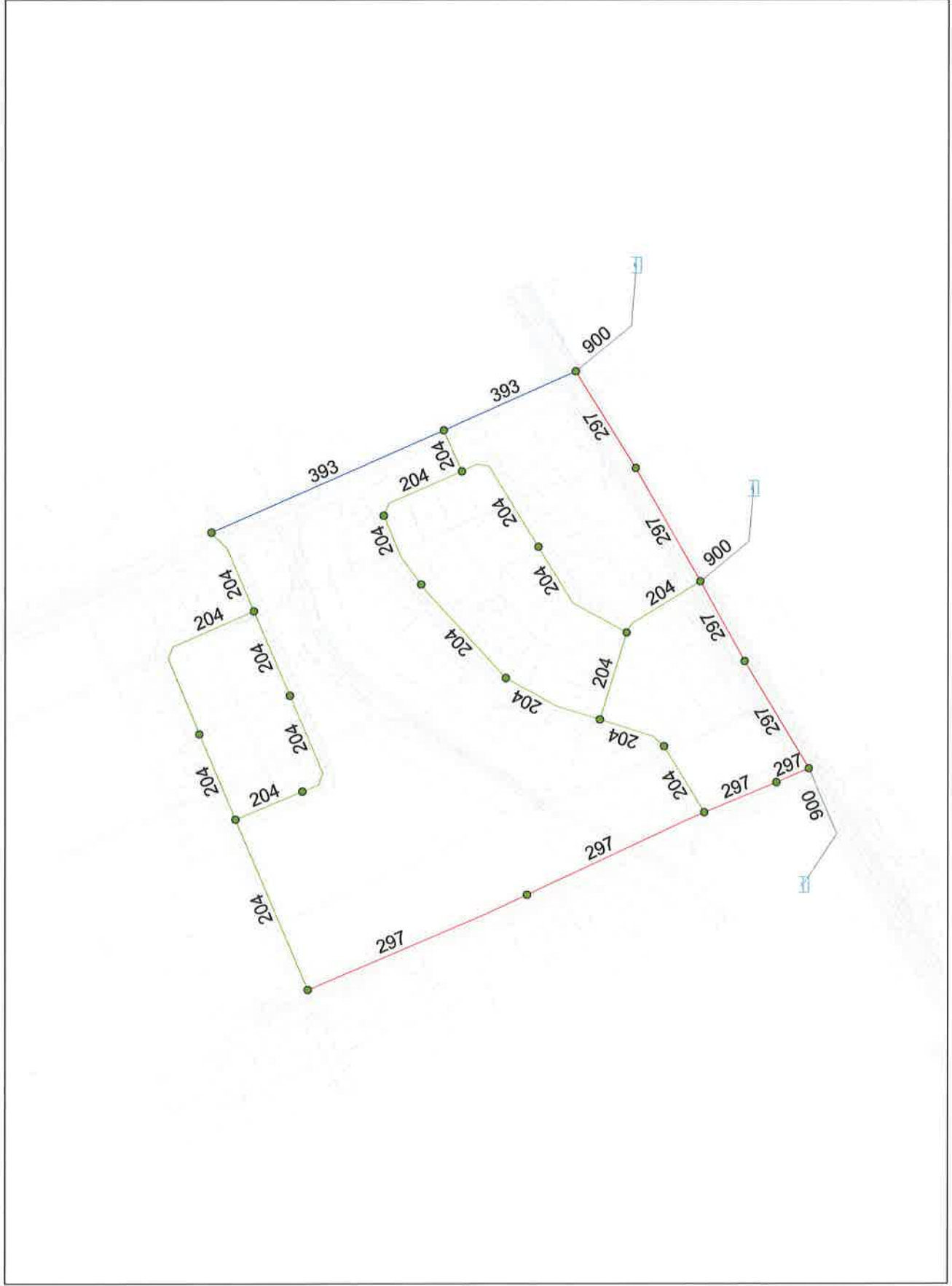
TRAILSEEDGE II - Phase 2A and 2B - Node ID's



TRAILSEGE II - Phase 2A and 2B - Pipe ID's



TRAILSEGE II - Phase 2A and 2B - Pipe Sizes



Phase 2A and 2B - Junction Report - High Pressure Check (HGL = 134.7m)

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	10	0.11	87.23	134.70	465.17
2	100	0.11	87.60	134.70	461.54
3	1000	0.00	87.43	134.70	463.21
4	110	0.08	87.25	134.70	464.97
5	120	0.14	87.53	134.70	462.23
6	130	0.10	87.62	134.70	461.35
7	140	0.28	87.10	134.70	466.44
8	150	0.06	87.38	134.70	463.70
9	160	0.07	87.44	134.70	463.11
10	180	0.06	87.55	134.70	462.03
11	190	0.00	87.25	134.70	464.97
12	20	0.03	87.34	134.70	464.09
13	200	0.03	87.45	134.70	463.01
14	2000	0.00	87.69	134.70	460.66
15	30	0.12	87.10	134.70	466.44
16	3000	0.00	87.38	134.70	463.70
17	40	0.06	87.30	134.70	464.48
18	4000	0.00	87.46	134.70	462.91
19	50	0.11	87.35	134.70	463.99
20	5000	0.00	87.28	134.70	464.68
21	60	0.17	87.43	134.70	463.21
22	70	0.18	87.37	134.70	463.80
23	80	0.21	87.39	134.70	463.60
24	90	0.15	87.50	134.70	462.52

Phase 2A and 2B - Pipe Report - High Pressure Check (HGL = 134.7m)

	ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
1	105	3000	130	127.79	204.00	110.00	0.19	0.01	0.0000	0.000
2	115	130	140	64.17	204.00	110.00	0.13	0.00	0.0000	0.000
3	125	140	160	126.72	204.00	110.00	-0.15	0.00	0.0000	0.000
4	135	160	4000	62.75	204.00	110.00	-0.35	0.01	0.0000	0.00
5	145	130	200	50.08	204.00	110.00	-0.04	0.00	0.00	0.00
6	15	1000	110	86.75	297.00	120.00	0.03	0.000	0.00	0.00
7	155	150	160	63.45	204.00	110.00	-0.13	0.00	0.0000	0.000
8	165	20	40	53.61	204.00	110.00	0.25	0.01	0.0000	0.000
9	175	40	50	48.89	204.00	110.00	0.19	0.01	0.0000	0.000
10	185	50	70	71.41	204.00	110.00	0.18	0.01	0.0000	0.000
11	195	70	90	87.50	204.00	110.00	0.00	0.000	0.00	0.00
12	205	90	180	54.62	204.00	110.00	-0.15	0.00	0.0000	0.000
13	225	100	80	85.59	204.00	110.00	0.12	0.00	0.0000	0.000
14	235	60	80	88.03	204.00	110.00	0.09	0.00	0.00000	0.000
15	25	110	5000	63.21	297.00	120.00	-0.05	0.000	0.00	0.00
16	255	50	60	62.91	204.00	110.00	-0.11	0.00	0.00000	0.000
17	265	60	5000	62.86	204.00	110.00	-0.37	0.01	0.000	0.00
18	275	180	100	64.35	204.00	110.00	-0.21	0.01	0.0000	0.000
19	285	190	4000	175.51	393.00	120.00	0.35	0.00	0.00000	0.0000
20	295	190	100	30.96	204.00	110.00	0.44	0.01	0.0000	0.00
21	305	R-3	2000	0.10	900.00	130.00	0.86	0.00	0.00	0.00
22	315	R-2	5000	0.10	900.00	130.00	0.49	0.000	0.00	0.00
23	325	R-1	1000	90.47	900.00	130.00	0.73	0.00	0.00	0.00
24	335	200	150	79.03	204.00	110.00	-0.07	0.00	0.00000	0.000
25	35	5000	120	90.18	297.00	120.00	0.07	0.000	0.00	0.00
26	45	120	2000	78.85	297.00	120.00	-0.07	0.00	0.00	0.00
27	55	1000	10	24.60	297.00	120.00	0.70	0.01	0.0000	0.000
28	65	10	20	54.42	297.00	120.00	0.59	0.01	0.0000	0.000
29	75	20	30	135.38	297.00	120.00	0.31	0.00	0.0000	0.000
30	85	30	3000	165.50	297.00	120.00	0.19	0.00	0.0000	0.000
31	95	2000	190	100.01	393.00	120.00	0.78	0.01	0.0000	0.000

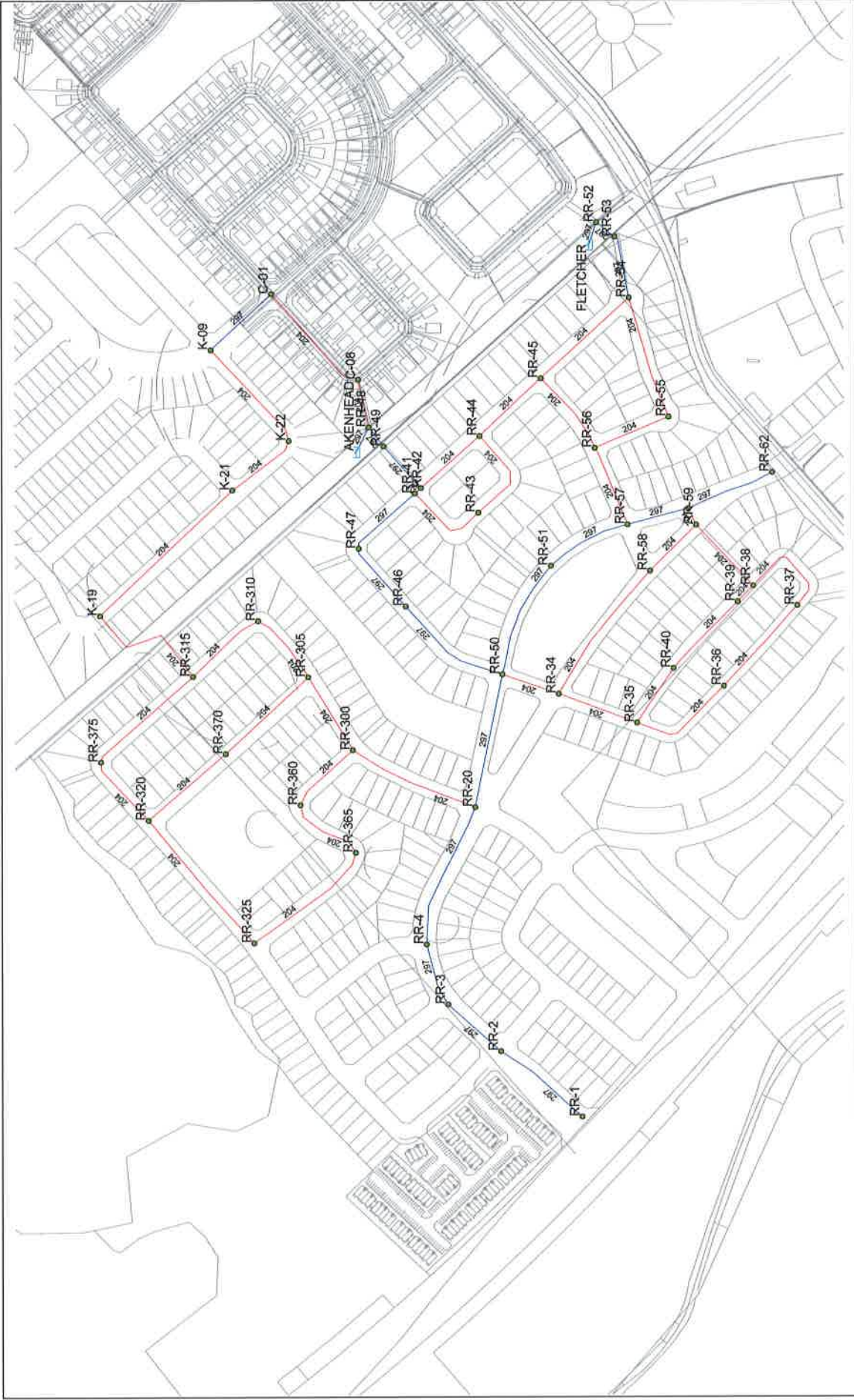
Phase 2A and 2B - Max Day + F/F - Fireflow Report (HGL = 116.9m, 115.8m, 114.7m)

	ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critical Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1	10	167.16	100	269.14	114.70	4,713.45	1,255.47	10	139.98	101.51	1,255.54	1,255.54
2	100	167.28	100	250.29	113.14	457.50	457.49	100	139.96	101.88	457.50	457.50
3	110	167.21	100	269.77	114.78	89,424.30	1,151.57	110	139.98	101.53	1,151.63	1,151.63
4	120	167.34	120	265.38	114.61	1,017.51	1,017.46	120	139.97	101.81	1,017.51	1,017.51
5	130	167.24	130	213.44	109.40	257.94	257.94	130	139.96	101.90	257.94	257.94
6	140	167.69	140	196.85	107.19	223.62	223.62	140	139.96	101.38	223.62	223.62
7	150	167.14	150	195.91	107.37	223.59	223.59	150	139.96	101.66	223.59	223.59
8	160	167.17	160	225.87	110.49	292.13	292.13	160	139.96	101.72	292.14	292.13
9	180	167.14	180	216.64	109.66	266.78	266.78	180	139.96	101.83	266.78	266.78
10	20	167.07	130	267.17	114.60	1,154.62	775.76	20	139.97	101.62	775.77	775.77
11	200	167.07	200	196.03	107.45	223.76	223.76	200	139.96	101.73	223.76	223.76
12	30	167.31	30	258.57	113.49	441.37	441.37	30	139.96	101.38	441.37	441.37
13	40	167.14	40	248.47	112.66	379.70	379.70	40	139.96	101.58	379.70	379.70
14	50	167.28	50	249.60	112.82	397.42	397.39	50	139.96	101.63	397.39	397.39
15	60	167.41	60	253.63	113.31	451.67	451.66	60	139.96	101.71	451.67	451.67
16	70	167.45	70	214.79	109.29	257.89	257.89	70	139.96	101.65	257.89	257.89
17	80	167.52	80	227.76	110.63	296.37	296.37	80	139.96	101.67	296.37	296.37
18	90	167.38	90	206.00	108.52	241.83	241.83	90	139.96	101.78	241.83	241.83

Phase 2A and 2B - Peak Hour - Junction Report (HGL = 127.3m)

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	10	0.30	87.23	127.30	392.65
2	100	0.61	87.60	127.30	389.01
3	1000	0.00	87.43	127.30	390.69
4	110	0.45	87.25	127.30	392.46
5	120	0.76	87.53	127.30	389.71
6	130	0.53	87.62	127.30	388.80
7	140	1.52	87.10	127.30	393.89
8	150	0.30	87.38	127.30	391.15
9	160	0.38	87.44	127.30	390.57
10	180	0.30	87.55	127.30	389.49
11	190	0.00	87.25	127.30	392.45
12	20	0.15	87.34	127.30	391.57
13	200	0.15	87.45	127.30	390.46
14	2000	0.00	87.69	127.30	388.15
15	30	0.68	87.10	127.30	393.91
16	3000	0.00	87.38	127.30	391.17
17	40	0.30	87.30	127.30	391.95
18	4000	0.00	87.46	127.30	390.39
19	50	0.61	87.35	127.30	391.45
20	5000	0.00	87.28	127.30	392.16
21	60	0.91	87.43	127.30	390.67
22	70	0.98	87.37	127.30	391.25
23	80	1.14	87.39	127.30	391.06
24	90	0.83	87.50	127.30	389.97

RR PHASE 3B



RR PHASE 3B MAX DAY + FIRE- RESIDUAL PRESSURE

Nodes (Residual Pressure)

- Less than 140
- 140.0-200
- 200.0-269
- 269.0-400
- Greater than 400.0

Links (TYPE)

- Pipe
- CV
- Pump
- Valve

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Appendix B Wastewater Servicing

B.1 Sanitary Sewer Design Sheet





SUBDIVISION:
Trailsedge West - Block 121

DATE: 3/19/2026
REVISION: 1
DESIGNED BY: WAJ
CHECKED BY: MW

SANITARY SEWER DESIGN SHEET (City of Ottawa)

FILE NUMBER: 160401760

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 FLOW	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V. PEAK FLOW (%)	VEL. (FULL) (m/s)
R24A	24	23	0.16	0	7	0	19	0.16	19	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.16	0.1	0.3	41.2	200	PVC	SDR 35	0.65	27.0	1.03%	0.85
R9B	9	23	0.07	0	4	0	11	0.07	11	3.73	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.07	0.07	0.0	0.2	33.5	200	PVC	SDR 35	0.65	27.0	0.57%	0.85	
R23A	23	22	0.02	0	1	0	3	0.24	32	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.24	0.1	0.5	8.9	200	PVC	SDR 35	0.40	21.1	2.21%	0.67	
R22A	22	21	0.09	0	4	0	11	0.33	43	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.33	0.1	0.6	25.5	200	PVC	SDR 35	0.40	21.1	2.94%	0.67	
R5B	5	21	0.14	0	10	0	27	0.14	27	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.14	0.0	0.4	83.1	200	PVC	SDR 35	0.65	27.0	1.36%	0.85	
	21	20	0.00	0	0	0	0	0.47	70	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.47	0.2	1.0	12.4	200	PVC	SDR 35	0.40	21.1	4.63%	0.67	
R5A	5	4	0.08	0	6	0	16	0.08	16	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.2	50.0	200	PVC	SDR 35	1.00	33.4	0.66%	1.05	
R4A	4	3	0.09	0	4	0	11	0.17	27	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.17	0.1	0.4	32.1	200	PVC	SDR 35	1.00	33.4	1.13%	1.05	
R10A	10	9	0.15	0	10	0	27	0.15	27	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.15	0.1	0.4	41.7	200	PVC	SDR 35	0.65	27.0	1.39%	0.85	
R9A	9	7	0.08	0	6	0	16	0.24	43	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.24	0.1	0.6	33.5	200	PVC	SDR 35	0.40	21.1	2.79%	0.67	
R8A	8	7	0.08	0	4	0	11	0.08	11	3.73	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.2	29.3	200	PVC	SDR 35	0.65	27.0	0.59%	0.85	
R7A	7	3	0.19	0	6	0	16	0.51	70	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.51	0.2	1.0	60.0	200	PVC	SDR 35	0.40	21.1	4.70%	0.67	
	3	2	0.00	0	0	0	0	0.68	97	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.68	0.2	1.4	19.3	200	PVC	SDR 35	0.40	21.1	6.42%	0.67	
R2A	2	1	0.04	0	2	0	5	0.72	103	3.59	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.04	0.72	0.2	1.4	30.0	200	PVC	SDR 35	0.40	21.1	6.77%	0.67	
R11A	11	1	0.08	0	5	0	14	0.08	14	3.72	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.2	33.4	200	PVC	SDR 35	0.65	27.0	0.70%	0.85	
	1	206A	0.00	0	0	0	0	0.80	116	3.58	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.80	0.3	1.6	10.0	200	PVC	SDR 35	0.40	21.1	7.62%	0.67	
	206A	205A	0.00	0	0	0	0	0.80	116	3.58	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.80	0.3	1.6	12.2	200	PVC	SDR 35	0.67	27.4	5.89%	0.86	

B.2 Background Report Excerpts





REPORT
PROJECT: 31855-5.2.2

DESIGN BRIEF

MINTO TRAILSEDGE PHASE II



Prepared for MINTO COMMUNITIES INC.
by IBI GROUP

REVISED FEB 2015

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

The proposed lands were designed, as part of the EUC, to be serviced by the Forest Valley Pumping Station (FVPS) which was commissioned in 2005. The EUC Infrastructure Servicing Update shows the lands ultimately being serviced by the existing 600mm diameter sanitary trunk sewer on Renaud Road, currently constructed up to the intersection of Glen Livett Avenue. This sewer has also been sized to collect wastewater from future lands to the north and east of the proposed site as part of the EUC Infrastructure Servicing Update recommendations.

3.2 Proposed Wastewater Plan

As mentioned in Section 3.1, wastewater flows from the Trailsedge development, east of Glen Livett Avenue, are to be directed to the Renaud Road Trunk Sanitary Sewer. A 525 mm sanitary sewer will be extended easterly from an existing cap on Renaud Road to Street 'A'. The Trunk sewer is proposed to run north on Street 'A' from Renaud Road to Street 'I', where a stubs for future connections are provided to the north and south. The trunk runs east on Street 'I' and south on Street 'J' towards the Belcourt Boulevard extension. Capped stubs are provided on Belcourt Boulevard for future connections to the North and South.

Proposed houses on Renaud Road are serviced by a new a Sanitary sewer which drains towards Street 'M', and ultimately towards Street 'A'. The new sanitary sewer on Renaud Road, east of Street 'A', is designed at a depth to adequately service the proposed units on the North side by gravity. Connections from existing houses on the south may be permitted, although pumping may be required.

Additionally, the Notre Dame Des Champs French Catholic School currently under construction is approved with a temporary outlet to the south through existing Ashcroft Eastboro lands. Residual capacity calculations have been completed by Genivar on behalf of the school board. However, the ultimate outlet for school block is to Renaud Road. The school has provided a capped stub to its north property line for connection to Renaud. A manhole with drop pipe is provided on the Renaud Road trunk sanitary sewer at the connection location.

3.3 Design Criteria

All sanitary sewers within the proposed development are designed in accordance with current City of Ottawa criteria, including, but not limited to the following:

Population:	3.4 persons per single family unit
	2.7 persons per semi detached or townhouse unit
Domestic Flow:	350 l/cap per day
Domestic Peak Factor:	Harmon Formula
Institutional:	50,000 l/d/Ha
Institutional Peak Factor:	1.5
Extraneous Flow:	0.28 l/s/Ha
Minimum Pipe Size:	200 mm diameter
Maximum Velocity:	3.0 m/s
Minimum Velocity:	0.6 m/s

Detailed design sheets and corresponding drainage area plans have been prepared and are located in **Appendix B**.



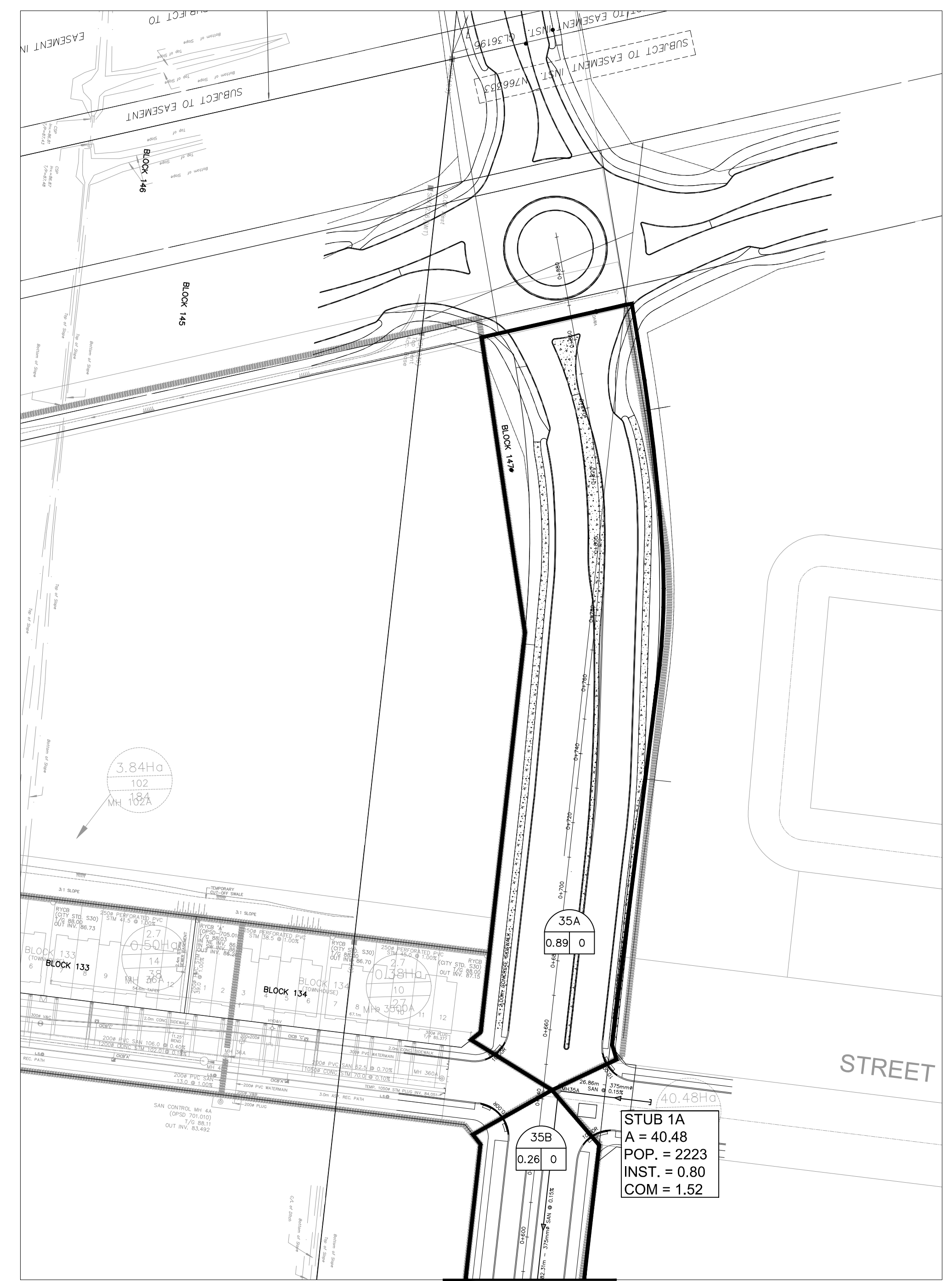
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: TRAILS EDGE II
LOCATION: CITY OF OTTAWA
CLIENT: MINTO COMMUNITIES INC.

LOCATION		RESIDENTIAL										ICI AREAS				INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN									
STREET	AREA #	FROM MH	TO MH	UNIT TYPES				Area (Ha)	POPULATION		CUMULATIVE FLOW		AREA (ha)				Pk. Flow (L/s)	Incr. Area (Ha)	Cum. Area (Ha)	Flow (L/s)	(L/s)	Capacity (L/s)	Pipe Size (mm)	Length (m)	Slope (%)	Vel (Full) (m/s)	Avail. Cap.		
		SF	SD	TH	APT	IND	CUM	Peaking Factor	Peak Flow (L/s)	INSTITUTION IND	CUM	COMMERCIAL IND	CUM	IND	CUM	L/s											(%)	L/s	(%)
Stub 1A	Stub 1A	MH35A						40.48	2223.0	2223.0	3.55	31.97	0.80	0.80	1.52	1.52	2.01	42.80	42.80	11.98	45.97	70.84	375	26.86	0.15	0.62	24.87	35.11	
Axis Street		MH35A	Stub W					0.00	0.0	0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.63	200	32.31	0.70	0.88	28.63	100.00		
Belcourt Boulevard	35A, 35B	MH35A	MH54A					1.15	0.0	2223.0	3.55	31.97	0.00	0.80	0.00	1.52	2.01	1.15	43.95	12.31	46.29	70.84	375	82.31	0.15	0.62	24.55	34.66	
Belcourt Boulevard	54	MH54A	MH55A					0.24	0.0	2223.0	3.55	31.97	0.00	0.80	0.00	1.52	2.01	0.24	44.19	12.37	46.36	70.84	375	76.74	0.15	0.62	24.48	34.56	
	Stub 1B	Stub 1B	MH55A					6.38	509.0	509.0	3.97	8.19	0.00	0.00	0.00	0.00	6.38	6.38	1.79	9.98	50.44	300	15.90	0.25	0.69	40.46	80.22		
Belcourt Boulevard	55	MH55A	MH55C					0.21	0.0	2732.0	3.48	38.48	0.00	0.80	0.00	1.52	2.01	0.21	50.78	14.22	54.71	70.84	375	68.67	0.15	0.62	16.13	22.77	
Belcourt Boulevard	55C	MH55C	MH56A					0.15	0.0	2732.0	3.48	38.48	0.00	0.80	0.00	1.52	2.01	0.15	50.93	14.26	54.75	70.84	375	52.59	0.15	0.62	16.09	22.71	
		Trunk 2	MH56A					27.73	1480.0	1480.0	3.68	22.09	3.43	3.43		0.00	2.98	31.16	31.16	8.72	33.79	50.44	300	24.10	0.25	0.69	16.65	33.01	
Locust Ridge	56, 56B, 56C	MH56A	MH 101A						0.0	4212.0	3.31	56.53	0.00	4.23		1.52	4.99	0.92	82.86	23.20	84.72	103.03	450	57.60	0.12	0.63	18.31	17.77	
Yellow Birch Street	112A	MH 112A	MH 101A						17.0	17.0	4.00	0.28	0.00	0.00		0.00	0.28	0.28	0.08	0.36	34.22	200	66.00	1.00	1.06	33.86	98.95		
Locust Ridge	101	MH 101A	MH102A						13.6	4242.6	3.31	56.89	0.00	4.23		1.52	4.99	0.39	83.53	23.39	85.27	103.03	450	63.27	0.12	0.63	17.76	17.24	
Locust Ridge	102	MH102A	MH 103A						17.0	4259.6	3.31	57.09	0.00	4.23		1.52	4.99	0.58	84.11	23.55	85.63	103.03	450	61.68	0.12	0.63	17.40	16.89	
Locust Ridge	103	MH 103A	MH 104A						0.0	4259.6	3.31	57.09	0.00	4.23		1.52	4.99	0.02	84.13	23.56	85.64	103.03	450	11.48	0.12	0.63	17.39	16.88	
Locust Ridge	104	MH 104A	MH 105A						0.0	4259.6	3.31	57.09	0.00	4.23		1.52	4.99	0.08	84.21	23.58	85.66	103.03	450	65.88	0.12	0.63	17.37	16.86	
Yellow Birch Street	112B	MH 112A	MH 113A						6.8	6.8	4.00	0.11	0.00	0.00		0.00	0.18	0.18	0.05	0.16	27.59	200	11.39	0.65	0.85	27.43	99.42		
Yellow Birch Street	113	MH 113A	MH 114A						34.0	40.8	4.00	0.66	0.00	0.00		0.00	0.42	0.60	0.17	0.83	24.19	200	57.72	0.50	0.75	23.36	96.58		
Yellow Birch Street	114	MH 114A	MH 105A						40.8	81.6	4.00	1.32	0.00	0.00		0.00	0.53	1.10	0.32	1.64	24.19	200	66.44	0.50	0.75	22.55	93.24		
Yellow Birch Street	105	MH 105A	MH 106A						0.0	4341.2	3.30	58.06	0.00	4.23		0.00	1.52	4.99	0.10	85.44	23.92	86.97	103.03	450	62.56	0.12	0.63	16.06	15.58
Yellow Birch Street	106	MH 106A	STUB						0.0	4341.2	3.30	58.06	0.00	4.23		0.00	1.52	4.99	0.11	85.55	23.95	87.01	103.03	450	48.05	0.12	0.63	16.02	15.55
Refer to DSEL Detail Design for Sanitary Sewer between MH 204A and Stub on Yellow Birch Street																													
Compass Street		MH 204A	MH 205A						0.0	5396.8	3.21	70.27	0.00	4.23		1.52	4.99	0.18	105.60	29.57	104.83	148.80	525	75.68	0.11	0.67	43.97	29.55	
Enclave Walk	301	MH 301A	MH 303A						57.8	57.8	4.00	0.94	0.00	0.00		0.00	0.82	0.82	0.23	1.17	27.59	200	114.47	0.65	0.85	26.42	95.76		
Enclave Walk	303	MH 303A	MH 304A						3.4	61.2	4.00	0.99	0.00	0.00		0.00	0.10	0.92	0.26	1.25	24.19	200	38.40	0.50	0.75	22.94	94.84		
Pin Cherry Grove	409	MH 314A	MH 304A						23.8	23.8	4.00	0.39	0.00	0.00		0.00	0.33	0.33	0.09	0.48	27.59	200	39.96	0.65	0.85	27.11	98.25		
Pin Cherry Grove	304	MH 304A	MH 305A						30.6	115.6	4.00	1.87	0.00	0.00		0.00	0.42	1.67	0.47	2.34	20.24	200	72.34	0.35	0.62	17.90	88.45		
Enclave Walk	307	MH 307A	MH 308A						20.4	20.4	4.00	0.33	0.00	0.00		0.00	0.31	0.31	0.09	0.42	27.59	200	65.34	0.65	0.85	27.17	98.49		
Enclave Walk	308	MH 308A	MH 309A						3.4	23.8	4.00	0.39	0.00	0.00		0.00	0.09	0.40	0.11	0.50	27.59	200	11.33	0.65	0.85	27.09	98.18		
Enclave Walk	309	MH 309A	MH 310A						10.2	34.0	4.00	0.55	0.00	0.00		0.00	0.31	0.71	0.20	0.75	20.24	200	31.99	0.35	0.62	19.49	96.30		
Enclave Walk	310	MH 310A	MH 311A						13.6	47.6	4.00	0.77	0.00	0.00		0.00	0.32	1.03	0.29	1.06	20.24	200	30.19	0.35	0.62	19.18	94.77		
Enclave Walk	311	MH 311A	MH 312A						47.6	95.2	4.00	1.54	0.00	0.00		0.00	1.00	2.03	0.57	2.11	20.24	200	81.91	0.35	0.62	18.13	89.58		
Enclave Walk	312	MH 312A	MH 313A						17.0	112.2	4.00	1.82	0.00	0.00		0.00	0.32	2.35	0.66	2.48	20.24	200	42.02	0.35	0.62	17.76	87.76		
Enclave Walk	313	MH 313A	MH 305A						6.8	119.0	4.00	1.93	0.00	0.00		0.00	0.20	2.55	0.71	2.64	20.24	200	28.42	0.35	0.62	17.60	86.94		
Enclave Walk	305	MH 305A	MH 306A						13.6	248.2	4.00	4.02	0.00	0.00		0.00	0.37	4.59	1.29	5.31	21.64	200	45.01	0.40	0.67	16.33	75.48		
Enclave Walk	306A,306B	MH 306A	MH 205A						0.12	269.6	4.00	4.37	0.00	0.00		0.00	0.47	5.06	1.42	5.79	21.64	200	65.82	0.40	0.67	15.85	73.26		
Institutional Block 249	206	MH 206A	MH 205A						0.0	0.0	4.00	0.00	0.79	0.79		0.00	0.69	0.63	0.63	0.18	0.86	24.19	200	14.50	0.50	0.75	23.33	96.44	
Compass Street		MH 205A	MH 411A						0.0	5666.4	3.19	73.32	0.00	5.02		1.52	5.68	0.18	111.47	31.21	110.21	148.80	525	81.85	0.11	0.67	38.59	25.94	
School Block	STUB 2B	MH 406A	MH 408A						0.0	0.0	4.00	0.00	0.00	0.00	5.07	5.07	4.40	5.07	5.07	1.42	5.82	34.22	200	11.93	1.00	1.06	28.40	82.99	
Renaud Road	STUB 2A, 408A-N	MH408A	MH 409A						1.79	153.8	153.8	4.00	2.49	0.00	0.00		5.07	4.40	2.35	7.42	2.08	8.97	21.64	200	120.00	0.40	0.67	12.67	58.56
Renaud Road	409A-C	MH 409A	MH 410A						0.34	45.9	199.7	4.00	3.24	0.00	0.00		5.07	4.40	0.86	8.28	2.32	9.96	21.64	200	120.00	0.40	0.67	11.68	53.98
Renaud Road	410A-C	MH 410A	MH 411A						1.08	90.6	290.3	4.00	4.70	0.00	0.00		5.07	4.40	1.39	9.67	2.71	11.81	21.64	200	120.00	0.40	0.67	9.83	45.43
EXISTING NDC SCHOOL BLOCK	411C	EX MH	MH 411B						0.0	0.0	4.00	0.00	1.98	1.98		0.00	1.72	1.98	1.98	0.55	2.27	48.39	200	16.68	2.00	1.49	46.12	95.30	
EXISTING NDC SCHOOL BLOCK		MH 411B	MH 411A						3.4	3.4	4.00	0.06	2.98	2.98		0.00	2.59	0.00	1.98	0.55	3.20	48.39	200	14.35	2.00	1.49	45.19	93.38	
Renaud Road	412C	MH411A	MH413A						0.0	5960.1	3.17	76.62	0.00	2.98		5.07	6.99	0.29	123.41	34.55	118.16	202.56	600	120.76	0.10	0.69	84.40	41.67	
High Level Sanitary	413A,413B	MH413A	EX MH						0.0	0.0	4.00	0.00	0.00	0.00	0.00	0.00	1.07	1.07											

J:\31855-TrailSedge\09 Drawings\Sheet\01 SANITARY DRAINAGE AREA PLAN.dwg Plot Scale: 1:25.4 Printed At: 2/13/2015 7:51 AM User: sward By: sward Date: Feb. 12, 15



MATCH LINE

STUB 1A
A = 40.48
POP. = 2223
INST. = 0.80
COM = 1.52



STUB 1B
A = 6.38
POP. = 509

TRUNK 2
A = 27.73
POP. = 1480
INST. = 3.43

REFER TO DSEL MSS FOR DETAILS ON EXTERNAL FLOW

STUB 2A
A = 1.79
POP. = 116

- LEGEND:**
- 112 AREA NUMBER
 - 0.10 3.4 POPULATION
 - AREA IN HECTARES
 - 204 AREA NUMBER
 - 1.2 INST. NON RESIDENTIAL USE
 - COM - COMMERCIAL
 - AREA IN HECTARES
 - EXTERNAL FLOW
 - A = 51.69 AREA Ha
 - POP. = 3748 POPULATION
 - INST. = 2.88 INSTITUTION AREA
 - COM = 1.61 COMMERCIAL AREA

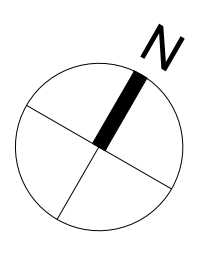
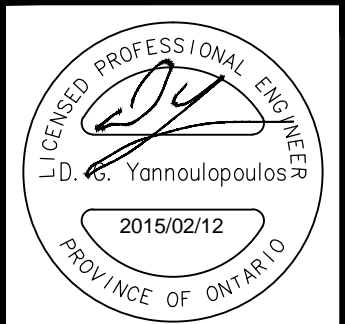
- RESIDENTIAL POP
3.4 PPU SINGLE
2.7 PPU TOWNS / SEMI
65 PPHa VACANT LANDS
- COMMERCIAL 50 000 l/Ha/d
INSTITUTION 50 000 l/Ha/d
INFILTRATION ALLOWANCE 0.28l/s/Ha

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8	REVISED PER CITY COMMENTS	DGY	15:02:12
7	REVISED PER CITY COMMENTS	DGY	15:01:26
6	REVISED PER CITY COMMENTS	DGY	14:11:07
5	REVISED PER CITY COMMENTS	DGY	14:09:16
4	REVISED PER CITY COMMENTS	DGY	14:07:28
3	REVISED PER NEW LEGAL	DGY	14:04:02
2	REVISED PER MASTER SERVING STUDY	DGY	14:03:24
1	ISSUED FOR CITY REVIEW	DGY	13:02:01



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333 Preston Street
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Canada K1S 5N4
Tel (613)225-1311
Fax (613)225-9868

Project Title
TRAILSEDGE II
1578051 ONTARIO INC.



Drawing Title
SANITARY DRAINAGE
AREA PLAN

Scale
1 : 1000

Design
R.M. Date
FEB 2014

Drawn
E.H. Checked
D.G.Y.

Project No.
31855 Drawing No.
501

D07-16-107-0018PH3

Appendix C Stormwater Management

C.1 Storm Sewer Design Sheet





Trailsedge West - Block 121

STORM SEWER DESIGN SHEET (City of Ottawa)

DESIGN PARAMETERS

I = a / (t+b)^2 (As per City of Ottawa Guidelines, 2012)

Table with columns for a, b, c values and MANNING'S n, MINIMUM COVER, TIME OF ENTRY.

DATE: 2026-03-12
REVISION: 1
DESIGNED BY: WAJ
CHECKED BY:

FILE NUMBER: 160401760

Main data table with columns: LOCATION, DRAINAGE AREA, PIPE SELECTION, and various flow/velocity metrics.

C.2 Sample PCSWMM Output Files



[TITLE]

;;Project Title/Notes

[OPTIONS]

```
;;Option      Value
FLOW_UNITS    LPS
INFILTRATION  HORTON
FLOW_ROUTING  DYNWAVE
LINK_OFFSETS  ELEVATION
MIN_SLOPE     0
ALLOW_PONDING NO
SKIP_STEADY_STATE NO
```

```
START_DATE    03/05/2026
START_TIME    00:00:00
REPORT_START_DATE 03/05/2026
REPORT_START_TIME 00:00:00
END_DATE      03/06/2026
END_TIME      00:00:00
SWEEP_START   01/01
SWEEP_END     12/31
DRY_DAYS      0
REPORT_STEP   00:01:00
WET_STEP      00:01:00
DRY_STEP      00:01:00
ROUTING_STEP  1
RULE_STEP     00:00:00
```

```
INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP    0
LENGTHENING_STEP 0
MIN_SURFAREA     0
MAX_TRIALS       8
HEAD_TOLERANCE   0.0015
SYS_FLOW_TOL     5
LAT_FLOW_TOL     5
MINIMUM_STEP     0.5
THREADS          8
```

[FILES]

```
;;Interfacing Files
USE HOTSTART "C:\Users\wajohnson\OneDrive -
Stantec\Desktop\PCSWMM\160401760\2026-03-06\hotstart\Block 121_100C_HSF.HSF"
```

[EVAPORATION]

```
;;Data Source Parameters
;;-----
CONSTANT 0.0
DRY_ONLY NO
```

[RAINGAGES]

```
;;Name      Format  Interval SCF  Source
;;-----
RG-1        INTENSITY 0:10  1.0  TIMESERIES 100YRCHI
```

[SUBCATCHMENTS]

```
;;Name      Rain Gage      Outlet      Area  %Imperv  Width
;;Slope     CurbLen      SnowPack
;;-----
COMP-1      RG-1          COMPASS      0.086452 61.429  72  6
0
L101A      RG-1          C101A-1      0.074215 88.571  28  6
0
L102A      RG-1          C102A-1      0.049764 68.571  22  5
0
L103A      RG-1          C103A-1      0.124714 77.143  50  4
0
L104A      RG-1          C104A-1      0.07814  77.143  27  5
0
L105A      RG-1          C105A-1      0.089403 90  44  5
0
L106A      RG-1          C106A-1      0.107765 94.286  66  5
0
L201A      RG-1          C201A-1      0.103815 84.286  36  3
0
L203A      RG-1          C203A-1      0.087589 87.143  36  5
0
L204A      RG-1          C204A-1      0.073538 82.857  32  5
0
MEL-1      RG-1          MELODIE      0.063902 80  41  6
0
NORTH-1    RG-1          CREEK        0.091458 11.429  68  3
0
NORTH-2    RG-1          CREEK        0.081315 0  91  6.5
0
REN-1      RG-1          RENAUD-W     0.109441 64.286  93  3
0
REN-2      RG-1          RENAUD-E     0.127995 61.429  102  3
0
WEST-1     RG-1          MELODIE      0.017468 0  91  30
0
```

[SUBAREAS]

```
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo
;;PctRouted
;;-----
COMP-1 0.013 0.25 1.57 4.67 0 OUTLET
L101A 0.013 0.25 1.57 4.67 0 OUTLET
```

L102A	0.013	0.25	1.57	4.67	0	OUTLET
L103A	0.013	0.25	1.57	4.67	0	OUTLET
L104A	0.013	0.25	1.57	4.67	0	OUTLET
L105A	0.013	0.25	1.57	4.67	0	OUTLET
L106A	0.013	0.25	1.57	4.67	0	OUTLET
L201A	0.013	0.25	1.57	4.67	0	OUTLET
L203A	0.013	0.25	1.57	4.67	0	OUTLET
L204A	0.013	0.25	1.57	4.67	0	OUTLET
MEL-1	0.013	0.25	1.57	4.67	0	OUTLET
NORTH-1	0.013	0.25	1.57	4.67	0	OUTLET
NORTH-2	0.013	0.25	1.57	4.67	0	OUTLET
REN-1	0.013	0.25	1.57	4.67	0	OUTLET
REN-2	0.013	0.25	1.57	4.67	0	OUTLET
WEST-1	0.013	0.25	1.57	4.67	0	OUTLET

[INFILTRATION]

;;Subcatchment	Param1	Param2	Param3	Param4	Param5
COMP-1	76.2	13.2	4.14	7	0
L101A	76.2	13.2	4.14	7	0
L102A	76.2	13.2	4.14	7	0
L103A	76.2	13.2	4.14	7	0
L104A	76.2	13.2	4.14	7	0
L105A	76.2	13.2	4.14	7	0
L106A	76.2	13.2	4.14	7	0
L201A	76.2	13.2	4.14	7	0
L203A	76.2	13.2	4.14	7	0
L204A	76.2	13.2	4.14	7	0
MEL-1	76.2	13.2	4.14	7	0
NORTH-1	76.2	13.2	4.14	7	0
NORTH-2	76.2	13.2	4.14	7	0
REN-1	76.2	13.2	4.14	7	0
REN-2	76.2	13.2	4.14	7	0
WEST-1	76.2	13.2	4.14	7	0

[OUTFALLS]

;;Name	Elevation	Type	Stage Data	Gated	Route To
200	84.14	FIXED	84.52	NO	
409A	83.7	FIXED	84.23	NO	
COMPASS	86.6	FREE		NO	
CREEK	0	FREE		NO	
MELODIE	86.79	FREE		NO	
OF1	87.13	FREE		NO	
OF2	87.15	FREE		NO	
RENAUD-E	87.46	FREE		NO	
RENAUD-W	87.06	FREE		NO	

[STORAGE]

;;Name	Elev.	MaxDepth	InitDepth	Shape	Curve Name/Params
	SurDepth	Fevap	Psi	Ksat	IMD

```

;;-----
100      83.885  3.162  0      FUNCTIONAL  0      0
1.13    0      0
100A    83.804  3.417  0      FUNCTIONAL  0      0
1.13    0      0
101     83.976  3.106  0      FUNCTIONAL  0      0
1.13    0      0
102     84.232  2.93   0      FUNCTIONAL  0      0
1.13    0      0
103     84.238  2.928  0      FUNCTIONAL  0      0
1.13    0      0
104     84.382  2.696  0      FUNCTIONAL  0      0
1.13    0      0
105     84.43   2.762  0      FUNCTIONAL  0      0
1.13    0      0
106     84.604  2.668  0      FUNCTIONAL  0      0
1.13    0      0
201     84.292  3.005  0      FUNCTIONAL  0      0
1.13    0      0
202     84.404  2.842  0      FUNCTIONAL  0      0
1.13    0      0
203     84.646  2.655  0      FUNCTIONAL  0      0
1.13    0      0
204     84.595  2.527  0      FUNCTIONAL  0      0
1.13    0      0
409     83.761  3.199  0      FUNCTIONAL  0      0
1.13    0      0
C101A-1 85.62   1.63   0      TABULAR    C101A
0      0
C102A-1 85.67   1.63   0      TABULAR    C102A
0      0
C103A-1 85.72   1.63   0      TABULAR    C103A
0      0
C104A-1 85.62   1.61   0      TABULAR    C104A
0      0
C105A-1 85.62   1.63   0      TABULAR    C105A
0      0
C106A-1 85.65   1.63   0      TABULAR    C106A
0      0
C201A-1 85.69   1.63   0      TABULAR    C110A
0      0
C203A-1 85.69   1.63   0      TABULAR    C108A
0      0
C204A-1 85.65   1.63   0      TABULAR    C107A
0      0

```

[CONDUITS]

;;Name	From Node	To Node	Length	Roughness	InOffset
	InitFlow	MaxFlow			

```

-----
Pipe_16      409      409A      12.037      0.013      83.761
83.7        0
Pipe_16_(1) 100A      409        6.462      0.013      83.804
83.791     0
Pipe_17      100      100A      25.242      0.013      83.885
83.834     0
Pipe_18      101      100        15.723      0.013      83.976
83.945     0
Pipe_19      102      101        26.321      0.013      84.232
84.126     0
Pipe_20      103      101        62.995      0.013      84.238
84.051     0
Pipe_21      105      103        33.469      0.013      84.43
84.313     0
Pipe_22_(1) 204      202        24.659      0.013      84.595
84.434     0
Pipe_23      202      201        9.338      0.013      84.404
84.367     0
Pipe_24      201      200        37.999      0.013      84.292
84.14      0
Pipe_25      203      202        32.564      0.013      84.646
84.434     0
Pipe_26      106      105        32.623      0.013      84.604
84.49      0
Pipe_27      104      103        17.201      0.013      84.382
84.313     0

```

[ORIFICES]

```

;;Name      From Node      To Node      Type      Offset      Qcoeff
  Gated      CloseTime
-----
C101A-1IC  C101A-1      101          SIDE      85.62      0.572
NO         0
C103A-1IC  C103A-1      103          SIDE      85.72      0.572
NO         0
C104A-1IC  C104A-1      104          SIDE      85.62      0.572
NO         0
C105A-1IC  C105A-1      105          SIDE      85.62      0.572
NO         0
C106A-1IC  C106A-1      106          SIDE      85.65      0.572
NO         0
C201A-1IC  C201A-1      201          SIDE      85.69      0.572
NO         0
C203A-1IC  C203A-1      203          SIDE      85.69      0.572
NO         0
C204A-1IC  C204A-1      204          SIDE      85.65      0.572
NO         0

```

[WEIRS]

```

;;Name      From Node      To Node      Type      CrestHt      Qcoeff
  Gated      EndCon      EndCoeff      SurchARGE   RoadWidth   RoadSurf     Coeff. Curve
-----
W1          C101A-1      OF2          TRANSVERSE  87.15      1.67
NO         0
W10        C104A-1      OF1          TRANSVERSE  87.13      1.67
NO         0
W11        C105A-1      C104A-1     TRANSVERSE  87.15      1.67
NO         0
W12        C204A-1      C105A-1     TRANSVERSE  87.18      1.67
NO         0
W13        C201A-1      C204A-1     TRANSVERSE  87.22      1.67
NO         0
W14        C106A-1      C105A-1     TRANSVERSE  87.18      1.67
NO         0
W15        C203A-1      C204A-1     TRANSVERSE  87.22      1.67
NO         0
W2         C102A-1      C101A-1     TRANSVERSE  87.2       1.67
NO         0
W3         C103A-1      C101A-1     TRANSVERSE  87.25      1.67
NO         0

```

[OUTLETS]

```

;;Name      From Node      To Node      Offset      Type
  QTable/Qcoeff  Qexpon      Gated
-----
C102A-1IC  C102A-1      102          85.67      FUNCTIONAL/HEAD
5.716      0.5         NO

```

[XSECTIONS]

```

;;Link      Shape      Geom1      Geom2      Geom3      Geom4
  Barrels   Culvert
-----
Pipe_16     CIRCULAR  0.45      0          0          0          1
Pipe_16_(1) CIRCULAR  0.45      0          0          0          1
Pipe_17     CIRCULAR  0.45      0          0          0          1
Pipe_18     CIRCULAR  0.45      0          0          0          1
Pipe_19     CIRCULAR  0.3       0          0          0          1
Pipe_20     CIRCULAR  0.375    0          0          0          1
Pipe_21     CIRCULAR  0.3       0          0          0          1

```

Pipe_22_(1)	CIRCULAR	0.3	0	0	0	1
Pipe_23	CIRCULAR	0.3	0	0	0	1
Pipe_24	CIRCULAR	0.375	0	0	0	1
Pipe_25	CIRCULAR	0.3	0	0	0	1
Pipe_26	CIRCULAR	0.3	0	0	0	1
Pipe_27	CIRCULAR	0.3	0	0	0	1
C101A-1IC	CIRCULAR	0.083	0	0	0	
C103A-1IC	CIRCULAR	0.094	0	0	0	
C104A-1IC	CIRCULAR	0.083	0	0	0	
C105A-1IC	CIRCULAR	0.083	0	0	0	
C106A-1IC	CIRCULAR	0.094	0	0	0	
C201A-1IC	CIRCULAR	0.094	0	0	0	
C203A-1IC	CIRCULAR	0.083	0	0	0	
C204A-1IC	CIRCULAR	0.083	0	0	0	
W1	RECT_OPEN	0.25	3	0	0	
W10	RECT_OPEN	0.27	3	0	0	
W11	RECT_OPEN	0.25	3	0	0	
W12	RECT_OPEN	0.25	3	0	0	
W13	RECT_OPEN	0.25	3	0	0	
W14	RECT_OPEN	0.25	3	0	0	
W15	RECT_OPEN	0.25	3	0	0	
W2	RECT_OPEN	0.25	3	0	0	
W3	RECT_OPEN	0.25	3	0	0	

[LOSSES]

;;Link	Kentry	Kexit	Kavg	Flap Gate	Seepage
;;-----					
Pipe_16_(1)	0	0.157	0	NO	0
Pipe_17	0	0.229	0	NO	0
Pipe_18	0	1.323	0	NO	0
Pipe_19	0	0.034	0	NO	0
Pipe_20	0	1.323	0	NO	0
Pipe_21	0	0.022	0	NO	0
Pipe_22_(1)	0	0.47	0	NO	0
Pipe_23	0	0.353	0	NO	0
Pipe_25	0	0.353	0	NO	0
Pipe_26	0	1.344	0	NO	0
Pipe_27	0	1.323	0	NO	0

[CURVES]

;;Name	Type	X-Value	Y-Value
;;-----			
C101A	Storage	0	0
C101A		1.38	0
C101A		1.53	60

C102A	Storage	0	0
C102A		1.38	0
C102A		1.53	41
C103A	Storage	0	0
C103A		1.38	0
C103A		1.53	99
C104A	Storage	0	0
C104A		1.38	0
C104A		1.51	85
C105A	Storage	0	0
C105A		1.38	0
C105A		1.53	87
C106A	Storage	0	0
C106A		1.38	0
C106A		1.53	91
C107A	Storage	0	0
C107A		1.38	0
C107A		1.53	85
C108A	Storage	0	0
C108A		1.38	0
C108A		1.53	99
C110A	Storage	0	0
C110A		1.38	0
C110A		1.53	71

[TIMESERIES]

;;Name	Date	Time	Value
;;-----			
100YRCHI		0:00	0
100YRCHI		0:10	6.05
100YRCHI		0:20	7.54
100YRCHI		0:30	10.16
100YRCHI		0:40	15.97
100YRCHI		0:50	40.65
100YRCHI		1:00	178.56
100YRCHI		1:10	54.05
100YRCHI		1:20	27.32
100YRCHI		1:30	18.24
100YRCHI		1:40	13.74
100YRCHI		1:50	11.06
100YRCHI		2:00	9.29
100YRCHI		2:10	8.02
100YRCHI		2:20	7.08

100YRCHI	2:30	6.35
100YRCHI	2:40	5.76
100YRCHI	2:50	5.28
100YRCHI	3:00	4.88
100YRCHI+20	0:00	0
100YRCHI+20	0:10	7.26
100YRCHI+20	0:20	9.048
100YRCHI+20	0:30	12.192
100YRCHI+20	0:40	19.164
100YRCHI+20	0:50	48.78
100YRCHI+20	1:00	214.272
100YRCHI+20	1:10	64.86
100YRCHI+20	1:20	32.784
100YRCHI+20	1:30	21.888
100YRCHI+20	1:40	16.488
100YRCHI+20	1:50	13.272
100YRCHI+20	2:00	11.148
100YRCHI+20	2:10	9.624
100YRCHI+20	2:20	8.496
100YRCHI+20	2:30	7.62
100YRCHI+20	2:40	6.912
100YRCHI+20	2:50	6.336
100YRCHI+20	3:00	5.856
2YRCHI	0:00	0
2YRCHI	0:10	2.81
2YRCHI	0:20	3.5
2YRCHI	0:30	4.69
2YRCHI	0:40	7.3
2YRCHI	0:50	18.21
2YRCHI	1:00	76.81
2YRCHI	1:10	24.08
2YRCHI	1:20	12.36
2YRCHI	1:30	8.32
2YRCHI	1:40	6.3
2YRCHI	1:50	5.09
2YRCHI	2:00	4.29
2YRCHI	2:10	3.72
2YRCHI	2:20	3.29
2YRCHI	2:30	2.95
2YRCHI	2:40	2.68
2YRCHI	2:50	2.46
2YRCHI	3:00	2.28
5YRCHI	0:00	0
5YRCHI	0:10	3.68
5YRCHI	0:20	4.58
5YRCHI	0:30	6.15
5YRCHI	0:40	9.61
5YRCHI	0:50	24.17

5YRCHI	1:00	104.19
5YRCHI	1:10	32.04
5YRCHI	1:20	16.34
5YRCHI	1:30	10.96
5YRCHI	1:40	8.29
5YRCHI	1:50	6.69
5YRCHI	2:00	5.63
5YRCHI	2:10	4.87
5YRCHI	2:20	4.3
5YRCHI	2:30	3.86
5YRCHI	2:40	3.51
5YRCHI	2:50	3.22
5YRCHI	3:00	2.98

```
[REPORT]
;;Reporting Options
INPUT YES
CONTROLS NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
```

```
[TAGS]
Node 200 MN
Node 409A MN
Node 100 MN
Node 100A MN
Node 101 MN
Node 102 MN
Node 103 MN
Node 104 MN
Node 105 MN
Node 106 MN
Node 201 MN
Node 202 MN
Node 203 MN
Node 204 MN
Node 409 MN
Node C101A-1 MJ
Node C102A-1 MJ
Node C103A-1 MJ
Node C104A-1 MJ
Node C105A-1 MJ
Node C106A-1 MJ
Node C201A-1 MJ
Node C203A-1 MJ
Node C204A-1 MJ
Link C102A-1IC LMF80
```

```
[MAP]
DIMENSIONS 382146.5002 5032963.35315 382354.4618 5033147.81985
```

UNITS Meters

[COORDINATES]

;;Node	X-Coord	Y-Coord
200	382209.8	5032983
409A	382332.9	5033125
COMPASS	382340.612	5033103.668
CREEK	382241.779	5033100.367
MELODIE	382159.452	5032991.836
OF1	382235.405	5033085.488
OF2	382293.362	5033103.095
RENAUD-E	382307.377	5033042.735
RENAUD-W	382240.389	5033001.928
100	382293.9	5033107
100A	382315.3	5033120
101	382302.1	5033093
102	382315.9	5033071
103	382248.7	5033060
104	382239.7	5033074
105	382220.2	5033042
106	382203.1	5033070
201	382190	5033016
202	382191.6	5033025
203	382174.6	5033053
204	382212.6	5033038
409	382321.8	5033120
C101A-1	382299.047	5033093.466
C102A-1	382312.883	5033070.62
C103A-1	382279.056	5033075.859
C104A-1	382241.916	5033073.934
C105A-1	382236.322	5033049.54
C106A-1	382213.304	5033057.244
C201A-1	382195.055	5033011.025
C203A-1	382184.785	5033040.187
C204A-1	382211.929	5033034.501

C.3 Background Report Excerpts



4 STORMWATER MANAGEMENT

4.1 Overall Stormwater Management Approach

4.1.1 External Residential, Commercial and Institutional Lands

The proposed storm sewer system for the external lands will be accommodated in accordance with the EUC Servicing Report (Stantec, 2006) and the Servicing Update being prepared by DSEL. These areas will drain internally (through the proposed developments) and discharge to the existing SWM facility on the west side of Compass Street.

4.1.2 Existing Residential on Renaud Road

In accordance with the EUC Servicing Report (2006), runoff from Renaud Road and a portion of Mer Blue are to be accommodated by the Renaud Road trunk sewer. The proposed storm sewer system has been designed to service the existing residential lots on the south side of Renaud Road. The drainage Boundary and runoff coefficient for these lands is consistent with the EUC Servicing Report.

Additionally, a portion of storm sewer is proposed on Renaud Road between the NDC school block and Glenlivett Avenue. As part of works previously constructed, a 750 mm storm stub was provided at the intersection of Renaud Road and Glenlivett Avenue. This stub was sized to collect storm runoff from Street 'N' connecting to Renaud Road approximately 40 m east of Glenlivett Avenue. These lands are owned by Richcraft Homes. As part of its detailed design, the proposed residential flows were re-routed and conveyed internally. The connection to Renaud Road from Richcraft lands is not required. A drop manhole and local sewer have been provided in this section of Renaud Road to provide drainage for the street and for the existing properties on the north and south side of Renaud Road. Refer to EUC (Stantec, 2006) and Servicing Update by DSEL.

4.1.3 Existing Notre Dame Des Champs School

The proposed storm sewer system is also designed to receive flows from the existing Notre Dame Des Champs (NDC) School. The drainage boundary and runoff coefficient for these lands is consistent with the EUC and servicing update by DSEL.

The existing school block has two storm outlets into the existing Renaud Road roadside ditch. Headwalls are provided for each of the separate outlets, one specific to the building and the other specific to site drainage.

Two separate connections are proposed as part of the Renaud Road works for the school block accepting flows of 72.5 l/s and 87 l/s with storage of 374 m³ as per the servicing Report for the NDC French Catholic School, prepared by Genivar.

4.2 Objectives

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, of the Trails Edge Phase II development. The evaluation includes assessment of the cascading major flow, sizing of inlet control devices, maximum depth and velocity of flow on the surface and hydraulic grade line analysis. The evaluation and design takes into consideration the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014), the City of Ottawa Sewer Design Guidelines (OSDG) (November 2004), the January 2012 Technical Bulletin ISDTB-2012-1, June 2012 Technical Bulletin ISDTB-2012-4 and the notes from the Stormwater Sub-Committee Meeting #9 (November 19, 2013).

In accordance with the Stormwater Report for the Trails Edge West Subdivision (DSEL 2014) it should be noted that some pipes function as HGL relief pipes and convey 5 year flows and HGL relief from the main trunk. In certain cases, such as on Axis Way (east of the intersection at Belcourt) where major flow from an external area needs to be captured in addition to the 5 year flows generated by the drainage area, ICDs have been sized to capture flows in order to prevent ponding depths of greater than 0.3 m. As per the Stormwater Report (DSEL 2014) connections to manholes are at springline rather than obvert to obvert where Belcourt Boulevard and Compass Street connect to HGL relief pipes.

Modelling and analysis for Renaud Rd has been undertaken in conjunction with the evaluation of the Trails Edge Phase II development. As such, subsequent sections include details of the subdivision and Renaud Rd.

4.3 Dual Drainage Design

The subject site is designed with dual drainage features, accommodating minor and major system flow. Minor flow from the subject site will be conveyed via two trunk sewers within the north and south portions of the site to EUC Pond 1. Major flow from the subject site will be conveyed via street segments through the site to either the ravine (former Mud Creek) or directly into EUC Pond 1 (see **Drawing 700**).

Minor System

The minor system from the subject site is tributary to the southern inlet of EUC Pond 1. On-site detention is available within the subject site. Inlet control devices (ICDs) are proposed to limit the flow into the minor system during the 100 year event.

Inlet control devices (ICDs) are proposed to limit the flow into the minor system during the 100 year event. The 5 year flow restriction was based on the 5 year 3 hour Chicago (10 minute time step) modeled flow. During the 100 year 3 hour Chicago storm event, the flow into the minor system was increased by approximately 12% from the 5 year modeled flow. The purpose of the increased inflow into the system is to account for the additional flows captured by standard inlet control devices during the 100 year storm event with ponding. Additional details are provided in **Section 4.4.3**.

Street Segments

Due to the existing flat topography, the majority of street segments within the subject site have a saw-tooth road grade pattern with on-site detention. The saw-tooth road grade pattern on the subject site includes more catchbasins and low points with shallower ponding depth (on average 150 mm across the subject site). Renaud Road is continuous grade with several low points in the road for ponding.

The grading pattern was designed to minimize the ponding depth to ensure that a maximum of 300 mm depth of water during cascading conditions was maintained. As noted previously, inflow into the minor system will be controlled by ICDs to meet the flow allowance of the downstream system. Further details regarding the street segment minor and major system design is presented in Sections 4.4.3 and 4.4.4, respectively.

Major flow from the site will cascade via street segments to either the ravine (former Mud Creek) or via Compass Street to the southern sediment forebay (see Drawing 700).

Rear Yards

Rear yards within the subject site have minor inflow restrictions with major flow cascading to a street segment. ICDs will control the inflow into the minor system from rear yards. Further discussion regarding the rear yard minor and major system design is presented in **Sections 4.4.3 and 4.4.4**, respectively.

Summary of Dual Drainage Design

The overall sewer design and rational method spreadsheet for the 5 year storm event and corresponding drainage area plan are enclosed in **Appendix C**. The rational method design indicates that the 5 year rational flow is conveyed in the system under free flow conditions, thus ensuring some spare capacity.

4.4 Hydrological Evaluation

Hydrological analysis of the proposed dual drainage system, for the subject site, was conducted using DDSWMM. This technique offers a single storm event flow generation and routing. Land use, selected modeling routines, and input parameters are discussed in the following sections. A model schematic is presented in **Drawing 700** and model files are included in **Appendix C**. It should be noted that hydrographs generated by the DDSWMM model were downloaded to the XPSWMM model to evaluate the hydraulic performance of the proposed system.

As noted in **Section 4.1**, the hydrographs of the minor and major system flow conveyed through the subject site from external development areas were obtained and imported into the DDSWMM evaluation. The hydraulic evaluation undertaken in XPSWMM for the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014) Interim B conditions were modified to include the design of the trunk sewers and the lateral sewers for the subject site. The minor system hydrographs from the external development areas were imported into the appropriate manholes and obtained from the other consultant. This is discussed in further detail in **Section 4.4.5**.

4.4.1 Land Use

The subject site will be developed with single family units, a school and a park. The DDSWMM schematic is presented in **Drawing 700**.

4.4.2 Storms and Drainage Area Parameters

The main hydrological parameters for the subject site are summarized below and in Table 4.1. Supporting calculations are presented in **Appendix C**.

Design Storms

The site was evaluated using the following storm events:

5 and 100 year 3 hour Chicago storm event (10 minute time step), as per the OSDG;

July 1, 1979 Historical storm (5 minute time step) as per the OSDG;

August 4, 1988 Historical storm (5 minute time step) as per the OSDG;

August 8, 1996 Historical storm (5 minute time step) as per the OSDG; and

100 year 3 hour Chicago storm event (10 minute time step) with 20% increase for Climate Change consideration, as per the January 2012 Technical Bulletin ISDTB-2012-1.

It should be noted the storms used are consistent with those used to evaluate the storm sewer system in the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).

Area and Imperviousness

Catchment areas are based on the rational method spreadsheet, with some minor modifications for modeling purposes. See **Drawing 700** for the catchment areas used in the DDSWMM modeling for the subject site.

Imperviousness for the subject site was determined by obtaining the footprint of the model units intended for the site and placing the maximum footprint on the lots. The imperviousness ratios for single family units were calculated for a typical single family unit street segment and rear yard segment (calculations are enclosed in **Appendix C**). Runoff coefficient values used in the rational method design are based on these values.

Infiltration

Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: $f_o = 76.2 \text{ mm/h}$, $f_c = 13.2 \text{ mm/h}$, $k = 0.00115 \text{ s}^{-1}$.

Subcatchment Width

The catchment width was based on the conveyance route length of the drainage area and multiplied by two. The multiplier of two was only used if the drainage area had runoff contribution from both sides of the drainage area.

Slope

The ground slope was based upon the average slope for both impervious and pervious area. Generally, the slope is approximately 2% (0.02 m/m). This assumes a slope of approximately 1% for impervious or road surfaces and 3% for pervious surfaces (lot grading).

Initial Abstraction (Detention Storage)

Detention storage depths of 1.5 mm and 4.67 mm were used for impervious and pervious areas, respectively. These values are consistent with the OSDG³.

Manning's roughness

Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.

Baseflow

No baseflow components were assumed for any of the areas contributing runoff to the minor system within the DDSWMM model.

4.4.3 Minor System Capture

The minor system for the subject site is tributary to the southern inlet of EUC Pond 1. The street segments within the subject site have a saw-tooth road grade pattern with on-site detention. Inlet control devices (ICDs) are proposed to limit the flow into the minor system during the 100 year event.

Inlet control devices (ICDs) are proposed to limit the 5 year flow into the minor system during the 100 year event. The 5 year flow restriction was based on the 5 year 3 hour Chicago (10 minute time step) modeled flow. During the 100 year 3 hour Chicago storm event, the flow into the minor system was increased by approximately 12% from the 5 year modeled flow. The purpose of the increased inflow into the system is to account for the additional flows captured by standard inlet control devices during the 100 year storm event.

Street and rear yard segments were considered independently. The restricted inflow from street segments during the 100 year storm event is 2147 l/s, which is a flow rate of 241 l/s/ha on an average basis. From the rear yards, the restricted inflow is 1646 l/s, which is a flow rate of 151 l/s/ha on an average basis. The total minor system inflow from street and rear yard segments in the subject site is 3793 l/s during the 100 year storm event, which is a flow rate of 191 l/s/ha, on an average basis.

For those areas within the subject site which are designated institutional, park or commercial, the minor system inflow rate is 5 year modeled flow increased by 12%. Major flow will be stored on-site without overflow to the street or rear yard segments. Further discussion is provided in **Section 4.4.4**.

The minor system inflow rate along Renaud Road, within the subject site, was optimised to account for continuous grade and the requirement for curb inlets on an arterial road. As such, ICDs have been sized on continuous grade to match the actual flow entering the minor system based on approach-capture curves. At low points in the road, ICDs have been sized to capture overflow from upstream street segments while ensuring that there is no ponding during the five year storm event.

The minor system inflow rate along Belcourt Boulevard, within the subject site, was increased to capture additional flow due to a significant amount of major flow cascading from Street F (see **Drawing 700**). Further discussion is provided in **Section 4.4.6**.

Table 4.1 summarizes and compares 5 year modeled flow versus the ICD (100 year) flow. Calculations to support custom ICD sizes, including flows and head, are presented in **Appendix C**.

The dual drainage system for the subject site was evaluated using the DDSWMM model. Minor system flows (hydrographs) from the external drainage area were imported into DDSWMM if they were not already included as part of the hydraulic modeling (see **Section 4.6** for further discussion). The major system flows (hydrographs) entering the subject site from external drainage areas were read into DDSWMM (see **Drawing 700**). As noted in previous sections, the hydrographs were obtained from the evaluation undertaken in support of the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014). The minor system HGL analysis was evaluated using XPSWMM and discussed in **Section 4.6**.

4.4.4 Major System

As noted in **Section 4.3**, the major system was modeled with DDSWMM. The subject site has a saw-tooth design grade pattern with catchbasins installed with inlet control devices (ICDs) at the low points. The flow is attenuated within these localized low points with potential overflow cascading to the next segment downstream. The total volume at each low point, up to the overflow depth, is the maximum static storage. It should be noted that the site provides significant increase in storage capacity over the depth which would be applicable during overflow conditions. Rear yard segments have a saw-tooth pattern with some storage available, but the storage is not accounted for as part of the analysis.

All major flow from the site is directed west toward EUC Pond 1. One major overland flow route to EUC Pond 1 is to the ravine transecting the development site. Major flow from east of Belcourt Boulevard will be conveyed to the ravine via a culvert to be located beneath the road. Some major flow from the subject site will be directed to the ravine as shown in **Drawing 700**. The second major overland flow route to EUC Pond 1 is via Compass Street to the improved Mud Creek channel which eventually discharges to the southern sediment forebay.

Major System Storage Attenuation and Routing

For street segments, the cascading overflow to the next segment or low point, utilizes the static storage available plus an additional amount of storage equivalent to the depth required for the flow to carry over the high point. The attenuation in street sags was evaluated to account for static storage and, if overflow occurs, dynamic storage. Within this report it is referred to as double routing.

The DDSWMM model does not have a direct way of coding double routing since it does not allow the user to code dynamic storage over the high point. For this analysis, an alternative method was employed where the overflow from a street segment (regular static storage at a sag) is conveyed to a dummy segment. In other words, a regular low point segment was provided with a downstream dummy segment for further flow attenuation to account for the dynamic ponding during overflow.

The dummy segment does not have any drainage area attributes associated with it since it is a segment for routing. In addition, there is no inflow to the minor system from these dummy segments. The overflow hydrograph from the upstream catchment is routed in the dummy segment to the next "real" downstream segment. The dummy segments have specific characteristics which are noted below:

Segment Length – equivalent to length of maximum static storage from the street segment contributing to it.

Road Type – equivalent to appropriate right-of-way characteristics from the segment contributing to it, but with a longitudinal slope is 0.01% (0.0001 m/m).

The double routing method noted above, and applied to DDSWMM, is a recommended double routing method presented within the the February 2014 City of Ottawa Technical Bulletin.

The dummy segments for major system routing were applied to the analysis of the subject site. The segments are referenced as D1, D2, D3, etc. within the DDSWMM modelling file. The DDSWMM schematic presented in **Drawing 700** does not show the dummy segments, but DDSWMM computer output file shows the dummy segments immediately following the corresponding major segment which cascades into that dummy segment.

4.4.5 External Areas

As noted in **Section 4.1**, the subject site is bounded on three sides by development area which contributes minor and major flow to the subject site (see **Drawing 700**). The development surrounding the subject site was modeled in support of the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).

Major flow from the eastern and northern development areas cascade onto street segments within the subject site. This has been modeled at a conceptual level of detail and includes major flow to Belcourt Boulevard and Renaud Road. There is limited capacity to convey overland flow on Belcourt Blvd and the external major flow entering at Axis Street and Street A would overwhelm the capacity of the street to convey flow within the 0.30 m depth requirements as per the City of Ottawa. As such, the upstream drainage areas of A2090a and A112a are to be provided with full capture of major system cascading overflow which will be confirmed during the detailed design stage of these areas east of Belcourt Blvd. These flows have been incorporated into the model as minor system flows and zero overland flow. **Drawing 700** indicates where major system hydrographs from external development areas were imported into the DDSWMM model. All other external major flow hydrographs were obtained and imported into DDSWMM.

Minor system hydrographs from the upstream development were only incorporated into DDSWMM if they were not already included in the hydraulic modeling. The minor system hydrograph was imported into DDSWMM for MH399 which captures the full 1:100 year (2.7 cms)

of the upstream section of Renaud Rd, East of Belcourt. See **Drawing 700** for the manhole locations.

Further details regarding the modeling of the external areas which contribute flow (minor and major) to Trails Edge Phase II is presented in the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).

The hydraulic boundary conditions for the proposed Renaud Road trunk sewer and storm water inlet to Mud Creek (XPSWMM Node Chan2) are consistent with the values presented within the ultimate conditions DSEL servicing update. Comparison of the hydraulic grade line at Mud Creek is presented in the below table.

Table 4.1. Hydraulic Grade Line

NODE	HGL (M)	
	DSEL	IBI
Chan2 (Mud Creek)	84.002	84.002

The following table provides comparison of the parameters used in the design of the subject site under the DSEL Servicing study versus the current IBI detailed design.

Table 4.2. Design Parameter Comparison

DESIGN PARAMETER	DSEL	IBI
	VALUE	
Stormwater Management Models:	DDSWMM (release 2.1), SWMHYMO (version 5.02), and XPSWMM (version 10)	DDSWMM (release 2.1), SWMHYMO (version 4.02), and XPSWMM (version 10)
Minor System Design:	1:5 year	1:5 year
Major System Design:	1:100 year	1:100 year
Max. Allowable Flow Depth:	30 cm above gutter	30 cm above gutter
Extent of Major System:	Must be contained within the municipal right-of-way	Must be contained within the municipal right-of-way
Model Parameters:	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm (as per 2004 City of Ottawa Guidelines)	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm (as per 2004 City of Ottawa Guidelines)
Imperviousness:	Detailed Areas: based on development layout and taken as fully effective in the front lot portion and half effective in the rear lot portion of each house. Undetailed Areas: based on runoff coefficient (C) where Percent Imperviousness = $(C - 0.2) / 0.7 \times 100\%$.	Based on detailed design runoff coefficient (C) where Percent Imperviousness = $(C - 0.2) / 0.7 \times 100\%$.
Design Storms:	Chicago 3-hour Design Storms and 24-hour SCS Type	Chicago 3-hour Design Storms 5 YR

DESIGN PARAMETER	DSEL	IBI
	VALUE	
	II Design Storms. Maximum intensity averaged over 10 minutes. Based on 2004 City of Ottawa Sewer Design Guidelines	100 YR
Historical Events:	July 1st, 1979, August 4th, 1988 and August 8th, 1996 events per 2004 City of Ottawa Sewer Design Guidelines	July 1st, 1979, August 4th, 1988 and August 8th, 1996 events per 2004 City of Ottawa Sewer Design Guidelines
Climate Change Street Test:	20% increase in the 100-year, 3-hour Chicago storm, as per January 2012 City of Ottawa Technical Bulletin ISTB-2012-1	20% increase in the 100-year, 3-hour Chicago storm, as per January 2012 City of Ottawa Technical Bulletin ISTB-2012-1
Manning's Roughness Coeff.:	0.013 for concrete pipes (free flow)	0.013 for concrete pipes (free flow)
Minor System Losses:	Refer to appendix J, Attachment E for manhole loss coefficients	Minor system losses within the subject site were accounted for in accordance with Appendix 6-B of the OSDG
Freeboard in HGL Analysis	0.3 m between underside of footing elevation and 100-year hydraulic gradeline	0.3 m between underside of footing elevation and 100-year hydraulic gradeline
Downstream HGL:	Free outfall conditions assumed at SWM Pond Outlet	As per DSEL modeling

Table 4.3 summarizes the main hydrological parameters used in the DDSWMM model of the subject site. The drainage area plan (DDSWMM schematic) is presented in **Drawing 700**. A summary of all the parameters used in the DDSWMM model and the model output files are enclosed in **Appendix C**.

4.4.6 Summary of Modeling Output Files

For ease of review, the following is a reference list of the computer modeling output files including names and storm event evaluated. The modeling output files are found on the enclosed CD.

DDSWMM

- 5 YR CHICAGO DDSWMM OUTPUT (TE-5CH.dat/out)
- 100 YR CHICAGO DDSWMM OUTPUT (TE-100CH.dat/out)
- JULY 79 DDSWMM OUTPUT (TE-JUL79.dat/out)
- AUGUST 88 DDSWMM OUTPUT (TE-AUG88.dat/out)
- AUGUST 96 DDSWMM OUTPUT (TE-AUG96.dat/out)
- 100 YR CH INCREASE 20 DDSWMM OUTPUT (TE-100CH_20.dat/out)

SWMHYMO

- SWMHYMO (31855vxd.dat/out)

XPSWMM

- 5 YEAR CHICAGO XPSWMM OUTPUT (E005C_U.xp/out)
- 100 YEAR CHICAGO XPSWMM OUTPUT (E100C_U.xp/out)
- JULY 79 STORM XPSWMM OUTPUT (E100C_U.xp/out)
- AUGUST 88 STORM XPSWMM OUTPUT (E1988_C1988_U.xp/out)
- AUGUST 96 STORM XPSWMM OUTPUT (E1996_U.xp/out)
- 100 YEAR CH INCREASE 20 XPSWMM (E100C+20%_U.xp/out)

Table 4.3. Hydrological Parameters and Modeling Results
 (DDSWMM Output – See below for file names)

Drainage Area		Downstream Segment ID	MH	XP-SWMM Node ID	IMP Ratio (%)	Segment Length (m)	Sub-catchment Width (m)	Road ROW Cross Section	Max. Storage Available (m ³)	Minor System Restriction	
Segment ID	Area (ha)									5 Year Modeled Flow (l/s)*	100 Year ICD Flow (l/s)†
Trails Edge Phase II											
<i>Street Segments</i>											
S112A	0.14	S112B	112	N112	73	60	60	Swale	1.85	35	39
S113	0.34	S112B	113	N113	73	65	130	Swale	23.5	84	94
S112B	0.06	S101	112	N112	73	60	60	Swale	0.15	15	17
S101	0.2	EXT2A	101	N101	73	60	60	Swale	16.35	49	55
S102	0.18	S101	102	N102	73	65	65	Swale	10.12	44	49
S106	0.15	S104	106	N106	73	74	74	Swale	21.4	37	41
S114	0.29	S104	114	N114	73	70	140	Swale	4.97	72	81
S104	0.1	S102	104	N104	73	64	64	Swale	22.67	25	28
S307	0.25	S311	307	N307	73	73	73	Swale	48.26	61	68
S311	0.43	S312	311	N311	73	96	192	Swale	28.78	107	120
S312	0.35	S306	312	N312	73	88	176	Swale	14.86	87	97
S306	0.39	S203	306	N306	73	107	214	Swale	57.34	98	142
S301	0.36	S303	301	N301	73	96	192	Swale	40.08	90	101
S303	0.31	S304	303	N303	73	82	164	Swale	48.74	78	87
S304	0.28	S306	304	N304	73	68	136	Swale	34.52	70	78
S314	0.17	S304	314	N314	73	44	88	Swale	2.25	43	48
S404	0.16	S203	404	N404	70	75	75	Swale	10.99	55	104 [‡]
Total flow for Street Segments (l/s)											1249
<i>Rear Yard Segments</i>											
BLK246	2.89	R114	106	N106	64	325	650	Swale	233.6 [€]	613	613
R114	0.11	R113	114	N114	49	75	75	Swale	0	20	20
R113	0.13	R112A	113	N113	49	85	85	Swale	0	23	23
R112A	0.17	S112A	112	N112	49	112	112	Swale	0	30	30
P104	0.42	Park	104	N104	0	47	95	Swale	67.0 [€]	9	9
R112B	0.09	R104	112	N112	49	35	70	Swale	0	16	16
R104	0.22	S104	104	N104	49	80	160	Swale	0	39	39
EXT2B	0.72	EXT2A	Ext2B	DExt2B	49	81	162	Swale	0	119	0 [§]
R301B	0.16	S301	301	N301	49	70	140	Swale	0	29	29
R312A	0.33	R312B	312	N312	49	90	180	Swale	0	58	58
R312B	0.11	S312	312	N312	49	50	50	Swale	0	19	19
R301A	0.15	R301C	301	N301	49	57	114	Swale	0	27	27
R301C	0.12	R301D	301	N301	49	44	88	Swale	0	21	21
R301D	0.1	S303	301	N301	49	50	100	Swale	0	18	18
R305	0.17	S306	305	N305	49	75	150	Swale	0	31	31
R402B	0.13	R305	402	N402	49	40	80	Swale	0	23	23

Drainage Area		Downstream Segment ID	MH	XP-SWMM Node ID	IMP Ratio (%)	Segment Length (m)	Sub-catchment Width (m)	Road ROW Cross Section	Max. Storage Available (m ³)	Minor System Restriction	
Segment ID	Area (ha)									5 Year Modeled Flow (l/s)*	100 Year ICD Flow (l/s)†
R402A	0.13	S404	402	N402	49	15	29	Swale	0	22	22
410F	0.52	CDUM	410C	N410C	64	59	117	Swale	0	110	110
21	0.63	CDUM	404	N404	86	71	142	Swale	0	175	175
R410A	1.83	S410A	410B	N410B	42	206	412	Swale	374 [£]	263	73 [£]
R410B	0.48	S410C	410B	N410B	42	54	108	Swale	0	69	87
402I	0.76	ODUM	402I	D402I	63	86	171	Swale	54.3 [£]	159	159
R410G	0.55	S410D	410C	N410C	64	62	124	Swale	0	117	117
Total flow for rear Yard Segments (l/s)										1719	
<i>Renaud Rd</i>											
S400e	0.03	S400B	400	N400	71	17	17	Swale	1.35	7	8
S400A	0.1	S400C	400	N400	71	60	60	Swale	0	25	12 [§]
S400B	0.1	S400D	400	N400	71	45	45	Swale	0	24	12 [§]
S400C	0.12	S401A	400	N400	71	39	39	Swale	0	43	17 [§]
S400D	0.07	S401B	400	N400	71	30	30	Swale	0	32	14 [§]
S401A	0.06	S401C	401	N401	71	23	23	Swale	0	45	18 [§]
S401B	0.11	S401C	401	N401	71	41	41	Swale	0	48	18 [§]
S401C	0.29	S402A	401	N401	71	82	82	Swale	48.85	133	327 [†]
S401E	0.02	S402A	401	N401	71	17	17	Swale	0	5	6
S402A	0.51	S402C	402	N402	71	66	66	Swale	18.12	113	127
S402C	0.34	S402G	402	N402	71	54	54	Swale	12.8	77	86
S402G	0.11	S404	402	N402	71	28	28	Swale	0	26	12 [§]
S410A	0.21	S410B	410B	N410B	86	75	75	Swale	13.35	60	67
S410B	0.09	S404	410	N410	86	31	31	Swale	0	26	12 [§]
S410C	0.11	S410D	410C	N410C	86	47	47	Swale	0	32	20 [§]
S410D	0.08	S410E	410C	N410C	86	30	30	Swale	0	44	30 [§]
S410E	0.1	Renaud	410C	N410C	86	36	36	Swale	0	59	32 [§]
Total flow for Renaud Rd. (l/s)										818	
<i>Belcourt Boulevard</i>											
S3901	0.46	S54	3901	N3901	86	120	240	Swale	26.13	133	149
S3900B	0.22	S54	3900	N3900	86	72	72	Swale	61.11	62	69
S54	0.28	S55A	54	N54	86	87	174	Swale	19.44	81	91
S55A	0.22	S55B	55	N55	86	70	140	Swale	15.97	64	72
S55B	0.21	S56	55B	N55B	86	70	140	Swale	15.28	61	68
S55C	0.08	S56	55B	N55B	86	45	90	Swale	0.08	23	26
S56	0.27	EXT2A	56	N56	86	110	220	Swale	12.96	79	88
S500C	0.31	S307	500C	N500C	86	100	200	Swale	52.09	90	101
S500	0.26	S500C	500	N500	86	81	162	Swale	13.55	75	84
Total flow for Belcourt Boulevard (l/s)										748	

Notes: * 5 year modeled flow is from the DDSWMM output file 5 YR CHICAGO DDSWMM OUTPUT (TE-5CH.dat/out) presented in **Appendix C**.

† ICD flow is from the DDSWMM output file 100 YR CHICAGO DDSWMM OUTPUT (TE-100CH.dat/out) presented on the CD in **Appendix C**.

§The minor flow restriction has been reduced to account for the actual capture rate through the grill using curb inlets on a continuous grade

‡ The minor flow restriction has been increased to allow full capture of overflow from upstream segments on continuous grade during the 5 year storm event without ponding.

€ Storage is based on the requirement to retain the 100-year Chicago major flow on-site

£ Storage and ICD flow as per the servicing Report for the NDC French Catholic School, prepared by Genivar

β The flows produced by drainage area EXT-2B flow overland to EXT-2A.

The size of the inlet control devices (ICDs) was optimized using DDSWMM. ICDs are incorporated into the stormwater management design to protect the minor system from surcharge during major storm events. All ICD sizes, including flow and head, are presented in **Appendix C**.

It should be noted that there is a significant amount of major flow from Axis Street cascading onto Belcourt Boulevard (see **Drawing 700**). To control major system flow on the subject site, the minor system inflow rate for segments S404, S401C, S410E, and S3900B was increased 2 to 10 times the 5 year modeled flow.

4.5 Simulation Results

As noted previously in **Section 4.4**, minor system hydrographs generated in DDSWMM were imported to the applicable manholes in the XPSWMM model for hydraulic grade line analysis (refer to **Section 4.6**).

The storage available on-site and the results of the DDSWMM evaluation for the subject site are presented in **Table 4.4**. The ponding plan for the subject site is presented on **Drawing 400**. The DDSWMM output files are presented on the CD in **Appendix C**.

Table 4.4 Summary of On-Site Storage
 (DDSWMM Output File Names listed below)

Major System Segment ID	Max. Available Storage (m ³)	Storage Used (m ³)					
		5 year 3 hour Chicago*	100 year 3 hour Chicago†	July 1, 1979 Historical‡	August 4, 1988 Historical§	August 8, 1996 Historical§	100 year 3 hour Chicago - Increased 20%€
BLK246	233.6	0.0	233.6	73.8	55.2	7.5	233.6
S112A	1.9	0.0	1.9	1.9	1.9	0.7	1.9
S113	23.5	0.0	21.5	0.4	1.8	0.0	23.5
S112B	0.2	0.0	0.2	0.2	0.2	0.0	0.2
S101	16.4	0.0	16.4	2.2	2.9	0.0	16.4
S102	10.1	0.0	10.1	0.3	0.9	0.0	10.1
P104	67.0	0.1	66.9	67.0	67.0	15.1	67.0
S106	21.4	0.0	10.1	0.3	0.9	0.0	17.9
S114	5.0	0.0	5.0	0.4	1.6	0.0	5.0
S104	22.7	0.0	22.7	14.3	12.3	2.0	22.7
S3901	26.1	0.0	26.1	0.0	0.5	0.0	26.1
S3900B	61.1	0.0	13.6	0.0	0.2	0.0	23.5
S54	19.4	0.0	17.5	0.0	0.3	0.0	19.4

Major System Segment ID	Max. Available Storage (m ³)	Storage Used (m ³)					
		5 year 3 hour Chicago*	100 year 3 hour Chicago†	July 1, 1979 Historical‡	August 4, 1988 Historical¥	August 8, 1996 Historical§	100 year 3 hour Chicago - Increased 20%€
S55A	16.0	0.0	16.0	0.0	0.2	0.0	16.0
S55B	15.3	0.0	15.3	0.0	0.2	0.0	15.3
S55C	0.1	0.0	0.1	0.0	0.1	0.0	0.1
S56	13.0	0.0	13.0	0.0	0.4	0.0	13.0
S500C	52.1	0.0	19.4	0.0	0.4	0.0	49.8
S500	13.6	0.0	13.6	0.0	0.2	0.0	13.6
S307	48.3	0.0	15.4	0.4	1.1	0.0	27.6
S311	28.8	0.0	28.0	0.3	2.0	0.0	28.8
S312	14.9	0.0	14.9	12.8	14.8	0.9	14.9
S306	57.3	0.0	57.3	0.0	0.6	0.0	57.3
S301	40.1	0.0	35.2	4.4	6.6	0.2	40.1
S303	48.7	0.0	48.7	10.6	12.4	1.1	48.7
S304	34.5	0.0	24.5	0.3	1.7	0.0	34.5
S314	2.3	0.0	2.3	0.1	1.1	0.0	2.3
S400e	1.4	0.0	1.4	0.2	0.3	0.0	1.4
S401C	48.9	0.0	0.0	0.0	0.0	0.0	5.4
S402A	18.1	0.0	18.1	2.4	3.4	0.0	18.1
S402C	12.8	0.0	12.8	1.3	2.0	0.0	12.8
S404	11.0	0.0	11.0	11.0	0.2	0.0	11.0
S410A	13.4	0.0	12.8	13.4	13.4	0.0	13.4
R410A	374.0	113.2	374.0	374.0	374.0	178.0	374.0
402I	54.3	0.0	54.3	17.8	18.8	2.4	54.3

Notes: * 5 year modeled flow is from the DDSWMM output file 5 YR CHICAGO DDSWMM OUTPUT (TE-5CH.dat/out) presented on the CD in **Appendix C**.

† 100 year modeled flow is from the DDSWMM output file 100 YR CHICAGO DDSWMM OUTPUT (TE-100CH.dat/out) presented on the CD in **Appendix C**.

‡ July 1, 1979 historical storm modeled flow is from the DDSWMM output file JULY 79 DDSWMM OUTPUT (TE-JUL79.dat/out) presented on the CD in **Appendix C**.

¥ August 4, 1988 historical storm modeled flow is from the DDSWMM output file entitled AUGUST 88 DDSWMM OUTPUT (TE-AUG88.dat /out) and presented on the CD in **Appendix C**.

§ August 8, 1996 historical storm modeled flow is from the DDSWMM output file entitled AUGUST 96 DDSWMM OUTPUT (TE-AUG96.dat/out) and presented on the CD in **Appendix C**.

€ The modeled flow from the 100 year storm increased by 20% is from the DDSWMM output file 100 YR CH INCREASE 20 DDSWMM OUTPUT (TE-100CH_20.dat/out) presented on the CD in **Appendix C**.

The results of the on-site detention analysis indicate that during the 5 year storm event, there is no ponding on the subject site.

Tables 4.5 and 4.6 summarize the cascading flows on the subject site for the 100 year 3 hour Chicago storm event and the 100 year Chicago storm increased by 20%, respectively. The cascading overflow is the flow exiting a drainage area when maximum minor system inflow and maximum available ponding has been utilized. The overflow is obtained from the respective DDSWMM output file and is noted in the title in the tables below.

To determine velocity of the cascading overflow, SWMHYMO was used. The 24 m, 18 m, and 30.5 m ROW sections were entered into the model with the appropriate longitudinal slopes to obtain the maximum velocity of flow using the Route Channel routine. The typical road cross sections and output files are provided in **Appendix C**.

To determine depth of the cascading overflow, the *Calculation Sheet: Overflow From Typical Road Ponding Area* provided at the November 19, 2013 Stormwater Sub-Committee Meeting #9 were used. The exception to this is where the road is on grade in which case the depths were obtained from the SWMHYMO model. The tables and communication with J.F. Sabourin and Associates is provided in **Appendix C**.

Table 4.5. Summary of Cascading Flow during the 100 Year 3 hour Chicago Storm (100 YR CHICAGO DDSWMM OUTPUT TE-100CH.dat/out)

Major System Segment ID (Dummy Segment ID)	Street Name	Road Allowance	Longitudinal Slope (%)	Overflow (l/s)*	Velocity (m/s)	Depth (m)	Velocity x Depth (m ² /s)	Max. Depth of Ponding (m)	Max. Depth of Ponding plus Overflow Depth (m) – if applicable
S3901 (D9)	Belcourt Blvd	24 m	0.50	1	0.110	0.015 [†]	0.00	0.15	0.17
S3900B (D11)	Belcourt Blvd	½ of 24 m	0.50	0	n/a	n/a	n/a	0.15	0.15
S54 (D12)	Belcourt Blvd	½ of 24 m	0.50	0	n/a	n/a	n/a	0.15	0.15
S55A (D13)	Belcourt Blvd	½ of 24 m	0.50	53	0.588	0.095 [†]	0.06	0.15	0.25
S55B (D14)	Belcourt Blvd	½ of 24 m	0.53	147	0.777	0.134 [†]	0.10	0.15	0.3
S500 (D18)	Belcourt Blvd	24 m	0.56	0	n/a	n/a [†]	n/a	0.15	0.15
S500C	Belcourt Blvd	24 m	-	0	n/a	n/a	n/a	0.27	0.27
S400A	Renaud Rd	24 m	0.51	38	0.546	0.065 [‡]	0.04	n/a	0.06
S400B	Renaud Rd	24 m	0.51	37	0.542	0.064 [‡]	0.03	n/a	0.06
S400C	Renaud Rd	24 m	0.51	73	0.643	0.082 [‡]	0.05	n/a	0.08
S400D	Renaud Rd	24 m	0.51	53	0.593	0.073 [‡]	0.04	n/a	0.07
S401A	Renaud Rd	24 m	0.51	81	0.660	0.085 [†]	0.06	n/a	0.09
S401B	Renaud Rd	24 m	0.51	84	0.666	0.087 [†]	0.06	n/a	0.09
S401C (D28)	Renaud Rd	24 m	0.55	0	n/a	n/a	n/a	0.21	0.21
S402A (D29)	Renaud Rd	24 m	0.50	5	0.264	0.030 [†]	0.01	0.17	0.20
S402C (D30) + S402G + S410B	Renaud Rd	24 m	1.70	77	0.855	0.132 [†]	0.11	0.17	0.30
S410A (D32)	Renaud Rd	24 m	0.50	0	n/a	n/a	n/a	0.15	0.15
S410C	Renaud Rd	24 m	0.64	96	0.630	0.067 [‡]	0.04	n/a	0.07
S410D	Renaud Rd	24 m	0.64	210	0.770	0.090 [‡]	0.07	n/a	0.09
S410E	Renaud Rd	24 m	0.64	222	0.780	0.091 [‡]	0.07	n/a	0.09
S301 (D23)	Enclave Walk	18 m	0.77	0	n/a	n/a	n/a	0.25	0.25
S303(D24) + S314 (D26)	Enclave Walk	18 m	1.04	23	0.525	0.051 [†]	0.03	0.24	0.29
S304(D25) + S312 (D21)	Enclave Walk	18 m	0.60	98	0.619	0.089 [†]	0.06	0.18	0.27

Major System Segment ID (Dummy Segment ID)	Street Name	Road Allowance	Longitudinal Slope (%)	Overflow (l/s)*	Velocity (m/s)	Depth (m)	Velocity x Depth (m ² /s)	Max. Depth of Ponding (m)	Max. Depth of Ponding plus Overflow Depth (m) – if applicable
S307 (D19)	Enclave Walk	18 m	0.67	0	n/a	n/a	n/a	0.25	0.25
S311 (D20)	Enclave Walk	18 m	1.08	0	n/a	n/a	n/a	0.20	0.20
S404(D31) + S306 (D22)	Compass Street	24 m	0.50	19	0.399	0.048 [†]	0.02	0.25	0.30
S112A(D1) + S112B (D3)	Locust Ridge	18 m	0.95	141	0.806	0.101 [†]	0.08	0.15	0.25
S113 (D2)	Locust Ridge	18 m	0.56	0	n/a	n/a	n/a	0.18	0.18
S114(D7) + S106 (D6)	Locust Ridge	18 m	0.56	28	0.437	0.056 [†]	0.02	0.19	0.25
S104 (D8)	Locust Ridge	18 m	0.54	52	0.509	0.071 [†]	0.04	0.20	0.27
S102 (D5)	Locuse Ridge	18 m	0.61	17	0.400	0.046 [†]	0.02	0.14	0.19

Notes: *Major system segment overflow from the 100 year 3 hour Chicago storm event was taken from the results of the DDSWMM model entitled 100 YR CHICAGO DDSWMM OUTPUT (TE-100CH.dat/out) and presented on the CD in **Appendix C**.
 † Depth of the cascading overflow was determined from the *Calculation Sheet: Overflow From Typical Road Ponding Area* provided at the November 19, 2013 Stormwater Sub-Committee Meeting #9. Tables and communication with J.F. Sabourin and Associates is provided in **Appendix C**.
 ç Depth of the cascading overflow on continuous grade was determined using the SWMHYMO model.

During the 100-year storm event flow needs to be conveyed from the east side of Belcourt Blvd to the west side of Belcourt Blvd in drainage area S56. A weir calculation was used to determine the maximum flow that could be conveyed through the 4.0 m depressed median is 0.32 cms. During the 100-year storm event, the total flow in drainage area S56 including upstream inflows is 0.306 cms well within the capacity of the depressed median.

Once the flow has reached the west side of Belcourt Blvd, a 5.0 m pathway conveys the flow into Mud Creek. A weir calculation was used to determine the maximum flow that could be conveyed is 0.70 cms. The 100-year flow of 0.143 cms can be conveyed by the pathway into Mud Creek.

Supporting calculations can be found in Appendix C.

Table 4.6. Summary of Cascading Flow during the 100 Year 3 Hour Chicago Storm Increased by 20%

(100 YR CHICAGO INCREASED BY 20% DDSWMM OUTPUT TE-100CH_20.dat/out)

Major System Segment ID (Dummy Segment ID)	Street Name	Road Allowance	Longitudinal Slope (%)	Overflow (l/s)*	Velocity (m/s)	Depth (m)	Velocity x Depth (m ² /s)	Max. Depth of Ponding (m)	Max. Depth of Ponding plus Overflow Depth (m) – if applicable
S3901 (D9)	Belcourt Blvd	24 m	0.50	58	0.500	0.074 [†]	0.037	0.150	0.22
S3900B (D11)	Belcourt Blvd	½ of 24 m	0.50	0	n/a	n/a	n/a	0.150	0.15
S54 (D12)	Belcourt Blvd	½ of 24 m	0.50	47	0.568	0.088 [†]	0.050	0.150	0.24
S55A (D13)	Belcourt Blvd	½ of 24 m	0.50	146	0.758	0.135 [†]	0.102	0.150	0.28
S55B (D14)	Belcourt Blvd	½ of 24 m	0.53	346	0.962	0.198[†]	0.190	0.150	0.35
S500 (D18)	Belcourt Blvd	24 m	0.56	44	0.492	0.066 [†]	0.033	0.150	0.22
S500C	Belcourt Blvd	24 m	-	0	n/a	n/a	n/a	0.27	0.27
S400A	Renaud Rd	24 m	0.51	48	0.578	0.071 [‡]	0.041	n/a	0.07
S400B	Renaud Rd	24 m	0.51	50	0.584	0.072 [‡]	0.042	n/a	0.07
S400C	Renaud Rd	24 m	0.51	94	0.685	0.091 [‡]	0.062	n/a	0.09
S400D	Renaud Rd	24 m	0.51	71	0.638	0.081 [‡]	0.052	n/a	0.08
S401A	Renaud Rd	24 m	0.51	106	0.706	0.095 [†]	0.067	n/a	0.09
S401B	Renaud Rd	24 m	0.51	111	0.714	0.096 [†]	0.069	n/a	0.10
S401C (D28)	Renaud Rd	24 m	0.55	0	n/a	n/a	n/a	0.210	0.21
S402A (D29)	Renaud Rd	24 m	0.50	81	0.550	0.083 [†]	0.046	0.170	0.25
S402C (D30) + S402G + S410B	Renaud Rd	24 m	1.70	401	1.304	0.148[†]	0.193	0.170	0.32
S410A (D32)	Renaud Rd	24 m	0.50	204	0.716	0.118 [†]	0.084	0.150	0.27
S410C	Renaud Rd	24 m	0.64	149	0.705	0.079 [‡]	0.056	n/a	0.08
S410D	Renaud Rd	24 m	0.64	321	0.857	0.105 [‡]	0.090	n/a	0.11
S410E	Renaud Rd	24 m	0.64	335	0.865	0.107 [‡]	0.093	n/a	0.11
S301 (D23)	Enclave Walk	18 m	0.77	18	0.439	0.047 [†]	0.021	0.250	0.30
S303(D24) + S314 (D26)	Enclave Walk	18 m	1.04	87	0.738	0.085[†]	0.062	0.240	0.32
S304(D25) + S312 (D21)	Enclave Walk	18 m	0.60	205	0.749	0.118[†]	0.088	0.220	0.34
S307 (D19)	Enclave Walk	18 m	0.67	0	n/a	n/a	n/a	0.250	0.25
S311 (D20)	Enclave Walk	18 m	1.08	8	0.395	0.035 [†]	0.014	0.200	0.24
S404(D31) + S306 (D22)	Compass Street	24 m	0.50	295	0.764	0.135[†]	0.103	0.250	0.39
S112A(D1) + S112B (D3)	Locust Ridge	18 m	0.95	1056	1.439	0.210[†]	0.302	0.150	0.36
S113 (D2)	Locust Ridge	18 m	0.56	4	0.256	0.028 [†]	0.007	0.180	0.21
S114(D7) + S106 (D6)	Locust Ridge	18 m	0.56	54	0.520	0.072 [†]	0.037	0.190	0.26

Major System Segment ID (Dummy Segment ID)	Street Name	Road Allowance	Longitudinal Slope (%)	Overflow (l/s)*	Velocity (m/s)	Depth (m)	Velocity x Depth (m ² /s)	Max. Depth of Ponding (m)	Max. Depth of Ponding plus Overflow Depth (m) – if applicable
S104 (D8)	Locust Ridge	18 m	0.54	120	0.628	0.096 [†]	0.061	0.200	0.30
S102 (D5)	Locuse Ridge	18 m	0.61	97	0.622	0.089 [†]	0.055	0.140	0.23

Notes: * Major system segment overflow from the 100 year 3 hour Chicago increased by 20% storm event was taken from the results of the DDSWMM model entitled 100 YR CH INCREASE 20 DDSWMM OUTPUT (TE-100CH_20.dat/out) and presented on the CD in **Appendix C**.

† Depth of the cascading overflow was determined from the *Calculation Sheet: Overflow From Typical Road Ponding Area* provided at the November 19, 2013 Stormwater Sub-Committee Meeting #9. Tables and communication with J.F. Sabourin and Associates is provided in **Appendix C**.

‡ Depth of the cascading overflow on continuous grade was determined using the SWMHYMO model.

In all locations within the subject site and under all storm events, the v x d product is less than the maximum allowable product of 0.6 m²/s per the OSDG.

At each location for each storm event presented, the maximum depth of ponding plus overflow on the street is less than the maximum allowable 300 mm.

During the 100 year storm event increased by 20%, the summation of depth of ponding and depth of cascading flow is more than 0.30 m in six (6) locations throughout the subject site. These areas are noted in **Table 4.6** in bold. However, at three (3) locations within the subject site the total depth exceeds 0.35 m. The street segments are S112A+S112B, S404+S306, and S55B.

As noted previously, major flow from upstream development areas will cascade into Trails Edge Phase II. During detail design of the external development areas to Trails Edge Phase II, an evaluation of the major flow route through the site should be undertaken if the major flows are greater than presented in the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).

The following table summarizes the elevation of the top of grate, ponding depth, and the garage elevations for the street segments where summation of depth of ponding and depth of cascading flow is exceeds 0.30 m.

Table 4.7 Summary of Extent of Cascading Flow in Relation to Property Lines and Garage Elevations – Interim Conditions for 100 Year 3 Hour Chicago increased by 20%

(100 YR CHICAGO INCREASED BY 20% DDSWMM OUTPUT TE-100CH_20.dat/out)

Major System Segment ID	Top of Grate (m)	Ponding Depth (m)	Elevation at Closest Garage (m) (FOUNDATION)	Extent of Ponding and Cascading Depth (m)*
S55B	87.53	0.35	n/a	87.88
S402C + S402G+S410B	87.24	0.32	87.6	87.56
S303 + S314	86.82	0.32	87.28	87.14
S304 + S312	86.52	0.34	86.78 (87.03)	86.86
S404 + S306	86.39	0.39	86.8	86.78
S112A+S112B	87.2	0.36	87.7	87.56

Note: * Extent of ponding and cascading depth is the addition of the low point elevation for each major system segment with the cascading depth presented in **Table 4.7** (i.e., for S401B: $87.17 + 0.35 = 87.52$ m).

During the 100 year storm event increased by 20%, the major system will cascade from each street segment noted in **Table 4.7** and remain outside the lowest garage elevation at the low point. For street segment S304+S312 the major flow will encroach beyond the garage elevation but not beyond the foundation. For the remainder of the street segments, the major system cascading flow will not encroach the property line.

An evaluation of the overflow from drainage area S56 into Mud Creek via the 5.0 m conveyance pathway has been completed for the 100-year + 20% storm event. A weir calculation was used to determine the maximum flow that could be conveyed is 0.70 cms. The 100-year + 20% flow of 0.351 cms can be conveyed by the pathway into Mud Creek. Supporting calculations can be found in Appendix C.

4.6 Hydraulic Grade Line Analysis

The evaluation of the hydraulic grade line (HGL) was completed using XPSWMM. As noted in **Section 4.1**, an XPSWMM model was created for EUC Pond 1; the minor system (trunks only) and the major conveyance routes (ravines). EUC Pond 1 services the Trails Edge development, including the subject site, and the Orleans Business Park. The XPSWMM model was modified to include the detail design of the laterals and trunk sewers in the subject site (see **Appendix C** for a schematic of the overall system).

The storm sewer design for the subject site replaced those modeled as part of the December 2013 Servicing Report and November 2013 SWM Memo. Minor system losses within the subject site were accounted for in accordance with Appendix 6-B of the OSDG. A summary of the minor losses used for the hydraulic evaluation are presented in **Appendix C**.

It should also be noted that the trunk sewers adjacent to the subject site are interconnected via two flow splitters. The first flow splitter is located within Belcourt Boulevard at MH 210 (XPSWMM Node 210 and the second flow splitter is located at MH 3900 to MH 54 (see XPSWMM schematic in **Appendix C**). **Drawing 700** presents the locations of the flow splitter manholes. The flow splitters were modeled as part of the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).

Minor and major system hydrographs from remaining Trails Edge Development and the Orleans Business Park areas were obtained from the consultant and are consistent with the November 2013 SWM Memo.

XPSWMM simulations were conducted for the 5 year 3 hour Chicago storm; 100 year 3 hour Chicago storm; July 1, 1979, August 4, 1988 and August 8, 1996 Historical storms. A sensitivity evaluation of the hydraulic system was also undertaken using the 20% increased 100 year 3 hour Chicago storm event. The hydraulic grade line values, flow and velocity for all above noted storm events for all storm sewers within the subject site are presented in **Table 4.7**, along with a comparison of under-side of footing (USF) elevations, where available. XPSWMM model output files are provided in **Appendix C**.

Table 4.8: Hydraulic Grade Line Analysis

XPSWMM			USF (m)	5 year 3 hour Chicago ⁶				100 year 3 hour Chicago ⁷				July 1, 1979 Historical Storm ⁸				August 4, 1988 Historical Storm ⁹				August 8, 1996 Historical Storm ⁵				Sensitivity Evaluation - 100 year 3 hour Chicago - increased 20% ⁶			
U/S MH	D/S MH	Pipe		HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)
N101	N102	P101	85.71	84.46	1.25	0.50	1.60	84.96	0.75	0.66	1.78	84.85	0.86	0.59	1.62	84.81	0.90	0.58	1.67	84.61	1.10	0.59	1.65	85.12	0.59	0.70	1.89
N102	N103	P102	85.56	84.36	1.20	0.54	1.76	84.81	0.75	0.69	1.88	84.70	0.86	0.63	1.73	84.66	0.90	0.63	1.77	84.47	1.09	0.63	1.78	84.97	0.59	0.74	1.99
N103	N104	P103	n/a	84.20	n/a	0.54	1.60	84.62	n/a	0.68	1.71	84.53	n/a	0.62	1.58	84.49	n/a	0.63	1.51	84.33	n/a	0.62	1.57	84.78	n/a	0.73	1.72
N104	N105	P104	n/a	84.10	n/a	0.60	0.92	84.56	n/a	0.74	0.92	84.47	n/a	0.70	0.93	84.43	n/a	0.71	0.88	84.25	n/a	0.70	0.90	84.72	n/a	0.77	0.93
N105	N106	P105	n/a	84.03	n/a	0.80	0.89	84.50	n/a	0.98	0.89	84.41	n/a	0.93	0.82	84.36	n/a	0.96	0.82	84.18	n/a	0.93	0.86	84.65	n/a	1.00	0.88
N106	19	P106	n/a	84.00	n/a	1.33	1.50	84.47	n/a	1.62	3.19	84.38	n/a	1.57	2.47	84.33	n/a	1.62	1.43	84.15	n/a	1.56	1.51	84.62	n/a	1.65	1.45
N112B	N113	P112_1	85.76	85.30	0.46	0.03	1.16	85.30	0.46	0.03	1.25	85.30	0.46	0.03	1.27	85.30	0.46	0.03	1.43	85.30	0.46	0.03	1.25	85.30	0.46	0.03	1.20
N112_2	N101	P112_2	85.76	84.66	1.10	0.07	0.93	85.07	0.69	0.07	0.75	84.96	0.80	0.07	0.94	84.91	0.85	0.07	0.86	84.71	1.05	0.07	0.88	85.23	0.53	0.07	0.84
N113	N114	P113	85.71	85.25	0.46	0.14	1.71	85.26	0.45	0.15	1.73	85.26	0.45	0.15	1.73	85.26	0.45	0.15	1.74	85.26	0.45	0.14	1.73	85.26	0.45	0.15	1.74
N114	N105	P115	85.71	84.79	0.92	0.22	1.43	84.81	0.90	0.25	1.47	84.81	0.90	0.25	1.47	84.81	0.90	0.25	1.48	84.80	0.91	0.24	1.46	84.81	0.90	0.25	1.47
N301	N303	P301	85.36	84.58	0.78	0.18	1.46	84.65	0.71	0.20	1.47	84.62	0.74	0.20	1.49	84.62	0.74	0.20	1.49	84.60	0.76	0.19	1.49	85.01	0.35	0.22	1.48
N303	N304	P303	85.01	84.05	0.96	0.25	1.29	84.48	0.53	0.29	1.29	84.30	0.71	0.28	1.35	84.43	0.58	0.29	1.32	84.07	0.94	0.28	1.38	84.87	0.14	0.31	1.36
N304	N305	P304	85.11	84.02	1.09	0.35	1.18	84.48	0.63	0.41	1.20	84.30	0.81	0.40	1.12	84.42	0.69	0.38	1.12	84.06	1.05	0.39	1.16	84.92	0.19	0.42	1.18
N305	N306	P305	84.91	83.94	0.97	0.65	1.24	84.43	0.48	0.79	1.20	84.27	0.64	0.76	1.29	84.38	0.53	0.73	1.14	84.03	0.88	0.71	1.27	84.76	0.15	0.81	1.23
N306	N406	P306	84.86	83.80	1.06	0.73	1.29	84.29	0.57	0.93	1.21	84.19	0.67	0.86	1.43	84.26	0.60	0.82	1.25	83.92	0.94	0.77	1.41	84.61	0.25	0.96	1.24
N307	N308	P307	85.51	84.86	0.65	0.06	0.99	84.88	0.63	0.07	1.04	84.87	0.64	0.07	1.02	84.88	0.63	0.07	1.03	84.87	0.64	0.06	1.01	85.16	0.35	0.07	1.04
N308	N309	P308	85.76	84.50	1.26	0.06	1.49	84.70	1.06	0.08	1.56	84.51	1.25	0.07	1.56	84.57	1.19	0.07	1.56	84.51	1.25	0.06	1.53	85.06	0.70	0.09	1.56
N309	N310	P309	85.66	84.49	1.17	0.06	1.01	84.71	0.95	0.09	1.03	84.51	1.15	0.07	1.04	84.62	1.04	0.07	1.04	84.51	1.15	0.06	1.03	85.07	0.59	0.10	1.04
N310	N311	P310	85.46	84.34	1.12	0.06	1.01	84.67	0.79	0.09	1.01	84.39	1.07	0.07	1.01	84.58	0.88	0.08	0.99	84.35	1.11	0.06	1.04	85.01	0.45	0.11	1.02
N311	N312	P311	85.26	84.17	1.09	0.15	0.80	84.65	0.61	0.21	1.07	84.37	0.89	0.18	0.77	84.53	0.73	0.17	0.76	84.21	1.05	0.17	0.79	84.97	0.29	0.20	0.81
N312	N313	P312	84.96	84.08	0.88	0.30	1.11	84.56	0.40	0.36	1.10	84.35	0.61	0.35	1.09	84.49	0.47	0.33	1.02	84.14	0.82	0.33	1.11	84.89	0.07	0.37	1.12
N313	N305	P313	84.96	83.99	0.97	0.29	1.13	84.48	0.48	0.36	1.13	84.30	0.66	0.34	1.10	84.42	0.54	0.33	1.09	84.07	0.89	0.32	1.11	84.81	0.15	0.37	1.12
N314	N304	P314	85.36	84.31	1.05	0.04	0.95	84.55	0.81	0.05	0.98	84.34	1.02	0.05	0.98	84.48	0.88	0.05	0.98	84.33	1.03	0.05	0.98	85.11	0.25	0.08	1.07
N3900	N54	P3900	n/a	85.04	n/a	8.17	1.83	85.67	n/a	10.85	1.93	85.52	n/a	10.08	1.83	85.45	n/a	9.77	1.81	85.26	n/a	9.01	1.80	85.97	n/a	11.70	1.94
N3901	N3900	P3901	n/a	85.86	n/a	0.13	1.07	85.89	n/a	0.15	1.11	85.86	n/a	0.14	1.08	85.88	n/a	0.15	1.10	85.86	n/a	0.13	1.07	86.12	n/a	0.16	1.11
N399	N400	P399	n/a	84.07	n/a	1.34	1.54	85.02	n/a	2.73	1.82	84.68	n/a	2.00	1.25	85.06	n/a	2.59	1.37	84.33	n/a	1.91	1.55	86.06	n/a	3.55	1.94
N400	N401	P400	86.06	84.01	2.05	1.33	1.49	84.92	1.14	2.62	1.67	84.62	1.44	2.04	1.14	84.96	1.10	2.61	1.38	84.27	1.79	1.80	1.38	85.89	0.17	3.55	1.94
N401	N402	P401	85.71	83.96	1.75	1.40	1.42	84.82	0.89	2.88	1.53	84.55	1.16	2.14	1.16	84.86	0.85	2.76	1.47	84.21	1.50	1.89	1.26	85.71	0.00	3.79	2.07
N402	N403	P402	85.56	83.90	1.66	1.55	1.29	84.66	0.90	3.13	1.65	84.45	1.11	2.30	1.23	84.70	0.86	3.01	1.60	84.13	1.43	2.04	1.24	85.41	0.15	4.07	2.22
N404	N406	P404	n/a	83.79	n/a	1.89	1.39	84.38	n/a	3.60	1.89	84.29	n/a	2.72	1.45	84.42	n/a	3.39	1.78	83.99	n/a	2.34	1.41	84.89	n/a	4.57	2.49
N406	N407	P406	n/a	83.68	n/a	2.57	1.15	84.16	n/a	4.31	1.61	84.13	n/a	3.42	1.27	84.17	n/a	4.20	1.55	83.87	n/a	3.05	1.24	84.49	n/a	5.37	2.00
N410	N412	P410	n/a	84.32	n/a	0.21	1.89	84.48	n/a	0.24	1.88	84.39	n/a	0.24	1.92	84.48	n/a	0.23	1.90	84.33	n/a	0.23	1.92	85.01	n/a	0.25	1.91
N410B	N410	P410B	n/a	84.82	n/a	0.20	1.78	84.85	n/a	0.23	1.81	84.84	n/a	0.23	1.82	84.84	n/a	0.22	1.81	84.83	n/a	0.22	1.81	85.16	n/a	0.24	1.82
N412	N404	P412	85.76	83.85	1.91	0.21	1.46	84.41	1.35	0.24	1.43	84.30	1.46	0.23	1.49	84.43	1.33	0.22	1.43	84.00	1.76	0.22	1.48	84.91	0.85	0.26	1.46

XPSWMM			USF (m)	5 year 3 hour Chicago [£]			100 year 3 hour Chicago [†]				July 1, 1979 Historical Storm [‡]				August 4, 1988 Historical Storm [¥]				August 8, 1996 Historical Storm [§]				Sensitivity Evaluation - 100 year 3 hour Chicago - increased 20% [€]				
U/S MH	D/S MH	Pipe		HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)	HGL (m)	SB (m)*	Flow (cms)	Velocity (m/s)
N500	N500C	P500	n/a	85.28	n/a	0.07	0.91	85.42	n/a	0.09	0.90	85.29	n/a	0.08	0.92	85.31	n/a	0.08	0.92	85.29	n/a	0.07	0.92	85.62	n/a	0.09	0.85
N500C	N501	P500C	n/a	85.04	n/a	0.16	1.12	85.29	n/a	0.21	0.99	85.14	n/a	0.17	1.11	85.17	n/a	0.17	1.04	85.06	n/a	0.16	1.12	85.50	n/a	0.21	1.05
N501	N57	P501	n/a	84.68	n/a	1.24	2.79	85.18	n/a	1.46	2.98	85.09	n/a	1.40	3.07	85.10	n/a	1.32	2.73	84.91	n/a	1.58	3.18	85.52	n/a	1.48	2.88
N54	N55	P54	n/a	84.97	n/a	8.22	1.85	85.60	n/a	10.93	1.92	85.45	n/a	10.13	1.84	85.38	n/a	9.83	1.83	85.19	n/a	9.11	1.84	85.89	n/a	11.81	1.97
N55	N56	P55	n/a	84.85	n/a	8.83	1.96	85.47	n/a	12.03	2.10	85.34	n/a	11.16	2.01	85.27	n/a	10.84	2.00	85.07	n/a	9.75	1.95	85.72	n/a	13.03	2.18
N56	N57	P56_A	n/a	84.72	n/a	11.85	2.22	85.31	n/a	18.10	2.66	85.20	n/a	16.39	2.49	85.13	n/a	15.62	2.42	84.95	n/a	13.80	2.31	85.51	n/a	20.57	2.88
N56	N101	P56_B	n/a	84.72	n/a	0.39	1.35	85.31	n/a	0.56	1.91	85.20	n/a	0.48	1.65	85.13	n/a	0.49	1.68	84.95	n/a	0.49	1.68	85.51	n/a	0.60	2.03

Notes: * SB is the safety board between the USF and HGL (USF – HGL).
£ Hydraulic results for the 5 year 3 hour Chicago storm event were taken from the results of the XPSWMM model entitled "E005C_U.xp/out" and presented on the CD in **Appendix C**.
† Hydraulic results for the 100 year 3 hour Chicago storm event were taken from the results of the XPSWMM model entitled "E100C_U.xp/out" and presented on the CD in **Appendix C**.
‡ Hydraulic results for the July 1, 1979 historical storm were taken from the results of the XPSWMM model entitled "E1979_U.xp/out" and presented on the CD in **Appendix C**.
¥ Hydraulic results for the August 4, 1988 historical storm were taken from the results of the XPSWMM model entitled "E1988_C1988_U.xp/out" and presented on the CD in **Appendix C**.
§ Hydraulic results for the August 8, 1996 historical storm were taken from the results of the XPSWMM model entitled "E1996_U.xp/out" and presented on the CD in **Appendix C**.
€ Hydraulic results for the 100 year 3 hour Chicago storm event increased by 20% were taken from the results of the XPSWMM model entitled "E100C+20%_U.xp/out" and on the CD in **Appendix C**.
¶ USF obtained from the November 2013 SWM Memo.

The results of the hydraulic evaluation indicate that the HGL in the storm sewers for the subject site are below the USF elevations, during all storm events. Specifically, the minimum 300 mm clearance between the USF and HGL is maintained. The velocity in the pipes is between 0.8 m/s and 3.0 m/s as per the OSDG.

The results of the sensitivity run (100 year 3 hour Chicago plus 20%) indicate that the HGL in the storm sewers is between the USF elevation and 270 mm above the USF elevation in 11 locations. These locations are indicated in bold in Table 4.8.

As noted previously and as part of this evaluation, the XPSWMM model from the November 2013 SWM Memo was modified to include the detail design of the laterals and trunk sewers in the subject site (see Appendix C for a schematic of the overall system). The hydraulic grade line for the minor system external to the site was evaluated and the results were compared to the USFs as reported in the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014). A summary of the hydraulic grade line values, flow and velocity for the areas external to the subject site is presented in Appendix C. The results indicate that the design of the subject site has minimal impact on the HGL compared to the Stormwater Management Report for the Trails Edge West Subdivision (DSEL updated May 2014).



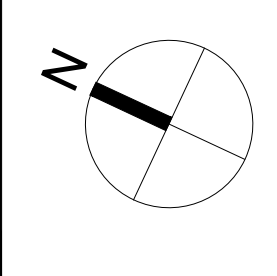
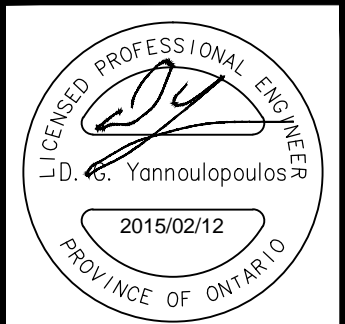
- LEGEND:**
- AREA NUMBER
RUNOFF COEFFICIENT
 - AREA IN HECTARES
 - 100 YEAR FLOW
AREA NUMBER
RUNOFF COEFFICIENT
 - AREA IN HECTARES
 - OFFSITE AREA
IN HECTARES
 - OFFSITE AREA
IN HECTARES
 - EXTERNAL FLOW
AREA X RUNOFF COEFFICIENT
TIME OF CONCENTRATION
 - SPLIT FLOW
AREA X RUNOFF COEFFICIENT
TIME OF CONCENTRATION
 - EMERGENCY FLOW ROUTE
FOR STORM ABOVE THE
1:100 EVENT
 - MINOR FLOW ROUTE

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8	REVISED PER CITY COMMENTS	DGY	15:02:12
7	REVISED PER CITY COMMENTS	DGY	15:01:26
6	REVISED PER CITY COMMENTS	DGY	14:11:07
5	REVISED PER CITY COMMENTS	DGY	14:09:16
4	REVISED PER CITY COMMENTS	DGY	14:07:28
3	REVISED PER NEW LEGAL	DGY	14:04:02
2	REVISED PER MASTER SERVING STUDY	DGY	14:03:24
1	ISSUED FOR CITY REVIEW	DGY	13:02:01



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Project Title
TRAILSEDGE II
1578051 ONTARIO INC.



Drawing Title
STORM DRAINAGE
AREA PLAN

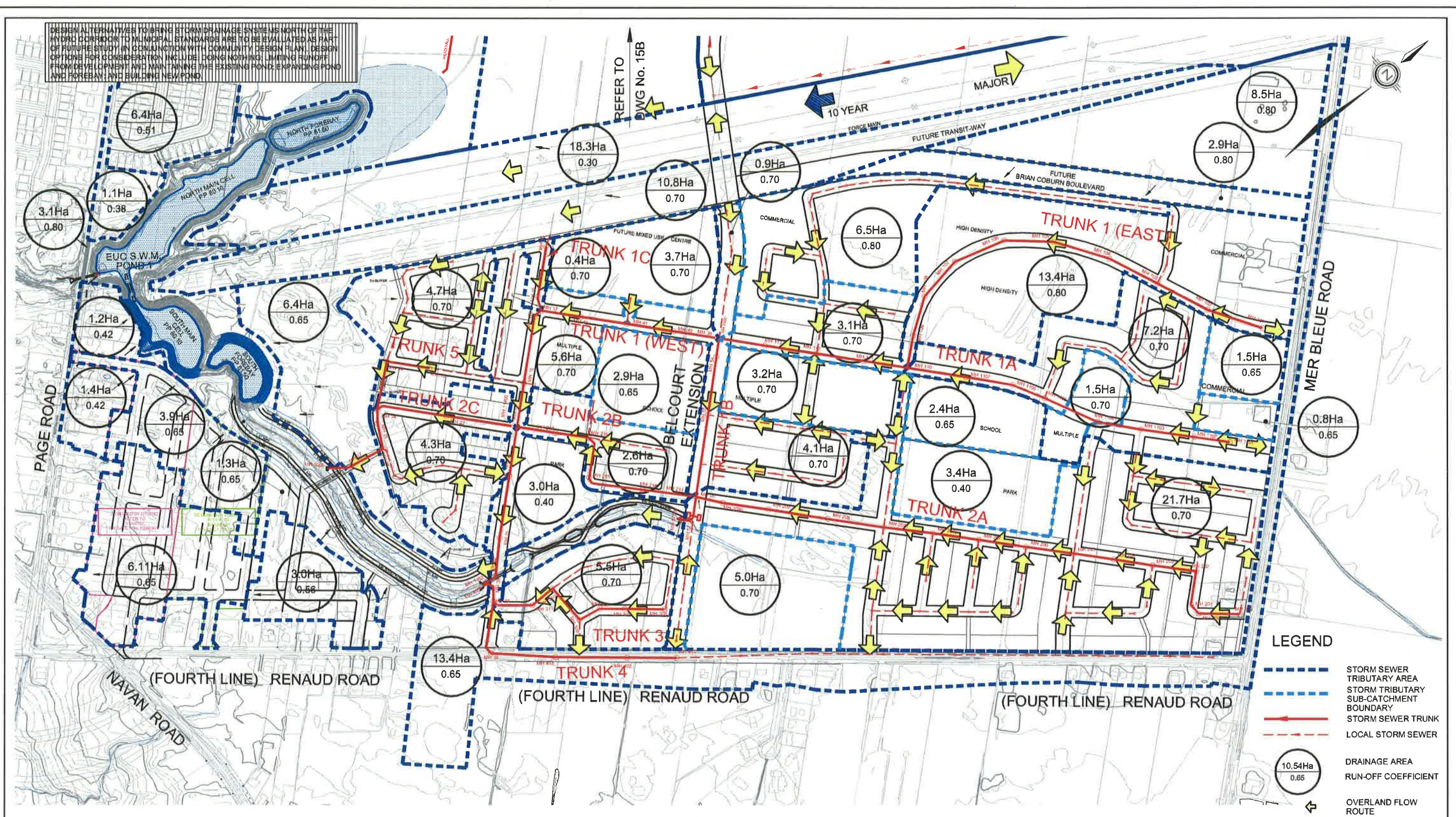
Scale
 1 : 1000

Design	R.M.	Date	FEB 2014
Drawn	E.H.	Checked	D.Y.G.
Project No.	31855	Drawing No.	500

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 Date: 2/13/2014 7:50 AM
 User: E.H.

D07-16-107-0018PH3
 16688

DESIGN ALTERNATIVES TO BRING STORM DRAINAGE SYSTEMS NORTH OF THE HYDRO CORRIDOR TO MUNICIPAL STANDARDS ARE TO BE EVALUATED AS PART OF FUTURE STUDY IN CONJUNCTION WITH COMMUNITY DESIGN PLAN. DESIGN OPTIONS FOR CONSIDERATION INCLUDE: DOING NOTHING; LIMITING RUNOFF FROM DEVELOPMENT AND MAINTAINING THE EXISTING POND; EXPANDING POND AND FOREBAY; AND BUILDING NEW POND.



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TRAILS EDGE

CONCEPTUAL STORM SERVICING - ULTIMATE

DATE:	NOVEMBER 2013
SCALE:	1:6000
PROJECT No.:	10-459
FIGURE	14A

Summary of DDSWMM Modeling Parameters

The following outlines the modeling parameters used and the justification for those parameters for the DDSWMM modeling.

DDSWMM Input Parameters

Table 1. Summary of DDSWMM Modeling Parameters

Drainage Area		Downstream Segment ID	MH	XP-SWMM Node ID	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section	Max. Storage Available (m3)	Minor System Restriction	
Segment ID	Area (ha)									5 Year Modeled Flow (l/s)*	100 Year ICD Flow (l/s)†
Trails Edge Phase II											
Street Segments											
S112A	0.14	S112B	112	N112	73	60	60	Swale	1.85	35	39
S113	0.34	S112B	113	N113	73	65	130	Swale	23.5	84	94
S112B	0.06	S101	112	N112	73	60	60	Swale	0.15	15	17
S101	0.2	EXT2A	101	N101	73	60	60	Swale	16.35	49	55
S102	0.18	S101	102	N102	73	65	65	Swale	10.12	44	49
S106	0.15	S104	106	N106	73	74	74	Swale	21.4	37	41
S114	0.29	S104	114	N114	73	70	140	Swale	4.97	72	81
S104	0.1	S102	104	N104	73	64	64	Swale	22.67	25	28
S307	0.25	S311	307	N307	73	73	73	Swale	48.26	61	68
S311	0.43	S312	311	N311	73	96	192	Swale	28.78	107	120
S312	0.35	S306	312	N312	73	88	176	Swale	14.86	87	97
S306	0.39	S203	306	N306	73	107	214	Swale	57.34	98	142
S301	0.36	S303	301	N301	73	96	192	Swale	40.08	90	101
S303	0.31	S304	303	N303	73	82	164	Swale	48.74	78	87
S304	0.28	S306	304	N304	73	68	136	Swale	34.52	70	78
S314	0.17	S304	314	N314	73	44	88	Swale	2.25	43	48
S404	0.16	S203	404	N404	70	75	75	Swale	10.99	55	104‡
Total Flow for Street Segments											1249
Rear Yards											
BLK246	2.89	R114	106	N106	64	325	650	Swale	233.6 [€]	613	613
R114	0.11	R113	114	N114	49	75	75	Swale	0	20	20
R113	0.13	R112A	113	N113	49	85	85	Swale	0	23	23
R112A	0.17	S112A	112	N112	49	112	112	Swale	0	30	30
P104	0.42	Park	104	N104	0	47	95	Swale	67.0 [€]	9	9
R112B	0.09	R104	112	N112	49	35	70	Swale	0	16	16
R104	0.22	S104	104	N104	49	80	160	Swale	0	39	39
EXT2B	0.72	EXT2A	Ext2B	DExt2B	49	81	162	Swale	0	119	0 [§]
R301B	0.16	S301	301	N301	49	70	140	Swale	0	29	29

Drainage Area		Downstream Segment ID	MH	XP-SWMM Node ID	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section	Max. Storage Available (m3)	Minor System Restriction	
Segment ID	Area (ha)									5 Year Modeled Flow (l/s)*	100 Year ICD Flow (l/s)†
R312A	0.33	R312B	312	N312	49	90	180	Swale	0	58	58
R312B	0.11	S312	312	N312	49	50	50	Swale	0	19	19
R301A	0.15	R301C	301	N301	49	57	114	Swale	0	27	27
R301C	0.12	R301D	301	N301	49	44	88	Swale	0	21	21
R301D	0.1	S303	301	N301	49	50	100	Swale	0	18	18
R305	0.17	S306	305	N305	49	75	150	Swale	0	31	31
R402B	0.13	R305	402	N402	49	40	80	Swale	0	23	23
R402A	0.13	S404	402	N402	49	15	29	Swale	0	22	22
410F	0.52	CDUM	410C	N410C	64	59	117	Swale	0	110	110
21	0.63	CDUM	404	N404	86	71	142	Swale	0	175	175
R410A	1.83	S410A	410B	N410B	42	206	412	Swale	374 ^E	263	73 ^E
R410B	0.48	S410C	410B	N410B	42	54	108	Swale	0	69	87
402I	0.76	ODUM	402I	D402I	63	86	171	Swale	54.3 ^E	159	159
R410G	0.55	S410D	410C	N410C	64	62	124	Swale	0	117	117
Total flow for Rear Yard Segments (l/s)											1719
Renaud Road											
S400e	0.03	S400B	400	N400	71	17	17	Swale	1.35	7	8
S400A	0.1	S400C	400	N400	71	60	60	Swale	0	25	12 [§]
S400B	0.1	S400D	400	N400	71	45	45	Swale	0	24	12 [§]
S400C	0.12	S401A	400	N400	71	39	39	Swale	0	43	17 [§]
S400D	0.07	S401B	400	N400	71	30	30	Swale	0	32	14 [§]
S401A	0.06	S401C	401	N401	71	23	23	Swale	0	45	18 [§]
S401B	0.11	S401C	401	N401	71	41	41	Swale	0	48	18 [§]
S401C	0.29	S402A	401	N401	71	82	82	Swale	48.85	133	327 [‡]
S401E	0.02	S402A	401	N401	71	17	17	Swale	0	5	6
S402A	0.51	S402C	402	N402	71	66	66	Swale	18.12	113	127
S402C	0.34	S402G	402	N402	71	54	54	Swale	12.8	77	86
S402G	0.11	S404	402	N402	71	28	28	Swale	0	26	12 [§]
S410A	0.21	S410B	410B	N410B	86	75	75	Swale	13.35	60	67
S410B	0.09	S404	410	N410	86	31	31	Swale	0	26	12 [§]
S410C	0.11	S410D	410C	N410C	86	47	47	Swale	0	32	20 [§]
S410D	0.08	S410E	410C	N410C	86	30	30	Swale	0	44	30 [§]
S410E	0.1	Renaud	410C	N410C	86	36	36	Swale	0	59	32 [§]
Total flow for Renaud Rd. (l/s)											818
Belcourt Boulevard											
S3901	0.46	S54	3901	N3901	86	120	240	Swale	26.13	133	149
S3900B	0.22	S54	3900	N3900	86	72	72	Swale	61.11	62	69
S54	0.28	S55A	54	N54	86	87	174	Swale	19.44	81	91
S55A	0.22	S55B	55	N55	86	70	140	Swale	15.97	64	72
S55B	0.21	S56	55B	N55B	86	70	140	Swale	15.28	61	68

Drainage Area		Downstream Segment ID	MH	XP-SWMM Node ID	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section	Max. Storage Available (m3)	Minor System Restriction	
Segment ID	Area (ha)									5 Year Modeled Flow (l/s)*	100 Year ICD Flow (l/s)†
S55C	0.08	S56	55B	N55B	86	45	90	Swale	0.08	23	26
S56	0.27	EXT2A	56	N56	86	110	220	Swale	22.08	79	88
S500C	0.31	S307	500C	N500C	86	100	200	Swale	52.09	90	101
S500	0.26	S500C	500	N500	86	81	162	Swale	13.55	75	84
Total flow for Belcourt Boulevard (l/s)											748

Notes: * 5 year modeled flow is the subject site modeled assuming full capture of the 5 year flow into the minor system without any ICD restriction. Values reported are from the DDSWMM output file "5 YR CHICAGO DDSWMM OUTPUT-2014-03-10.pdf" (TE-5CH.dat/out).

† ICD flow is from the DDSWMM output file "100 YR CHICAGO DDSWMM OUTPUT-2014-03-10.pdf" (TE-100CH.dat/out).

§ The minor flow restriction has been reduced to account for the actual capture rate through the grill using curb inlets on a continuous grade

‡ The minor flow restriction has been increased to allow full capture of overflow from upstream segments on continuous grade during the 5 year storm event without ponding.

€ Storage is based on the requirement to retain the 100-year Chicago major flow on-site

£ Storage and ICD flow as per the servicing Report for the NDC French Catholic School, prepared by Genivar

β The flows produced by drainage area EXT-2B flow overland to EXT-2A.

FOR HYDROLOGICAL PARAMETERS:

1. Refer to **Drawing 700** for the DDSWMM model schematic.
2. Catchment areas are based on the rational method spreadsheet with some minor modifications for modeling purposes. See **Drawing 700** for the catchment areas used in the DDSWMM modeling for the subject site.

Imperviousness for the subject site was determined by obtaining the footprint of the model units intended for the site and placing the maximum footprint on the lots. The imperviousness ratios for single family units were calculated for a typical single family unit street segment and rear yard segment.

3. Subcatchment width was measured from the segment length multiplied by 2 for those drainage areas where residences are located on both sides of the road (See **Figure 1**). For those drainage areas where there are no residences on one side of the road, the subcatchment width is equal to the segment length.

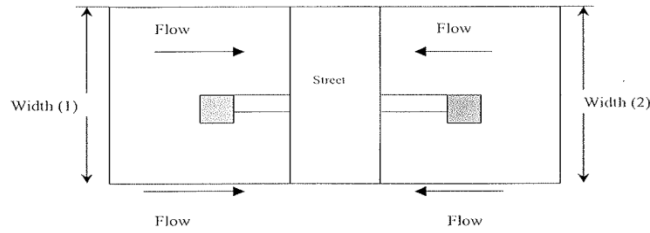


Figure 1. Schematic of Width Parameter for Typical Subdivision

(Reference: Figure 5.4, page 5.3 from the City of Ottawa Sewer Design Guidelines (November 2004))

For the Park, School (BLK246) and areas R410A, R410B, R410C, the subcatchment width of 225 m/ha was used.

4. Drainage area slope is based on the average of the impervious area slope (1%) and the pervious area slope (3%). The average slope is 2% (0.02 m/m).
5. Segment length for a street or rear yard is the measured length of the major system segment. See **Figure 2** for an example.

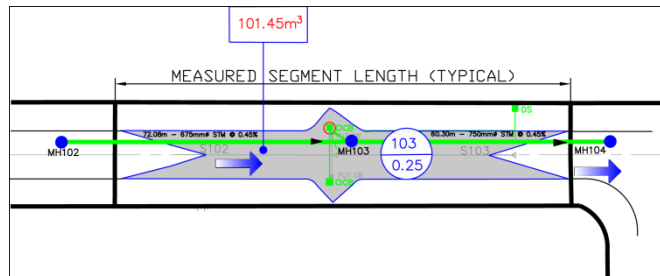


Figure 2. Segment Length for Street or Rear Yard (Typical)

6. Segment length for the dummy segment for routing is the measured length of the static ponding available in the street segment which drains to the dummy. See **Figure 3** for an example.

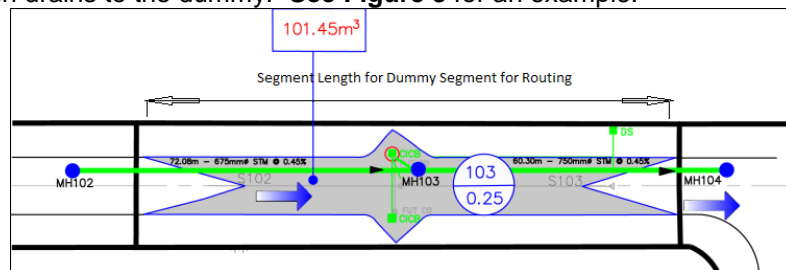


Figure 3. Segment Length for Dummy Segment for Routing (Typical)

Infiltration

Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: $f_o = 76.2 \text{ mm/h}$, $f_c = 13.2 \text{ mm/h}$, $k = 0.00115 \text{ s}^{-1}$.

CATCH BASIN DATA TABLE																
STRUCTURE ID	AREA ID	STRUCTURE	COVER	ELEVATION			OUTLET PIPE		HEAD	Dynamic Depth of Flow	Dynamic HEAD	FLOW	ICD TYPE	ORIFICE SIZE		
				TOP OF GRATE	INVERT		DIAMETER (mm)	TYPE						AREA	DIAMOND	CIRCULAR
					INLET	OUTLET										
DCICB 3901A		OPSD 705.020	S22 & S23	87.91		86.31	200	PVC DR-35	1.650	0.015	1.665					
DCICB 3901B	S3901	OPSD 705.020	S22 & S23	87.91	86.21	86.11	250	PVC DR-35	1.825	0.015	1.840	99.3	Tempest HF & HF Sump			
DCICB 3901C	S3901	OPSD 705.020	S22 & S23	88.09		86.49	200	PVC DR-35	1.600	0.015	1.615	49.7	Tempest HF & HF Sump			
DCICB 3900A		OPSD 705.020	S22 & S23	87.74		86.04	300	PVC DR-35	1.700	0.000	1.700					
DCICB 3900B	S3900B	OPSD 705.020	S22 & S23	87.74	85.94	85.84	375	PVC DR-35	1.863	0.000	1.863	69.4	Tempest HF & HF Sump			
DCICB 54A		OPSD 705.020	S22 & S23	87.65		86.00	250	PVC DR-35	1.655	0.000	1.655					
DCICB 54B	S54	OPSD 705.020	S22 & S23	87.65	85.90	85.80	300	PVC DR-35	1.830	0.000	1.830	91.0	Tempest HF & HF Sump			
DCICB 55A		OPSD 705.020	S22 & S23	87.58		85.98	200	PVC DR-35	1.500	0.095	1.595					
DCICB 55B	S55A	OPSD 705.020	S22 & S23	87.58	85.88	85.78	250	PVC DR-35	1.675	0.095	1.770	72.0	Tempest HF & HF Sump			
DCICB 55C		OPSD 705.020	S22 & S23	87.53		85.93	200	PVC DR-35	1.500	0.134	1.634					
DCICB 55D	S55B	OPSD 705.020	S22 & S23	87.53	85.83	85.73	250	PVC DR-35	1.675	0.134	1.809	68.0	Tempest HF & HF Sump			
CB 55E	S55C	OPSD 705.010	S19	87.30		85.70	200	PVC DR-35	1.500	0.000	1.500	26.0	Tempest HF & HF Sump			
DCICB 500A		OPSD 705.020	S22 & S23	87.13		85.53	200	PVC DR-35	1.650	0.000	1.650					
DCICB 500B	S500	OPSD 705.020	S22 & S23	87.13	85.43	85.33	250	PVC DR-35	1.825	0.000	1.825	84.0	Tempest HF & HF Sump			
DCICB 500C		OPSD 705.020	S22 & S23	87.04		85.44	200	PVC DR-35	1.720	0.000	1.720					
DCICB 500D	S500C	OPSD 705.020	S22 & S23	87.00	85.34	85.24	250	PVC DR-35	1.895	0.000	1.895	101.0	Tempest HF & HF Sump			
DCICB 57A		OPSD 705.020	S22 & S23	87.27		86.19	200	PVC DR-35	1.050	0.110	1.160		Tempest HF & HF Sump			
DCICB 57B	S56	OPSD 705.020	S22 & S23	87.16	86.09	85.71	250	PVC DR-35	1.505	0.110	1.615	78.0	Tempest HF & HF Sump			
CICB56A	S56	OPSD 705.010	S22 & S23	87.32		85.67	250	PVC DR-35	1.585	0.110	1.695	10	Tempest LMF			
CBMH137	BLK246	OPSD 701.010	S28.1	85.82		83.90	525	PVC DR-35	1.662	0.000	1.662	613.0	Custom	0.176	473	
DICB139	R106	OPSD 705.030	OPSD 403.010	86.50		84.58	525	PVC DR-35	1.662	0.000	1.662	529.0	Custom	0.152	440	
CB 101A	S112A	OPSD 705.010	S19	87.23		85.63	200	PVC DR-35	1.590	0.101	1.691					
CB 101B	S112B	OPSD 705.010	S19	87.18	85.53	85.43	250	PVC DR-35	1.645	0.101	1.746	56.0	Tempest HF & HF Sump			
CB 101C		OPSD 705.010	S19	87.00		85.40	200	PVC DR-35	1.680	0.120	1.800					
CB 101D	S101	OPSD 705.010	S19	87.00	85.30	85.20	250	PVC DR-35	1.855	0.120	1.975	55.0	Tempest HF & HF Sump			
CB 102A		OPSD 705.010	S19	87.08		85.48	200	PVC DR-35	1.640	0.046	1.686					
CB 102B	S102	OPSD 705.010	S19	87.08	85.38	85.28	250	PVC DR-35	1.815	0.046	1.861	49.0	Tempest HF & HF Sump			
CBMH104	P104	OPSD 701.010	S19	96.64		94.99	250	PVC DR-35	1.875	0.000	1.875	9.0	Tempest LMF			
CB 104A		OPSD 705.010	S19	87.12		85.52	200	PVC DR-35	1.710	0.071	1.781					
CB 104B	S104	OPSD 705.010	S19	87.12	85.42	85.32	250	PVC DR-35	1.885	0.071	1.956	28.0	Tempest HF & HF Sump			
CB 113A		OPSD 705.010	S19	87.33		85.73	200	PVC DR-35	1.680	0.000	1.680					
CB 113B	S113	OPSD 705.010	S19	87.33	85.63	85.53	250	PVC DR-35	1.855	0.000	1.855	94.0	Tempest HF & HF Sump			
CB 114A		OPSD 705.010	S19	87.34		85.74	200	PVC DR-35	1.630	0.056	1.686					
CB 114B	S114	OPSD 705.010	S19	87.34	85.64	85.54	250	PVC DR-35	1.805	0.056	1.861	81.0	Tempest HF & HF Sump			
CB 106A		OPSD 705.010	S19	87.25		85.65	200	PVC DR-35	1.690	0.056	1.746					
CB 106B	S106	OPSD 705.010	S19	87.25	85.55	85.45	250	PVC DR-35	1.865	0.056	1.921	41.0	Tempest HF & HF Sump			
CICB 404A		OPSD 705.010	S22 & S23	86.39		84.79	200	PVC DR-35	1.620	0.048	1.668					
CICB 404B	S404	OPSD 705.010	S22 & S23	86.39	84.69	84.59	250	PVC DR-35	1.795	0.048	1.843	104.0	Tempest HF & HF Sump			
CB 301A		OPSD 705.010	S19	86.77		85.17	200	PVC DR-35	1.750	0.000	1.750					
CB 301B	S301	OPSD 705.010	S19	86.77	85.07	84.97	250	PVC DR-35	1.925	0.000	1.925	101.0	Tempest HF & HF Sump			
CB 303A		OPSD 705.010	S19	86.62		85.02	200	PVC DR-35	1.740	0.051	1.791					
CB 303B	S303	OPSD 705.010	S19	86.62	84.92	84.82	250	PVC DR-35	1.915	0.051	1.966	87.0	Tempest HF & HF Sump			
CB 314A		OPSD 705.010	S19	86.82		85.22	200	PVC DR-35	1.570	0.051	1.621					
CB 314B	S314	OPSD 705.010	S19	86.82	85.12	85.02	250	PVC DR-35	1.745	0.051	1.796	48.0	Tempest HF & HF Sump			
CB 304A		OPSD 705.010	S19	86.47		84.87	200	PVC DR-35	1.720	0.089	1.809					
CB 304B	S304	OPSD 705.010	S19	86.47	84.77	84.67	250	PVC DR-35	1.895	0.089	1.984	78.0	Tempest HF & HF Sump			
CB 307A		OPSD 705.010	S19	87.07		85.47	200	PVC DR-35	1.750	0.000	1.750					
CB 307B	S307	OPSD 705.010	S19	87.07	85.37	85.27	250	PVC DR-35	1.925	0.000	1.925	68.0	Tempest HF & HF Sump			
CB 311A		OPSD 705.010	S19	86.92		85.32	200	PVC DR-35	1.700	0.000	1.700					
CB 311B	S311	OPSD 705.010	S19	86.92	85.22	85.12	250	PVC DR-35	1.875	0.000	1.875	120.0	Tempest HF & HF Sump			
CB 312A		OPSD 705.010	S19	86.52		84.92	200	PVC DR-35	1.680	0.089	1.769					
CB 312B	S312	OPSD 705.010	S19	86.52	84.82	84.72	250	PVC DR-35	1.855	0.089	1.944	97.0	Tempest HF & HF Sump			
CB 306A		OPSD 705.010	S19	86.27		84.62	250	PVC DR-35	1.525	0.048	1.573					
CB 306B	S306	OPSD 705.010	S19	86.27	84.52	84.42	300	PVC DR-35	1.700	0.048	1.748	142.0	Tempest HF & HF Sump			
RYCB 112A	R112A	OPSD 705.010	S19	87.30		85.65	250	PVC DR-35	1.525	0.000	1.525	30.0	Tempest HF & HF Sump			
RYCB 112B	R112B	OPSD 705.010	S19	87.35		85.70	250	PVC DR-35	1.525	0.000	1.525	16.0	Tempest HF & HF Sump			
RYCB 113A	R113	OPSD 705.010	S19	87.35		85.70	250	PVC DR-35	1.525	0.000	1.525	23.0	Tempest HF & HF Sump			
RYCB 114A	R114	OPSD 705.010	S19	87.45		85.80	250	PVC DR-35	1.525	0.000	1.525	20.0	Tempest HF & HF Sump			
RYCB 104	R104	OPSD 705.010	S19	87.25		85.60	250	PVC DR-35	1.525	0.000	1.525	39.0	Tempest HF & HF Sump			
RYCB 301A	R301A	OPSD 705.010	S19	86.85		85.20	250	PVC DR-35	1.525	0.000	1.525	27.0	Tempest HF & HF Sump			
RYCB 301B	R301B	OPSD 705.010	S19	86.85		85.20	250	PVC DR-35	1.525	0.000	1.525	29.0	Tempest HF & HF Sump			
RYCB 301C	R301C	OPSD 705.010	S19	86.75		85.10	250	PVC DR-35	1.525	0.000	1.525	21.0	Tempest HF & HF Sump			
RYCB 301D	R301D	OPSD 705.010	S19	86.70		85.05	250	PVC DR-35	1.525	0.000	1.525	18.0	Tempest HF & HF Sump			
RYCB 312A	R312A	OPSD 705.010	S19	86.55		84.90	250	PVC DR-35	1.525	0.000	1.525	58.0	Tempest HF & HF Sump			
RYCB 312B	R312B	OPSD 705.010	S19	86.50		84.85	250	PVC DR-35	1.525	0.000	1.525	19.0	Tempest HF & HF Sump			
RYCB 305	R305	OPSD 705.010	S19	86.40		84.75	250	PVC DR-35	1.525	0.000	1.525	31.0	Tempest HF & HF Sump			

Note: Head elevation derived using maximum static ponding elevation, plus 100 year dynamic depth, less the invert plus 1/2 diameter of outletting pipe.
Capacity of inlets at sags have been determined using MTO Design Chart 4.19 Inlet Capacity at Road Sag (Appendix 7-A.9 from the City of Ottawa Design Guidelines)

Stormwater Management Report for the Trails Edge West Subdivision

in the City of Ottawa

December 2012

Updated January 2015

1 INTRODUCTION AND OBJECTIVES

J.F. Sabourin and Associates Inc. (JFSA) were retained by David Schaeffer Engineering Ltd. (DSEL) to prepare a Stormwater Management (SWM) Plan for the Trails Edge West subdivision, part of the Trails Edge Community and located within the City of Ottawa. As shown by Figure 1, the proposed development is located east of Page Road, north of Renaud Road, west of Mer Bleue Road and south of the Hydro Easement. The Trails Edge Community is serviced by East Urban Community Stormwater Management (SWM) Pond 1, which discharges to Mud Creek.

The Trails Edge West subdivision has a total drainage area of 13.40 ha, including 13.30 ha of residential development and a 0.10 ha buffer block, all tributary to East Urban Community SWM Pond 1.

Under interim conditions, SWM Facility 1 has a drainage area of approximately 369.32 ha, including 13.40 ha of Trails Edge West, 26.15 ha of existing residential development, 5.34 ha of channel block, a 12.29 ha pond block, the 18.30 ha hydro easement, the 7.79 ha Brian Colburn Boulevard extension, 9.20 ha of the future transitway corridor (undeveloped), a 6.55 ha existing woodlot, 21.71 ha of external development west of the Belcourt Extension, 80.89 ha of future development east of the Belcourt extension, 14.83 ha of existing commercial development north of the hydro easement, and 152.88 ha of the future business park north of the hydro easement (undeveloped).

Interim conditions are further defined by Interim A conditions, wherein the 7.79 ha Brian Colburn Boulevard extension block remains undeveloped, and Interim B conditions, wherein the Brian Colburn Boulevard extension is constructed. It should be noted that the 80.89 ha future development east of Belcourt extension is not expected to be developed until after the Brian Colburn Boulevard extension is constructed under Interim B conditions; however, it has been modelled as developed under both Interim A and Interim B conditions in order to be conservative and consistent with previous studies.

As presented in the *Trails Edge Subdivision Stormwater Management Facility 1 Reconstruction and Preliminary Stormwater Management Plan* memo (January 2014, JFSA), changes to the drainage area characteristics, modelling methods and City of Ottawa standards have resulted in



a need for increased storage in the existing SWM Facility 1. For interim conditions, existing Pond 1 will be modified to support the development of the Trails Edge Community south of the hydro easement. The south channel of Mud Creek to Pond 1 is to be constructed, and the south forebay and south main cell of the existing pond reconstructed. Under Interim B conditions only, a small portion of the north main cell will be filled by the proposed Brian Coburn Boulevard extension, and a 3000 mm diameter circular concrete culvert will be installed under Brian Coburn Boulevard to connect the north and south main cells. The existing north forebay will remain as-built. The existing controls currently installed for the pond as per the *EUC Pond No. 1 Page Road Stormwater Management Facility As-Built Drawings* (Stantec, January 2012) will be retained under interim conditions.

For the purposes of this report, only interim conditions will be evaluated. As noted above, the future business park north of the hydro easement, and the future Transitway corridor, will remain undeveloped under these interim conditions. These areas will be developed under ultimate conditions, and design alternatives to meet municipal standards and stormwater management requirements under ultimate conditions are to be evaluated as part of a future study by the proponent for those lands.

The purpose of the present study/report is to evaluate the major and minor system flows of the proposed development with respect to the City of Ottawa stormwater management guidelines and to check the adequacy of the proposed pipe sizes to convey the 5-year and the 100-year storm flows from within the development and from external areas. Background documents that were reviewed in preparing this report include the following:

- *Stormwater Management Planning and Design Manual*, Ministry of the Environment, March 2003.
- *Gloucester East Urban Community Infrastructure Servicing Study Update*, Stantec Consulting Ltd., March 2005.
- *East Urban Community Pond No. 1 Design Brief*, Stantec Consulting Ltd., April 2008.
- *Trails Edge Phase 1 Design Brief*, IBI Group, April 2010.
- *Trails Edge Phase 1 Stormwater Management Report*, IBI Group, June 2010.
- *EUC Pond No. 1 Page Road Stormwater Management Facility As-Built Drawings*, Stantec Consulting Ltd., January 2012.
- *City of Ottawa Sewer Design Guidelines*, City of Ottawa, October 2012.
- *Trails Edge Subdivision Stormwater Management Facility 1 Reconstruction and Preliminary Stormwater Management Plan*, J.F. Sabourin and Associates Inc., January 2014.
- *City of Ottawa Technical Bulletin ISDTB-2014-01*, City of Ottawa, February 2014.
- *Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1 for the Trails Edge Subdivision*, David Schaeffer Engineering Ltd. and J.F. Sabourin and Associates Inc., March 2014.
- *Servicing Report for Trails Edge and Orleans Business Park*, David Schaeffer Engineering Ltd., March 2014.



- *Trails Edge Subdivision / Proposed Modification of Mud Creek Channel Between Belcourt Extension and Compass Street, J.F. Sabourin and Associates Inc., January 2015.*

The DDSWMM, SWMHYMO and XPSWMM programs were used to model the major and minor systems, to ensure that all of the City of Ottawa's stormwater management requirements are satisfied. The general SWM design criteria and guidelines that are to be met are described in Section 2.





Figure 1: General Site Location



2 DESIGN CRITERIA AND GUIDELINES

The design criteria and guidelines used for the stormwater management of the subject subdivision are those that were developed in the background documents as well as those provided in the October 2012 *City of Ottawa Sewer Design Guidelines* and generally accepted stormwater management design guidelines.

During the course of the detailed design of the proposed development, it was determined that the proposed 13.40 ha Trails Edge West development has an average imperviousness of 53%. The total 369.32 ha interim conditions drainage area to SWM Facility 1 has an average imperviousness of 38%.

A detailed analysis of the proposed dual drainage system was required to confirm that the following general design criteria and guidelines for the minor and major systems would be met.

2.1 Minor System

- a) Storm sewers on local roads are to be designed to provide a 5-year level of service. On arterial roads, a 10-year level of service is required.
- b) The 100-year hydraulic grade line (HGL) within the minor system must be maintained at least 0.3 m below the underside of footing elevation where gravity house connections are installed.
- c) For less frequent storms (i.e. larger than 1:5 year), the minor system shall, if required, be limited with the use of inlet control devices to prevent excessive hydraulic surcharges.
- d) Road catchbasins on Compass Street, Axis Way and the Belcourt Extension are to be equipped with City standard type S22 side inlets. Grates for all other road catchbasins are to be City standard type S19 (fish), and grates for catchbasins in rear yards, park and open spaces with pedestrian traffic are to be City standard type S19, S30 and S31.
- e) Single catchbasins are to be equipped with 200 mm minimum lead pipes and double catchbasins are to be equipped with 250 mm minimum lead pipes.
- f) Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.
- g) Minor system capture within those areas draining to Trails Edge Phase 1 (south of Mud Creek and west of Compass Street) is limited as per the *Trails Edge Phase 1 Stormwater Management Report* dated June 2010 by IBI Group (approx. 85 L/s/ha).



2.2 Major System

- a) The major system shall be designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within municipal property.
- b) Roof leaders shall be installed to direct the runoff to splash pads and on to grassed areas.
- c) Flow across road intersections shall not be permitted for minor storms (generally 5-year or less).
- d) For the 100-year storm and for all roads, the maximum depth of water (static and/or dynamic) on streets, rearyards, public space and parking areas shall not exceed 0.30 m at the gutter and should be retained within the right-of-way.
- e) A minimum of 0.30 m freeboard is to be provided to building openings. When catchbasins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas.
- f) The product of the maximum flow depths on streets and maximum flow velocity must be less than $0.60 \text{ m}^2/\text{s}$ on all roads.



3 ASSUMPTIONS AND SOURCE OF DATA USED IN THIS STUDY

Sources of information and assumptions made in this study are listed below:

- Stormwater management model: *DDSWMM (release 2.1), SWMHYMO (version 5.02) and XPSWMM (version 10)*
- Minor system design: *1:5 year (see rational method in Appendix A)*
- Major system design: *1:100 year*
- Max. flow depth on roads: *0.30 m above gutter*
- Extent of major system: *Must be contained within the municipal right-of-way*
- DDSWMM model parameters: *Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm (as per 2012 City of Ottawa Sewer Design Guidelines)*
Detailed Area Imperviousness: based on development layout and taken as fully effective in the front lot portion and half effective in rear lot portion of each house.
Lumped Area Imperviousness: based on runoff coefficient (C) where C = 0.7 x imperviousness ratio + 0.2.
- Design storms: *5- and 100-year 3-hour Chicago and 100-year 24-hour SCS Type II storms as per 2012 City of Ottawa Sewer Design Guidelines; peak averaged over 10 minutes.*
- Historical Events: *July 1st, 1979; August 4th, 1988; and August 8th, 1996 events as per 2012 City of Ottawa Sewer Design Guidelines.*
- Climate Change Stress Test: *20% increase in the 100-year 3-hour Chicago storm.*
- Street catchbasin covers: *City Standard Type S22 (side inlet) on Compass Street, Axis Way and the Belcourt Extension; City Standard Type S19 (fish) elsewhere. Type S19 approach flow-capture curves as per MTO design charts (equivalent to OPSD 400.010), Type S22 approach flow-capture curves as per 2012 City of Ottawa Guidelines.*
- Rearyard catchbasin covers: *City Standard Type S19, S30 and S31*
- Curb and gutter: *City Standard SC1.3 (mountable) and City Standard SC1.1 (barrier). In the absence of flow capture curves for these curb and gutters, OPSD 600.010 curb and gutters are assumed.*
- Manning's' roughness coeff.: *0.013 for concrete and PVC pipes (free flow).*
- Minor system losses: *Refer to Appendix C for manhole loss coefficients.*
- Underside of footing elevations: *As provided by DSEL.*
- Freeboard in HGL analysis: *0.3 m between underside of footing elevation and 100-year hydraulic gradeline.*
- Inlet Control Devices: *As required.*
- Extent of major system: *Must be contained within the municipal right-of-way.*



- Ponding Area Routing: *Double Routing Method, as per the February 2014 "City of Ottawa Technical Bulletin ISDTB-2014-01".*
- Depth of backyard swales: *As per DSEL's Grading Plan*
- Street and pipe dimensions: *As per DSEL's Plan and Profiles*
- Right-of-way characteristics: *As per DSEL's Details of Roads*
- Downstream HGL: *Free outfall conditions assumed at the pond outlet.*

4 PROPOSED MINOR AND MAJOR SYSTEM DRAINAGE

The proposed minor and major system drainage routes are shown in plan view in Figures 2 and 3, respectively. In accordance with the City of Ottawa standards, the minor system has been designed to accommodate the 5-year post development flows from within the site and from external areas.

A Rational Method design was conducted by DSEL (refer to Appendix A) in order to estimate minor system flows based on the City of Ottawa IDF relationship and selected runoff coefficients. Note that DSEL's Rational Method design sheets have been prepared on the understanding that the future development east of Belcourt extension will remain undeveloped under Interim A conditions (labeled "pre-development" conditions in Appendix A). As previously noted, the DDSWMM / XPSWMM modelling for this report treats this area as developed under both Interim A and Interim B conditions in order to be conservative and consistent with previous studies.

The minor system capture on the following areas should be limited to the 5-year Rational Method flows as per DSEL's design (estimated below):

Park Block 9 (A047PK1, 0.377 ha, C = 0.25)	:	25 L/s
Existing Woodlot (AWood1, 0.847 ha, C = 0.25)	:	62 L/s
External Mixed Use Centre Block 135 (A041a, 3.73 ha, C = 0.80)	:	846 L/s
External Multiple Blocks 138/139 (by others; A018b/A018a, 1.86 ha, C=0.80)	:	366 L/s
External Park Block 140 (by others; A019a, 1.93 ha, C = 0.40)	:	229 L/s

Excess flows from these blocks will spill onto the street and be conveyed overland to Mud Creek, with the exception of the park blocks. Excess flows from Park Block 9 will spill onto the street and be conveyed overland to East Urban Community SWM Pond 3, and excess flows from external Park Block 140 will spill directly overland to Mud Creek.

Within the proposed development, standard Tempest Inlet Control Device (ICD) types A, B, C, D and E and lead pipe capacities will be used to limit minor system capture to the 5-year flow. Note that IPEX has changed these standard ICDs of Types A, B, C, D and F to "Tempest" ICDs of Types A, B, C, D and E (refer to Appendix B for details). For the previously approved



townhouse development draining to Trails Edge Phase 1 (south of Mud Creek and west of Compass Street), minor system capture is limited as per the *Trails Edge Phase 1 Stormwater Management Report* dated June 2010 by IBI Group (approx. 85 L/s/ha).

For modelling purposes, minor system capture rates on undetailed future residential development to the east of Trails Edge West were limited to 112% of the 5-year flows, as simulated in DDSWMM, with 30 m³/ha of surface storage. The additional 12% capture is to account for the additional flows captured by standard inlet control devices during the 100-year storm.

Minor system capture rates in future (undetailed) school, high density, mixed use, multiples, institutional and commercial blocks south of the transitway corridor / hydro easement are to be limited to the 5-year flow with sufficient on-site storage to retain excess flows up to the 100-year return period.

Continuous overland flow routes have been provided on the internal streets of the proposed Trails Edge West subdivision in order to convey the major system flows to the pond. In general, the major system has been designed to accommodate the 100-year less the 5-year post-development flows from within the site and from external areas. Note that the 100-year major system flows on large lumped catchments may be significant due to the size of the drainage area; these areas will be further discretized and the actual major system flows identified at the appropriate detailed design stages for these areas.

The street segments within the proposed development have been designed using a 'saw tooth' or 'sagged' road profile. The runoff from within these segments will be conveyed to catchbasins located at the lowest point within the street segment. Flows in excess of the catchbasin capture rate will be temporarily stored within the 'sagged' street segments and released slowly to the storm sewers. When the storage on a specific street segment is surpassed, the excess water will flow towards the next downstream street sag, and eventually to the appropriate outlet. It should be noted that the major system would outlet without flooding any properties in the subdivision.

In the event that the drainage system's capacity to capture surface flows is exceeded, Figure 4 presents the maximum extent of static surface ponding on the streets based on grading. Note that the double routing method was used to model the attenuation provided by dynamic storage above static ponding areas, in accordance with the February 2014 *City of Ottawa Technical Bulletin ISDTB-2014-01*.

Details of 100-year street storage results (i.e. actual volume used and depth of water) are provided in Table D-7 of Appendix D. This information, combined with the dynamic flow depths calculated in DDSWMM, demonstrates that total 100-year depth of water (static and dynamic) on the street at these ponding areas would be retained within the right-of-way and would not exceed 30 cm within the proposed subdivision, or 35 cm with the previously approved townhouse development where minor system capture is limited to 85 L/s/ha by



existing infrastructure (per the February 2014 *City of Ottawa Technical Bulletin ISDTB-2014-01*).

Note that those ponding areas in the townhouse development with significant 5-year ponding and with 100-year total depths exceeding 30 cm, but less than the 35 cm requirement, are outside of the current study area. These areas are either designed by others, or are part of the future phase to be detailed at a later stage.

Note that Belcourt Extension and part of Compass Street are to be designed by IBI Group; static ponding depths on these roads, once available, will be set to meet City criteria for total water depth. Also note that no surface storage volumes were accounted for in the DDSWMM model in rear lot swales.

Table D-7 of Appendix D also presents the street storage climate change stress test results based on a 20% increase in the 100-year storm, as per the October 2012 *City of Ottawa Sewer Design Guidelines*. As shown in Table D-7, the maximum depth of water at any Trails Edge West ponding area under these conditions is calculated as 34.6 cm.

A 4.0 m wide overland flow route from Compass Street to the Mud Creek, with a curb cut of 4.0 m, is provided east of the channel. Similarly, a 3.0 m wide overland flow route from Shinleaf Crescent to Mud Creek, with a curb cut of 4.0 m, is provided north of the channel. Refer to Calculation Sheet 2 of Appendix D for the required capacity of the overland flow routes. Note that 100-year major system flows on the east side of the Belcourt Extension will be captured to separate 100-year intakes and discharge to Mud Creek to the west of the Belcourt Extension.

The DDSWMM and XPSWMM analyses, discussed in the next sections, have demonstrated that the proposed drainage system for the subdivision will have sufficient capacity to control the excess flow during a 100-year storm and safely capture and convey the 5-year flow to the pond.

4.1 Interim A and Interim B Conditions

Under Interim A conditions, 2.2 m³/s (equal to the 5-year flow generated by the existing Costco site and associated interim SWM pond block) will be captured from the north to a ditch inlet catchbasin connected to the south trunk sewer on Compass Street. Excess flows will pond in the north existing areas under these conditions before spilling overland to the north main cell of the SWM facility. For the purposes of this analysis, it is assumed that a diversion ditch will be constructed with the extension of Brian Coburn under Interim B conditions to direct existing flows from the north to the north main cell of the pond, and the temporary ditch inlet catchbasin will be decommissioned.

In accordance with conceptual design information provided by the City of Ottawa, minor system capture on the future transitway corridor and Brian Coburn Boulevard extension will be



restricted to the 10-year flows, and minor system capture on the hydro easement will be restricted to the 5-year flows. It is understood that sufficient on-site storage will be provided to retain excess flows up to the 100-year return period on these areas under Interim B conditions. The captured flows from these areas will be conveyed to the south main cell of the SWM facility by a future storm sewer, with quality control provided by an oil-and-grit separator or separators.

4.2 Major System and DDSWMM Analysis

The DDSWMM computer program was used to model the major and minor system flows within the proposed development and from external areas. Note that as the DDSWMM program is most appropriate for use in modelling urban drainage, the large undeveloped drainage areas north of the hydro easement were instead modelled using SWMHYMO, and the generated hydrographs then input to DDSWMM.

The DDSWMM and SWMHYMO models presented in Appendix B were developed based on the information provided in Figures 2 and 3. Seven simulations were conducted, one for each of the following rainfall events (as per the October 2012 *City of Ottawa Sewer Design Guidelines*):

- i) the 5-year, 3-hour Chicago storm;
- ii) the 100-year, 3-hour Chicago storm;
- iii) the 100-year, 24-hour SCS Type II storm;
- iv) the July 1st, 1979 historical event;
- v) the August 4th, 1988 historical event;
- vi) the August 8th, 1996 historical event; and
- vii) the 100-year, 3-hour Chicago storm + 20%.

Note that the purpose of simulating the 100-year, 3-hour Chicago storm with a 20% increase is to stress test the drainage system for potential flooding resulting from climate change, as per the October 2012 *City of Ottawa Sewer Design Guidelines*.

The DDSWMM model depression storage and infiltration parameters are as per the October 2012 *City of Ottawa Sewer Design Guidelines*. The percent imperviousness of the detailed Trails Edge West drainage areas were measured based on the development layout; impervious areas were taken as fully effective in the front and half effective in the rear of each lot to account for indirectly connected roof drainage. The percent imperviousness of undetailed drainage areas were calculated based on the runoff coefficient (C), where $C = 0.7 \times$ imperviousness ratio + 0.2.

The natural drainage areas north of the hydro easement were modelled in SWMHYMO with an SCS Curve Number of 78 ($CN^* = 70$) based on hydrologic soil group D and a combination of woods, meadow and brush in fair condition. Time to peak values for the undeveloped areas were calculated using existing contour data and the Bransby Williams equation.



On-site storage was modelled using a storage-discharge relationship with three points: the first with 0 L/s capture and 0 cu.m. storage; the second with maximum capture and negligible storage; and the third with maximum capture and maximum available storage. Note that where high surface storage on large undetailed areas produced instability in the DDSWMM-generated minor system capture hydrographs, the hydrograph flows were averaged over ten minute intervals to produce a smooth curve. The peaks of the hydrographs are unaffected by this instability, which only occurs after the time to peak has passed.

The models use actual catchbasin capture flow curves, and the inflows are limited by standard Tempest ICD types A, B, C, D and E and by lead pipe capacities. Note that 200 mm diameter lead pipes were assumed and are required between single catchbasins and the storm sewers, and 250 mm diameter lead pipes were assumed and are required between double or rearyard catchbasins and the storm sewers. Refer to Table D-6 of Appendix D for a summary of inlet controls. As may be seen from Table D-6, the selected controls are sufficient to capture the 5-year flows within proposed subdivision.

Table 1 presents a summary of the major system results simulated in DDSWMM and SWMHYMO during the 100-year Chicago storm. Note that the total water depths at low points shown in Table 1 were calculated as flow depth plus static ponding depth (per grading plan), as per Table D-7 of Appendix D. Dummy segments used in the double routing method for road ponding areas are also included in Table 1 for completeness; however, note that DDSWMM flow depths for dummy segments do not represent actual conditions, as dummy segments are intended for the purpose of replicating dynamic attenuation effects only.



Table 1: Summary of Major System Results for the 100-Year 3-Hour Chicago Storm

DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
A001N1	0.017	4.5	0.000	0	A008R1	0.090	5.2	0.028	0
LP001N1	0.031	20.5	0.020	4.04	A008R2	0.082	5.1	0.000	0
A001N2	0.015	4.2	0.000	0	A008R3	0.040	2.8	0.000	0
A001NE	0.016	4.3	0.000	0	A008SE	0.068	7.5	0.000	0
LP001NE	0.023	15.0	0.020	0.75	A008SW	0.010	3.6	0.000	0
A001NW	0.008	3.2	0.000	0	A009E1	0.051	6.7	0.000	0
A001R1	0.009	0.6	0.008	0	LP009E1	0.069	16.5	0.036	1
A001S1	0.032	5.6	0.000	0	A009E2	0.019	4.6	0.000	0
LP001S1	0.037	21.0	0.020	6	A009N1	0.008	3.3	0.000	0
A001S2	0.006	2.9	0.000	0	LP009N1	0.020	13.7	0.010	1
A001SE	0.023	5.0	0.000	0	A009N2	0.012	3.8	0.000	0
LP001SE	0.041	16.2	0.020	2	A009N3	0.010	3.5	0.000	0
A001SW	0.018	4.6	0.000	0	LP009N3	0.012	12.9	0.010	1
A003R1	0.048	3.3	0.020	0	A009NE	0.026	5.1	0.000	0
A003R2	0.038	2.7	0.000	0	LP009NE	0.051	16.7	0.028	2
A004NE	0.057	7.0	0.000	0	A009NW	0.013	3.9	0.000	0
LP004NE	0.056	10.9	0.028	1	LP009NW	0.034	15.7	0.020	2
A004NW	0.082	8.0	0.000	0	A009SE	0.026	5.1	0.000	0
LP004NW	0.087	12.2	0.020	1	A009SW	0.021	4.8	0.000	0
A004SW	0.010	3.5	0.000	0	A009W1	0.047	6.5	0.000	0
A005NE	0.014	4.0	0.000	0	LP009W1	0.064	16.3	0.036	1
LP005NE	0.021	14.8	0.010	1	A009W2	0.018	4.5	0.000	0
A005NW	0.008	3.3	0.000	0	A010NE	0.049	6.6	0.000	0
A005SE	0.090	8.3	0.000	0	LP010NE	0.075	18.8	0.036	2
LP005SE	0.089	26.3	0.050	12.71	A010NW	0.049	6.6	0.000	0
A005SW	0.069	7.5	0.000	0	LP010NW	0.074	18.7	0.036	3
LP005SW	0.068	25.5	0.050	4.17	A010S1	0.089	8.2	0.000	0
A005W1	0.016	4.3	0.000	0	LP010S1	0.106	21.8	0.050	2
LP005W1	0.016	14.3	0.010	1	A010S2	0.089	8.3	0.000	0
A006NE	0.051	6.7	0.000	0	LP010S2	0.116	20.2	0.050	1
LP006NE	0.065	13.4	0.036	1	A010SE	0.027	5.3	0.000	0
A006NW	0.016	4.3	0.000	0	A010SW	0.026	5.1	0.000	0
A006SE	0.072	7.7	0.000	0	A010W1	0.018	4.6	0.000	0
LP006SE	0.072	20.6	0.036	3	A011NE	0.057	7.0	0.000	0
A006SW	0.067	7.5	0.000	0	A011NW	0.072	7.7	0.000	0
LP006SW	0.084	21.1	0.036	2	LP011NW	0.122	21.3	0.028	2
A007E1	0.071	7.6	0.000	0	A011SW	0.097	8.5	0.000	0
LP007E1	0.088	20.2	0.028	2	LP011SW	0.145	22.9	0.050	2
A007E2	0.067	7.5	0.000	0	A012NE	0.045	6.4	0.000	0
LP007E2	0.095	20.4	0.036	3	LP012NE	0.060	17.1	0.020	2
A007N1	0.034	5.7	0.000	0	A012NW	0.025	5.1	0.000	0
A007NE	0.043	6.3	0.000	0	A012SE	0.045	6.4	0.000	0
LP007NE	0.087	23.2	0.035	6	LP012SE	0.064	17.3	0.036	2
A007NW	0.053	6.8	0.000	0	A012SW	0.021	4.8	0.000	0
A007R1	0.051	3.6	0.000	0	A013N1	0.087	8.2	0.000	0
A007R2	0.058	4.1	0.020	0	LP013N1	0.115	24.1	0.020	2
A007S1	0.011	3.7	0.000	0	A013N2	0.037	6.0	0.000	0
A007SE	0.035	5.8	0.000	0	A013NE	0.050	6.6	0.000	0
LP007SE	0.061	22.2	0.035	6	LP013NE	0.068	16.5	0.028	1
A007SW	0.027	5.2	0.000	0	A013NW	0.019	4.6	0.000	0
A008NE	0.057	6.9	0.000	0	A013S1	0.053	6.7	0.000	0
LP008NE	0.115	19.1	0.020	2	LP013S1	0.158	12.3	0.028	1
A008NW	0.067	7.5	0.000	0	A013S2	0.044	6.3	0.000	0
LP008NW	0.071	17.6	0.020	2	A013SE	0.043	6.3	0.000	0

Table 1: Summary of Major System Results for the 100-Year 3-Hour Chicago Storm

DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
LP013SE	0.063	16.3	0.028	1	A019SW	0.011	3.7	0.000	0
A013SW	0.021	4.8	0.000	0	A019W1	0.038	6.0	0.000	0
A015N1	0.009	3.4	0.000	0	LP019W1	0.075	24.8	0.020	6
LP015N1	0.012	10.8	0.010	0.77	A019W2	0.033	5.7	0.000	0
A015N2	0.004	2.4	0.000	0	LP019W2	0.061	24.2	0.020	6
A015NE	0.027	5.2	0.000	0	A020E1	0.202	11.2	0.020	0
LP015NE	0.041	22.2	0.020	7.36	A020N1	0.027	5.2	0.000	0
A015NW	0.029	5.3	0.000	0	LP020N1	0.049	16.6	0.028	2
LP015NW	0.068	23.5	0.036	6	A020N2	0.250	12.2	0.000	0
A015S1	0.010	3.6	0.000	0	LP020N2	0.251	22.2	0.020	2
LP015S1	0.013	10.9	0.010	1	A020N3	0.023	4.9	0.000	0
A015S2	0.003	2.2	0.000	0	A020NE	0.029	5.4	0.000	0
A015SE	0.014	4.1	0.000	0	LP020NE	0.051	28.7	0.028	7.62
A015SW	0.040	6.1	0.000	0	A020NW	0.030	5.5	0.000	0
A017NE	0.046	6.4	0.000	0	LP020NW	0.052	16.7	0.028	1
LP017NE	0.051	15.6	0.020	2	A020S1	0.022	4.9	0.000	0
A017NW	0.088	8.2	0.000	0	A020S2	0.011	3.7	0.000	0
LP017NW	0.109	18.0	0.069	1	A020SE	0.036	5.9	0.000	0
A017SE	0.011	3.6	0.000	0	LP020SE	0.036	27.9	0.020	5.36
A017SW	0.023	5.0	0.000	0	A020SW	0.034	5.8	0.000	0
A018a	0.324	10.4	0.171	48.48	LP020SW	0.034	6.8	0.020	1
A018b	0.632	13.3	0.334	95.29	A020W1	0.049	6.6	0.006	0
A018NE	0.024	5.0	0.000	0	A020W2	0.022	4.9	0.000	0
LP018NE	0.034	15.8	0.020	2	A021NE	0.039	6.1	0.000	0
A018NW	0.093	8.4	0.000	0	LP021NE	0.603	24.5	0.036	6
LP018NW	0.098	18.6	0.020	2	A021NW	0.098	8.6	0.000	0
A018R1	0.089	5.2	0.028	0	LP021NW	0.466	20.4	0.069	1
A018R2	0.051	3.6	0.000	0	A021SE	0.596	16.9	0.000	0
A018R3	0.023	1.6	0.000	0	A021SW	0.078	7.9	0.000	0
A018SE	0.011	3.6	0.000	0	A023N1	0.013	3.9	0.000	0
A018SW	0.011	3.7	0.000	0	A023N2	0.042	6.2	0.000	0
A019a	0.448	9.9	0.194	152.23	LP023N2	0.054	14.8	0.028	1
A019E1	0.329	13.5	0.000	0	A023NE	0.042	6.2	0.000	0
LP019E1	0.328	23.5	0.020	2	LP023NE	0.059	14.0	0.028	1
A019E2	0.011	3.7	0.000	0	A023NW	0.017	4.5	0.000	0
A019N1	0.017	4.4	0.000	0	A023R1	0.145	6.0	0.028	0
A019N2	0.045	6.4	0.000	0	A023R2	0.133	5.8	0.000	0
LP019N2	0.061	15.2	0.028	1	A023R3	0.106	5.4	0.000	0
A019N3	0.012	3.9	0.000	0	A023R4	0.071	5.0	0.000	0
A019N4	0.042	6.2	0.000	0	A023S1	0.009	3.3	0.000	0
LP019N4	0.053	13.8	0.028	1	A023S2	0.149	10.0	0.000	0
A019NE	0.493	15.7	0.000	0	LP023S2	0.154	18.2	0.020	1
LP019NE	0.500	25.2	0.020	2	A023SE	0.044	6.3	0.000	0
A019NW	0.039	6.1	0.000	0	LP023SE	0.057	14.0	0.028	1
LP019NW	0.042	15.6	0.020	1	A023SW	0.014	4.0	0.000	0
A019R1	0.068	4.8	0.020	0	A025NE	0.127	9.5	0.000	0
A019R2	0.021	1.5	0.000	0	LP025NE	0.133	17.6	0.020	1
A019S1	0.018	4.5	0.000	0	A025NW	0.285	12.8	0.000	0
A019S2	0.045	6.4	0.000	0	LP025NW	0.288	25.6	0.028	1
LP019S2	0.062	15.2	0.028	1	A025SE	0.016	4.3	0.000	0
A019S3	0.014	4.1	0.000	0	A025SW	0.008	3.3	0.000	0
A019S4	0.041	6.2	0.000	0	A028R1	0.221	6.9	0.000	0
LP019S4	0.054	13.8	0.028	1	A029NE	0.023	4.9	0.000	0
A019SE	0.010	3.6	0.000	0	A029NW	0.007	3.2	0.000	0

Table 1: Summary of Major System Results for the 100-Year 3-Hour Chicago Storm

DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
A029R1	0.077	5.1	0.020	0	A040R3	0.039	2.7	0.000	0
A029R2	0.047	3.3	0.000	0	A040R4	0.023	1.6	0.000	0
A029R3	0.010	0.7	0.000	0	A040R5	0.011	0.8	0.000	0
A029R4	0.033	2.3	0.000	0	A040S1	0.010	3.5	0.000	0
A029R5	0.086	5.2	0.000	0	A040S2	0.017	4.4	0.000	0
A029R6	0.097	5.3	0.028	0	LP040S2	0.026	15.2	0.020	1.56
A029S1	0.030	5.5	0.000	0	A040SE	0.017	4.4	0.000	0
LP029S1	0.040	18.1	0.020	2	LP040SE	0.026	15.2	0.020	1.56
A029S2	0.049	6.6	0.000	0	A040SW	0.010	3.5	0.000	0
LP029S2	0.054	18.8	0.028	2	A041a	1.868	20.5	0.984	312.08
A029SE	0.071	5.9	0.000	0	A041N1	0.092	8.3	0.000	0
LP029SE	0.093	25.4	0.050	14.41	LP041N1	0.107	21.9	0.050	2
A029SW	0.085	6.3	0.000	0	A041N2	0.016	4.3	0.000	0
LP029SW	0.091	21.4	0.050	10	A041NE	0.080	7.9	0.000	0
A031NE	0.040	6.1	0.000	0	LP041NE	0.090	18.3	0.036	2
LP031NE	0.056	15.9	0.028	1	A041NW	0.022	4.9	0.000	0
A031NW	0.017	4.4	0.000	0	A041S1	0.033	5.7	0.000	0
A031SE	0.037	6.0	0.000	0	LP041S1	0.070	17.6	0.020	2
LP031SE	0.046	15.4	0.020	1	A041SE	0.017	4.4	0.000	0
A031SW	0.010	3.5	0.000	0	LP041SE	0.026	17.2	0.020	1.56
A032NE	0.036	5.9	0.000	0	A041SW	0.010	3.5	0.000	0
LP032NE	0.044	16.3	0.020	1	A043R1	0.026	1.8	0.000	0
A032NW	0.008	3.3	0.000	0	A043R2	0.028	1.9	0.020	0
A032R1	0.021	1.5	0.019	0	A043R3	0.024	1.7	0.020	0
A032SE	0.038	6.0	0.000	0	A043R4	0.024	1.7	0.020	0
LP032SE	0.054	16.8	0.028	1	A043SE	0.019	4.6	0.000	0
A032SW	0.017	4.5	0.000	0	LP043SE	0.019	9.6	0.010	1
A034NE	0.012	3.8	0.000	0	A043SW	0.021	4.8	0.000	0
A034NW	0.006	3.1	0.000	0	LP043SW	0.026	10.2	0.010	1
A034SE	0.021	4.8	0.000	0	A044R1	0.035	2.4	0.020	0
LP034SE	0.028	11.3	0.020	1	A045N1	0.024	5.0	0.000	0
A034SW	0.051	6.7	0.000	0	A045N2	0.142	9.8	0.000	0
LP034SW	0.057	13.0	0.028	1	LP045N2	0.156	27.2	0.010	9
A036DV1	0.253	9.4	0.130	0	A045NE	0.128	9.5	0.000	0
A036NE	0.021	4.8	0.000	0	LP045NE	0.148	22.0	0.010	5
A036NW	0.137	9.7	0.000	0	A045NW	0.023	4.9	0.000	0
A036SE	0.026	5.1	0.000	0	A045R1	0.039	2.7	0.020	0
LP036SE	0.087	N/A	0.025	13.27	A045S1	0.023	4.9	0.000	0
A036SW	0.027	5.2	0.000	0	A045S2	0.089	8.2	0.000	0
LP036SW	0.161	N/A	0.025	20	LP045S2	0.110	26.0	0.010	9
A039N1	0.023	3.7	0.000	0	A045SE	0.063	7.3	0.000	0
A039N2	0.037	4.6	0.000	0	LP045SE	0.083	20.0	0.010	5
LP039N2	0.059	15.4	0.036	2	A045SW	0.023	4.9	0.000	0
A039S1	0.010	2.7	0.000	0	A046NE	0.220	11.6	0.000	0
A039S2	0.016	3.3	0.000	0	LP046NE	0.230	21.8	0.010	2
LP039S2	0.026	13.9	0.020	1.38	A046NW	0.022	4.8	0.000	0
A040N1	0.017	4.5	0.000	0	A046R1	0.041	2.8	0.020	0
A040N2	0.044	6.3	0.000	0	A046SE	0.110	9.0	0.000	0
LP040N2	0.060	17.1	0.028	2	LP046SE	0.135	19.7	0.010	2
A040NE	0.051	6.7	0.000	0	A046SW	0.036	5.9	0.000	0
LP040NE	0.065	20.4	0.036	2	A047E1	0.009	3.3	0.000	0
A040NW	0.015	4.2	0.000	0	A047E2	0.019	4.7	0.000	0
A040R1	0.059	4.1	0.020	0	LP047E2	0.027	15.3	0.027	0.5
A040R2	0.050	3.5	0.000	0	A047NE	0.004	2.5	0.000	0

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DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
A047NW	0.011	3.6	0.000	0	A170S2	0.011	3.7	0.000	0
A047PK1	0.053	3.7	0.025	0	A170SE	0.010	3.6	0.000	0
A047PK2	0.075	5.0	0.000	0	A170SW	0.022	4.9	0.000	0
A047R1	0.040	2.8	0.020	0	A200NE	0.045	6.4	0.000	0
A047R2	0.127	5.7	0.020	0	A200NW	0.016	4.3	0.000	0
A047R3	0.020	1.4	0.000	0	A200R1	0.006	0.5	0.000	0
A047R4	0.030	2.1	0.000	0	A200R2	0.014	1.0	0.000	0
A047R5	0.036	2.5	0.020	0	A200R3	0.024	1.7	0.000	0
A047SE	0.020	4.7	0.000	0	A200R4	0.030	2.1	0.020	0
LP047SE	0.023	15.9	0.010	2	A213a	0.359	10.8	0.187	22.5
A047SW	0.060	7.1	0.000	0	A216a	0.686	13.8	0.369	45.3
LP047SW	0.068	18.5	0.010	2	A216b	1.133	16.7	0.576	216.08
A047W1	0.018	4.5	0.000	0	A250NE	0.112	9.1	0.000	0
A047W2	0.072	7.7	0.000	0	A250NW	0.253	12.3	0.000	0
LP047W2	0.089	18.3	0.027	2	A250SE	0.039	6.1	0.000	0
A049NE	0.023	4.9	0.000	0	LP250SE	0.129	22.2	0.036	3
LP049NE	0.030	20.5	0.027	0.8	A250SW	0.033	5.6	0.000	0
A049NW	0.009	3.3	0.000	0	LP250SW	0.348	19.6	0.020	1
A049SE	0.065	7.4	0.000	0	A306a	0.643	13.4	0.354	44.7
LP049SE	0.076	22.8	0.027	2	A308a	0.353	10.7	0.049	6
A049SW	0.019	4.6	0.000	0	A309a	0.490	12.1	0.146	18.6
A100NE	1.632	19.4	0.416	97	A310a	0.747	14.2	0.151	18.9
A101E1	0.052	6.7	0.000	0	A310b	0.708	13.9	0.390	49.2
A101E2	0.126	9.4	0.000	0	A401a	1.688	19.7	1.668	0
LP101E2	0.170	23.3	0.023	7.79	A401b	3.931	28.0	2.774	0
A101E3	0.049	6.6	0.000	0	A403a	0.096	6.5	0.053	6.6
A101N1	0.069	7.6	0.016	0	A460NE	0.038	6.0	0.000	0
A101N2	0.075	7.8	0.016	0	LP460NE	0.168	23.5	0.010	2
A101NE	0.221	11.7	0.000	0	A460NW	0.137	9.7	0.000	0
A101NW	0.022	4.8	0.000	0	LP460NW	0.240	25.0	0.010	2
A101S1	0.051	6.7	0.000	0	A460SE	0.132	9.6	0.000	0
LP101S1	0.255	32.3	0.013	33.65	A560a	0.283	9.8	0.155	16.8
A101S2	0.055	6.9	0.000	0	A560b	1.898	20.6	0.970	370.63
LP101S2	0.249	32.2	0.013	33.65	AChan1	0.842	12.2	0.842	0
A101SE	0.129	9.5	0.000	0	AChan2	1.582	15.3	1.582	0
LP101SE	0.143	25.9	0.013	33.65	AChan3	1.265	14.5	1.265	0
A101SW	0.035	5.8	0.000	0	AChan4	1.465	15.1	1.465	0
A101W1	0.016	4.4	0.000	0	AForeS	0.489	10.2	0.489	0
A101W2	0.117	9.2	0.000	0	ARes2	0.360	10.8	0.000	0
LP101W2	0.278	28.7	0.023	7.79	AWood1	0.131	5.8	0.061	0
A107NW	0.046	6.4	0.000	0	AWood2	0.403	9.3	0.000	0
LP107NW	1.513	30.1	0.048	58.71	OUT-W	0.374	14.2	0.000	0
A107SW	0.307	13.2	0.000	0	D001N1	0.000	N/A (2)	N/A (2)	N/A (2)
A140R1	0.165	6.2	0.028	0	D001NE	0.000	N/A (2)	N/A (2)	N/A (2)
A140R2	0.153	6.1	0.000	0	D001S1	0.007	N/A (2)	N/A (2)	N/A (2)
A140R3	0.120	5.6	0.000	0	D001SE	0.021	N/A (2)	N/A (2)	N/A (2)
A140R4	0.092	5.3	0.000	0	D004NE	0.028	N/A (2)	N/A (2)	N/A (2)
A140WK1	0.258	7.9	0.000	0	D004NW	0.067	N/A (2)	N/A (2)	N/A (2)
A170NE	0.030	5.5	0.000	0	D005NE	0.011	N/A (2)	N/A (2)	N/A (2)
LP170NE	0.035	15.8	0.020	2	D005SE	0.000	N/A (2)	N/A (2)	N/A (2)
A170NW	0.061	7.2	0.000	0	D005SW	0.000	N/A (2)	N/A (2)	N/A (2)
LP170NW	0.083	18.0	0.036	2	D005W1	0.006	N/A (2)	N/A (2)	N/A (2)
A170S1	0.024	5.0	0.000	0	D006NE	0.030	N/A (2)	N/A (2)	N/A (2)
LP170S1	0.034	15.7	0.020	2	D006SE	0.036	N/A (2)	N/A (2)	N/A (2)

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DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
D006SW	0.049	N/A (2)	N/A (2)	N/A (2)	D025NE	0.113	N/A (2)	N/A (2)	N/A (2)
D007E1	0.060	N/A (2)	N/A (2)	N/A (2)	D025NW	0.260	N/A (2)	N/A (2)	N/A (2)
D007E2	0.059	N/A (2)	N/A (2)	N/A (2)	D029S1	0.020	N/A (2)	N/A (2)	N/A (2)
D007NE	0.053	N/A (2)	N/A (2)	N/A (2)	D029S2	0.026	N/A (2)	N/A (2)	N/A (2)
D007SE	0.006	N/A (2)	N/A (2)	N/A (2)	D029SE	0.000	N/A (2)	N/A (2)	N/A (2)
D008NE	0.095	N/A (2)	N/A (2)	N/A (2)	D029SW	0.005	N/A (2)	N/A (2)	N/A (2)
D008NW	0.051	N/A (2)	N/A (2)	N/A (2)	D031NE	0.028	N/A (2)	N/A (2)	N/A (2)
D009E1	0.033	N/A (2)	N/A (2)	N/A (2)	D031SE	0.027	N/A (2)	N/A (2)	N/A (2)
D009N1	0.010	N/A (2)	N/A (2)	N/A (2)	D032NE	0.024	N/A (2)	N/A (2)	N/A (2)
D009N3	0.001	N/A (2)	N/A (2)	N/A (2)	D032SE	0.026	N/A (2)	N/A (2)	N/A (2)
D009NE	0.023	N/A (2)	N/A (2)	N/A (2)	D034SE	0.008	N/A (2)	N/A (2)	N/A (2)
D009NW	0.014	N/A (2)	N/A (2)	N/A (2)	D034SW	0.028	N/A (2)	N/A (2)	N/A (2)
D009W1	0.028	N/A (2)	N/A (2)	N/A (2)	D036SE	0.000	N/A (2)	N/A (2)	N/A (2)
D010NE	0.040	N/A (2)	N/A (2)	N/A (2)	D036SW	0.136	N/A (2)	N/A (2)	N/A (2)
D010NW	0.038	N/A (2)	N/A (2)	N/A (2)	D039N2	0.024	N/A (2)	N/A (2)	N/A (2)
D010S1	0.056	N/A (2)	N/A (2)	N/A (2)	D039S2	0.000	N/A (2)	N/A (2)	N/A (2)
D010S2	0.066	N/A (2)	N/A (2)	N/A (2)	D040N2	0.032	N/A (2)	N/A (2)	N/A (2)
D011NW	0.093	N/A (2)	N/A (2)	N/A (2)	D040NE	0.030	N/A (2)	N/A (2)	N/A (2)
D011SW	0.094	N/A (2)	N/A (2)	N/A (2)	D040S2	0.000	N/A (2)	N/A (2)	N/A (2)
D012NE	0.041	N/A (2)	N/A (2)	N/A (2)	D040SE	0.000	N/A (2)	N/A (2)	N/A (2)
D012SE	0.029	N/A (2)	N/A (2)	N/A (2)	D041N1	0.057	N/A (2)	N/A (2)	N/A (2)
D013N1	0.095	N/A (2)	N/A (2)	N/A (2)	D041NE	0.055	N/A (2)	N/A (2)	N/A (2)
D013NE	0.040	N/A (2)	N/A (2)	N/A (2)	D041S1	0.050	N/A (2)	N/A (2)	N/A (2)
D013S1	0.130	N/A (2)	N/A (2)	N/A (2)	D041SE	0.000	N/A (2)	N/A (2)	N/A (2)
D013SE	0.035	N/A (2)	N/A (2)	N/A (2)	D043SE	0.009	N/A (2)	N/A (2)	N/A (2)
D015N1	0.000	N/A (2)	N/A (2)	N/A (2)	D043SW	0.016	N/A (2)	N/A (2)	N/A (2)
D015NE	0.000	N/A (2)	N/A (2)	N/A (2)	D045N2	0.146	N/A (2)	N/A (2)	N/A (2)
D015NW	0.032	N/A (2)	N/A (2)	N/A (2)	D045NE	0.138	N/A (2)	N/A (2)	N/A (2)
D015S1	0.000	N/A (2)	N/A (2)	N/A (2)	D045S2	0.100	N/A (2)	N/A (2)	N/A (2)
D017NE	0.031	N/A (2)	N/A (2)	N/A (2)	D045SE	0.073	N/A (2)	N/A (2)	N/A (2)
D017NW	0.040	N/A (2)	N/A (2)	N/A (2)	D046NE	0.220	N/A (2)	N/A (2)	N/A (2)
D018NE	0.014	N/A (2)	N/A (2)	N/A (2)	D046SE	0.125	N/A (2)	N/A (2)	N/A (2)
D018NW	0.078	N/A (2)	N/A (2)	N/A (2)	D047E2	0.000	N/A (2)	N/A (2)	N/A (2)
D019E1	0.308	N/A (2)	N/A (2)	N/A (2)	D047SE	0.013	N/A (2)	N/A (2)	N/A (2)
D019N2	0.033	N/A (2)	N/A (2)	N/A (2)	D047SW	0.058	N/A (2)	N/A (2)	N/A (2)
D019N4	0.025	N/A (2)	N/A (2)	N/A (2)	D047W2	0.062	N/A (2)	N/A (2)	N/A (2)
D019NE	0.480	N/A (2)	N/A (2)	N/A (2)	D049NE	0.000	N/A (2)	N/A (2)	N/A (2)
D019NW	0.022	N/A (2)	N/A (2)	N/A (2)	D049SE	0.049	N/A (2)	N/A (2)	N/A (2)
D019S2	0.034	N/A (2)	N/A (2)	N/A (2)	D170NE	0.015	N/A (2)	N/A (2)	N/A (2)
D019S4	0.026	N/A (2)	N/A (2)	N/A (2)	D170NW	0.047	N/A (2)	N/A (2)	N/A (2)
D019W1	0.055	N/A (2)	N/A (2)	N/A (2)	D170S1	0.014	N/A (2)	N/A (2)	N/A (2)
D019W2	0.041	N/A (2)	N/A (2)	N/A (2)	D250SE	0.093	N/A (2)	N/A (2)	N/A (2)
D020N1	0.020	N/A (2)	N/A (2)	N/A (2)	D250SW	0.329	N/A (2)	N/A (2)	N/A (2)
D020N2	0.231	N/A (2)	N/A (2)	N/A (2)	D460NE	0.158	N/A (2)	N/A (2)	N/A (2)
D020NE	0.000	N/A (2)	N/A (2)	N/A (2)	D460NW	0.230	N/A (2)	N/A (2)	N/A (2)
D020NW	0.023	N/A (2)	N/A (2)	N/A (2)	A039NE	0.015	4.2	0.000	0
D020SE	0.000	N/A (2)	N/A (2)	N/A (2)	LP039NE	0.056	16.9	0.028	2
D020SW	0.014	N/A (2)	N/A (2)	N/A (2)	A039NW	0.023	4.9	0.000	0
D021NE	0.567	N/A (2)	N/A (2)	N/A (2)	A039SE	0.010	3.6	0.000	0
D021NW	0.397	N/A (2)	N/A (2)	N/A (2)	LP039SE	0.032	15.6	0.020	2
D023N2	0.026	N/A (2)	N/A (2)	N/A (2)	A039SW	0.011	3.7	0.000	0
D023NE	0.030	N/A (2)	N/A (2)	N/A (2)	A051NE	0.035	4.5	0.000	0
D023S2	0.134	N/A (2)	N/A (2)	N/A (2)	LP051NE	0.052	16.7	0.028	2
D023SE	0.029	N/A (2)	N/A (2)	N/A (2)	A051NW	0.036	4.5	0.000	0

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DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
LP051NW	0.053	16.7	0.028	2	A108a	0.927	15.4	0.547	56.4
A051SE	0.018	3.4	0.000	0	A110a	1.491	18.7	0.201	22.5
A051SW	0.018	3.4	0.000	0	A112a	1.615	19.3	0.198	22.2
A052E1	0.046	4.9	0.000	0	A112b	0.693	13.8	0.367	102.32
LP052E1	0.064	17.3	0.036	3	A112c	0.697	13.8	0.400	48
A052E2	0.019	3.5	0.000	0	A112d	1.213	17.2	0.666	66.6
A052NE	0.041	4.7	0.000	0	A112e	1.364	18.0	0.717	225.56
LP052NE	0.059	17.0	0.028	2	A201a	0.420	11.4	0.236	27
A052NW	0.046	4.9	0.000	0	A202a	2.036	21.3	1.163	138.9
LP052NW	0.063	17.3	0.036	3	A203a	1.348	18.0	0.211	27.6
A052SE	0.019	3.5	0.000	0	A204a	1.194	17.1	0.082	10.2
A052SW	0.019	3.5	0.000	0	A205a	1.516	18.8	0.858	113.4
A052W1	0.045	4.9	0.000	0	A206a	1.769	20.1	0.252	33.3
LP052W1	0.063	17.3	0.036	3	A207a	1.717	19.8	0.237	31.2
A052W2	0.019	3.5	0.000	0	A208a	1.903	20.7	0.167	18.9
A053NE	0.045	4.9	0.000	0	A209a	1.793	20.2	0.127	14.4
LP053NE	0.055	19.6	0.028	1	A1101a	0.444	11.7	0.059	5.4
A053NW	0.045	4.9	0.000	0	A1101b	0.285	9.9	0.151	42.15
LP053NW	0.063	19.9	0.036	6	A1101c	0.412	11.3	0.218	61.59
A053SE	0.011	2.9	0.000	0	A1101d	0.333	10.5	0.169	57.75
A053SW	0.019	3.5	0.000	0	A1101e	0.606	13.1	0.307	110.74
A054E1	0.054	5.2	0.000	0	A1101f	0.888	15.2	0.500	57.3
LP054E1	0.081	N/A	0.036	6	A1102a	2.147	21.7	1.240	156
A054E2	0.028	4.1	0.000	0	A2001a	0.516	12.3	0.226	26.7
A054NE	0.059	5.4	0.000	0	A2070a	1.699	19.7	0.260	34.8
LP054NE	0.083	N/A	0.036	6	A2071a	1.234	17.3	0.651	195.43
A054NW	1.403	18.3	0.000	0	A2071b	0.758	11.7	0.379	102.3
LP054NW	1.389	N/A	0.036	6	A2071c	2.091	21.5	1.199	144.9
A054SE	0.027	4.0	0.000	0	A2090a	1.658	19.5	0.037	4.2
A054SW	0.027	4.0	0.000	0	A2110a	0.492	12.1	0.272	30.3
A054W1	1.046	16.2	0.000	0	A2110b	1.431	18.4	0.743	274.37
LP054W1	1.046	N/A	0.036	6	D039NE	0.036	N/A (2)	N/A (2)	N/A (2)
A054W2	0.028	4.1	0.000	0	D039SE	0.017	N/A (2)	N/A (2)	N/A (2)
A055a	0.922	15.4	0.509	64.2	D051NE	0.024	N/A (2)	N/A (2)	N/A (2)
A055NE	0.052	5.2	0.000	0	D051NW	0.024	N/A (2)	N/A (2)	N/A (2)
LP055NE	0.079	N/A	0.036	1	D052E1	0.028	N/A (2)	N/A (2)	N/A (2)
A055NW	0.852	15.0	0.000	0	D052NE	0.030	N/A (2)	N/A (2)	N/A (2)
LP055NW	0.879	N/A	0.036	1	D052NW	0.028	N/A (2)	N/A (2)	N/A (2)
A055S1	0.059	5.4	0.008	0	D052W1	0.028	N/A (2)	N/A (2)	N/A (2)
A055SE	0.028	4.1	0.000	0	D053NE	0.027	N/A (2)	N/A (2)	N/A (2)
A055SW	0.422	11.4	0.000	0	D053NW	0.004	N/A (2)	N/A (2)	N/A (2)
A056E1	0.082	6.2	0.000	0	D054E1	0.047	N/A (2)	N/A (2)	N/A (2)
LP056E1	0.112	N/A	0.112	0	D054NE	0.051	N/A (2)	N/A (2)	N/A (2)
A056E2	0.034	4.4	0.000	0	D054NW	1.353	N/A (2)	N/A (2)	N/A (2)
A056W1	1.643	19.5	0.000	0	D054W1	1.011	N/A (2)	N/A (2)	N/A (2)
LP056W1	1.624	N/A	1.624	0	D055NE	0.044	N/A (2)	N/A (2)	N/A (2)
A056W2	0.034	4.4	0.000	0	D055NW	0.843	N/A (2)	N/A (2)	N/A (2)
A101a	0.446	11.7	0.265	24.6	AForeN	1.308	14.8	1.300	0
A101b	1.668	19.6	1.163	0	AMainN	1.236	14.4	1.226	0
A101c	1.663	19.6	0.873	280.42	AMainS	0.784	11.8	0.780	0
A101d	4.107	28.6	2.150	681.82	ARes1	0.251	9.4	0.000	0
A103a	0.576	12.9	0.345	31.5	AResN1	1.860	20.5	1.836	0
A103b	1.449	18.5	0.764	233.82	AResN2	0.268	9.6	0.265	0
A103c	1.776	20.1	0.937	284.38	AHE1b	2.905	16.8	0.688	3226.76

Table 1: Summary of Major System Results for the 100-Year 3-Hour Chicago Storm

DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)	DDSWMM Segment ID	Approach Flow (m ³ /s)	Flow Depth (cm)	Captured Flow (m ³ /s)	Storage Used (m ³)
ATW1b	0.518	10.3	0.000	0	NCOM2	3.680	N/A	0.000	0
ATW2b	1.388	15.1	0.000	0	NNAT1	3.415	N/A	0.000	0
ATW3b	2.554	29.7	0.000	0	NNAT2	0.540	N/A	0.000	0
NorthB	9.389	24.1	9.389	0	NNAT3	1.575	N/A	0.000	0
S-TW1b	3.162	32.5	1.563	1501.81	NNAT4	3.211	N/A	0.000	0
NCOM1	2.627	N/A	0.000	0					

- ⁽¹⁾ Flow depths on major system catchments were estimated using DDSWMM. Total water depths at low points calculated as flow depth plus static ponding depth (per grading plan); refer to Table D-7 of Appendix D for details.
- ⁽²⁾ Dummy segments used in the double routing method for road ponding areas; DDSWMM flow depths do not represent actual conditions, as dummy segments are intended to replicate dynamic attenuation effects only.

4.3 Minor System and Hydraulic Gradeline Analysis

The minor system analysis was completed using the XPSWMM program based on the peak flows captured during the rainfall events, as calculated with the DDSWMM and SWMHYMO programs. Note that the storm sewer design is as provided by DSEL, and a Manning's roughness coefficient of 0.013 was used for the concrete and PVC storm sewer pipes. Refer to Appendix C for manhole loss coefficients used in the XPSWMM model.

A 675 mm orifice is proposed at the west outlet of MH 39 at an invert of 84.086 m (equal to the pipe invert) to ensure that the flow split at this location does not exceed the capacity of the downstream pipes during the 5-year design storm.

The minor system performance was analyzed based free outfall conditions at the outlet of the facility for all storms. Table 2 presents the peak minor system inflows to Mud Creek obtained with the Rational Method and with the above-mentioned simulations.

Table 2: Comparison of Minor System Flows to Mud Creek

Location	Interim A Flows (m ³ /s)			Interim B Flows (m ³ /s)		
	5-Year Rational	5-Year DD/XP	100-Year DD/XP	5-Year Rational	5-Year DD/XP	100-Year DD/XP
MH 22 to Channel	4.594	4.830	6.362	3.340	2.738	4.439
MH 27 to Channel	1.257	1.006	1.806	1.188	1.017	1.543
MH 38 to Channel	N/A	2.357	6.030	N/A	2.409	5.765
MH 560 to Channel	N/A	12.641	18.584	N/A	12.622	18.488
Ex. MH 111 to Channel	N/A	0.608	0.655	N/A	0.608	0.657
Total ⁽¹⁾	5.851	21.442	33.436	4.528	19.393	30.891

⁽¹⁾ Total inflow taken as a direct summation of minor system flows.

Table 2 shows that the 5-year total flow simulated with the DDSWMM/XPSWMM models is much higher than the Rational Method flow. This may be explained by the fact that DSEL's Rational Method design sheet does not include the drainage areas to MH 38, MH 560 or MH 111, which are partly designed by others.

The DDSWMM/XPSWMM simulations have determined that for the selected 5- and 100-year storms, the total maximum minor system peak inflows to the pond would be 21.442 m³/s and 33.436 m³/s, respectively. The 100-year flow will surcharge most parts of the minor system; however, a freeboard of 0.3 m between the hydraulic grade line and the underside of footings has been provided throughout the proposed development.

Within the proposed subdivision, the dynamic flow depth on the road will be retained within the right-of-way and will not exceed the maximum allowable value of 30 cm at the gutter during the 100-year Chicago storm (refer to Calculation Sheet 1A of Appendix D, where the calculated maximum was 13.7 cm). Furthermore, it was determined that, for the 100-year storm and for all major system segments, the product of the depth of water (m) at the gutter multiplied by the



velocity of flow (m/s) will not exceed the maximum allowable 0.60 m²/s (refer to Calculation Sheet 1 of Appendix D, where the calculated maximum was 0.148 m²/s). Refer to Section 4 for an assessment of static ponding depth on the road.

Calculation Sheet 1B of Appendix D presents the climate change stress test results for dynamic flow depth on the road based on a 20% increase in the 100-year storm, as per the October 2012 *City of Ottawa Sewer Design Guidelines*. As shown in Calculation Sheet 1B, the maximum dynamic flow depth under these conditions is calculated as 17.6 cm, and the product of the depth of water at the gutter multiplied by the velocity of flow is 0.222 m²/s.

Table C-1 of Appendix C summarizes the pipe data and hydraulic simulation results for the 100-year 3-hour Chicago storm, 100-year 24-hour SCS Type II storm and the three historical events. The results presented in Table C-1 of Appendix C are a composite of Interim A and B conditions, where the maximum hydraulic gradeline elevation of the two scenarios is presented at each manhole. Note that a freeboard of 0.3 m between the hydraulic grade line and the underside of footings has been provided throughout the proposed Trails Edge West development for these rainfall events under both Interim A and Interim B conditions. Additionally, note that the flowing full pipe velocities are no less than 0.80 m/s and no greater than 6.0 m/s for all proposed pipes. Table 3 presents the composite hydraulic gradeline results for these events.

Table C-1F of Appendix C presents the climate change stress test results for the hydraulic gradeline analysis based on a 20% increase in the 100-year storm, as per the October 2012 *City of Ottawa Sewer Design Guidelines*. Under these conditions, a freeboard of 0.3 m between the hydraulic grade line and the underside of footings has been provided for all proposed Trails Edge West lots under both Interim A and Interim B conditions.



Table 3: Composite Hydraulic Gradeline Results for 100-Year Design Storms and Historical Events

U/S MH	D/S MH	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (1) (m)
1	2	85.077	84.774	B91W	85.99	0.913
2	3	84.774	84.686	N/A	N/A	N/A
3	4	84.650	84.546	B90N	85.76	1.110
4	8	84.546	84.513	N/A	N/A	N/A
5	6	84.960	84.807	B87S	85.67	0.710
6	12	84.807	84.531	B95SS	85.57	0.763
7	8	84.953	84.574	B84W	85.52	0.567
8	14	84.513	84.059	N/A	N/A	N/A
9	10	85.015	84.883	B94NN	85.78	0.765
10	11	84.883	84.678	B96SS	85.56	0.677
11	12	84.678	84.531	B79E	85.53	0.852
11	18	84.678	84.567	B80E	85.38	0.702
12	13	84.531	84.280	B77W	85.51	0.979
13	14	84.264	84.049	B75W	85.37	1.106
14	140	84.049	83.998	N/A	N/A	N/A
15	17	85.137	84.788	B97NN	85.85	0.713
17	170	84.788	84.655	B96NS	85.72	0.932
18	19	84.567	84.477	N/A	N/A	N/A
19	19S	84.477	84.473	N/A	N/A	N/A
19	19W	84.477	84.475	N/A	N/A	N/A
20	20S	84.379	84.374	N/A	N/A	N/A
20	20W	85.979	84.396	N/A	N/A	N/A
21	22	84.248	84.095	68	85.16	0.912
22	Chan2	84.095	84.059	N/A	N/A	N/A
23	230	84.216	83.795	B74W	85.14	0.924
24	25	83.595	83.578	N/A	N/A	N/A
25	250	83.578	83.544	17	85.09	1.512
26	27	83.516	83.470	N/A	N/A	N/A
27	Chan3	83.470	83.441	N/A	N/A	N/A
28	29	84.361	84.361	52	85.18	0.819
29	30	84.361	84.070	53	85.16	0.799
30	31	84.070	83.987	42	85.14	1.070
31	32	83.987	83.920	41	85.08	1.093
32	33	83.920	83.753	39	85.01	1.090
33	34	83.753	83.679	37	85.13	1.377
34	35	83.679	83.538	22	84.97	1.291
35	26	83.538	83.516	20	85.01	1.472
36	37	85.694	84.913	N/A	N/A	N/A
37	38	84.913	84.638	N/A	N/A	N/A
38	Chan2	84.638	84.059	N/A	N/A	N/A
39	54	85.823	85.746	Ground	88.15	2.331
39	39W	85.823	85.030	N/A	N/A	N/A
40	41	84.934	84.879	B133W	85.88	0.946
41	17	84.879	84.788	B132E	85.88	1.001
43	44	83.954	83.505	B4N	85.11	1.156
44	45	83.505	83.390	B6E	84.63	1.125
45	46	83.294	82.735	B6W	84.63	1.336
46	ExPlug1	82.725	82.608	N/A	N/A	N/A
47	460	83.474	83.086	N/A	N/A	N/A
47	47N	83.474	83.815	N/A	N/A	N/A
48	49	83.586	83.575	N/A	N/A	N/A
49	50	83.575	83.241	N/A	N/A	N/A
50	ExPlug2	83.241	83.199	N/A	N/A	N/A

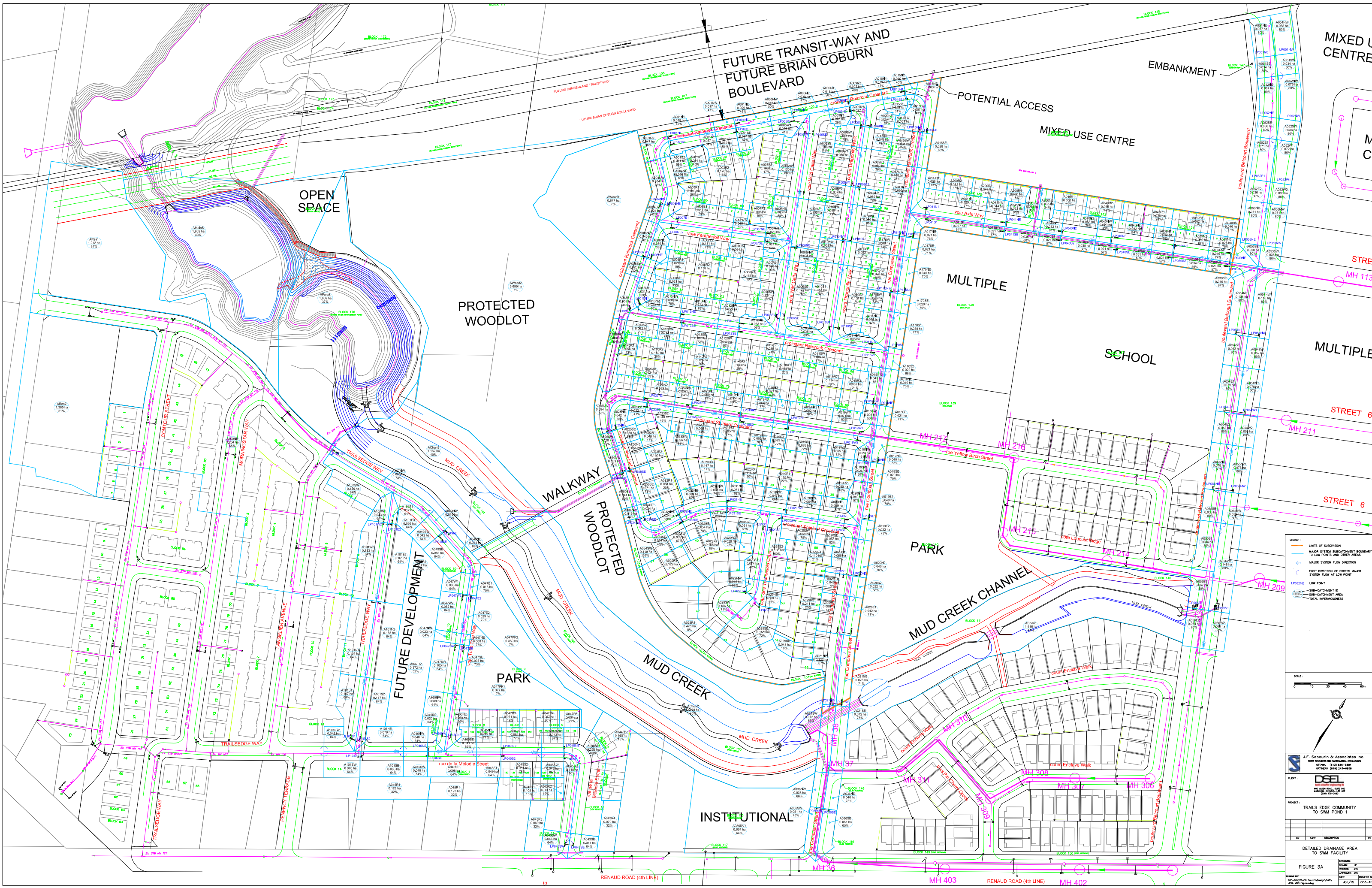
Table 3: Composite Hydraulic Gradeline Results for 100-Year Design Storms and Historical Events

U/S MH	D/S MH	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (1) (m)
51	52	85.983	85.941	Ground	88.44	2.454
52	53	85.941	85.852	Ground	88.29	2.348
53	39	85.852	85.823	Ground	88.17	2.314
54	55	85.746	85.633	Ground	88.11	2.365
55	56	85.633	85.447	Ground	88.00	2.370
56	560	85.447	85.258	Ground	87.41	1.966
56	214	85.447	85.236	Ground	87.41	1.966
560	Chan1	85.258	85.046	N/A	N/A	N/A
101	102	87.254	87.090	Ground	88.87	1.615
102	103	87.090	86.958	Ground	89.63	2.543
103	104	86.958	86.870	Ground	89.50	2.542
104	105	86.870	86.766	Ground	89.37	2.497
105	106	86.766	86.660	Ground	89.22	2.455
106	107	86.660	86.544	Ground	89.10	2.440
107	108	86.544	86.441	Ground	88.97	2.421
108	109	86.441	86.357	Ground	88.85	2.409
109	110	86.357	86.241	Ground	88.75	2.391
110	111	86.241	86.175	Ground	88.65	2.409
111	112	86.175	86.103	Ground	88.56	2.386
112	113	86.103	85.978	Ground	88.44	2.335
113	39	85.978	85.823	Ground	88.30	2.325
170	18	84.655	84.567	B96SS	85.56	0.905
201	2001	86.465	86.426	Ground	88.94	2.474
2002	202	86.413	86.377	Ground	88.81	2.394
202	203	86.377	86.323	Ground	88.72	2.339
203	204	86.323	86.259	Ground	88.61	2.284
204	205	86.259	86.187	Ground	88.51	2.251
205	206	86.187	86.082	Ground	88.41	2.223
206	207	86.082	86.006	Ground	88.29	2.204
207	2070	86.006	85.920	Ground	88.17	2.159
208	209	85.751	85.679	Ground	87.77	2.014
209	2090	85.679	85.619	Ground	87.60	1.922
211	55	85.732	85.633	Ground	87.68	1.948
214	215	85.236	84.930	Ground	87.59	2.353
215	216	84.930	84.690	Ground	87.58	2.648
216	217	84.690	84.626	Ground	87.57	2.880
217	19	84.626	84.477	Ground	87.46	2.832
306	307	85.655	85.459	Ground	87.84	2.183
307	308	85.459	85.432	Ground	87.74	2.278
308	309	85.432	85.253	Ground	87.68	2.243
309	310	85.253	85.164	Ground	87.62	2.364
310	311	85.164	84.991	Ground	87.51	2.349
311	37	84.991	84.913	Ground	87.45	2.456
401	402	86.527	86.161	Ground	86.99	0.466
402	403	86.161	86.036	Ground	86.88	0.723
403	36	86.036	85.694	Ground	86.90	0.864
460	46	83.086	82.761	N/A	N/A	N/A
1101	1102	86.687	86.670	Ground	89.51	2.821
1102	1103	86.670	86.569	Ground	89.42	2.746
1103	1104	86.569	86.483	Ground	89.28	2.709
1104	1105	86.483	86.422	Ground	89.17	2.684
1105	1106	86.422	86.378	Ground	89.02	2.596
1106	1107	86.378	86.318	Ground	88.93	2.551

Table 3: Composite Hydraulic Gradeline Results for 100-Year Design Storms and Historical Events

U/S MH	D/S MH	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (1) (m)
1107	110	86.318	86.241	Ground	88.81	2.490
2001	2002	86.426	86.413	Ground	88.84	2.411
2070	2071	85.920	85.815	Ground	88.05	2.126
2071	208	85.815	85.751	Ground	87.92	2.105
2090	56	85.619	85.447	Ground	87.48	1.856
2110	211	85.821	85.732	Ground	87.80	1.979
19S	20	84.473	84.379	N/A	N/A	N/A
19W	23	84.475	84.216	B71W	85.25	0.775
20S	21	84.374	84.248	64	85.23	0.856
20W	30	84.396	84.149	56	85.28	0.884
47N	48	83.815	83.586	N/A	N/A	N/A
Chan1	Chan1a	85.046	84.794	N/A	N/A	N/A
Chan1a	Chan1b	84.794	84.681	N/A	N/A	N/A
Chan1b	Chan1c	84.681	84.615	N/A	N/A	N/A
Chan1c	Chan1d	84.615	84.271	N/A	N/A	N/A
Chan1d	Chan1e	84.271	84.209	N/A	N/A	N/A
Chan2	Chan3	84.059	83.441	N/A	N/A	N/A
Chan3	Chan4	83.441	83.121	N/A	N/A	N/A
Chan4	ForeS	83.121	83.121	N/A	N/A	N/A
DICB	15	85.431	85.159	N/A	N/A	N/A
Ex100	Ex111	83.122	83.121	IBI (3)	83.47	0.348
Ex107	Ex100	83.184	83.122	IBI (3)	83.58	0.396
Ex111	Chan4	83.121	83.121	IBI (3)	83.45	0.329
ExPlug1	Ex102	82.608	82.590	IBI (3)	83.66	1.052
ExPlug2	Ex107	83.199	83.184	N/A	N/A	N/A
ForeN	MainN	83.119	83.118	N/A	N/A	N/A
ForeS	MainS	83.121	83.120	N/A	N/A	N/A
MainN	Out	83.119	80.100	N/A	N/A	N/A
MainS	MainN	83.121	83.119	N/A	N/A	N/A
140	141	83.998	83.657	N/A	N/A	N/A
141	24	83.657	83.595	N/A	N/A	N/A
230	24	83.795	83.650	N/A	N/A	N/A
250	26	83.544	83.516	N/A	N/A	N/A
39W	40	85.030	84.934	B134W	86.14	1.110
280	28	84.381	84.361	47	85.21	0.829
200	41	84.881	84.879	N/A	N/A	N/A
Chan1e	Chan2	84.209	84.059	N/A	N/A	N/A

Note: ⁽¹⁾ Conservative estimate of freeboard based on U/S HGL and lowest USF connected to pipe.



FUTURE TRANSIT-WAY AND
 FUTURE BRIAN COBURN
 BOULEVARD

EMBANKMENT

MIXED USE CENTRE

OPEN SPACE

PROTECTED
 WOODLOT

MULTIPLE

SCHOOL

MULTIPLE

WALKWAY
 PROTECTED
 WOODLOT

PARK

FUTURE DEVELOPMENT

MUD CREEK

MUD CREEK CHANNEL

PARK

INSTITUTIONAL

BY	DATE	DESCRIPTION	BY

Appendix D External Report Excerpts



Geotechnical Investigation

Proposed Residential Development

Trailsedge West – Block 121
6259, 6267, 6271 & 6273 Renaud Road
Ottawa, Ontario

Prepared for Richcraft

Report PG6405-1 Revision 3 dated June 24, 2025

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current supplemental geotechnical investigation was carried out on July 12, 2024, and consisted of advancing a total of 3 boreholes to a maximum depth of 10.4 m below existing ground surface. A previous geotechnical investigation was completed on October 3, 2022, consisting of 4 boreholes advanced to a maximum depth of 8.1 m below the existing ground surface.

Furthermore, an initial geotechnical investigation was completed by Paterson in August 2006 which included 1 borehole and 1 test pit at the subject site, which were advanced to depths of 9.6 m and 3.8 m below ground surface, respectively.

The test hole locations were distributed in a manner to provide general coverage of the subject site, taking into consideration underground utilities and site features. The approximate borehole locations are shown on Drawing PG6405-1 – Test Hole Location Plan included in Appendix 2.

The boreholes were completed using a low clearance auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The testing procedure consisted of augering to the required depths at the selected locations, and sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split spoon (SS) sampler. All samples were visually inspected and initially classified on-site. The auger and split-spoon samples were placed in sealed plastic bags.

All samples were transported to our laboratory for further examination and classification. The depths at which the auger and split spoon samples were recovered from the boreholes are shown as AU, and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

4.0 Observations

4.1 Surface Conditions

The subject site consists of 4 contiguous properties: 6259, 6267, 6271 & 6273 Renaud Road. The western portion of the site is currently occupied by 3 residential properties, while the eastern portion is used as a construction staging area, with an office trailer and several storage containers.

The site is bordered by Renaud Road to the south, Compass Street to the east, Melodie Street to the west, and a pedestrian pathway followed by Mud Creek to the north. The ground surface across the subject site is relatively level at approximate geodetic elevation 87 m, however, beyond the site boundary to the north, the existing grades slope downward moderately toward Mud Creek, which is at approximate 82 m.

4.2 Subsurface Profile

Generally, the subsurface profile at the test hole locations consists of topsoil and/ or fill underlain by silty sand and a deep silty clay deposit. Fill was observed to generally consist of loose to compact silty sand with gravel and crushed stone. The fill was observed to extend to depths ranging between about 0.3 to 1.8 m below the existing ground surface.

Underlying the fill, the silty sand layer generally consists of a loose to dense, brown silty sand, and extends to depths ranging from about 0.9 and 1.8 m below the existing ground surface.

The deep silty clay deposit, encountered underlying silty sand layer, was observed to consist of a very stiff to stiff, brown silty clay, extending to depths ranging between 2.1 and 2.4 m, and becoming a firm to soft, grey silty clay below these depths. However, in borehole BH 3-24, a thin interbedded layer of silty sand to sandy silt deposit was encountered at depth of 2.2 m.

No practical refusal to the DCPT was encountered at boreholes BH 1-24 and BH 4 -22 to approximate depths of 30 m.

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

Bedrock

Based on available geological mapping, bedrock in the area of the subject site consists of interbedded limestone and shale of the Lindsay Formation with an overburden drift thickness of about 25 to 50 m in depth.

Grain Size Distribution and Hydrometer Testing

Grain size distribution (sieve and hydrometer analysis) was completed on 2 selected soil samples. The results of the grain size analysis are summarized in Table 1 and presented on the Grain-Size Distribution and Hydrometer Testing Results sheets in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis – Current Investigation						
Borehole	Sample	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 4-22	SS4	2.3-2.9	0.0	5.4	36.6	58.0
BH 3-24	SS5	3.1-3.7	0.0	0.9	24.6	74.5

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

Atterberg Limits Testing

Atterberg limits testing was completed on the recovered silty clay samples at selected locations throughout the subject site during the current and previous investigations. The results of the Atterberg limits are presented in Table 2 and on the Atterberg Limits Results sheet in Appendix 1.

Table 2 – Atterberg Limits Results – Current Investigation						
Borehole	Sample	Depth (m)	LL (%)	PL (%)	PI (%)	Classification
BH 1-22	SS4	2.3-2.9	78	38	40	MH
BH 2-22	SS4	2.3-2.9	49	25	24	CH
BH 3-22	SS4	2.3-2.9	74	36	38	MH
BH 2-24	SS5	3.1-3.7	66	27	39	CH

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plastic Index; CH: Inorganic Clay of High Plasticity.
 MH: Inorganic Silt of High Plasticity

Shrinkage Testing

Linear shrinkage testing was completed on 1 selected sample. The results are summarized in Table 3 on the next page, and on the Shrinkage Testing Results sheet in Appendix 1.

Table 3 – Linear Shrinkage Results				
Borehole	Sample	Depth (m)	Shrinkage Limit	Shrinkage Ratio
BH 4-22	SS4	2.3-2.9	23.55	1.726

Consolidation Testing

Generally, the potential long-term settlement of the silty clay deposit is evaluated based on its compressibility characteristics. A method to evaluate these characteristics is by completing unidimensional consolidation tests on undisturbed soil samples collected using Shelby tubes. A total of 1 consolidation test was completed from the Shelby tubes collected during the previous investigation. The results of the consolidation testing are presented on the Consolidation Test sheet in Appendix 1.

4.3 Groundwater

Groundwater levels were measured within the installed piezometers at the time of the investigation. The measured groundwater levels noted at that time are presented in Table 1 on below.

Table 4 – Summary of Groundwater Levels				
Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-24	87.56	7.29	80.27	July 19, 2024
BH 2-24	87.28	2.18	85.1	July 19, 2024
BH 3-24	87.29	9.06	78.23	July 19, 2024
BH 1-22*	86.87	2.98	83.89	October 13, 2022
BH 2-22*	86.86	1.82	85.04	October 13, 2022
BH 3-22*	86.79	1.84	84.95	October 13, 2022
BH 4-22*	86.84	5.72	81.12	October 13, 2022
BH 1-08*	86.83	1.74	85.09	August 28, 2008
TP 1-08 *	86.83	2.00	84.83	August 28, 2008

Note: Ground surface elevations at borehole location are referenced to a geodetic datum.

* - Denotes ground water levels from previous investigation

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 long-term groundwater table can be expected at approximately 2 to 3 m below ground surface.

However, 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 considered suitable for the proposed development. It is recommended that the proposed structures be founded on conventional spread footings placed on the undisturbed, firm to stiff silty clay bearing surface.

Due to the presence of a silty clay deposit at the site, the proposed development will be subjected to grade raise restrictions. Our permissible grade raise recommendations are discussed in Section 5.3.

Further, as the existing ground surface slopes downward to Mud Creek, beyond the northern boundary of the site, a slope stability assessment has been completed, which is provided in Section 6.9.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, containing significant amounts of organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures. Care should be taken not to disturb adequate bearing soils below the founding level during site preparation activities. Disturbance of the subgrade may result in sub-excavating the disturbed material and the placement of additional suitable fill material.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness.

Fill placed beneath the proposed building areas should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Permissible Grade Raise Recommendations

Consideration must also be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For buildings, a minimum value of 50% of the live load is often recommended by Paterson. A post-development groundwater lowering of 0.5 m was assumed.

Due to the presence of the silty clay deposit, a permissible grade raise restriction of **1.0 m** is recommended for grading at the subject site.

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

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class X_E** in accordance with the Ontario Building Code (OBC) 2024 for foundations considered at this site. The soils underlying the site are not susceptible to liquefaction. Reference should be made to the latest revision of the OBC 2024 for a full discussion of the earthquake design requirements.

5.5 Basement Floor Slab

With the removal of all topsoil and deleterious fill from within the footprint of the proposed buildings, the undisturbed, compact silty sand or undisturbed, stiff silty clay will be considered an acceptable subgrade on which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Types I or II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slabs.

It is recommended that the upper 200 mm of subfloor fill underlying the basement slabs consist of 19 mm clear crushed stone.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5 K_o \cdot \gamma \cdot H^2$, where $K = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\} / P_{AE}$$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2024.

5.7 Pavement Design

For design purposes, the pavement structures presented in Table 5 and 6 below are recommended for the design of driveways, car only parking areas, access lanes, and local roadways.

Table 5 - Recommended Pavement Structure – Driveways and Car Only parking Areas	
Thickness (mm)	Material Description
50	Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete
150	BASE - OPSS Granular A Crushed Stone
300	SUBBASE - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Table 6 - Recommended Pavement Structure – Access Lanes and 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
450	SUBBASE - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

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

7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

- Review of the Grading Plan, from a geotechnical perspective.
- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials used.
- 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

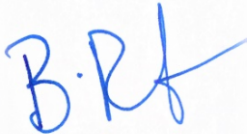
The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

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 Richcraft, 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.



Puneet Bandi, M.Eng.



Scott S. Dennis, P.Eng.

Report Distribution:

- Richcraft (Email Copy)
- Paterson Group (1 Copy)

Appendix E City of Ottawa Correspondence

E.1 Phase 1 Pre-consultation Feedback Form



February 28, 2025

Jaafar Oleiche
Richcraft Homes Ltd.
Via email: joleiche@richcraft.com

**Subject: Pre-Consultation: Meeting Feedback
Proposed ZBL and SPC Applications – 6259, 6267, 6271, 6273
Renaud Road**

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-consultation meeting held on February 20, 2025.

Pre-Consultation Preliminary Assessment

1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	5 <input type="checkbox"/>
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One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. A review of the proposal and materials submitted for the above-noted pre-consultation has been undertaken. Should you choose, proceed to complete a Phase 2 Pre-consultation Application Form. Please submit this information together with the necessary studies and/or plans to planningcirculations@ottawa.ca.
2. In your subsequent pre-consultation submission, please ensure that all comments or issues detailed herein are addressed. A detailed cover letter stating how each issue has been addressed is requested with the submission materials. Please coordinate the numbering of your responses within the cover letter with the comment number(s) herein.
3. Please note, if your development proposal changes significantly in scope, design, or density it is recommended that a subsequent pre-consultation application be submitted.

Supporting Information and Material Requirements

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified, during this phase of pre-consultation, as either required (R) or advised (A) as part of a future complete application submission.

- a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.

Consultation with Technical Agencies

1. You are encouraged to consult with technical agencies early in the development process and throughout the development of your project concept. A list of technical agencies and their contact information is enclosed.

Planning

Comments:

- 1) Site is designated as Neighbourhood within the Suburban (East) Transect
- 2) Site is split-zoned DR and I1A. Proposal is rezone to R3Z[XXXX] to permit townhouses (Back to back towns).
- 3) Western-most residential block was confirmed to be included in the ZBLA/SPC applications and a revised concept plan was provided.
- 4) Staff generally have no concerns with the proposed introduction of townhouse uses to the site; the Official Plan and Community Design Plan contemplate residential uses on the subject lands, particularly lot consolidation and development for larger residential uses.
- 5) Applicant noted that there was no current intent to provide a public access easement through the N/S open space corridor leading to the northern public trail.
 - a) Please consider providing a public access easement through this amenity space as it aligns with the crosswalk on Renaud Road and ends at the trail access at the north of the site. This is compounded by the City's request for CILP rather than land dedication. For further discussion regarding the areas to contain the easements and applicable CILP amounts, please contact Craig.hamilton@ottawa.ca and Jessica.button@ottawa.ca.
- 6) Applicant noted a relief requirement for the distance between front walls of dwellings and the sidewalk: waiving of the minimum visitor parking space requirement is based on the ability to accommodate a legal parking space in the driveway of the dwelling. Please ensure this is accommodated (and dimensioned), at minimum. The City has an interest in ensuring appropriate soft landscaping area and tree planting in front yards- Ensure that adequate space for both is provided when designing the reduced front yards and provide a rationale as to the need for the relief.

- a) Please note that the site is currently I1A and open space and planting aligning with that typically provided on an Institutional site is strongly preferred.
- 7) Street trees and tree planting along the private way (where feasible) are requested and will be reviewed by the City
- 8) Staff note that while multiple private approaches are not preferred on the ROW, this design is consistent with the existing neighbourhoods in the area, and the alternative of removing private accesses and accommodating the parking in a surface lot interior to the site severely impacts the amount of soft landscaping and amenity area.
- 9) For Reference: Area 4 of the Community Design Plan (CDP) expects 25 units/net ha can be supported due to the proximity of significant natural features and environmental conditions. Other areas of the CDP are anticipated to develop with 29 units/net ha and 35 units/net ha. Current proposed density is 57 du/net ha (entire site).
 - a) The applicant noted that proposed densities are 31 du/net ha within Area 4 and 43du/net ha outside of Area 4.
- 10) Section 37 requirements and/or Community Benefits Charge
 - a) The former Section 37 regime has been replaced with a “Community Benefits Charge”, [By-law No. 2022-307](#), of 4% of the land value. This charge will be required for ALL buildings that are 5 or more storeys and 10 or more units and will be required at the time of building permit unless the development is subject to an existing registered Section 37 agreement. Questions regarding this change can be directed to Ranbir.Singh@ottawa.ca.

Urban Design

Submission Requirements:

- Urban Design Brief – can be a part of planning rationale at rezoning
- Site Plan
- Landscape Plan (conceptual for rezoning)
- Elevations (for site plan)

Preliminary Design Comments:

- 11) An Urban Design Brief will be required as part of a complete application. Please see the

- 12) attached Terms of Reference for requirementsThe ample open space and amenity is appreciated.
- 13) Ensure that tree plantings can be provided on public roadways and along private roadways internal to the site. Sensitive Marine clays may require an increased setback to accommodate trees.
- 14) The connectivity to the MUP is appreciated. A public access easement is recommended to provide connection from the PXO/School to the larger open space area.
- 15) Drive aisles should be screened with landscaping from the properties to the west and from the open space to the rear.
- 16) Look for opportunities to maintain existing trees at the rear of the site and on Renaud Road.
- 17) Elevations should address public roadways.

Please feel free to contact Lisa Stern, Urban Designer, for any additional questions.

Engineering

Comments:

Water

- 18) Watermain looping is recommended for 50 or more dwellings to avoid creating a vulnerable service area. District Metering Area (DMA) Chamber(s) are required for private developments serviced by a connection 150 mm or larger or when there are two or more private connections to the public watermain. Refer to the City of Ottawa Water Distribution Guidelines.
- 19) Please be advised that capacity of the existing system will be determined after Water Boundary conditions are requested. Water Boundary condition requests must be submitted to the City Project Manager, Development Review by the civil design engineer or consultant prior to submission and include the following information:
 - 20) The location of the service and the expected water demand of the proposed development shown on a plan, figure, or map;
 - a) Type of development;
 - b) Average daily demand: ___ l/s;
 - c) Maximum daily demand: ___l/s;

- d) Maximum hourly daily demand: ____ l/s;
- 21) Required fire flow and completed FUS Design Declaration if applicable;
- 22) Supporting Calculations for all demands listed above and required fire flow as per Ontario Building Code or Fire Underwriter Surveys (See technical Bulletin ISTB-2021-03;
- 23) Watermain system analysis demonstrating adequate pressure as per section 4.2.2 of the Water Distribution Guidelines;
- 24) Demonstrate adequate hydrant coverage for fire protection. Please review Technical Bulletin ISTB-2018-02, Appendix I Table 1 – maximum flow to be considered from a given hydrant;
- 25) Show proposed emergency route (to be satisfactory to Fire Services).
- 26) Water metering requirements need to be confirmed through circulation of the water metering group at the City.

Sanitary Sewers

- 27) Confirm available capacity to receive additional flows in the receiving sewers.
- 28) A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use by-law for details.
- 29) Provide pre and post CCTV of the sanitary trunk sewer as per City Standard CCTV spec S.P. F-4090.
- 30) Provide an analysis to demonstrate that there is adequate residual capacity in the receiving and downstream wastewater system to accommodate the proposed development.
- 31) Please apply the wastewater design flow parameters in Technical Bulletin PIEDTB-2018-01.
- 32) A maintenance hole is required to be installed over the public sewer where private sewer connection to the public sewer exceeds 50% of the public sewer diameter. If a maintenance hole is proposed to be installed over existing City infrastructure, clearly indicate on the design drawings the applicable Standard City Drawing. For example, S12.1 or doghouse structure / S12.2, etc.

Stormwater Management

- 33) A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use by-law for details.
- 34) A maintenance hole is required to be installed over the public sewer where private sewer connection to the public sewer exceeds 50% of the public sewer diameter.
- 35) If a maintenance hole is proposed to be installed over existing City infrastructure, clearly indicate on the design drawings the applicable Standard City Drawing. For example, S12.1 or doghouse structure / S12.2, etc.

Stormwater Quality

- 36) Characterize the water quality to be protected and Stormwater Contaminants (e.g., suspended solids, nutrients, bacteria, water temperature) for potential impact on the Natural Environment, and control as necessary; OR As per the MSS, watershed/subwatershed plan, similar area-wide Stormwater study, or Stormwater management plan to minimize, or where possible, prevent increases in Contaminant loads and impacts to receiving waters.
- 37) Provide Enhanced level of protection (80%) for suspended solids removal.
- 38) OGS unit shall be ISO 14034 Environmental Technology Verification (ETV) certified.

Stormwater Quantity

- 39) Servicing and Stormwater Management as per East Urban Community CDP and Gloucester EUC Infrastructure Servicing Study (release rate to 85 l/s/ha)
- 40) Time of concentration (Tc) to be calculated, min Tc = 10mins
- 41) The allowable release rate is to be computed using the lesser of C=0.5 or existing.

Grading and Drainage

- 42) Active coordination and grading transition encouraged with the adjacent properties to reduce reliance on retaining walls
- 43) No retaining walls especially within or along public ROW - ensure grading design accounts for the transition rather than retaining walls.

44) Permissible ponding of 350mm for 100-year. No spilling to adjacent sites. At 100-year ponding elevation, you must spill to the ROW. 100-year Spill elevation must be 300mm lower than any building opening or ramp.

45) Consider Pedestrian Accessibilities at max 5%.

Geotechnical and Slope Stability

46) Sensitive Marine Clay (SMC) is widely found across Ottawa- geotechnical reports should include Atterberg Limits, consolidation testing, sensitivity values, and vane shear test. Refer to City of Ottawa Geotechnical and Slope Stability Guidelines.

47) Due to the close proximity of the site to the **Mud Creek** watercourse, refer to existing floodplain studies to confirm **development setbacks**.

Additional Engineering Notes

48) Sanitary, storm and water servicing stubs are available along Compass Street, so I suggest servicing the property from Compass Street.



- 49) The following studies are attached for your reference:
- a) Mud Creek Cumulative Impact Study prepared by Stantec Consulting Ltd. and JTB Environmental Systems dated May 5, 2020
 - b) The Design Brief for the Trails Edge West Richcraft Group of Companies prepared by DSEL dated January 26, 2015, Revision 3
- 50) No road moratorium that would impact the application has been identified.
- 51) Any future road widening setbacks, existing easements or proposed easements should be shown on all plans. Proposed infrastructure shall not be located within setbacks.
- 52) For any proposed exterior light fixtures, please provide certification from a licensed professional engineer confirming lighting has been designed only using fixtures that meet the criteria for full cut-off classification as recognized by the

Illuminating Engineering Society of North America and result in minimal light spillage onto adjacent properties (maximum allowable spillage is 0.5 fc). Additionally, include in the submission the location of the fixtures, fixture type (make, model, part number and mounting height).

53) Sewer connections to be made above the springline of the sewermain as per:

- a) Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
- b) Std Dwg S11 (For rigid main sewers) – lateral must be less than 50% the diameter of the sewermain,
- c) Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less than 50% the diameter of the sewermain,

54) Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

55) No submerged outlet connections.

Minimum Drawing and File Requirements

56) Plans are to be submitted on standard A1 size (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500).

57) With all submitted hard copies provide individual PDF of the DWGs and for reports please provide one PDF file of the reports. All PDF documents are to be unlocked and flattened.

Drawings, Plans and geoOttawa

58) Record drawings, utility plans and/or LIDAR information are also available for purchase from the City (Contact the City's Information Centre by email at geoinformation@ottawa.ca or by phone at (613) 580-2424 x.44455.

59) Please refer to GeoOttawa with the Water and Wastewater Infrastructure layer turned on to determine what servicing is available for this site: <https://maps.ottawa.ca/geooottawa/>.

For information on preparing required studies and plans refer to:

- a) Planning application submission information and materials | City of Ottawa;

- b) Ottawa Sewer Design Guidelines (October 2012);
- c) Ottawa Design Guidelines – Water Distribution (2010);
- d) Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007);
- e) City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012);
- f) City of Ottawa Environmental Noise Control Guidelines (January, 2016);
- g) City of Ottawa Park and Pathway Development Manual (2012);
- h) City of Ottawa Accessibility Design Standards (2012);
- i) Ottawa Standard Tender Documents (latest version);
- j) Please refer to other applicable Guidelines (provincial and federal);
- k) Site Alteration (By-law No. 2018-164) | City of Ottawa;
- l) Sewer Connection (By-law No. 2003-513) | City of Ottawa;
- m) Sewer Use (By-law No. 2003-514) | City of Ottawa;
- n) Building (By-law No. 2014-220) | City of Ottawa;
- o) Community Benefits Charge By-law (By-law No. 2022-307) | City of Ottawa;
- p) Delegation of Authority (By-law No. 2023-67) | City of Ottawa;
- q) Encroachments on City Highways (By-law No. 2003-446) | City of Ottawa;
- r) Fence (By-law No. 2003-462) | City of Ottawa;
- s) Fire Routes (By-law No. 2003-499) | City of Ottawa;
- t) Integrated Orléans Community Improvement Plan (By-law No. 2021-284) | City of Ottawa;
- u) Integrated Orléans Community Improvement Plan (By-law No. 2021-285) | City of Ottawa;
- v) Montreal Road Community Improvement Plan (By-law No. 2019-224) | City of Ottawa;

- w) Montreal Road Community Improvement Plan Area (By-law No. 2019-213) | City of Ottawa;
 - x) Noise (By-law No. 2017-255) | City of Ottawa;
 - y) Private Approach (By-law No. 2003-447) | City of Ottawa;
 - z) Road Activity (By-law No. 2003-445) | City of Ottawa;
 - aa) Site Plan Control (By-law No. 2014 - 256) | City of Ottawa;
 - bb) Tree Protection (By-law No. 2020-340) | City of Ottawa;
 - cc) Water (By-law No. 2019-74) | City of Ottawa;
 - dd) Zoning (By-law No. 2008-250) | City of Ottawa;
- 60) Please contact Alex Polyak, Infrastructure Project Manager, for questions regarding engineering.
- 61) Please consider these comments in combination with comments you receive from other technical groups, agencies and the public. Contact me if it is necessary to resolve any conflicting comments.
- 62) “Please provide a resubmission which addresses each of the comments or issues listed above. **A cover letter must also be included that states how each provided comment was addressed in the resubmission. Please coordinate the numbering of each resubmission comment, or issue, with the above noted comment number.**”
- 63) All addenda or revisions to any studies, or plans, must be accompanied by a *.pdf copy (either by CD or e-mail).”

Feel free to contact Alex Polyak, Project Manager [Select Position](#), for follow-up questions.

Noise

Comments:

- 64) A road noise study is required.

Feel free to contact Mike Giampa, TPM, for follow-up questions.

Transportation

Comments:

- 65) Right-of-way protection (Renaud Road).
- a) See [Schedule C16 of the Official Plan](#).
 - b) Any requests for exceptions to ROW protection or corner triangle requirements must be discussed with Transportation Planning and concurrence provided by Transportation Planning management.
- 66) Corner sight triangle for two Renaud Road intersections: 3m x 9m with the longer dimension along the collector road.
- 67) A complete TIA is not warranted but a transportation memo is recommended. The memo should highlight key aspects of the site including vehicle trip generation, proposed mode shares, turning movements and left-turn warrants for the two private approaches.

Feel free to contact Mike Giampa, Transportation Project Manager, for follow-up questions.

Environment

Comments:

68) Due to the existing zoning at the rear of the subject lands, no Environmental Impact Statement/Study (EIS) shall be required. The rear of 6267 Renaud is zoned Parks and Open Space (OR1), and the rear of 6271 Renaud is zoned OR1 and Environmental Protection (EP). The existing zoning lists permitted uses as environmental preserve and education area, as well as forestry operations on OR1 and EP.

With the above said, most of the OR1 and EP appear to be in public ownership, whereas the rear portions of 6267 Renaud and 6271 Renaud appear to be in private ownership. It would be nice to have the OR1 and EP portions of those lands dedicated to the city for protection and continuity.

69) According to the MNR Natural Heritage Information Centre (NHIC), endangered Butternut trees may be present in this general area. A landscape plan must be submitted and ensure the existing tree species and the proposed tree species are identified. Any new plantings (including plant species) should be local species, and any identified SAR may require further evaluation as per the Endangered Species Act and in coordination with MOECP.

70) The city strives for an urban forest canopy cover of 40% while also using native tree plantings to help achieve that long-term goal. The target aims to improve health and wellbeing, climate resiliency, etc. More trees and Low Impact Development (LID) strategies are welcome, where feasible on the site.

71) Please refer to the city's Bird Safe-Design Guidelines early in the development stage to ensure safe design and landscaping elements can be incorporated with those risks and avoidance measures in mind.

Feel free to contact Kimberley MacDonald, Environmental Planner, for follow-up questions.

Forestry

Comments:

72) A Tree Conservation Report and Landscape Plan are submission requirements.

73) The conceptual site plan does a good job of providing greenspace that overlaps with areas of tree retention potential.

- a) Tree retention over removal and replacement is a priority under the Official Plan (Section 4.8.2, policy 3,d).
- b) Ensure the distance between these greenspace areas and the proposed buildings align with the Geotechnical Investigation.
- c) Prioritize the placement of large canopy tree species throughout the site and especially in the greenspaces adjacent the northern property line

74) Provide street tree planting on public and private roads. Refer to Section 4.1.3 of the Official Plan, 6.1.1 of the CDP, and 4.3 policy 18 (i) of the East Urban Community Secondary Plan.

- i) There are no overhead wires observed so large canopy trees should be planted along the public streets if sensitive soil implications don't apply.

75) Removal and replacement of the hackberry trees in the Right of Way along Compass is anticipated.

76) **Tree Conservation Report requirements. The following Tree Conservation Report (TCR) requirements have been adapted from the Schedule E of the Urban Tree Protection Guidelines – for more information on these requirements please contact hayley.murray@ottawa.ca**

- A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
- Any tree 10 cm in diameter or greater and City-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.

- The TCR must contain 2 separate plans/maps:
- Plan/Map 1 - show existing conditions with tree cover information.
- Plan/Map 2 - show proposed development with tree cover information.
- The TCR must list all trees on site, as well as off-site trees if the CRZ (critical root zone) extends into the developed area, by species, diameter, and health condition. Please note that averages can be used if there are forested areas.
- Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.
- The removal of trees on a property line will require the permission of both property owners.
- All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
- The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
- Removal of a City tree is not permitted unless justified. If justified, monetary compensation for the value of the tree must be paid before a tree removal permit is issued.

77) Landscape Plan (LP) requirements.

78) Landscape Plan Terms of Reference must be adhered to for all tree planting: [Click Here](#). For more information on these requirements please contact hayley.murray@ottawa.ca

79) Additional Elements for Tree Planting in the Right of Way:

- Please ensure any retained trees are shown on the LP
- Sensitive Marine Clay - Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines.
- Soil Volume - Please demonstrate as per the Landscape Plan Terms of Reference that the available soil volumes for new plantings will meet or exceed the minimum soil volumes requested.
- The city requests that consideration be given to planting native species wherever there is a high probability of survival to maturity.
- Efforts shall be made to provide as much future canopy cover as possible at a site level, through tree planting and tree retention. The Landscape Plan shall show/document that the proposed tree planting and retention will contribute to the City's overall canopy cover over time. Please provide a projection of the future canopy cover for the site to 40 years

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.
- Maintain 2.5m from curb

- Coniferous species require a minimum 4.5m setback from curb, sidewalk, or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and if possible, include watering and warranty as described in the specification.
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Feel free to contact Hayley Murray, Planning Forester, for follow-up questions.

Parkland

Comments:

- 80) Cash-in-lieu of parkland / parkland dedication
 - a. Parkland Dedication [By-law No. 2022-280](#)
- 81) Provide a breakdown of past parkland dedication as it relates to the site and draft parkland dedication calculation for cash in lieu of parkland dedication.
- 82) Given the site's proximity to parkland, proposed connectivity to the pathway system, and amenity space on site, PFP is willing to consider cash in lieu of parkland dedication. Note that if the proposed density or layout changes, this comment may change.
- 83) The pathway extending to the north, and connection to the Mud Creek Trail is a desirable location for a public access easement.

Feel free to contact Jessica Button, Parks Planner, for follow-up questions.

Conservation Authority

Comments:

- 84) To be provided under separate cover.

Feel free to contact Insert Name, Rideau Valley Conservation Authority, for follow-up questions.

Other

- 85) Under the Affordable Housing Community Improvement Plan, a Tax Increment Equivalent Grant (TIEG) program was created to incentivize the development of affordable rental units. It provides a yearly fixed grant for 20 years. The grant helps offset the revenue loss housing providers experience when incorporating affordable units in their developments.
- a) To be eligible for the TIEG program you must meet the following criteria:
 - i) the greater of five units OR 15 per cent of the total number of units within the development must be made affordable
 - ii) provide a minimum of 15 per cent of each unit type in the development as affordable
 - iii) enter into an agreement with the city to ensure the units maintain affordable for a minimum period of 20 years at or below the city-wide average market rent for the entire housing stock based on building form and unit type, as defined by the Canada Mortgage and Housing Corporation
 - iv) must apply after a formal Site Plan Control submission, or Building Permit submission for projects not requiring Site Plan Control, and prior to Occupancy Permit issuance
 - b) Please refer to the TIEG information at [Affordable housing community improvement plan / Plan d'améliorations communautaires pour le logement abordable](#) for more details or contact the TIEG coordinator via email at affordablehousingcip@ottawa.ca.
- 86) Other concerns or comments

Submission Requirements and Fees

1. Major Zoning By-law Amendment and Site Plan Control applications
 - a. Additional information regarding fees related to planning applications can be found [here](#).
2. The attached **Study and Plan Identification List** outlines the information and material that has been identified as either required (R) or advised (A) as part of a future complete application submission.
 - a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and



Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.

3. All of the above comments or issues should be addressed to ensure the effectiveness of the application submission review.

Should there be any questions, please do not hesitate to contact myself or the contact identified for the above areas / disciplines.

Yours Truly,
Colleen Ivits

Encl. Study and Plan Identification List

Technical Agencies

Urban Design Brief

c.c. Kim Macdonald
Lisa Stern
Mike Giampa
Alex Polyak
Craig Hamilton
Kelly Livingstone
Jessica Button
Hayley Murray
Amy MacPherson

E.2 Permitted ROW Service Connections



From: [Jaafar Oleiche](#)
To: [Gillis, Sheridan](#)
Subject: FW: 6259 Renaud Road - Pre-application Consultation (PC2025-0018)
Date: Wednesday, January 14, 2026 2:54:54 PM
Attachments: [image001.jpg](#)
[image002.png](#)
[image003.jpg](#)
[image004.jpg](#)
[image005.jpg](#)
[image006.png](#)
[image007.png](#)
[image008.png](#)

FYI this is a previous correspondence with the city allowing for the connection of water services to Renaud Rd.



Jaafar Oleiche

Project Manager - Land Development

2280 St. Laurent Blvd. Suite 201

Ottawa, ON, K1G 4K1

P 613.739.7111 x 169 | **C** 905.966.7697

joleiche@richcraft.com | richcraft.com |

From: Polyak, Alex <alex.polyak@ottawa.ca>
Sent: Thursday, March 13, 2025 3:59 PM
To: Virginia Johnson <vjohnson@lrl.ca>
Cc: Hamilton, Craig <craig.hamilton@ottawa.ca>; Livingstone, Kelly <kelly.livingstone@ottawa.ca>;
Stephane Godin <SGodin@lrl.ca>; Haynes, Kris <Kris.Haynes@ottawa.ca>; Maxime Longtin
<mlongtin@lrl.ca>; Miguel Tremblay <tremblay@fotenn.com>; Jaafar Oleiche
<joleiche@richcraft.com>; Nico Church <church@fotenn.com>
Subject: RE: 6259 Renaud Road - Pre-application Consultation (PC2025-0018)

You don't often get email from alex.polyak@ottawa.ca. [Learn why this is important](#)

Good afternoon Virginia,

We reviewed your proposal in detail and should highlight a few things:

- The example you shared from Riverside South should not be taken out of context as the decisions that were made on that development are not a precedent to the decisions being made on this proposed development.
- We have discussed internally about the 19mm water service connections to the units fronting the ROW, and engineering will be supportive of these connections so long as there will be room for landscaping and trees and the impact to Traffic during construction is reduced. Note that trenchless installation may be required to reduce the impact to the community during construction.

- Regarding the units facing Melodie Street, only the units facing Melodie Street would be permitted connection to the ROW. Note that the full length from road-cut to road-cut would need to be resurfaced.

Happy to discuss with you further if you have follow-up questions or comments.

Regards,

Oleksandr (Alex) Polyak, B.Eng., C.E.T., P.Eng. 

Project Manager, Infrastructure Approvals, Development Review East Branch | Gestionnaire de projet, Direction de l'examen des projets d'aménagement – Est.

Planning, Development and 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., 4th Fl East, Ottawa ON K1P 1J1

Email: alex.polyak@ottawa.ca

Cell : 613-857-4380

www.Ottawa.ca



Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Virginia Johnson <vjohnson@lrl.ca>

Sent: March 12, 2025 4:49 PM

To: Polyak, Alex <alex.polyak@ottawa.ca>

Cc: Hamilton, Craig <craig.hamilton@ottawa.ca>; Livingstone, Kelly <kelly.livingstone@ottawa.ca>;
Stephane Godin <SGodin@lrl.ca>; Haynes, Kris <Kris.Haynes@ottawa.ca>; Maxime Longtin
<m-longtin@lrl.ca>; Miguel Tremblay <tremblay@fotenn.com>; Jaafar Oleiche
<joleiche@richcraft.com>; Nico Church <church@fotenn.com>

Subject: RE: 6259 Renaud Road - Pre-application Consultation (PC2025-0018)

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Hello Alex,

Thanks for meeting with us yesterday and the summary you provided below.

The intention of the meeting was to discuss the challenges we for see with the servicing if this was to

be reviewed as a traditional a planned unit development.

We have reviewed the historic design and construction of Hennessy Court in Riverside South (attached) as it is a similar product and has some similar characteristics. For this development, the 19mm water connection for each of the units facing the municipal ROW was tied directly into the watermain in the street. Due to separation requirements and layout constraints, we would be looking to have a very similar design concept on the Renaud Road Project to the previously approved Hennessy Court.

I understand this is not typical for a PUD, and would be looking for a deviation acceptance for stand alone water connections for units fronting Renaud. We would be able to service the sanitary and storm internally utilizing the existing stub's to the property for the majority of the units, with the Exception of the unit's Facing Melodie street. Attached to this e-mail is conceptual layout of what this would look like.

To support this product with active frontage on Renaud, and accommodate the future road widening, we would like to better understand the opportunities for acceptance of the individual water service connections.

Happy to meet to discuss further, and understand if there were any specific challenges that City's team had with the Hennessy Court project.

Thank you,
Virginia Johnson, P.Eng
Civil Engineering Manager/Associate

Please Note: I'll be out of the office on Friday, March 14th.



Head Office – 5430 Canotek Rd., Ottawa, ON

C +1 613-915-9503 **E** vjohnson@lrl.ca

Ottawa | Pembroke | Moncton

www.lrl.ca

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E.3 Stormwater Criteria Confirmation



From: [Giovannitti, Terenzo](#)
To: [Gillis, Sheridan](#)
Cc: [Polyak, Alex](#); [Livingstone, Kelly](#); [Jaafar Oleiche](#); [Thiffault, Dustin](#); [Haynes, Kris](#)
Subject: RE: Trailsedge West – Block 121: Transfer of File and Request for Criteria Confirmation
Date: Monday, February 2, 2026 10:59:01 AM
Attachments: [image001.png](#)

Hi Sheridan,

This is to confirm you can revise the stormwater quantity control criteria to the originally modelled release rates in the phase 2 report. Please provide excerpts from the report to support the design. You may proceed with the parameters you've identified in your item 2 below.

As for your item 3, the EUC pond 1 provides quality treatment. Therefore, any flows generated on-site travelling to this pond are covered and do not need on-site quality control measures. Please provide excerpts from high level reports to support this design.

Regards,
Terenzo Giovannitti, P.Eng
Project Manager
Development Review
Planning, Development and Building Services Department
City of Ottawa
110 Laurier Ave W. Ottawa, ON
613-580-2424 (ext. 23436)
terenzo.giovannitti@ottawa.ca

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Gillis, Sheridan <Sheridan.Gillis@stantec.com>
Sent: January 29, 2026 2:19 PM
To: Giovannitti, Terenzo <terenzo.giovannitti@ottawa.ca>
Cc: Polyak, Alex <alex.polyak@ottawa.ca>; Livingstone, Kelly <kelly.livingstone@ottawa.ca>; Jaafar Oleiche <joleiche@richcraft.com>; Thiffault, Dustin <dustin.thiffault@stantec.com>
Subject: RE: Trailsedge West – Block 121: Transfer of File and Request for Criteria Confirmation

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Hi Terenzo,
No problem, the IBI report is attached. See page 88 for minor system flow restrictions as modeled. Storm Drainage Plans and Design Sheet are also included on pages 82-84.

If there's anything else you need, just let us know.
Cheers,

Sheridan Gillis
Project Manager, Community Development
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4

Phone: (613) 799-1363
sheridan.gillis@stantec.com



Design with community in mind

From: Giovannitti, Terenzo <terenzo.giovannitti@ottawa.ca>
Sent: Thursday, January 29, 2026 10:20 AM
To: Gillis, Sheridan <Sheridan.Gillis@stantec.com>
Cc: Polyak, Alex <alex.polyak@ottawa.ca>; Livingstone, Kelly <kelly.livingstone@ottawa.ca>; Jaafar Oleiche <joleiche@richcraft.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: RE: Trailsedge West – Block 121: Transfer of File and Request for Criteria Confirmation

You don't often get email from terenzo.giovannitti@ottawa.ca. [Learn why this is important](#)

Hi Sheridan,

Please provide me with a copy of the reports you referenced so that I can verify your request to alter the SWM controls.

Thanks,
Terenzo Giovannitti, P.Eng
Project Manager
Development Review
Planning, Development and Building Services Department
City of Ottawa
110 Laurier Ave W. Ottawa, ON
613-580-2424 (ext. 23436)
terenzo.giovannitti@ottawa.ca

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Gillis, Sheridan <Sheridan.Gillis@stantec.com>
Sent: January 27, 2026 4:17 PM
To: Giovannitti, Terenzo <terenzo.giovannitti@ottawa.ca>
Cc: Polyak, Alex <alex.polyak@ottawa.ca>; Livingstone, Kelly <kelly.livingstone@ottawa.ca>; Jaafar Oleiche <joleiche@richcraft.com>; Thiffault, Dustin <dustin.thiffault@stantec.com>
Subject: Trailsedge West – Block 121: Transfer of File and Request for Criteria Confirmation

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Hi Terenzo,
I'm writing to let you know that Stantec will be taking over the civil engineering and stormwater management design for the Trailsedge West Block 121 development on behalf of Richcraft, replacing LRL Associates as the engineer of record. We've begun our review of the previous submissions and supporting background material, and as we move forward, there are a few items we'd like to confirm with the City to ensure we are applying the correct design criteria.

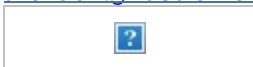
1. We have updated the fire flow requirements for the site based on revised FUS calculations. This results in the need for new hydraulic boundary conditions. Ziyi Wang from our office will follow up shortly with the formal request and supporting information for those updated fire flow demands
2. We would appreciate confirmation of the appropriate stormwater quantity control criteria for the block. The prior submissions applied an 85 L/s/ha release rate, but our review indicates that this value may not reflect the servicing assumptions originally established for Trailsedge West Phase 1. Although an 85L/s/ha discharge rate is noted on later design reports for Phases 2 and lands east of Compass Street, this rate relates to contemplated residential areas within Phase 1. The development site was previously intended for use as an institutional block, and maintained a different level of stormwater controls per the Phase 1 report. Background modeling as prepared by IBI group for the site referenced as Area 21 and 410F to MH409/Renaud Road MH410C identifies a peak allowable discharge rate of 175L/s + 110L/s with major system flows directed uncontrolled to Mud Creek. Additionally this area did not include the entirety of the Block 121 development as there is additional area added to the block adjacent to Melodie street which was provided with an 85 l/s/ha residential rate in the Phase 1 report. We would like to request revised stormwater criteria given the information in the Phase 1 report and think that the release rate would be a combination of those identified for Areas 21 and 410F and the 85 l/sec/ha for additional block lands.
3. We would also like to confirm the requirements for stormwater quality control. Based on the subdivision-level stormwater strategy, Block 121 drains to EUC Pond 1, which provides the quality treatment for this area. Our understanding is that on-site quality measures (such as an OGS unit) should not be required, consistent with surrounding developments. Please let us know if the City still considers Pond 1 to be providing the required treatment for this block.

If you prefer to discuss any of this in a brief call, we are happy to do so. Otherwise, any clarification you can provide on the quantity and quality control targets would be much appreciated. Ziyi will follow shortly with the hydraulic boundary condition request.

Thanks,

Sheridan Gillis

Project Manager, Community Development
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: (613) 799-1363
sheridan.gillis@stantec.com



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