Mattamy Northwoods Block 454 (Phase 6)

Site Servicing and Stormwater Management Report

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Prepared for:
Mattamy Homes Ltd.

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1 Introduction

Mattamy Homes Ltd. has commissioned Stantec Consulting Ltd. to prepare the following Site Servicing and Stormwater Management Report for the Kanata Northwoods Subdivision Block 454 site plan development. The subject property is located at the northwest parcel of the Kanata Northwoods subdivision, east of March Road in the Kanata North neighbourhood within the City of Ottawa.

The block is currently zoned as General Mixed-Use GM15 [3021] and measures approximately 1.09 ha in area. The site is bordered by Linseed Road to the south, March Road to the west, existing residential development to the north, and residential development which is part of Phase 1 of the Northwoods Subdivision to the east.

The proposed development is comprised of three (3) back-to-back stacked townhouse blocks and a mixed-used apartment block with commercial space on the ground floor, for a total of 48 townhouse units, 24 apartment units, 705 m^2 of commercial retail space, and associated private streets. 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, utilizes the existing local infrastructure in accordance with the various background studies including the Mattamy Northwoods Subdivision Servicing and Stormwater Management Report, as outlined in Section 2.

Figure 1.1: Location of Northwoods Block 454

2 Background

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

- *Mattamy Northwoods Subdivision Servicing and Stormwater Management Report,* Stantec Consulting Ltd., Rev. 05, February 25, 2025
- *Geotechnical Investigation, Proposed Residential Development 1020 and 1070 March Road, Ottawa, Paterson Group Inc., Rev. 03, August 20, 2022*
- *Kanata North Master Servicing Study, Novatech, June 28, 2016*
- *Stormwater Management Planning and Design Manual,* Ministry of the Environment (Ontario), March 2003
- *Ottawa Design Guidelines – Water Distribution,* City of Ottawa, July 2010, and all subsequent Technical Bulletins
- *City of Ottawa Sewer Design Guidelines, 2nd Ed.,* City of Ottawa, October 2012, and all subsequent Technical Bulletins

3 Water Servicing

3.1 Background

The Mattamy Northwoods development is within Pressure Zone 2W2C of the City of Ottawa's water distribution system. As part of the detailed design of the Mattamy Northwoods subdivision, a water hydraulic analysis was completed to demonstrate that the water distribution network for the subdivision would adequately meet the domestic and fire supply requirements for the future development blocks. Results are documented in the Mattamy Northwoods Subdivision Servicing and SWM Report (Stantec, February 2025). Block 454 will be serviced by the 300 mm diameter municipal watermain in Linseed Road that was constructed as part of the Kanata Northwoods subdivision development.

3.2 Design Criteria

3.2.1 Water Demand and Allowable Pressure

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

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

3.2.2 Fire Flow and Hydrant Capacity

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

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

3.3 Water Demands

3.3.1 Domestic Water Demands

The City of Ottawa Water Distribution Guidelines (July 2010) and ISTB 2021-03 Technical Bulletin were used to determine water demands based on projected population densities for residential dwellings and associated peaking factors. The population was estimated using an occupancy of 1.8 persons per unit for apartments and 2.7 persons per unit for the townhouses. Based on the unit type breakdown for the overall site, the development is estimated to have a total population of 173. A daily rate of 280 L/cap/day has been used to estimate average daily (AVDY) potable water demand for the residential units and 28,000 L/ha/day for the commercial area. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and 1.5 for commercial areas, while peak hourly (PKHR) demands were determined by multiplying the MXDY by a factor of 2.2 for residential areas and 1.8 for commercial areas. The estimated demands for the site are summarized in **Table 3.1** and detailed in **Appendix A.1**.

Table 3.1: Estimated Water Demands

No. of Units	Population	Commercial Area (ha)	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
72	173	0.071	0.6	1.4	3.1

3.3.2 Fire Flow Demands

Wood frame construction was considered in the assessment for fire flow requirements according to the Fire Underwriter's Survey (FUS) Guidelines. The FUS Guidelines indicate that low hazard occupancies include dwellings, apartments, dormitories, hotels, and schools. As such, except for Building C, a limited combustible building contents credit was applied for the townhomes. Based on the FUS 2020 methodology in assuming the townhomes to be wood frame, limited combustible, and not sprinklered, the worst-case required fire flows at the site is 16,000 L/min (267 L/s) for Buildings A and B.

Through correspondence with the architect, it is confirmed that the mixed-use building (Building C) will be fully sprinklered, while a combustible occupancy charge is applied. The floor immediately above the retail area will have two-hour fire resistive rating.

On site fire protection will be provided by private hydrants and existing public hydrants located with a maximum of 90 m spacing and within 90 m of all building entrances. The internal private streets have been designed with a fire route providing access to all hydrants and residential units.

The FUS calculation sheets and correspondence on the Building C construction are all attached in **Appendix A.2**.

3.3.3 Boundary Conditions

For the worst case fire flow of 267 L/s (16,000 L/min), the Mattamy Northwoods Subdivision model was run under the scenario using boundary conditions provided by the City of Ottawa to establish the pressure and flow in the main on Linseed Road in the ultimate condition. The boundary conditions used for the Block 6 site plan analysis were taken from Nodes 95 and 96 of the Northwoods Subdivision hydraulic model (Stantec, 2025), depicted in **Figure 3.1** and **Table 3.2.** Excerpts from the subdivision model are included in **Appendix A.3**.

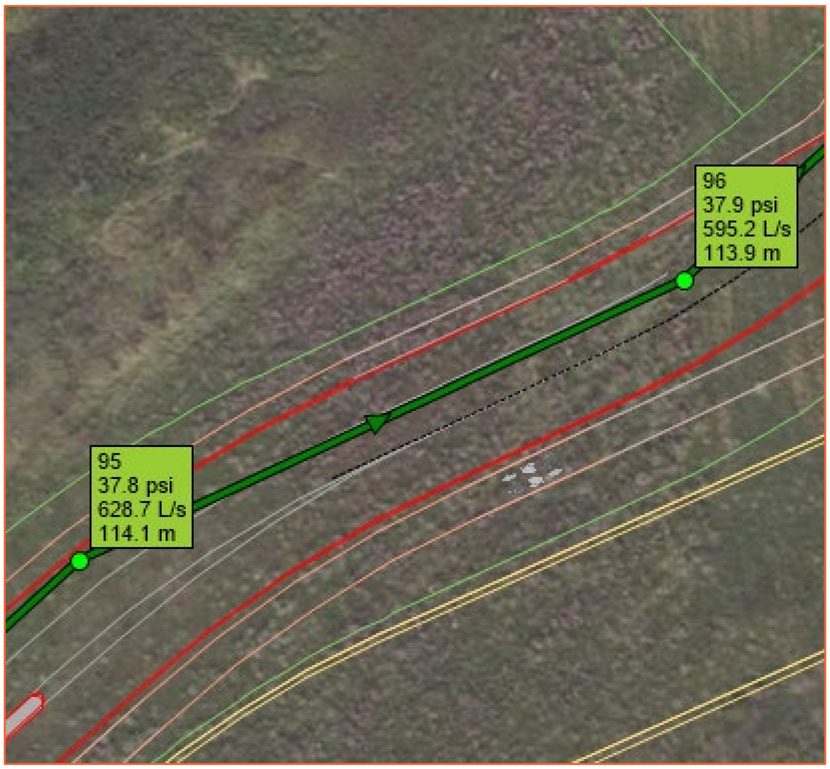


Figure 3.1: Northwoods Subdivision Nodes 95 and 96 Boundary Conditions (MXDY+267 L/s FF)

Table 3.2: Boundary Conditions at Linseed Road

Connection	Connection 1	Connection 2
Min. HGL (m)	125.0	124.9
Max. HGL (m)	130.9	130.9
MXDY+FF (267 L/s)	114.1	113.9

3.4 Proposed Watermain Servicing and Layout

The proposed watermain alignment and sizing for Block 454 has been designed to tie into the adjacent watermains within the Mattamy Northwoods subdivision development and to provide required domestic and fire flows.

Private watermains with a diameter of 200 mm are proposed within Block 454 and will be fed by the existing 300 mm diameter municipal watermain on Linseed Road. Two connections are proposed to provide redundancy should there be a need to isolate portions of the watermain on Linseed Road. **Drawing SSP-1** details the proposed private watermain design and connections.

Building D is greater than 600 m^2 in area and will require a fire wall in accordance with the Ontario Building Code (OBC). The assumed fire wall location is identified on **Drawing GP-1**. The final location will be coordinated with the Architect.

3.5 Hydraulic Assessment

3.5.1 Level of Service

The City of Ottawa Water Distribution Design Guidelines state that the desired range of system pressures under normal demand conditions (i.e. basic day, maximum day and peak hour) should be in the range of 350 to 552 kPa (50 to 80 psi) and no less than 275 kPa (40 psi) at the ground elevation in the streets (i.e. at hydrant level). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way is 552 kPa (80 psi).

As per the OBC & Guide for Plumbing, if pressures greater than 552 kPa (80 psi) are anticipated, pressure relief measures are required. The maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). Under emergency fire flow conditions, the minimum pressure objective in the distribution system is 138 kPa (20 psi).

3.5.2 Model Development

New watermains were imported 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 and as shown in **Table 3.3** below.

Table 3.3: Proposed Watermain C-Factors

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

3.6 Hydraulic Model 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 established from the subdivision model.

3.6.1 Average Day & Peak Hour

The results from the existing zone analysis show that the maximum pressure modeled for Block 454 is approximately 489 kPa (71.0 psi) and the minimum pressure during the peak hour scenario was approximately 422 kPa (61.2 psi) within the block, as shown in **Figure 3.2** and **Figure 3.3** respectively. These pressures are well above the minimum allowable pressure of 276 kPa (40 psi) and within the normal serviceable limit of 345 kPa to 552 kPa (50 psi to 80 psi).

Figure 3.2: AVDY Pressure Results

Figure 3.3: PKHR Pressure Results

3.6.2 Maximum Day Plus Fire Flow

The hydraulic model was used to assess the fire flow conditions of the proposed site. The model was run to verify if the worst-case fire flow requirement can be provided while maintaining minimum residual pressure.

Results demonstrate that flows in excess of 267 L/s can be delivered while maintaining a residual pressure of 138 kPa (20 psi) as shown in **Figure 3.4**. Results of the hydraulic modeling are included for reference in **Appendix A.4**.

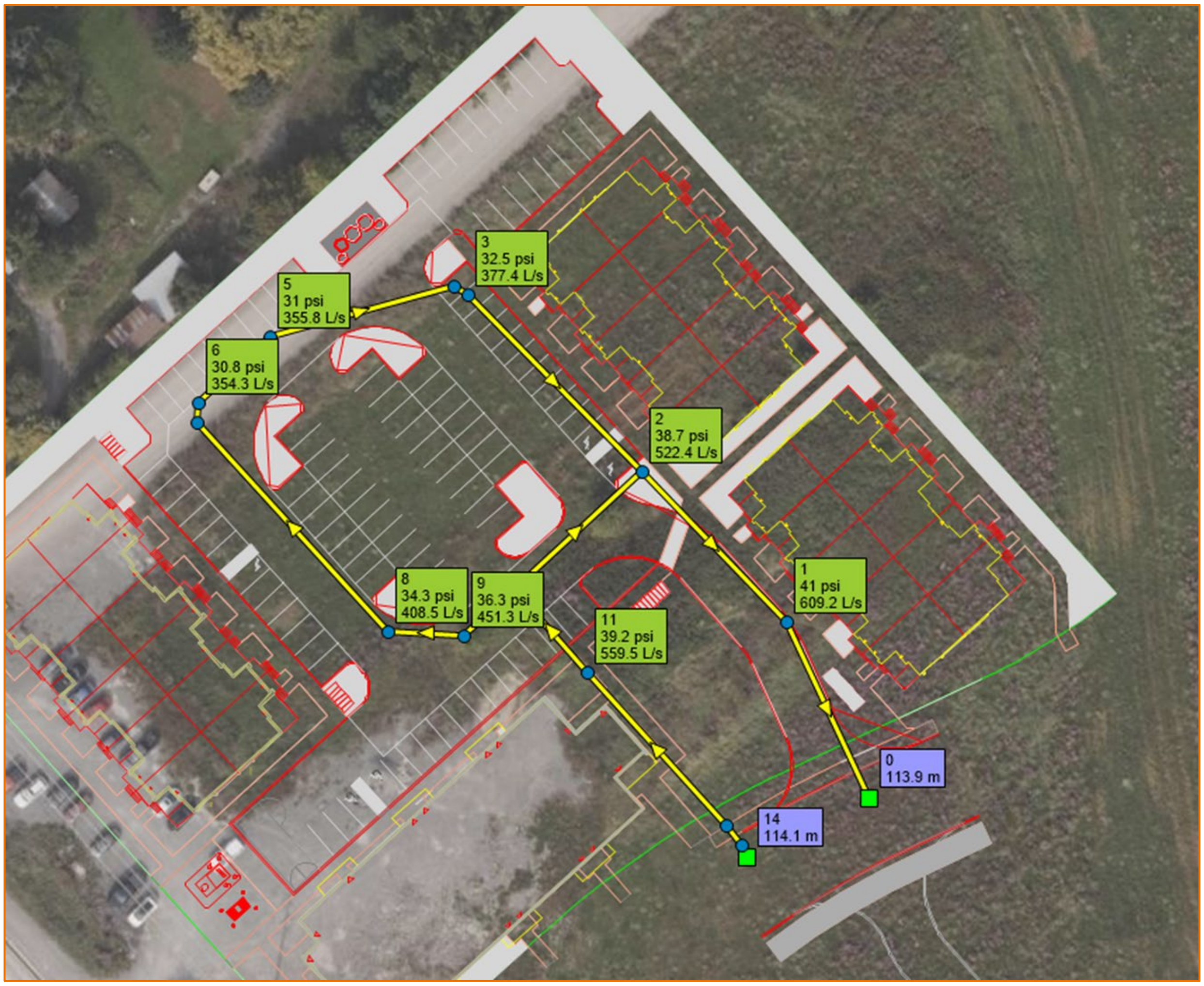


Figure 3.4: MXDY+FF Residual Pressure Results

3.6.3 Fire Hydrant Coverage

There are two fire hydrants proposed on site to deliver fire flow in the site and supplement the two existing fire hydrants on Linseed Road adjacent to the site. The full site falls under the coverage of all four hydrants, existing and proposed. 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 watermain and hydrant layout will provide all buildings with hydrant coverage exceeding their respective fire flow demands. See **Appendix A.5** for fire hydrant coverage table calculations, NFPA Table 18.5.4.3, and the fire hydrant coverage figure.

3.7 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 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 and within the site. Fire walls will be required for Building D which is over 600 m^2 in area to meet OBC requirements.

4 Wastewater Servicing

4.1 Background

The proposed development within Block 454 of the Kanata Northwoods subdivision will be serviced by the 300 mm diameter sanitary sewer in Linseed Road which directs flow from the western portion of the subdivision to March Road.

4.2 Design Criteria

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP Design Guidelines for Sewage Works, the following criteria are used to calculate the estimated wastewater flow rates and to determine the size and location of the sanitary service laterals:

- Minimum velocity = 0.6 m/s (0.8 m/s for upstream sections)
- Maximum velocity = 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes = 0.013
- Minimum size of sanitary sewer service = 135 mm
- Minimum grade of sanitary sewer service = 1.0 % (2.0 % preferred)
- Average residential wastewater generation = 280 L/person/day (per City Design Guidelines)
- Average commercial wastewater generation = 28,000 L/ha/day (per City Design Guidelines)
- Peak Factor = based on Harmon Equation; maximum of 4.0 (residential)
- Peak Factor = 1.5 (commercial)
- Harmon correction factor = 0.8
- Infiltration allowance = 0.33 L/s/ha (per City Design Guidelines)
- Minimum cover for sewer service connections = 2.0 m
- Population density for townhome units = 2.7 persons/unit
- Population density for apartment units = 1.8 persons/unit

4.3 Proposed Servicing

Block 454 will be serviced by a network of 200 mm diameter gravity sanitary sewers, which will direct wastewater peak flows (approximately 2.4 L/s with allowance for infiltration) to the existing 300 mm diameter PVC sanitary sewer in Linseed Road. The receiving sewers within Linseed Road and downstream have been sized to accommodate wastewater from Block 454. The sanitary sewer design sheet for the proposed sanitary sewers within the Block 454 site plan development and the sanitary design sheet and sanitary drainage area plan for the Northwoods subdivision are included in **Appendix B**.

Block 454 is represented by Area ID Number C102A on the subdivision sanitary design sheet. As part of the subdivision design, it was assumed that Block 454 would be developed with commercial uses. Given that the development is proceeding with a mixture of residential and commercial development, design flows for the development block are higher than the flows assumed at the time of subdivision design. The Kanata North Master Servicing Study (KNMSS) (Novatech, June 2016), assumed 28.7 L/s would be directed to

March Road from the Northwoods subdivision whereas the subdivision design assumed a flow of 16.5 L/s to March Road. As such, the increase in sanitary flow from both Block 453 and 454 can easily be accommodated in the downstream system sized in accordance with the KNMSS.

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

5 Stormwater Management

The following section describes the stormwater management (SWM) design for Block 454 in accordance with the background documents and governing criteria for the Northwoods subdivision established in the Mattamy Northwoods Servicing and Stormwater Management Report (Stantec, February 2025).

5.1 Proposed Conditions

The proposed 1.09 ha development is located within the northwest corner of the Northwoods subdivision and comprises a total of 72 residential units with commercial space. The storm sewer collection system for Block 454 will discharge to the existing 900 mm diameter storm sewer on Linseed Road (see **Drawing SD-1**).

Stormwater collected from the Northwoods subdivision is ultimately discharged to the Kanata North Urban Expansion Area (KNUEA) SWM Pond 3, which was constructed as part of the Minto Brookline Subdivision to the south of the Northwoods subdivision and will provide quantity and quality control (80 % TSS Removal) of runoff before discharging to Shirley's Brook.

5.2 Criteria and Constraints

The overall approach for storm servicing and stormwater management for the proposed development is outlined in the Mattamy Northwoods Servicing and SWM Report by Stantec (February 2025), excerpts can be found in **Appendix C.3**. The following summarizes the SWM criteria and constraints that will govern the detailed design of the proposed site as per the latest revision of the City of Ottawa Sewer Design Guidelines as well as the conclusions made in the Northwoods Site Servicing and SWM Report.

- Design using the dual drainage principle. (City of Ottawa SDG)
- Minor system capture rate from Block 454 up to the 100-year storm is to be restricted to **304 L/s**. (Mattamy Northwoods Servicing and SWM Report)
- The hydraulic grade line in the storm sewer must remain at least 0.3m below the underside of adjacent building footings during the 100-year storm event or a minimum clearance of 0.3m from the pipe obvert. Whatever governs. (City)
- Where there is footing drainage connected to the storm collection system, maximum 'climate change' HGL to be lower than proposed basement elevations. (City)
- Total maximum depth of flow under static and dynamic conditions shall be less than 0.35 m. (City)
- Design storm sewers along local roadways to convey the 5-year peak flow respectively under free-flow conditions using 2004 City of Ottawa I-D-F parameters and an inlet time of 10 minutes. (City)
- Assess impact of 5-year storm, and the worst case 100-year storm events, on the major & minor drainage system. (City)
- Building openings to be above the 100-year water level. (City)
- There must be at least 30 cm of vertical clearance between the spill elevation on the private street and the lowest building opening that is in the proximity of the flow route or ponding area. (City)
- Minimum roadway profile grades at 0.5 %. (City)

- Minimum roadway slope of 0.1 % from crest-to-crest for overland flow route. (City)
- Provide adequate emergency overflow conveyance off-site. (City)

5.3 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 304 L/s minor system allowable release rate in the 100-year storm.
- Ensure that total dynamic and static surface ponding depths do not exceed 0.35 m during the 100-year storm scenario.
- Confirm that climate change storm simulation does not result in flooding of properties.

The site is designed using the "dual drainage" principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 5-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely to the appropriate outlet without impacting proposed or existing downstream properties.

In keeping with the minor system target peak outflow, Inlet Control Devices (ICDs) or orifice plates have been specified for all catch basins to limit the inflow to the minor system, which outlets to the 900 mm diameter storm sewer on Linseed Road. Restricted inlet rates to the sewer are necessary to meet the target peak outflows.

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

5.4 Modeling Rationale

A comprehensive hydrologic modeling exercise was completed with PCSWMM, accounting for the estimated major and minor systems to evaluate the storm sewer infrastructure and major system segments. The use of PCSWMM for modeling of the site hydrology and hydraulics allowed for an analysis of the systems' response during various storm events. The following assumptions were applied to the detailed model:

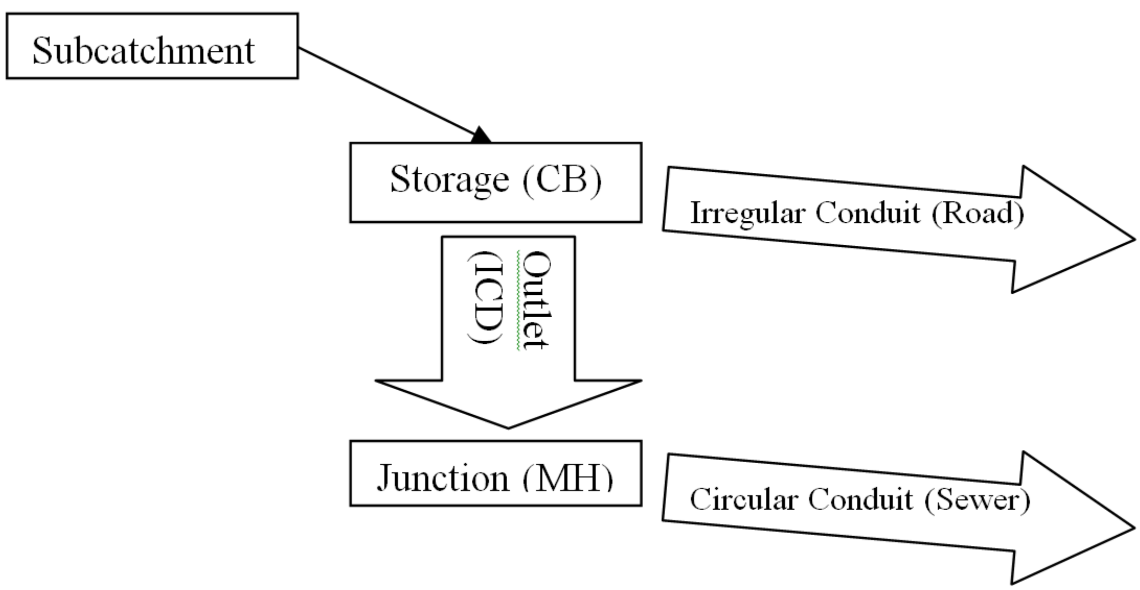
- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Horton infiltration, Manning's 'n', and depression storage values.
- 3-hour Chicago Storm distribution for the 2-year, 5-year and 100-year analysis.
- To 'stress test' the system a 'climate change' scenario was created by adding 20% of the individual intensity values of the 100-year storm at their specified time step.
- Percent imperviousness calculated based on actual soft and hard surfaces for the proposed catchments and converted to equivalent Runoff Coefficient using the relationship C = (Imp. X 0.7) + 0.2.

- Subcatchment areas are defined from high-point to high-point where sags occur.
- Width parameter was taken as twice the length of the street/swale segment for two-sided catchments and as the length of the street/swale segment for one-sided catchments. Irregular shaped catchments were calculated by measuring the flow length on the drawing and the width parameter was calculated respectively, or alternatively set at 225 x subcatchment area per recommendations of the OSDG.
- Catch basin inflow restricted with inlet-control devices (ICDs) as necessary to maintain the minor system target peak outflow.
- Surface storage in road sags calculated based on grading plans (**Drawing SD-1**).

5.4.1 SWMM Dual Drainage Methodology

The proposed development is modeled in one modeling program as a dual conduit system (see **Figure 5.1**), with: 1) circular conduits representing the sewers & storage nodes representing manholes; 2) irregular conduits using street-shaped cross-sections to represent the approximate overland road network and storage nodes representing catchbasins. The dual drainage systems are connected via outlet/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 on the surface so that generated hydrographs are directed there firstly.

Figure 5.1: Schematic Representing Model Object Roles



Storage nodes are used in the model to represent catch basins as well as major system junctions. For storage nodes representing catch basins (CBs), the invert of the storage node represents the invert of the CB and the rim of the storage node represents the top of the CB plus an allowable flow depth on the segment. For the purpose of this SWM plan, CB inverts have been set 1.38 m below the top of the CB. An additional depth of 0.40 m has been added to rim elevations to allow routing from one surface storage to the next.

Storage nodes that represent catch basins at sags, are connected by weirs that discharge at the spill elevation for each subcatchment area. The widths of each weir were calculated based on the respective elevation across the length of the spill location.

The storage value assigned to the storage node represents the available ponding volume above the catch basin. The maximum ponding volumes are calculated using the cone equation in the drawing and equivalent surface areas are inputted into the storage curves within PCSWMM using the trapezoidal equation. If the available storage volume in a storage node is exceeded, flows spill to the downstream storage node and continue routing through the system until ultimately flows either re-enter the minor system or reach the outfall of the major system.

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

5.4.2 Design Storms

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

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

5.4.3 Boundary Conditions

The detailed PCSWMM hydrology and the proposed storm sewers were used to assess the peak inflows and hydraulic grade line (HGL) in the proposed site. Dynamic boundary conditions in the form of backwater elevations were obtained from Stantec's Northwoods subdivision PCSWMM model (February 2025) from the outlet for Block 454 (Node 215) and attached in **Appendix C.3**.

5.4.4 Modeling Parameters

Table 5.1 presents the general subcatchment parameters used:

Table 5.1: General Subcatchment Parameters

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

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

Table 5.2: Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
L102A	0.102	25.5	0.6	85.7	0.80
L102B	0.065	28.3	3.0	31.4	0.42
L103A	0.050	26.0	1.7	81.4	0.77
L103C	0.068	18.2	1.7	80.0	0.76
L103D	0.018	4.1	0.7	54.3	0.58
L104C	0.405	35.7	2.5	90.0	0.83
L105A	0.056	16.4	1.0	90.0	0.83
L105B	0.057	5.0	33.0	17.1	0.32
L106A	0.152	14.5	2.0	65.7	0.66
UNC-1	0.059	55.7	3.0	75.7	0.73
UNC-2	0.041	42.8	2.7	62.9	0.64
UNC-3	0.013	15.8	0.7	22.9	0.36

Table 5.3 summarizes the storage node parameters used in the model. All catch basins have been modeled as having an outlet invert as depicted on **Drawings SSP-1**. Static ponding depths, areas, and volumes within the proposed development area are as per **Drawings SD-1**.

Table 5.3: Storage Node Parameters

Storage Node	Invert Elevation (m)	Rim Elevation (m)	Total Depth (m)	Storage Curve	Curve Name
L102A-S	79.6	81.16	1.56	TABULAR	L102A-V
L102B-S	79.72	81.35	1.63	TABULAR	L102B-V
L103A-S	80.07	81.7	1.63	TABULAR	L103A-V
L104C-S	78.8	81.38	2.58	TABULAR	L104C-V
L105A-S	79.48	81.2	1.72	TABULAR	L105A-V
L105B-S	80.58	81.08	0.5	TABULAR	L105B-V
L106A-S	78.27	80.249	1.979	TABULAR	L106A-V

*The rim of the storage node represents the maximum allowable flow depth elevation above the storage node (equal to the top of the catch basin plus an additional 0.40 m).

5.4.5 Hydraulic Parameters

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

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

Table 5.4: Exit Loss Coefficients for Bends at Manholes

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

Table 5.5 and **Table 5.6** present the parameters for the outlet and orifice link objects in the model, which represent ICDs. All IPEX tempest orifices were assigned a discharge coefficient of 0.572. It should be noted that the proposed ICDs will consist of slide type vertical circular orifices. A coefficient of 0.572 was applied when using orifices to conform to head/discharge curves as supplied by the manufacturer for IPEX Tempest HF model ICDs.

Table 5.5: Orifice Parameters for Proposed Catchments

Orifice Name	Catchbasin ID	Tributary Area ID	Minor System Node	ICD Type
C102A-IC	CB 102A	L102A	102	152 mm Orifice
C103A-IC	CB 103A	L103A L103C L103D	104	127 mm Orifice
C105A-IC	CB 105A	L105A	105	83 mm Orifice
C104C-IC	CB 104C	L104C	105	140 mm Orifice
C106A-IC	CB 106A	L106A	106	152 mm Orifice

Table 5.6: Outlet Parameters

Name	Inlet	Outlet	Inlet Elev.	Curve Name	ICD Type
C102B-IC	CB 102B	MH 102	79.72	-	LMF 80
OR4	CB 104B	MH 104	80.58	Single	-

A detailed schematic of the model is attached in **Appendix C.2**.

5.5 Modeling Results and Discussion

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

5.5.1 Proposed Inlet Control Devices

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

Table 5.7: Proposed Phase Orifice Link Results

Orifice Name	Catchbasin ID	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
C102A-IC	CB 102A	L102A	152 mm Orifice	0.24	1.44	18.6	53.7
C102B-IC	CB 102B	L102B	LMF 80	0.52	1.55	4.1	7.1
C103A-IC	CB 103A	L103A L103C L103D	127 mm Orifice	0.60	1.55	22.6	38.6
C104C-IC	CB 104C	L104C	140 mm Orifice	1.98	2.44	54.0	60.1
C105A-IC	CB 105A	L105A	83 mm Orifice	0.63	1.53	10.6	16.7
C106A-IC	CB 106A	L106A	152 mm Orifice	0.88	1.77	21.0	48.1

5.5.2 Proposed Development Hydraulic Grade Line Analysis

The 100-year hydraulic grade line (HGL) elevation across the proposed development was estimated using the PCSWMM model for the worst-case HGL using the 3-hour Chicago storm for the 100-year runoff with the 100-year water level in MH 215 as a boundary condition. The boundary conditions used are based on the Mattamy Northwoods subdivision model.

The climate change scenario was assessed using the 100-year runoff intensities (worst-case HGL) increased by 20% with the 100-year water level in MH 215 as a boundary condition. The HGL values for manhole 215 were obtained from Stantec's Northwoods PCSWMM model (February 2025), excerpts of the stormwater management section can be found in **Appendix C.3**. **Table 5.8** presents the clearance between the proposed storm sewers worst case HGL and the nearest proposed under side of footing (USF). The storm sewer design sheet is included in **Appendix C.1**.

Table 5.8: Worst-Case 100-Year HGL Results

STM MH	USF (m)	100-Year, 3hr Chicago Storm		100-year+20%, 3hr Chicago Storm	
		HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
101	78.97	77.60	1.37	77.61	1.36
102	78.97	77.65	1.32	77.67	1.30

STM MH	USF (m)	100-Year, 3hr Chicago Storm		100-year+20%, 3hr Chicago Storm	
		HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
103	79.17	77.70	1.47	77.71	1.46
104	80.04	79.43	0.61	79.43	0.61
105	-	78.31	-	78.33	-
106	78.97	77.97	1.00	77.99	0.98
100	-	77.56	-	77.56	-

The model results indicate that there is sufficient clearance between the worst-case HGL and the proposed USFs within Block 454. Detailed grading of the site has been completed to ensure that the maximum hydraulic grade line is kept at least 0.30 m below the underside-of-footing (USF) of the adjacent units connected to the storm sewer during the worst case 100-year storm event and below proposed basement elevations during the 'climate change' event.

5.5.3 Overland Flow

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

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

Storage node ID	Structure ID	Top of Grate Elevation (m)	2-year, 3-hour Chicago		100-year, 3-hour Chicago		100-year, 3-hour Chicago+20%	
			Max HGL (m)	Total Surface Water Depth (m)	Max HGL (m)	Total Surface Water Depth (m)	Max HGL (m)	Total Surface Water Depth (m)
L102A-S	CB 102A	80.98	79.84	-	81.04	0.06	81.08	0.10
L102B-S	CB 102B	81.10	80.24	-	81.27	0.17	81.27	0.17
L103A-S	CB 103A	81.45	80.67	-	81.62	0.17	81.63	0.18
L104C-S	CBMH 104C	80.99	80.78	-	81.24	0.25	81.3	0.31
L105A-S	CB 105A	80.70	80.12	-	81.01	0.31	81.01	0.31
L105B-S	DICB 105B	80.58	80.60	0.02	80.65	0.07	80.67	0.09
L106A-S	CB 106A	80.25	79.15	-	80.04	-	80.25	-

A 900 mm diameter storage pipe has been included as part of the stormwater management design. The pipe is not required to provide storage in the 100-year event but to eliminate ponding from the parking area L104C in the 2-year event.

The model results indicate that there will be ponding at DICB 104B during the 2-year 3-hour Chicago storm event. The DICB is located in a grassed area, the depth of ponding is 2 cm, lasting no more than 10 minutes and is considered negligible.

5.5.4 Results

The following section summarizes the key hydrologic and hydraulic model results for the proposed site and demonstrates the proposed stormwater management plan meets target peak rates established in the Northwoods subdivision servicing and stormwater management report. For detailed model results or inputs please refer to the example input file in **Appendix C.2** and the electronic model files.

Table 5.10: Target and Resultant Major and Minor System Release Rates

Storm event	Minor System Release Rate per Subdivision Design (L/s)	Target Major System Release Rate per Subdivision Design (L/s)	Minor System to Linseed Road Storm Sewer (L/s)	Major System to March Road ROW (L/s)	Major System to Linseed Road ROW (L/s)	Total (L/s)
2-year, 3-hour Chicago	304	0	134.1	0.6	15.4	150.2
5-year, 3-hour Chicago	304	0	172.9	1.6	25.2	199.7
100-year, 3-hour Chicago	304	0	251.2	4.8	47.4	303.4
100-year, 3-hour Chicago+20%	N/A	N/A	269.2	6.3	86.0	361.4

6 Grading

The proposed Block 454 development site measure approximately 1.09 ha in area. The topography across the site under existing conditions slopes towards the southeast. 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 design also follows the recommendations outlined in the Mattamy Northwoods Servicing and Stormwater Management Report (Stantec, February 2025) and directs majority of the overland drainage towards Linseed Road and ultimately into the outlet of the KNUEA SWM Pond 3.

The grading plan (**Drawing GP-1**) was prepared considering the grade raise restrictions identified in the geotechnical investigation.

7 Utilities

As the subject site lies within an existing residential community under development, electrical, gas, and telecommunications servicing for the proposed site will be readily available within the neighbouring rights-of-way. Exact size, location and routing of utilities will be established with the utility providers.

8 Approvals

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 consultant shall determine whether EASR reporting is required prior to construction.

The private site is exempt from Environmental Compliance Approval requirements.

9 Erosion Control

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 to prevent the migration of sediment offsite.
7. Install track out control mats (mud mats) at the entrance/egress as shown in **Drawing ECDS-1** 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 August 2022. The report summarizes the existing soil conditions within the Block 454 site and construction recommendations. For details which are not summarized below, please see the Paterson report included in the submission package.

Subsurface soil conditions within Block 454 were determined through field investigations conducted for the overall subdivision on December 6, 2019, in addition to the previous investigations, completed by Paterson in 2011. A single test pit was drilled within the site in the 2011 investigation along with a probehole.

In general, soil stratigraphy consisted of topsoil overlying silty clay or silty sand within the west and east portion of the site, respectively. A glacial till layer was noted at all test pit locations of the subdivision. Practical refusal to excavation was encountered between 0.9 and 3.7 m depth at all test pit locations complete by Paterson. Bedrock was estimated to occur between depths of 0 to 5 m. Based on moisture levels and colour of the recovered soil samples, the long-term groundwater table is expected to be at 4 m to 5 m below ground surface, though as groundwater levels fluctuate seasonally, they could vary at the time of construction.

Based on the results of the geotechnical investigation, the subject site is suitable for the proposed development, and it is recommended that the proposed dwellings be founded on conventional spread footings placed on an undisturbed, very stiff silty clay, compact silty sand, compact glacial till, engineered fill, and/or surface-sounded bedrock bearing surface. Due to the presence of a silty clay deposit, the site is subject to a permissible grade raise restriction of 2.0 m above existing grade at the southwest corner of the site.

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

Table 10.1: Recommended Pavement Structure

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

11 Conclusions and Recommendations

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

11.1 Potable Water Analysis

The water distribution system is designed in accordance with City of Ottawa design criteria to meet the domestic and fire flow needs of the development. The site is designed with two watermain feeds to ensure reliability for domestic supply and adequate fire hydrant coverage has been provided. Fire walls will be required forBuilding D to meet OBC requirements.

11.2 Wastewater Servicing

Block 454 will be serviced by a network of gravity sewers which will direct wastewater flows to Linseed Road. The receiving sewer system has sufficient available capacity to receive the design flows. Design guidelines for slope and velocity have been met within the proposed sewers.

11.3 Stormwater Management

- The proposed stormwater management plan complies with the goals specified in the background reports and the 2012 City of Ottawa Sewer Design Guidelines.
- Inlet control devices are proposed to limit inflow from the site area into the minor system to the 2-year storm event based on City of Ottawa IDF curves.
- All dynamic surface water depths are less than 0.35 m during all storm events up to the 100-year storm event.
- The storm sewer hydraulic grade line will be maintained at least 0.30 m below the underside of footing in the subdivision during design storm events.
- Minor system peak flows from the proposed site will be directed to the receiving sewer in Linseed Road.
- The minor system outflow rates are within the Mattamy Northwoods subdivision targets.

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, and telecommunications infrastructure exist within the Mattamy Northwoods subdivision development designed by the respective utility providers. . Private utility servicing for Block 454 will be designed by the respective utilities.

Appendix A Water Servicing

A.1 Domestic Water Demands

Kanata Northwoods Phase 6, Ottawa, ON - Domestic Water Demand Estimates

Site Plan provided by Urbantypology (2026-02-19)

Project No. 160402120 Designed by: MW

Date: 2026-03-12 Checked by:

Revision: 02 City File No. D07-12-25-0148

Population densities per Table 4.1 City of Ottawa Water Design Guidelines:		
Apartment	1.8	ppu
Townhouse	2.7	ppu

Demand conversion factors per Table 4.2 of the City of Ottawa Water Design Guidelines and Technical Bulletin ISTB-2021-03:		
Residential	280	L/cap/day
Commercial	28000	L/ha/day

Building ID	Commercial Floor Area (m²)	No. of Units	Population	Avg Day Demand		Max Day Demand [1 2]		Peak Hour Demand [1 2]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Building A									
Stacked Townhouse		15	41	7.9	0.1	19.7	0.3	43.3	0.7
Building B									
Stacked Townhouse		15	41	7.9	0.1	19.7	0.3	43.3	0.7
Building C									
Apartment		24	43	8.4	0.1	21.0	0.4	46.2	0.8
Commercial	705			1.4	0.0	2.1	0.0	3.7	0.1
Building C Subtotal	*705*	*24*	*43*	*9.8*	*0.2*	*23.1*	*0.4*	*49.9*	*0.8*
Building D									
Stacked Townhouse		18	49	9.5	0.2	23.6	0.4	52.0	0.9
Residential Subtotal		*72*	*173*	*33.6*	*0.6*	*84.0*	*1.4*	*184.8*	*3.1*
Commerical Subtotal	*705*			*1.4*	*0.0*	*2.1*	*0.0*	*3.7*	*0.1*
Total Site :	**705**	**72**	**173**	**35.0**	**0.6**	**86.1**	**1.4**	**188.5**	**3.1**

1 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum day demand rate = 2.5 x average day demand rate
peak hour demand rate = 2.2 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

2 Water demand criteria used to estimate peak demand rates for commercial areas are as follows:
maximum daily demand rate = 1.5 x average day demand rate
peak hour demand rate = 1.8 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

A.2 FUS Calculation Sheets

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec

Stantec Project #: 160402120
Project Name: Kanata Northwoods Phase 6
Date: 2026-03-12
Fire Flow Calculation #: 1
Description: Building A

Notes: 15-unit back-to-back stacked townhouses. Building footprint of 585 m².

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										NO	-
		585	585	585								1755	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	14000
4	Determine Occupancy Charge	Limited Combustible										-15%	11900
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	> 30	0	0	0-20	Type V		NO			0%	3927
		East	10.1 to 20	34	3	> 100	Type V		NO			15%	
		South	3.1 to 10	21	3	61-80	Type V		NO			18%	
		West	> 30	0	0	0-20	Type V		NO			0%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											16000
		Total Required Fire Flow in L/s											266.7
		Required Duration of Fire Flow (hrs)											3.50
		Required Volume of Fire Flow (m^3)											3360

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec

Stantec Project #: 160402120
Project Name: Kanata Northwoods Phase 6
Date: 2026-03-12
Fire Flow Calculation #: 2
Description: Building B

Notes: 15-unit back-to-back stacked townhouses. Building footprint of 585 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										YES	-
		585	585	585								1755	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	14000
4	Determine Occupancy Charge	Limited Combustible										-15%	11900
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	3.1 to 10	21	3	61-80	Type V		NO			18%	4403
		East	10.1 to 20	34	3	> 100	Type V		NO			15%	
		South	> 30	0	0	0-20	Type V		NO			0%	
		West	20.1 to 30	19	3	41-60	Type V		NO			4%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											16000
		Total Required Fire Flow in L/s											266.7
		Required Duration of Fire Flow (hrs)											3.50
		Required Volume of Fire Flow (m^3)											3360

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402120
Project Name: Kanata Northwoods Phase 6
Date: 2026-03-12
Fire Flow Calculation #: 3
Description: Building C
Notes: Mixed-use building with commercial space on ground floor and residential apartments above. Building footprint area of 796 m². Correspondence with architect via client confirmed the building will be sprinklered.

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										-	-
		796	796	796								2387	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	16000
4	Determine Occupancy Charge	Combustible										0%	16000
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-8000
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	10.1 to 20	21	3	61-80	Type V		NO			13%	2720
		East	20.1 to 30	19	3	41-60	Type V		NO			4%	
		South	> 30	0	0	0-20	Type V		NO			0%	
		West	> 30	0	0	0-20	Type V		NO			0%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											11000
		Total Required Fire Flow in L/s											183.3
		Required Duration of Fire Flow (hrs)											2.00
		Required Volume of Fire Flow (m^3)											1320

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402120
Project Name: Kanata Northwoods Phase 6
Date: 2026-03-12
Fire Flow Calculation #: 8
Description: Building D

Notes: Back-to-back stacked townhouses. Building footprint of 700 m². Broken down into a 12-unit and a 6-unit cluster to reduce floor area to 464 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										YES	-
		464	464	464								1393	-
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	> 30	0	0	0-20	Type V		NO			0%	0
		East	> 30	19	3	41-60	Type V		NO			0%	
		South	0 to 3	21	3	61-80	Type V		YES			0%	
		West	> 30	0	0	0-20	Type V		NO			0%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											10000
		Total Required Fire Flow in L/s											166.7
		Required Duration of Fire Flow (hrs)											2.00
		Required Volume of Fire Flow (m^3)											1200

Wu, Michael

From: Arden Hamilton <arden.hamilton@mattamycorp.com>
Sent: October 21, 2025 09:50
To: Wu, Michael
Cc: Smadella, Karin; Olivia Hughes
Subject: RE: [EXTERNAL] Northwoods Phase 6 Block 454 Building C Construction Type Confirmation

Hi Michael,

Please see comments from our architect,

1. It is combustible
2. There are sprinklers throughout the building
   a. All floors are to be 0.75hr FRR expect for the floor above the retail which is to be 2hr FRR

Thanks,

mattamyHOMES

Arden Hamilton, MRED
Land Development Coordinator
C (613) 223-3866(cell).
Arden.hamilton@mattamycorp.com
Ottawa Office: 50 Hines Road, Suite 100, Ottawa, ON Canada K2K 2M5

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: October 16, 2025 12:26 PM
To: Arden Hamilton <arden.hamilton@mattamycorp.com>
Cc: Smadella, Karin <Karin.Smadella@stantec.com>; Olivia Hughes <olivia.hughes@mattamycorp.com>
Subject: [EXTERNAL] Northwoods Phase 6 Block 454 Building C Construction Type Confirmation
Importance: High

Good afternoon, Arden:

Could you reach out to the architect to confirm the following information for the proposed mixed-use Building C in Block 454 of Northwoods? We would require the information to confirm the fire flow requirements for water boundary conditions from the City.

1. Construction type.
2. Confirmation that the vertical openings (between floors) are going to be **protected** per the fire code requirements outlined in the Ontario and National Building Codes and whether the building will be sprinklered.

Thanks,

Michael Wu, EIT
Civil Engineering Intern
He, him

Direct: (613) 738 6033

michael.wu@stantec.com

Stantec

With every community, we redefine what's possible.

A.3 Boundary Conditions

Boundary Conditions
Northridge Subdivision

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	568.8	9.48
Maximum Daily Demand	1303.2	21.72
Peak Hour	2796	46.6
Fire Flow Demand # 1	13000	216.7
Fire Flow Demand # 2	18000	300

Location

Results

Connection 1 – March Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.9	73.6
Peak Hour	125.1	65.3
Max Day plus Fire #1	118.6	56.1
Max Day plus Fire #2	112.4	47.4

[1] Ground Elevation = 79.9 m

Connection 2 – Celtic Ridge Crescent

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.9	86.3
Peak Hour	125.0	78.0
Max Day plus Fire #1	113.4	61.5
Max Day plus Fire #2	103.3	47.1

[1] Ground Elevation = 70.1 m

Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.
2. The future 305 mm watermain linking the March Road watermain to the Celtic Ridge Crescent watermain was included for modelling purposes.

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.

From:	Candow, Julie
To:	Mott, Peter
Subject:	RE: Cavanagh''s Northridge Subdivision - Boundary Conditions Request
Date:	Wednesday, November 23, 2022 7:55:20 AM
Attachments:	Northridge_22Nov2022.docx

Hi Peter,

Please see attached.

Thanks,

Julie Candow, P.Eng
Project Manager
Planning, Real Estate and Economic Development Department - West Branch
City of Ottawa
110 Laurier Avenue West Ottawa, ON
613.580.2424 ext. 13850

Please take note that due to the current COVID situation, I am working remotely and phone communication may not be reliable at this time. The best way to reach me is by email.

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: November 07, 2022 4:45 PM
To: Candow, Julie <julie.candow@ottawa.ca>
Subject: Cavanagh's Northridge Subdivision - Boundary Conditions Request

Hello Julie,

I would like to request the updated hydraulic boundary conditions for Cavanagh's proposed Northridge Subdivision Development (Zone 2W). Please find attached the draft plan, the key map showing the location of the proposed development, our functional water servicing drawing showing connection locations, domestic water demand calculations, and fire flow calculations.

A summary of the proposed site is provided below:

We anticipate a minimum of three (3) connections: one to the existing watermain stub from March Road and two from the adjacent Minto development to the south-east. The following connections are expected for servicing:

➢Connection to the existing 400 mm watermain (300 mm dimeter stub provided) on March Road.
➢Connection to the existing 300 mm watermain stub on Leone Farrell Road (Minto)/ Street 8 (Cavanagh).
➢Connection to the existing 200 mm watermain within Elsie MacGill Walk (Minto).

*Please verify if hydraulic modelling information is available for the adjacent Minto Subdivision development, as I will have to contact Minto directly to obtain hydraulic information.

For the purpose of the boundary conditions request, may you please provide us with the boundary conditions for the following servicing options:

i. Watermain connections to the above listed connections; assuming a fire flow requirement of **15,000 L/min (217 L/s)** for the site in addition to the domestic water demands provided below.
ii. Watermain connections to the above listed connections; assuming a fire flow requirement of **18,000 L/min (300 L/s)** for the site in addition to the domestic water demands provided below.

- The intended land use is a combination of residential, institutional, commercial/mixed use, and park land dedication per the summary provided in the Domestic Demands spreadsheet. (See attached Draft Plan)
- Estimated fire flow demand per the FUS methodology: 15,000 L/min (217 L/s) for the worst-case scenario (Back-to-Back Townhomes and Townhouse Rows)
- Domestic water demands for the entire development:
    - **Average day: 568.5 L/min (9.48 L/s)**
    - **Maximum day: 1303.5 L/min (21.72 L/s)**
    - **Peak hour: 2796.9 L/min (46.6 L/s)**

Thank you for your time and please contact me at your earliest convenience if any additional information or clarification is required.

Best regards,

Peter Mott EIT
Engineering Intern, Community Development

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Ottawa ON K2C 3G4

'

Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
95	0.96	81.00	130.89	49.89	70.95	489.16
39	0.00	81.00	130.89	49.89	70.95	489.17
38	0.00	81.00	130.90	49.90	70.95	489.18
91	0.00	80.32	130.89	50.57	71.91	495.79
57	0.17	80.00	130.89	50.89	72.36	498.92
58	0.07	80.00	130.89	50.89	72.36	498.92
59	0.00	80.00	130.89	50.89	72.36	498.92
60	0.00	80.00	130.89	50.89	72.36	498.92
61	0.21	80.00	130.89	50.89	72.36	498.92
62	0.11	80.00	130.89	50.89	72.36	498.92
63	0.07	80.00	130.89	50.89	72.36	498.92
87	0.18	80.00	130.89	50.89	72.36	498.92
88	0.14	80.00	130.89	50.89	72.36	498.92
89	0.18	80.00	130.89	50.89	72.36	498.92
92	0.16	80.00	130.89	50.89	72.36	498.92
94	0.24	80.00	130.89	50.89	72.36	498.92
114	0.03	80.00	130.89	50.89	72.36	498.92
151	0.21	80.00	130.89	50.89	72.36	498.92
152	0.09	80.00	130.89	50.89	72.36	498.92
85	0.04	80.00	130.89	50.89	72.36	498.93
99	0.13	80.00	130.89	50.89	72.36	498.93
100	0.10	80.00	130.89	50.89	72.36	498.93
109	0.00	80.00	130.89	50.89	72.36	498.93
110	0.15	80.00	130.89	50.89	72.36	498.93
111	0.14	80.00	130.89	50.89	72.36	498.93
112	0.00	80.00	130.89	50.89	72.36	498.93
93	0.09	80.00	130.89	50.89	72.37	498.94
97	0.00	80.00	130.89	50.89	72.37	498.94
98	0.00	80.00	130.89	50.89	72.37	498.94
96	0.00	80.00	130.89	50.89	72.37	498.95
80	0.11	79.00	130.89	51.89	73.78	508.73
86	0.16	79.00	130.89	51.89	73.78	508.73
113	0.13	79.00	130.89	51.89	73.78	508.73
115	0.22	79.00	130.89	51.89	73.78	508.73
101	0.92	79.00	130.89	51.89	73.79	508.74
79	0.16	78.50	130.89	52.39	74.50	513.63
64	0.00	78.00	130.89	52.89	75.21	518.53
65	0.00	78.00	130.89	52.89	75.21	518.53
81	0.05	78.00	130.89	52.89	75.21	518.53
82	0.04	78.00	130.89	52.89	75.21	518.53
153	0.22	77.24	130.89	53.65	76.29	525.98
83	0.11	77.00	130.89	53.89	76.63	528.34
66	0.00	76.00	130.89	54.89	78.05	538.14
102	0.00	75.00	130.89	55.89	79.47	547.94
24	0.00	74.49	130.90	56.41	80.21	553.02
103	0.00	74.00	130.89	56.89	80.89	557.75
116	0.21	74.00	130.89	56.89	80.89	557.75
117	0.04	74.00	130.89	56.89	80.89	557.75
136	0.18	74.00	130.89	56.89	80.89	557.75
137	0.09	74.00	130.89	56.89	80.89	557.75
138	0.04	74.00	130.89	56.89	80.89	557.75
154	0.14	73.45	130.89	57.44	81.68	563.14
104	0.00	73.00	130.89	57.89	82.32	567.55
105	0.00	73.00	130.89	57.89	82.32	567.55
118	0.00	73.00	130.89	57.89	82.32	567.55
120	0.03	73.00	130.89	57.89	82.32	567.55
121	0.18	73.00	130.89	57.89	82.32	567.55
67	0.58	73.00	130.89	57.89	82.32	567.56
73	0.13	72.66	130.89	58.23	82.80	570.90
140	0.23	72.44	130.89	58.45	83.12	573.06
3	0.00	72.31	130.89	58.58	83.30	574.35

Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
95	2.59	81.00	124.96	43.96	62.51	431.01
39	0.00	81.00	124.99	43.99	62.55	431.24
38	0.00	81.00	125.01	44.01	62.57	431.43
91	0.00	80.32	124.86	44.54	63.34	436.69
60	0.00	80.00	124.86	44.86	63.79	439.78
61	1.15	80.00	124.86	44.86	63.79	439.78
62	0.61	80.00	124.86	44.86	63.79	439.78
63	0.36	80.00	124.86	44.86	63.79	439.78
58	0.41	80.00	124.86	44.86	63.79	439.79
59	0.00	80.00	124.86	44.86	63.79	439.79
57	0.91	80.00	124.86	44.86	63.79	439.81
88	0.77	80.00	124.86	44.86	63.79	439.81
92	0.87	80.00	124.86	44.86	63.79	439.81
94	1.30	80.00	124.86	44.86	63.79	439.81
87	1.01	80.00	124.86	44.86	63.79	439.84
89	1.01	80.00	124.86	44.86	63.79	439.84
152	0.48	80.00	124.86	44.86	63.80	439.85
114	0.18	80.00	124.87	44.87	63.80	439.86
151	1.16	80.00	124.87	44.87	63.80	439.89
85	0.24	80.00	124.88	44.88	63.81	439.96
100	0.55	80.00	124.88	44.88	63.81	439.98
112	0.00	80.00	124.88	44.88	63.82	439.99
111	0.79	80.00	124.88	44.88	63.82	440.00
110	0.81	80.00	124.89	44.89	63.83	440.10
109	0.00	80.00	124.89	44.89	63.83	440.11
99	0.69	80.00	124.90	44.90	63.84	440.17
93	0.48	80.00	124.90	44.90	63.84	440.19
98	0.00	80.00	124.90	44.90	63.85	440.25
97	0.00	80.00	124.91	44.91	63.86	440.32
96	0.00	80.00	124.93	44.93	63.89	440.48
80	0.58	79.00	124.86	45.86	65.21	449.60
86	0.60	79.00	124.86	45.86	65.21	449.60
115	1.21	79.00	124.87	45.87	65.22	449.67
113	0.73	79.00	124.87	45.87	65.22	449.71
101	2.48	79.00	124.87	45.87	65.23	449.75
79	0.91	78.50	124.86	46.36	65.92	454.50
64	0.00	78.00	124.86	46.86	66.63	459.40
65	0.00	78.00	124.86	46.86	66.63	459.40
81	0.28	78.00	124.86	46.86	66.63	459.40
82	0.24	78.00	124.86	46.86	66.63	459.40
153	1.21	77.24	124.86	47.62	67.71	466.86
83	0.60	77.00	124.86	47.86	68.05	469.21
66	0.00	76.00	124.86	48.86	69.48	479.07
102	0.00	75.00	124.87	49.87	70.91	488.88
24	0.00	74.49	125.02	50.53	71.85	495.35
116	1.15	74.00	124.86	50.86	72.33	498.67
117	0.24	74.00	124.86	50.86	72.33	498.67
103	0.00	74.00	124.86	50.86	72.33	498.68
136	0.97	74.00	124.86	50.86	72.33	498.68
137	0.48	74.00	124.87	50.87	72.33	498.69
138	0.24	74.00	124.87	50.87	72.33	498.69
154	0.79	73.45	124.86	51.41	73.11	504.06
120	0.18	73.00	124.86	51.86	73.74	508.39
121	0.97	73.00	124.86	51.86	73.74	508.39
105	0.00	73.00	124.86	51.86	73.74	508.45
104	0.00	73.00	124.86	51.86	73.75	508.47
118	0.00	73.00	124.86	51.86	73.75	508.47
67	1.56	73.00	124.87	51.87	73.76	508.57
73	0.70	72.66	124.89	52.23	74.27	512.06
140	1.29	72.44	124.88	52.44	74.57	514.15
3	0.00	72.31	124.91	52.60	74.80	515.73

Northwoods Subdivision Fire Flow Results - Max Day + 267 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
95	1.44	33.12	47.09	324.66	114.12	266.67	26.57	37.79	628.67	20
96	0.00	33.86	48.15	331.96	113.86	266.67	26.62	37.86	595.25	20

A.4 Hydraulic Modeling Results

Junction Results - Basic Day

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
1	0.10	81.00	130.90	49.90	70.96	489.23
2	0.00	81.40	130.90	49.50	70.39	485.33
3	0.10	81.31	130.90	49.59	70.52	486.22
4	0.00	81.29	130.90	49.61	70.54	486.34
5	0.00	81.25	130.90	49.65	70.61	486.81
6	0.00	81.42	130.90	49.48	70.36	485.10
7	0.00	81.43	130.90	49.47	70.35	485.04
8	0.20	81.46	130.90	49.44	70.30	484.73
9	0.00	81.44	130.90	49.46	70.32	484.87
10	0.00	81.35	130.90	49.55	70.46	485.80
11	0.20	81.89	130.90	49.01	69.69	480.50
12	0.00	81.32	130.90	49.58	70.50	486.10
13	0.00	81.21	130.90	49.69	70.66	487.16

Link Results - Basic Day

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	1	0	25.24	204	110	-0.289	0.009
1001	2	1	26.39	204	110	-0.189	0.006
1002	3	2	32.08	204	110	-0.128	0.004
1003	4	3	1.83	204	110	-0.028	0.001
1004	5	4	24.35	204	110	-0.028	0.001
1005	6	5	12.47	204	110	-0.028	0.001
1006	7	6	2.32	204	110	-0.028	0.001
1007	8	7	36.36	204	110	-0.028	0.001
1008	9	8	9.64	204	110	0.172	0.005
1009	10	9	8.74	204	110	0.172	0.005
1010	11	10	14.05	204	110	0.111	0.003
1011	12	11	26.61	204	110	0.311	0.010
1012	13	12	3.00	204	110	0.311	0.010
1013	14	13	1.78	204	110	0.311	0.010
1014	2	10	22.22	204	110	0.060	0.002

Junction Results - Peak Hour

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (m)	Pressure (psi)2	Pressure (kPa)
1	0.70	81.00	124.92	43.92	62.45	430.57
2	0.00	81.40	124.94	43.54	61.91	426.88
3	0.70	81.31	124.94	43.63	62.04	427.78
4	0.00	81.29	124.94	43.65	62.06	427.91
5	0.00	81.25	124.94	43.70	62.13	428.40
6	0.00	81.42	124.94	43.52	61.89	426.70
7	0.00	81.43	124.94	43.52	61.88	426.64
8	0.90	81.46	124.95	43.49	61.84	426.35
9	0.00	81.44	124.95	43.50	61.86	426.51
10	0.00	81.35	124.95	43.60	62.00	427.46
11	0.80	81.89	124.96	43.07	61.25	422.29
12	0.00	81.32	124.99	43.68	62.10	428.20
13	0.00	81.21	125.00	43.79	62.26	429.29

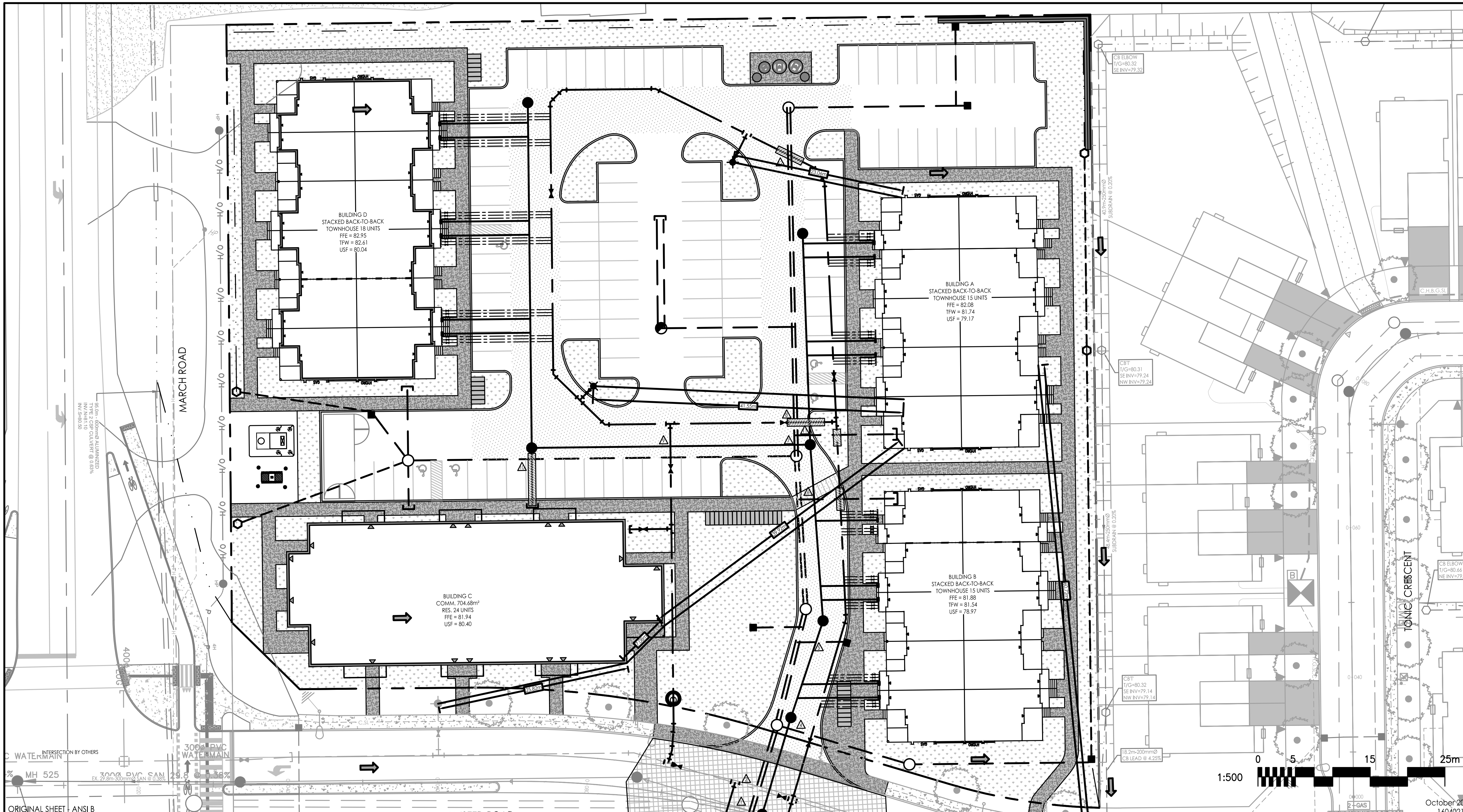
Link Results - Peak Hour

ID	FROM	TO	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
1000	1	0	25.24	204	110	9.148	0.280
1001	2	1	26.39	204	110	9.848	0.301
1002	3	2	32.08	204	110	2.262	0.069
1003	4	3	1.83	204	110	2.962	0.091
1004	5	4	24.35	204	110	2.962	0.091
1005	6	5	12.47	204	110	2.962	0.091
1006	7	6	2.32	204	110	2.962	0.091
1007	8	7	36.36	204	110	2.962	0.091
1008	9	8	9.64	204	110	3.862	0.118
1009	10	9	8.74	204	110	3.862	0.118
1010	11	10	14.05	204	110	11.448	0.350
1011	12	11	26.61	204	110	12.248	0.375
1012	13	12	3.00	204	110	12.248	0.375
1013	14	13	1.78	204	110	12.248	0.375
1014	2	10	22.22	204	110	-7.586	0.232

Fire Flow Results - Max Day + 267 L/s

ID	Static Demand (L/s)	Static Pressure (m)	Static Pressure (psi)	Static Pressure (kPa)	Static Head (m)	Fire Flow Demand (L/s)	Residual Pressure (m)	Residual Pressure (psi)	Available Flow (L/s)	Available Pressure (psi)
6	0.00	32.58	46.33	319.41	114.00	266.67	21.63	30.75	354.28	20
7	0.00	32.57	46.32	319.36	114.00	266.67	21.67	30.81	354.99	20
5	0.00	32.75	46.57	321.11	114.00	266.67	21.78	30.98	355.76	20
4	0.00	32.70	46.50	320.60	113.99	266.67	22.76	32.37	374.69	20
3	0.30	32.69	46.48	320.47	113.99	266.67	22.89	32.55	377.40	20
8	0.40	32.55	46.28	319.11	114.01	266.67	24.14	34.33	408.50	20
9	0.00	32.57	46.31	319.27	114.01	266.67	25.56	36.35	451.29	20
2	0.00	32.59	46.34	319.54	113.99	266.67	27.25	38.74	522.42	20
10	0.00	32.66	46.44	320.22	114.01	266.67	27.41	38.97	528.87	20
11	0.40	32.15	45.71	315.17	114.04	266.67	27.54	39.16	559.47	20
1	0.30	32.94	46.84	322.98	113.94	266.67	28.86	41.04	609.21	20
12	0.00	32.77	46.60	321.29	114.09	266.67	31.52	44.82	1161.48	20
13	0.00	32.89	46.76	322.41	114.10	266.67	32.35	46.00	1852.46	20

A.5 Hydrant Coverage Table and Figure



Stantec

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Notes

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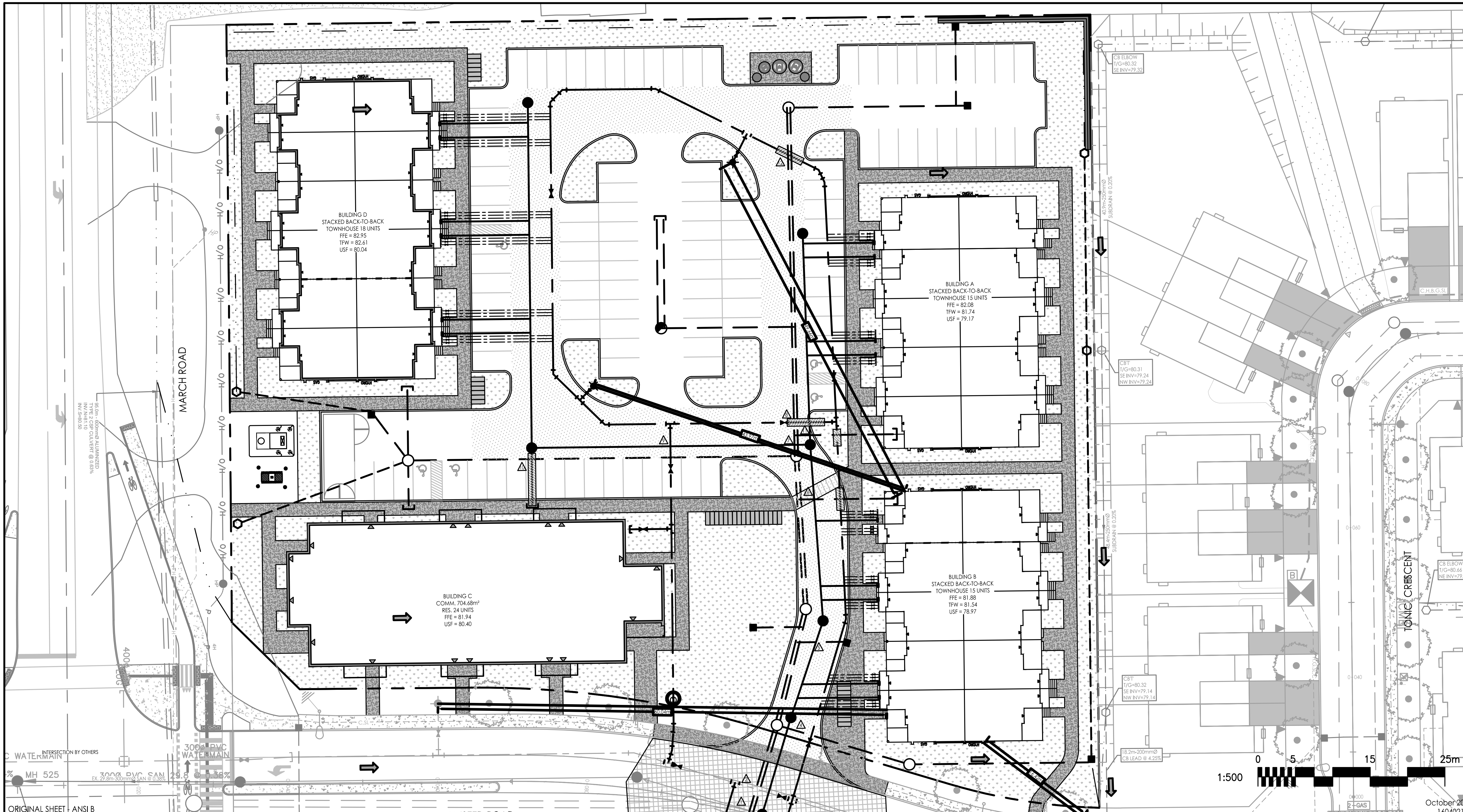
NOT TO BE USED FOR CONSTRUCTION

Client/Project
MATTAMY HOMES LTD.
KANATA NORTHWOODS
PHASE 6 BLOCK 454

Figure No.
1.0

Title
Hydrant Coverage Sketch
Building A



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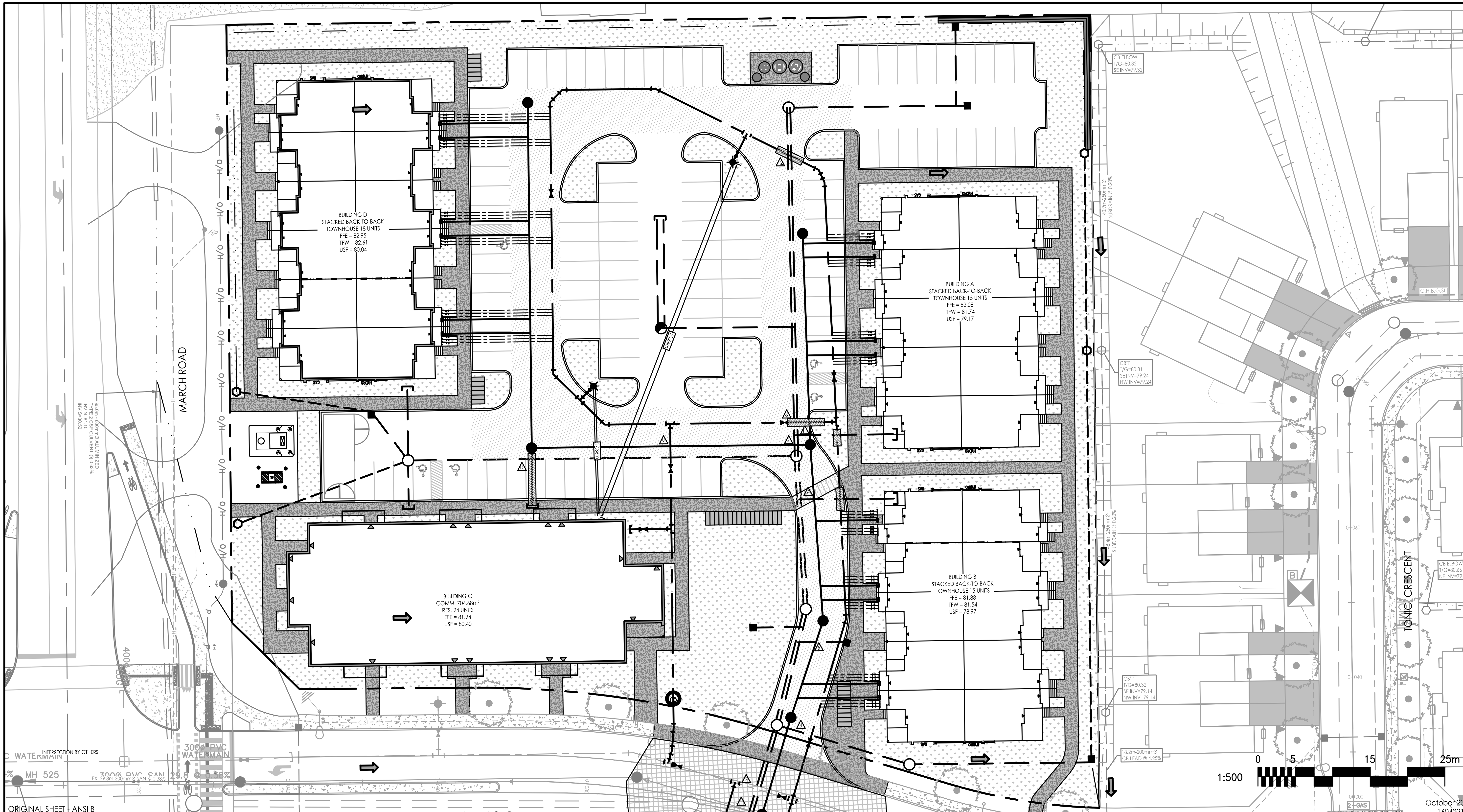
KANATA NORTHWOODS
PHASE 6 BLOCK 454

Figure No.
1.0

Title
Hydrant Coverage Sketch
Building B



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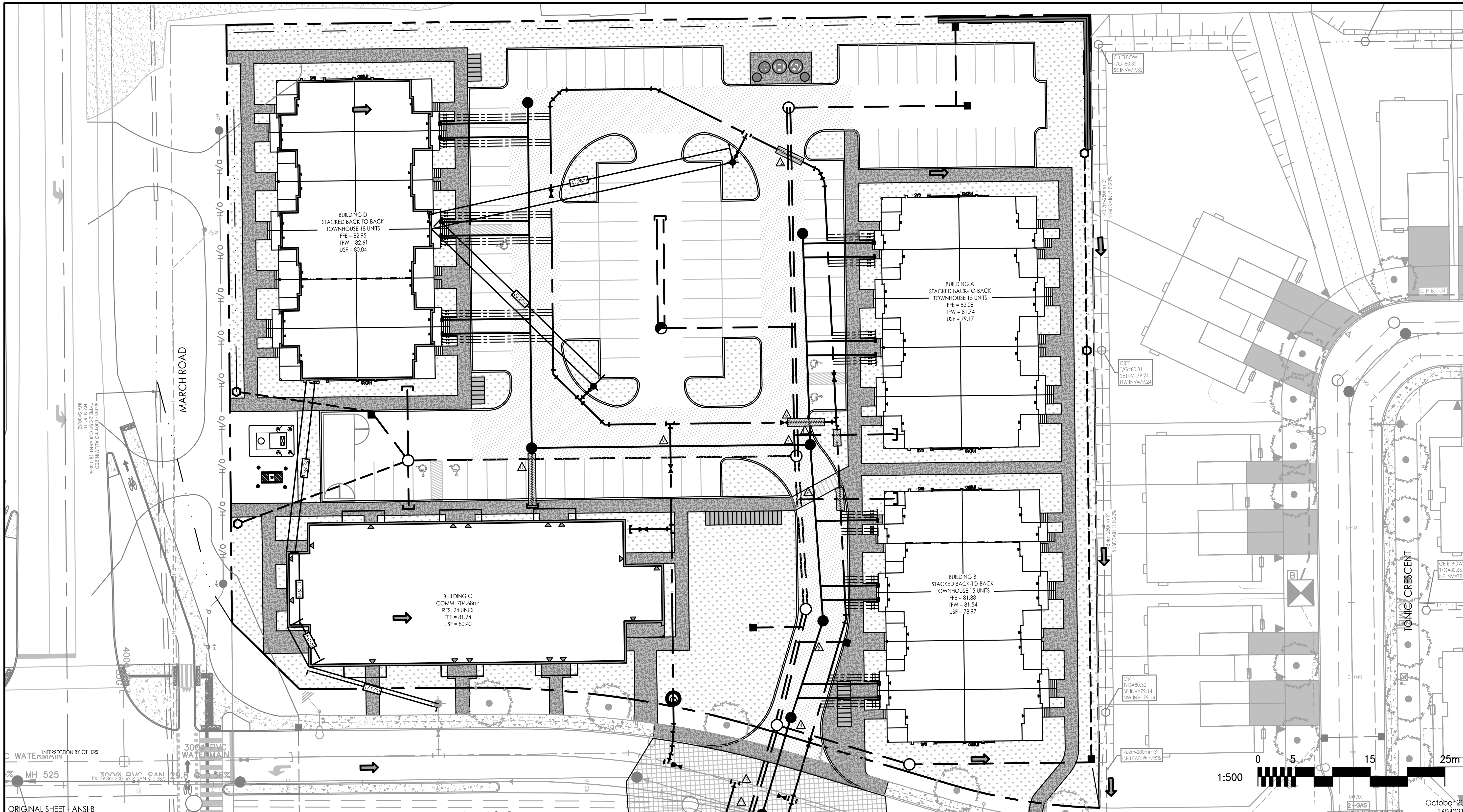
MATTAMY HOMES LTD.
KANATA NORTHWOODS
PHASE 6 BLOCK 454

Figure No.
1.0

Title
Hydrant Coverage Sketch
Building C



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PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Notes

Client/Project
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KANATA NORTHWOODS
PHASE 6 BLOCK 454

Figure No.
1.0

Title
Hydrant Coverage Sketch
Building D

Stantec	Project:	**Northwoods Block 454**	160402120
	TABLE 1: FIRE HYDRANT COVERAGE TABLE		
	Revision: 01	Prepared By: MW	
	Revision Date: 2026-03-12	Checked By:	

Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Building A					
Distance from building (m)	23.1	41.6	60.7	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	5,678	**17,034**	16,000

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

Notes:

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

Stantec	Project: Northwoods Block 454	160402120
	TABLE 1: FIRE HYDRANT COVERAGE TABLE	
	Revision: 01	Prepared By: MW
	Revision Date: 2026-03-12	Checked By:

Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Building B					
Distance from building (m)	49.7	44.0	16.4	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	5,678	**17,034**	16,000

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

Notes:

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

Stantec	Project: Northwoods Block 454	160402120
	TABLE 1: FIRE HYDRANT COVERAGE TABLE	
	Revision: 01	Prepared By: MW
	Revision Date: 2026-03-12	Checked By:

Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Building C					
Distance from building (m)	17.4	51.5	-	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	-	**11,356**	11,000

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

Notes:

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

	Project: Northwoods Block 454	160402120
Stantec	**TABLE 1: FIRE HYDRANT COVERAGE TABLE**	
	Revision: 01	Prepared By: MW
	Revision Date: 2026-03-12	Checked By:

Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Building D					
Distance from building (m)	41.3	30.2	-	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	-	**11,356**	10,000

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

Notes:

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

Appendix B Wastewater Servicing

B.1 Sanitary Sewer Design Sheet

Stantec

SUBDIVISION:

Northwoods Block 454

DATE: 2026-03-12
REVISION: 1
DESIGN BY: MJS
CHECKED BY: MW

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160402120

DESIGN PARAMETERS

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

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	UNITS SINGLE	UNITS TOWN	UNITS 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)
R6A	6	5	0.29	0	18	0	49	0.29	49	3.65	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.29	0.29	0.1	0.7	46.2	200	PVC	SDR 35	0.50	23.6	**2.84%**	0.74
R5A	5A	5	0.09	0	0	24	43	0.09	43	3.66	0.5	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.09	0.0	0.6	8.0	150	PVC	DR 28	1.00	15.3	**3.76%**	0.86
	5	4	0.00	0	0	0	0	0.38	92	3.60	1.1	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.38	0.1	1.2	37.3	250	PVC	SDR 35	0.40	38.3	**3.18%**	0.77
R7A	7	4	0.43	0	15	0	41	0.43	41	3.67	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.43	0.43	0.1	0.6	28.3	200	PVC	SDR 35	0.50	23.7	**2.63%**	0.75
R4A	4	3	0.16	0	9	0	24	0.97	157	3.55	1.8	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.97	0.3	2.1	23.6	250	PVC	SDR 35	0.40	38.3	**5.59%**	0.77
R3A	3	2	0.12	0	6	0	16	1.09	173	3.54	2.0	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.12	1.09	0.4	2.4	13.6	250	PVC	SDR 35	0.40	38.3	**6.16%**	0.77
	2	1	0.00	0	0	0	0	1.09	173	3.54	2.0	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.09	0.4	2.4	13.5	250	PVC	SDR 35	2.00	85.7	**2.76%**	1.73
																												250						
R9A	9	8	1.87	0	102	24	319	1.87	319	3.45	3.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.87	1.87	0.6	4.2	4.5	250	PVC	SDR 35	0.40	38.3	**10.91%**	0.77
	8	1	0.00	0	0	0	0	1.87	319	3.45	3.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.87	0.6	4.2	14.9	250	PVC	SDR 35	0.40	38.3	**10.91%**	0.77
																												250						

B.2 Sanitary Design Background Report Excerpts

Stantec Consulting Ltd.

Mattamy Northwoods Subdivision

Servicing and Stormwater Management Report

Stantec

Prepared for:
Mattamy Homes Ltd.

Prepared by:
Stantec Consulting Ltd.

February 25, 2025

Project/File:
160401977

4 Wastewater Servicing

4.1 Background

Two existing sanitary collection systems service the KNUEA and the Mattamy Northwoods Subdivision as outlined in the KNMSS (see report excerpts in **Appendix B.2**).

The eastern portion of the development will be serviced by the sanitary sewer network that conveys wastewater to the Briar Ridge Pump Station (BRPS), located south of Klondike Road and east of the former CN railway corridor. The BRPS discharges into the East March Trunk sanitary sewer. Upgrades are underway at the pump station as part of a City of Ottawa capital project. Commissioning of the upgraded pump station was scheduled for completion in April 2024 but has been delayed. The City of Ottawa has established a temporary solution to allow the upstream developments to proceed in advance of commissioning of the BRPS upgrades. The KNMSS assumed sewage from 19.80 ha within the proposed site would be directed to the BRPS outlet with a total peak flow of 26.4 L/s (see KNMSS excerpts in **Appendix B.2**).

The western portion of the development at the top of the ridge will outlet to the recently installed 600mm sanitary trunk sewer in March Road. The KNMSS assumed sewage from 19.99 ha within the proposed site would be directed to the March Road outlet with a total peak flow of 28.7 L/s (see KNMSS excerpts in **Appendix B.2**).

As part of the KNMSS, a hydraulic grade line (HGL) analysis was completed on the BRPS to ensure that, when the future lands within the KNUEA are added to the system, there were no negative impacts to the existing developments. The existing BRPS has two existing overflow outlets to provide relief to the system in the event of failure. The analysis concluded that an additional overflow outlet discharging into the KNUEA SWM Pond 3 (Overflow invert of 67.50 m) would be required to minimize any negative impacts on the existing subdivision. The sanitary overflow to Pond 3 has been incorporated into the DSEL design for the Minto Brookline Subdivision.

4.2 Design Criteria

The sanitary sewer design sheet is included in **Appendix B.1**. The sewers have been designed in conformance with all relevant City of Ottawa and MECP Guidelines and Policies. Per ISTB-2018-01, the City's current design parameters represent a flow reduction from the outdated standards used within the KNMSS. As a result, the revised sanitary sewer design criteria differ from the criteria previously used in the KNMSS as shown in the **Table 4.1** below.

Table 4.1: Sanitary Sewer Design Criteria Comparison

Design Parameters	Revised Design Criteria (City Guidelines - 2018)	2016 KNMSS Criteria
Minimum Velocity (m/s)	0.6	
Maximum Velocity (m/s)	3.0	
Manning roughness coefficient for all smooth wall pipes	0.013	
Minimum size	200mm dia. for residential areas, 250mm for commercial areas	
Single Family Persons per unit	3.4	3.4
Townhouse Persons per unit	2.7	2.7
Average Apartment Persons per unit	1.8	1.8
Extraneous Flow Allowance (L/s/ha)	0.33	0.28
Manhole Spacing (m)	120 m	
Minimum Cover (m)	2.5 m	
Average Daily Discharge / Person (L/cap/day)	280	350
Harmon Correction Factor	0.8	1.0
Institutional Daily Flow (L/ha/day)	28,000	28,000
Commercial Daily Flow (L/ha/day)	28,000	50,000

4.3 Sanitary Servicing

The wastewater servicing for the proposed development was considered within the KNMSS and the functional design. Sanitary sewage from the eastern portion of the development will drain the south, with a connection to the sanitary sewer system within the Minto Brookline Subdivision. The western portion of the development at the top of the ridge will drain to the west, with a connection to the 600 mm diameter trunk sanitary sewer in March Road (see **Appendix B.2**). **Drawings SA-1 and SA-2** detail the wastewater servicing and sanitary drainage areas for the development.

The proposed development will be serviced by a network of gravity sewers, designed in accordance with the wastewater design parameters from ISTB-2018-01 and the Sewer Design Guidelines, summarized above.

The sanitary sewer design sheet can be found in **Appendix B.1**. A breakdown of the estimated sewage peak flows that will be directed to each outlet is shown in **Table 4.2**.

Table 4.2: Estimated Wastewater Peak Flows

Sanitary Outlet	Residential Population (persons)	Residential Peak Flow (L/s)	Institutional Area (ha)	Commercial Area (ha)	Commercial /Institutional Peak Flow (L/s)	Total Area (ha)	Extraneous Flow (L/s)	Total Peak Flow (L/s)
BRPS (via Minto Brookline)	1,681	17.0	N/A	N/A	N/A	22.85	7.5	24.5
March Road	800	8.5	2.84	2.96	2.8	15.66	5.2	16.5

As can be seen in the above table, the total design peak flows to the March Road outlet and BRPS outlet are less than the peak flows assumed in the KNMSS of 28.7 L/s and 26.4 L/s respectively.

4.4 Sanitary HGL Analysis

The BRPS sanitary sewer overflow outlet at MH1470A will provide emergency relief to the sanitary sewer network under emergency conditions via a 375 mm diameter sewer with an invert of 67.50 m that will outlet into the Minto Brookline storm sewer and SWM Pond 3. The proposed minimum unit underside of footing elevations exceeds the 0.3m freeboard requirement between the sanitary sewer HGL and USF. Results of the analyses are demonstrated in **Table 4.3** below, as well as within **Appendix B**.

Table 4.3: Emergency Overflow HGL

Manhole	Rim Elev. (m)	Adjacent USF (m)	HGL (m)	Freeboard
1	72.39	70.59	67.66	2.93
2	72.41	70.55	67.89	2.66
3	72.14	70.45	68.08	2.37
4	72.18	70.41	68.11	2.30
5	72.31	70.41	68.18	2.23
6	72.29	70.27	69	1.27
7	72.16	70.06	69.09	0.97
8	72.08	69.74	69.14	0.60
9	72.21	70.01	69.27	0.74
10	72.50	70.41	69.43	0.98
11	72.60	70.41	69.57	0.84
11A	72.51	70.57	69.84	0.73
12	72.99	70.77	70.14	0.63
13	73.23	71.36	70.39	0.97
14	72.61	70.61	69.8	0.81

Appendix B Wastewater Servicing

B.1 Sanitary Sewer Design Sheet

Stantec

SUBDIVISION:
1020 & 1070 March Road

DATE: 2024-06-18
REVISION: 3
DESIGNED BY: WAJ
CHECKED BY: DCT

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401977

DESIGN PARAMETERS

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

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	UNITS SINGLE	UNITS TOWN	UNITS 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)	VEL. (ACT.) (m/s)
R110B	110	108	0.47	10	0	0	34	0.47	34	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.47	0.47	0.2	0.6	58.4	200	PVC	SDR 35	0.65	27.0	2.08%	0.85	0.29
R108A	108	107	0.52	11	0	0	37	0.99	71	3.62	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.52	0.99	0.3	1.2	61.2	200	PVC	SDR 35	0.45	22.4	5.19%	0.71	0.31
R107A	107	106	0.17	2	0	0	7	1.16	78	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.17	1.16	0.4	1.3	10.9	200	PVC	SDR 35	0.45	22.4	5.79%	0.71	0.32
R106A	106	105	0.27	5	0	0	17	1.43	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.27	1.43	0.5	1.6	66.3	200	PVC	SDR 35	0.45	22.4	7.06%	0.71	0.34
R133A	133	130	0.25	5	0	0	17	0.25	17	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	0.25	0.25	0.1	0.3	28.8	200	PVC	SDR 35	0.65	27.0	1.06%	0.85	0.23
R130A	130	129	0.40	7	0	0	24	0.65	41	3.67	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.65	0.2	0.7	62.1	200	PVC	SDR 35	0.32	18.9	3.69%	0.60	0.24
R129A	129	128	0.59	0	20	0	54	1.24	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.59	1.24	0.4	1.5	93.8	300	PVC	SDR 35	0.19	42.0	3.61%	0.60	0.24
R128A, I128B	128	127	0.25	0	10	0	27	1.49	122	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	2.84	2.84	0.00	0.00	1.4	3.09	4.33	1.4	4.2	65.9	300	PVC	SDR 35	0.19	42.0	10.06%	0.60	0.32
R127A	127	126	0.18	0	7	0	19	1.67	141	3.56	1.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	1.4	0.18	4.51	1.5	4.5	59.7	300	PVC	SDR 35	0.19	42.0	10.70%	0.60	0.33
R126A	126	105	0.12	0	0	0	0	1.79	141	3.56	1.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	1.4	0.12	4.63	1.5	4.5	74.0	300	PVC	SDR 35	0.19	42.0	10.80%	0.60	0.33
R105A	105	104	0.49	9	2	0	36	3.71	272	3.48	3.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	1.4	0.49	6.55	2.2	6.6	70.3	300	PVC	SDR 35	0.19	42.0	15.74%	0.60	0.36
R104A	104	103	0.45	9	1	0	33	4.16	305	3.46	3.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	1.4	0.45	7.00	2.3	7.1	64.7	300	PVC	SDR 35	0.19	42.0	16.95%	0.60	0.37
R110A	110	109	0.16	0	2	0	5	0.16	5	3.75	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.16	0.1	0.1	10.8	200	PVC	SDR 35	0.70	28.0	0.42%	0.88	0.19
R109A	109	103	0.27	0	7	0	19	0.43	24	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.27	0.43	0.1	0.4	66.3	200	PVC	SDR 35	0.70	28.0	1.55%	0.88	0.27
R133B	133	132	0.63	14	0	0	48	0.63	48	3.66	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.63	0.63	0.2	0.8	75.9	200	PVC	SDR 35	0.32	18.9	4.08%	0.60	0.24
R132A	132	131	0.41	8	0	0	27	1.04	75	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.41	1.04	0.3	1.2	59.4	200	PVC	SDR 35	0.32	18.9	6.45%	0.60	0.28
R131A	131	124	0.11	1	0	0	3	1.14	78	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.11	1.14	0.4	1.3	11.5	200	PVC	SDR 35	0.32	18.9	6.84%	0.60	0.28
R124A	124	123	0.28	5	0	0	17	1.42	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.28	1.42	0.5	1.6	59.8	200	PVC	SDR 35	0.32	18.9	8.35%	0.60	0.30
R123A	123	122	0.08	0	1	0	3	1.51	98	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	1.51	0.5	1.6	11.5	200	PVC	SDR 35	0.32	18.9	8.66%	0.60	0.30
R122A	122	113	0.55	0	20	0	54	2.05	152	3.55	1.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.55	2.05	0.7	2.4	90.0	250	PVC	SDR 35	0.25	30.3	8.00%	0.61	0.30
R121A	121	120	0.09	0	1	0	3	0.09	3	3.76	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.09	0.0	0.1	8.1	200	PVC	SDR 35	0.65	27.0	0.23%	0.85	0.13
R120B	120	119	0.19	0	6	0	16	0.28	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	0.19	0.28	0.1	0.3	45.0	200	PVC	SDR 35	0.32	18.9	1.68%	0.60	0.18
R119B	119	113	0.20	0	6	0	16	0.47	35	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.47	0.2	0.6	45.0	200	PVC	SDR 35	0.32	18.9	3.04%	0.60	0.23
R113A	113	112	0.30	0	13	0	35	2.83	222	3.50	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.30	2.83	0.9	3.5	70.4	300	PVC	SDR 35	0.19	42.0	8.23%	0.60	0.30
R112A	112	111	0.30	0	13	0	35	3.13	257	3.48	2.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.30	3.13	1.0	3.9	56.2	300	PVC	SDR 35	0.19	42.0	9.38%	0.60	0.31
R119A	119	117	0.26	0	14	0	38	0.26	38	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.26	0.26	0.1	0.5	64.5	200	PVC	SDR 35	0.32	18.9	2.84%	0.60	0.22
R117A	117	114	0.25	0	14	0	38	0.51	76	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.51	0.2	1.1	61.8	200	PVC	SDR 35	0.32	18.9	5.59%	0.60	0.27
R120A	120	118	0.26	0	14	0	38	0.26	38	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.26	0.26	0.1	0.5	65.9	200	PVC	SDR 35	0.32	18.9	2.84%	0.60	0.22
R118A	118	115	0.25	0	14	0	38	0.51	76	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.51	0.2	1.1	60.0	200	PVC	SDR 35	0.32	18.9	5.58%	0.60	0.27
R116A	116	115	0.15	0	4	0	11	0.15	11	3.73	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.15	0.1	0.2	28.1	200	PVC	SDR 35	0.65	27.0	0.67%	0.85	0.21
R115A	115	114	0.18	0	6	0	16	0.84	103	3.59	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.84	0.3	1.5	45.0	200	PVC	SDR 35	0.32	18.9	7.79%	0.60	0.30
R114A	114	111	0.16	0	5	0	14	1.52	192	3.52	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.16	1.52	0.5	2.7	45.0	200	PVC	SDR 35	0.32	18.9	14.23%	0.60	0.35
R111A	111	103	0.27	0	8	0	22	4.92	471	3.39	5.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.27	4.92	1.6	6.8	74.0	300	PVC	SDR 35	0.19	42.0	16.19%	0.60	0.36
R103A	103	102	0.10	0	0	0	0	9.61	800	3.29	8.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	1.4	0.10	12.45	4.1	14.0	44.5	300	PVC	SDR 35	0.19	42.0	33.40%	0.60	0.45
C102B, R102A, C102A	102	101	0.14	0	0	0	0	9.75	800	3.29	8.5	2.96	2.96	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	2.8	3.10	15.55	5.1	16.5	62.4	300	PVC	SDR 35	0.19	42.0	39.26%	0.60	0.47
R101A	101	100	0.12	0	0	0	0	9.87	800	3.29	8.5	0.00	2.96	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	2.8	0.12	15.66	5.2	16.5	45.4	300	PVC	SDR 35	0.19	42.0	39.35%	0.60	0.47
	100	525	0.00	0	0	0	0	9.87	800	3.29	8.5	0.00	2.96	0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	2.8	0.00	15.66	5.2	16.5	29.5	300	PVC	SDR 35	0.24	47.0	35.10%	0.67	0.51
																												300							
R17B	17	16	0.56	13	0	0	44	0.56	44	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.56	0.56	0.2	0.7	72.2	200	PVC	SDR 35	0.32	18.9	3.76%	0.60	0.24
R16A	16	15	0.68	15	0	0	51	1.24	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.68	1.24	0.4	1.5	81.9	200	PVC	SDR 35	0.32	18.9	8.03%	0.60	0.30
R15A	15	14	0.19	2	0	0	7	1.43	102	3.59	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	1.43	0.5	1.7	11.4	200	PVC	SDR 35	0.32	18.9	8.78%	0.60	0.30
R14A	14	11	0.31	5	0	0	17	1.74	119	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.31	1.74	0.6	2.0	66.0	200	PVC	SDR 35	0.32	18.9	10.33%	0.60	0.32
R17A	17	13	0.20	2	0	0	7	0.20	7	3.74	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.20	0.1	0.1	11.5	200	PVC	SDR 35	0.65	27.0	0.55%	0.85	0.18
R13A	13	12	0.26	5	0	0	17	0.46	24	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.26	0.46	0.2	0.4	65.9	200	PVC	SDR 35	0.32	18.9	2.32%	0.60	0.21
R12A	12	11A	0.73	0	23	0	62	1.19	86	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.73	1.19	0.4	1.4	95.1	200	PVC	SDR 35	0.32	18.9	7.39%	0.60	0.29
R11AA	11A	11	0.45	0	18	0	49	1.64	135	3.56	1.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.45	1.64	0.5	2.1	76.0	200	PVC	SDR 35	0.32	18.9	11.07%	0.60	0.33
R11A	11	10	0.20	3	0	0	10	3.58	264	3.48	3.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	3.58	1.2	4.2	49.0	250	PVC	SDR 35	0.24	29.7	13.99%	0.60	0.35

Appendix C Stormwater Management and Servicing

C.1 Storm Sewer Design Sheet

Stantec	Northwoods Block 454		STORM SEWER DESIGN SHEET (City of Ottawa)
	DATE:	2026-03-12	
	REVISION:	1	
	DESIGNED BY:	MJS	FILE NUMBER: 160402120
	CHECKED BY:	MW	

DESIGN PARAMETERS

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

	1:2 yr	1:5 yr	1:10 yr	1:100 yr			
a =	732.951	998.071	1174.184	1735.688	MANNING'S n =	0.013	BEDDING CLASS = B
b =	6.199	6.053	6.014	6.014	MINIMUM COVER:	2.00	m
c =	0.810	0.814	0.816	0.820	TIME OF ENTRY	10	min

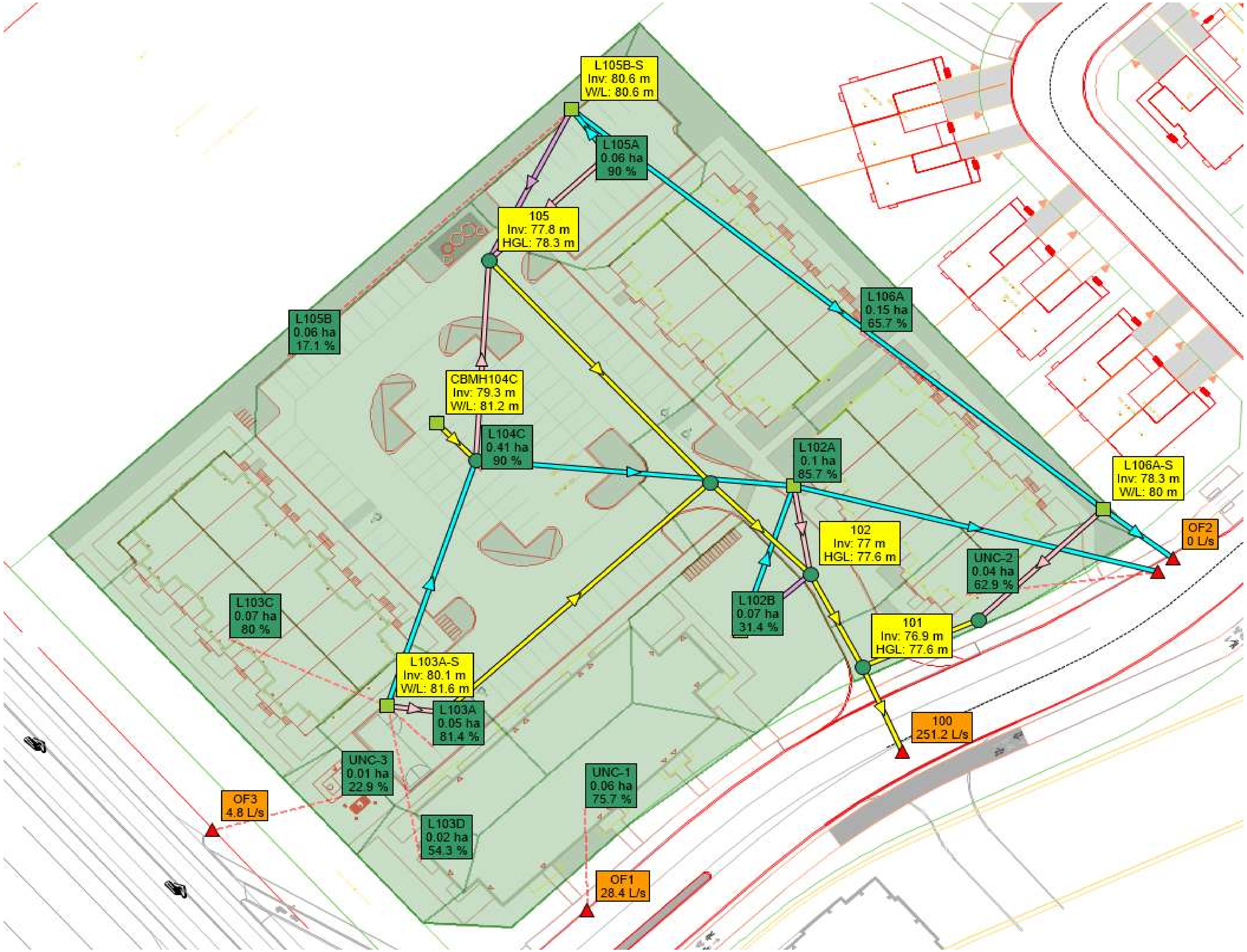
LOCATION / DRAINAGE AREA

AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	I_{2-YEAR} (mm/h)	I_{5-YEAR} (mm/h)	$I_{10-YEAR}$ (mm/h)	$I_{100-YEAR}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)
L106A	106	101	0.15	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.100	0.100	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	21.4
																				10.43							
L103D, L103C, L103A	104	103	0.14	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.102	0.102	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	21.7
																				11.33							
L104C, L105B, L105A	105	103	0.52	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.401	0.401	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	85.6
																				10.82							
	103	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.503	0.000	0.000	0.000	0.000	0.000	0.000	11.33	72.06	97.67	114.46	167.27	0.0	0.0	100.7
L102A, L102B	102	101	0.17	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.110	0.613	0.000	0.000	0.000	0.000	0.000	0.000	11.68	70.91	96.09	112.60	164.55	0.0	0.0	120.7
																				11.94							
	101	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.713	0.000	0.000	0.000	0.000	0.000	0.000	11.94	70.09	94.97	111.28	162.61	0.0	0.0	138.8
																				12.15							
	107A	107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0
L107A	107	100	1.87	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	1.306	1.306	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	278.7
																				10.19							

PIPE SELECTION

AREA ID NUMBER	FROM M.H.	TO M.H.	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)
L106A	106	101	18.5	300	300	CIRCULAR	PVC	-	0.50	68.0	**31.48%**	0.97
L103D, L103C, L103A	104	103	51.9	375	375	CIRCULAR	CONCRETE	-	0.40	104.3	**20.82%**	0.99
L104C, L105B, L105A	105	103	46.6	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	**45.52%**	1.15
	103	102	20.5	525	525	CIRCULAR	CONCRETE	-	0.40	283.8	**35.49%**	1.27
L102A, L102B	102	101	16.0	525	525	CIRCULAR	CONCRETE	-	0.40	283.8	**42.54%**	1.27
	101	100	13.6	525	525	CIRCULAR	CONCRETE	-	0.40	283.8	**48.93%**	1.27
				525	525							
	107A	107	3.5	600	600	CIRCULAR	CONCRETE	-	0.40	405.1	**0.00%**	1.39
L107A	107	100	15.3	600	600	CIRCULAR	CONCRETE	-	0.40	405.1	**68.80%**	1.39
				600	600							

C.2 Schematic and Sample PCSWMM Input and Output Files


L105B-S
Inv: 80.6 m
W/L: 80.6 m
L105A
0.06 ha
90 %
105
Inv: 77.8 m
HGL: 78.3 m
L105B
0.06 ha
17.1 %
L106A
0.15 ha
65.7 %
CBMH104C
Inv: 79.3 m
W/L: 81.2 m
L104C
0.41 ha
90 %
L102A
0.1 ha
85.7 %
L106A-S
Inv: 78.3 m
W/L: 80 m
OF2
0 L/s
102
Inv: 77 m
HGL: 77.6 m
UNC-2
0.04 ha
62.9 %
L103C
0.07 ha
80 %
L102B
0.07 ha
31.4 %
101
Inv: 76.9 m
HGL: 77.6 m
L103A-S
Inv: 80.1 m
W/L: 81.6 m
L103A
0.05 ha
81.4 %
100
251.2 L/s
UNC-3
0.01 ha
22.9 %
UNC-1
0.06 ha
75.7 %
OF3
4.8 L/s
L103D
0.02 ha
54.3 %
OF1
28.4 L/s

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

WARNING 03: negative offset ignored for Link C105A-IC

****
Element Count
****
Number of rain gages 4
Number of subcatchments ... 12
Number of nodes 19
Number of links 21
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
002	002_CHI	INTENSITY	10 min.
005	005_CHI	INTENSITY	10 min.
100	100_CHI	INTENSITY	10 min.
120	120_CHI	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
L102A	0.10	25.46	85.71	0.6000	100	L102A-S
L102B	0.07	28.30	31.43	3.0000	100	L102B-S
L103A	0.05	25.99	81.43	1.7000	100	L103A-S
L103C	0.07	18.20	80.00	1.7000	100	L103A-S
L103D	0.02	4.10	54.29	0.7000	100	L103A-S
L104C	0.41	35.69	90.00	2.5000	100	CBMH104C
L105A	0.06	16.37	90.00	1.0000	100	

L105A-S					
L105B	0.06	5.03	17.14	33.0000	100
L105B-S					
L106A	0.15	14.46	65.71	2.0000	100
L106A-S					
UNC-1	0.06	55.74	75.71	3.0000	100
OF1					
UNC-2	0.04	42.80	62.86	2.7000	100
OF4					
UNC-3	0.01	15.84	22.86	0.7000	100
OF3					

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
100	OUTFALL	76.77	0.90	0.0	
OF1	OUTFALL	80.09	0.00	0.0	
OF2	OUTFALL	80.31	0.00	0.0	
OF3	OUTFALL	81.16	0.00	0.0	
OF4	OUTFALL	80.83	0.00	0.0	
101	STORAGE	76.90	4.28	0.0	
102	STORAGE	76.99	4.12	0.0	
103	STORAGE	77.10	4.16	0.0	
104	STORAGE	78.97	2.74	0.0	
105	STORAGE	77.77	3.62	0.0	
106	STORAGE	77.44	3.55	0.0	
CBMH104C	STORAGE	79.32	2.07	0.0	
L102A-S	STORAGE	79.60	1.56	0.0	
L102B-S	STORAGE	79.72	1.63	0.0	
L103A-S	STORAGE	80.07	1.63	0.0	
L104C-S	STORAGE	78.80	2.58	0.0	
L105A-S	STORAGE	79.48	1.72	0.0	
L105B-S	STORAGE	80.58	0.50	0.0	
L106A-S	STORAGE	78.27	1.98	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	CBMH104C	L104C-S	CONDUIT	15.0	0.1333	0.0130

Pipe_10	104	103	CONDUIT	51.9	0.4006	0.0130
Pipe_13	105	103	CONDUIT	46.6	0.3992	0.0130
Pipe_22	106	101	CONDUIT	18.5	0.4978	0.0130
Pipe_41	102	101	CONDUIT	16.0	0.4005	0.0130
Pipe_8	101	100	CONDUIT	13.6	0.3969	0.0130
Pipe_9	103	102	CONDUIT	20.5	0.3998	0.0130
C102A-IC	L102A-S	102	ORIFICE			
C103A-IC	L103A-S	104	ORIFICE			
C104C-IC	L104C-S	105	ORIFICE			
C105A-IC	L105A-S	105	ORIFICE			
C106A-IC	L106A-S	106	ORIFICE			
W2	L102B-S	L102A-S	WEIR			
W3	L102A-S	OF4	WEIR			
W4	L106A-S	OF2	WEIR			
W5	L105B-S	L106A-S	WEIR			
W6	L104C-S	L102A-S	WEIR			
W7	L105A-S	L105B-S	WEIR			
W8	L103A-S	L104C-S	WEIR			
C102B-IC	L102B-S	102	OUTLET			
OR4	L105B-S	105	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.90	0.64	0.23	0.90	1	661.07
Pipe_10	CIRCULAR	0.38	0.11	0.09	0.38	1	110.97
Pipe_13	CIRCULAR	0.45	0.16	0.11	0.45	1	180.15
Pipe_22	CIRCULAR	0.30	0.07	0.07	0.30	1	68.23
Pipe_41	CIRCULAR	0.53	0.22	0.13	0.53	1	272.19
Pipe_8	CIRCULAR	0.53	0.22	0.13	0.53	1	270.95

```
  Pipe_9           CIRCULAR             0.53     0.22     0.13     0.53        1
271.96


  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 11/02/2025 00:00:00
  Ending Date .............. 11/03/2025 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:01:00
  Dry Time Step ............ 00:01:00
  Routing Time Step ........ 5.00 sec
  Variable Time Step ....... NO
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         0.078        71.667
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         0.013        11.478
  Surface Runoff ...........         0.064        59.075
  Final Storage ............         0.001         1.173
  Continuity Error (%) .....        -0.084


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.064         0.643
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
```

External Inflow	0.000	0.000
External Outflow	0.064	0.640
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.002
Continuity Error (%)	0.174	

****
Highest Flow Instability Indexes
****

All links are stable.

****
Most Frequent Nonconverging Nodes
****

Convergence obtained at all time steps.

****
Routing Time Step Summary
****

Minimum Time Step :	5.00 sec
Average Time Step :	5.00 sec
Maximum Time Step :	5.00 sec
% of Time in Steady State :	0.00
Average Iterations per Step :	2.01
% of Steps Not Converging :	0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
L102A	71.67	0.00	0.00	6.39	60.13					

						3.86	63.99	0.07	48.52	0.893
L102B	71.67	0.00	0.00	30.82	22.07	18.35	40.42	0.03	24.31	0.564
L103A	71.67	0.00	0.00	8.19	57.16	5.14	62.30	0.03	24.27	0.869
L103C	71.67	0.00	0.00	8.90	56.14	5.45	61.59	0.04	32.30	0.859
L103D	71.67	0.00	0.00	21.37	38.09	11.40	49.50	0.01	6.41	0.691
L104C	71.67	0.00	0.00	4.47	63.13	2.70	65.83	0.27	193.55	0.919
L105A	71.67	0.00	0.00	4.42	63.15	2.76	65.90	0.04	27.49	0.920
L105B	71.67	0.00	0.00	37.99	12.04	21.42	33.45	0.02	15.89	0.467
L106A	71.67	0.00	0.00	16.07	46.10	8.51	54.61	0.08	58.50	0.762
UNC-1	71.67	0.00	0.00	10.66	53.16	6.78	59.94	0.04	28.40	0.836
UNC-2	71.67	0.00	0.00	16.34	44.13	10.32	54.45	0.02	18.95	0.760
UNC-3	71.67	0.00	0.00	34.49	16.04	20.83	36.88	0.00	4.76	0.515

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
100	OUTFALL	0.19	0.79	77.56	0 01:10	0.79
OF1	OUTFALL	0.00	0.00	80.09	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	80.31	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	81.16	0 00:00	0.00
OF4	OUTFALL	0.00	0.00	80.83	0 00:00	0.00
101	STORAGE	0.31	0.70	77.60	0 01:10	0.70
102	STORAGE	0.31	0.65	77.64	0 01:10	0.64
103	STORAGE	0.31	0.58	77.68	0 01:10	0.58
104	STORAGE	0.30	0.43	79.40	0 01:10	0.43
105	STORAGE	0.31	0.54	78.31	0 01:10	0.54
106	STORAGE	0.30	0.53	77.97	0 01:11	0.53
CBMH104C	STORAGE	0.08	1.94	81.26	0 01:20	1.94
L102A-S	STORAGE	0.02	1.44	81.04	0 01:10	1.44
L102B-S	STORAGE	0.04	1.55	81.27	0 01:10	1.55
L103A-S	STORAGE	0.07	1.56	81.63	0 01:10	1.56
L104C-S	STORAGE	0.11	2.46	81.26	0 01:20	2.46

L105A-S	STORAGE	0.02	1.53	81.01	0	01:07	1.53
L105B-S	STORAGE	0.00	0.08	80.66	0	01:09	0.08
L106A-S	STORAGE	0.60	1.77	80.04	0	01:10	1.77

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
100	OUTFALL	0.00	237.80	0	01:11	0	0.578	0.000
OF1	OUTFALL	28.40	28.40	0	01:10	0.0356	0.0356	0.000
OF2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF3	OUTFALL	4.76	4.76	0	01:10	0.00468	0.00468	0.000
OF4	OUTFALL	18.95	18.95	0	01:10	0.0221	0.0221	0.000
101	STORAGE	0.00	236.38	0	01:10	0	0.578	-0.036
102	STORAGE	0.00	187.70	0	01:10	0	0.496	0.024
103	STORAGE	0.00	127.56	0	01:10	0	0.404	-0.072
104	STORAGE	0.00	25.08	0	01:10	0	0.0674	0.011
105	STORAGE	0.00	104.76	0	01:08	0	0.338	-0.002
106	STORAGE	0.00	48.06	0	01:10	0	0.0822	0.011
CBMH104C	STORAGE	193.55	193.55	0	01:10	0.267	0.267	-0.028
L102A-S	STORAGE	48.52	64.57	0	01:10	0.0657	0.0699	0.113
L102B-S	STORAGE	24.31	24.31	0	01:10	0.0266		

```
0.0266       0.205
  L103A-S              STORAGE      62.98    62.98     0  01:10      0.0828
0.0828       0.238
  L104C-S              STORAGE       0.00   230.36     0  01:10           0
0.282       0.241
  L105A-S              STORAGE      27.49    27.49     0  01:10      0.0372
0.0372       0.031
  L105B-S              STORAGE      15.89    27.21     0  01:09      0.0191
0.0232      -0.004
  L106A-S              STORAGE      58.50    58.50     0  01:10       0.083
0.083       0.661


  **********************
  Node Surcharge Summary
  **********************

  No nodes were surcharged.


  *********************
  Node Flooding Summary
  *********************

  No nodes were flooded.


  **********************
  Storage Volume Summary
  **********************


------------------------------------------------------------------------------------
-------------
                         Average    Avg   Evap  Exfil     Maximum    Max    Time of
Max    Maximum
                          Volume   Pcnt   Pcnt   Pcnt      Volume   Pcnt
Occurrence    Outflow
  Storage Unit           1000 m    Full   Loss   Loss     1000 m    Full    days
hr:min        LPS

------------------------------------------------------------------------------------
-------------
  101                      0.000    7.3    0.0    0.0       0.001   16.3       0
01:10     237.80
  102                      0.000    7.6    0.0    0.0       0.001   15.7       0
01:10     188.49
  103                      0.000    7.5    0.0    0.0       0.001   13.9       0
01:10     127.01
  104                      0.000   11.0    0.0    0.0       0.000   15.7       0
```

								01:10	25.07
105	0.000	8.6	0.0	0.0	0.001	15.0	0	01:10	102.48
106	0.000	8.5	0.0	0.0	0.001	15.0	0	01:11	47.99
CBMH104C	0.000	4.0	0.0	0.0	0.000	93.7	0	01:20	192.66
L102A-S	0.000	0.2	0.0	0.0	0.001	26.0	0	01:10	53.67
L102B-S	0.000	0.9	0.0	0.0	0.004	55.4	0	01:10	23.42
L103A-S	0.000	0.9	0.0	0.0	0.004	61.5	0	01:10	62.77
L104C-S	0.002	1.2	0.0	0.0	0.081	51.6	0	01:20	60.29
L105A-S	0.000	0.2	0.0	0.0	0.001	11.8	0	01:07	31.36
L105B-S	0.000	0.3	0.0	0.0	0.000	15.2	0	01:09	28.59
L106A-S	0.000	3.5	0.0	0.0	0.004	64.0	0	01:10	48.06

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
100	22.96	29.10	237.80	0.578
OF1	12.19	3.38	28.40	0.036
OF2	0.00	0.00	0.00	0.000
OF3	11.45	0.47	4.76	0.005
OF4	11.92	2.14	18.95	0.022
System	11.70	35.10	280.09	0.640

****
Link Flow Summary
****

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

C1	CONDUIT	192.66	0	01:10	0.70	0.29	1.00
Pipe_10	CONDUIT	25.07	0	01:10	0.80	0.23	0.33
Pipe_13	CONDUIT	102.48	0	01:10	1.24	0.57	0.52
Pipe_22	CONDUIT	47.99	0	01:11	0.96	0.70	0.67
Pipe_41	CONDUIT	188.49	0	01:10	1.35	0.69	0.68
Pipe_8	CONDUIT	237.80	0	01:11	1.56	0.88	0.77
Pipe_9	CONDUIT	127.01	0	01:10	1.19	0.47	0.57
C102A-IC	ORIFICE	53.67	0	01:10			1.00
C103A-IC	ORIFICE	25.08	0	01:10			1.00
C104C-IC	ORIFICE	60.29	0	01:20			1.00
C105A-IC	ORIFICE	16.74	0	01:06			1.00
C106A-IC	ORIFICE	48.06	0	01:10			1.00
W2	WEIR	16.32	0	01:10			0.16
W3	WEIR	0.00	0	00:00			0.00
W4	WEIR	0.00	0	00:00			0.00
W5	WEIR	0.00	0	00:00			0.00
W6	WEIR	0.00	0	00:00			0.00
W7	WEIR	14.62	0	01:07			0.12
W8	WEIR	37.70	0	01:10			0.27
C102B-IC	DUMMY	7.11	0	01:10			
OR4	DUMMY	28.59	0	01:08			

****

Flow Classification Summary

****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.02	0.00	0.00	0.05	0.00	0.00	0.93	0.00	0.00
Pipe_10	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
Pipe_13	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
Pipe_22	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
Pipe_41	1.00	0.02	0.00	0.00	0.01	0.00	0.00	0.96	0.00	0.00
Pipe_8	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.95	0.00	

0.00
Pipe_9 1.00 0.02 0.00 0.00 0.02 0.00 0.00 0.96 0.00
0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.96	0.96	0.96	0.01	0.01

Analysis begun on: Wed Mar 11 17:06:20 2026
Analysis ended on: Wed Mar 11 17:06:21 2026
Total elapsed time: 00:00:01

C.3 Storm Design Background Report Excerpts

Mattamy Northwoods Subdivision

Servicing and Stormwater Management Report

Stantec

Prepared for:
Mattamy Homes Ltd.

Prepared by:
Stantec Consulting Ltd.

February 25, 2025

Project/File:
160401977

Stantec Consulting Ltd.

Refer to **Table 5.12** for depth of flow in culvert C-1.

5.5.3 Development Blocks

Peak discharge rates and required storage volumes for development blocks (including the proposed school and park blocks) within the subdivision are noted in **Table 5.16** below. The proposed park block has been split into three catchments to represent treed areas to be retained that are anticipated to sheet flow to adjacent right-of-ways uncontrolled and managed within the ROW catchbasins.

Table 5.16: Storm Event Peak Discharge Rates to Pond 3

Catchment	2-Year Storm (L/s)	5-Year Storm (L/s)	100-Year Storm (L/s)	100-Year Storage Volume (m3)
C264A (Park)	27	84	294	0
C247B (Park)	2	14	68	0
C261B (Park)	3	25	120	0
C211B (School)	382	582	582	245
C216B (Block 454)	216	304	304	107
C216C (Block 453)	370	522	522	184

Stormwater management criteria for the future development blocks within the subdivision are noted in **Table 5.17** below.

Table 5.17: Future Development Block SWM Criteria

Catchment	Block Number	Allowable Minor System Release Rate up to the 100-Year Storm (L/s)	Allowable Major System Release Rate up to the 100-Year Storm (L/s)	Storage (up to 100-Year Storm)
C264A (Park)	456	294	0	Storage required for flows exceeding allowable release rate
C211B (School)	455	582	0	
C216B	454	304	0	
C216C	453	522	0	

The park block is divided into 3 drainage areas, two of the areas encompass the stand of white cedars which are to be retained as part of the park development. The City has asked that release rates be established for the portion of the forested portion of the park in the event that the trees are lost in the future and the area is considered for development. **Table 5.18** below provides the allowable release rates for the park block under that condition. Note that with development of the forested area of the park, adjustments to the ICDs in the downstream catchments within Leone Farrell Street will be required.

*Table 5.18: Park Block SWM Criteria (**under condition of loss of cedar forest**)*

Catchment	Block Number	Allowable Minor System Release Rate up to the 100-Year Storm (L/s)	Allowable Major System Release Rate up to the 100-Year Storm (L/s)	Storage (up to 100-Year Storm)
C264A (Park)	456	294	0	Storage required for flows exceeding allowable release rate
C247B		58*	10*	
C261B		32**	88**	

* ICD control to be reduced to 90 L/s in C247A

** ICD control to be reduced to 55 L/s in C261A.

5.6 Results

Table 5.19 demonstrates the modeled peak outflow from each modeled connection point to the downstream KNUEA SWM Pond 3 during the design storm events assessed.

Table 5.19: Storm Event Peak Discharge Rates to Pond 3

Storm Event	Minor System Discharge (201-200) (m3/s)	Major System Discharge (C1) (m3/s)	Total Discharge (HWL-200) m3/s)	Per Approved Pond 3 PCSWMM Model
2-Year, 3 Hour Chicago	4.898	0.041	**4.937**	**5.065**
5-Year, 3 Hour Chicago	6.793	0.067	**6.853**	**7.428**
10-Year, 3 Hour Chicago	7.417	0.115	**7.413**	**8.508**
100-Year, 3 Hour Chicago	8.275	0.612	**8.553**	**11.380**
100-Year, 3 Hour Chicago + 20%	8.554	1.152	**9.319**	**13.708**
100-Year, 24 Hour SCS	8.191	0.359	**8.280**	**10.602**
July 1979	7.758	0.179	**7.951**	**9.657**
August 1988	7.858	0.219	**7.922**	**9.347**
August 1996	7.487	0.112	**7.501**	**8.497**

5.7 Quality Control

Per the Pond Design Brief for Kanata North Pond 3, the pond has been sized to provide 80% long term TSS removal to meet conservation authority requirements for the receiving watercourse. The accompanying PCSWMM model and drainage area plan prepared by JFSA for the design of Pond 3 includes a lumped drainage area from the proposed subdivision totaling 38.4ha at 73.4% imperviousness to discharge for treatment to Pond 3. Based on subcatchment parameters detailed in sections above discharging directly to Pond 3, the subdivision is proposed to direct runoff from approximately 35.73 ha at approximately 67.7% imperviousness. As Pond 3 provides approximately 15,000 m^3 more permanent pool

Appendix C Stormwater Management and Servicing

C.1 Storm Sewer Design Sheet

Stantec

1020 & 1070 March Road

DATE: 2024-09-25
REVISION: 3
DESIGNED BY: WAJ
CHECKED BY: DCT

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401977

DESIGN PARAMETERS

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

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

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

LOCATION			DRAINAGE AREA																									PIPE SELECTION											
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETER (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
C248A (Leone Farrell Street)	248	247	0.00	0.19	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.000	0.000	0.115	0.115	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	33.4	87.4	525	525	CIRCULAR	CONCRETE	SDR 35	0.60	347.5	9.60%	1.56	0.81	1.80
																				11.80																			
L250B (Sea Buckthorn Way)	250	249	0.15	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.080	0.080	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	17.1	11.5	300	300	CIRCULAR	PVC	SDR 35	2.00	136.0	12.57%	1.93	1.10	0.17
L249A, L249B (Sea Buckthorn Way)	249	247	0.70	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.475	0.555	0.000	0.000	0.000	0.000	0.000	0.000	10.17	76.14	103.28	121.07	176.98	0.0	0.0	117.3	68.9	375	375	CIRCULAR	PVC	SDR 35	2.00	249.7	46.99%	2.25	1.89	0.61
																				10.78																			
C247B, C247A, L247B (Leone Farrell Street)	247	246	0.21	0.70	0.00	0.00	0.00	0.55	0.53	0.00	0.00	0.116	0.670	0.367	0.482	0.000	0.000	0.000	0.000	11.80	70.53	95.57	111.99	163.65	0.0	0.0	259.4	64.3	675	675	CIRCULAR	CONCRETE	100-D	0.50	620.1	41.83%	1.68	1.37	0.78
																				12.58																			
C262A (Leone Farrell Street)	262	261	0.00	0.12	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.000	0.000	0.094	0.094	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	27.1	33.5	450	450	CIRCULAR	CONCRETE	100-D	0.20	131.7	20.59%	0.80	0.53	1.06
																				11.06																			
L282B, F282C (Tincture Place)	282	271	0.18	0.00	0.00	0.32	0.00	0.72	0.00	0.00	0.57	0.130	0.130	0.000	0.000	0.000	0.000	0.182	0.182	10.00	76.81	104.19	122.14	178.56	0.0	0.0	118.3	54.5	300	300	CIRCULAR	PVC	SDR 35	2.00	136.0	87.01%	1.93	1.95	0.47
	271	268	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.130	0.000	0.000	0.000	0.000	0.000	0.182	10.47	75.06	101.80	119.32	174.42	0.0	0.0	115.6	11.9	300	300	CIRCULAR	PVC	SDR 35	3.00	166.5	69.40%	2.37	2.23	0.09
																				10.55																			
Catnip Crescent	270	269	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.5	300	300	CIRCULAR	PVC	SDR 35	0.50	68.0	0.00%	0.97	0.00	0.00
L269A (Catnip Crescent)	269	268	0.44	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.322	0.322	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	68.7	93.5	375	375	CIRCULAR	PVC	SDR 35	0.50	124.9	55.02%	1.12	0.99	1.58
																				11.58																			
F268B, L268A (Tincture Place)	268	265	0.24	0.00	0.00	0.20	0.00	0.72	0.00	0.00	0.57	0.174	0.626	0.000	0.000	0.000	0.000	0.114	0.296	11.58	71.24	96.54	113.13	165.32	0.0	0.0	260.1	71.0	450	450	CIRCULAR	CONCRETE	100-D	1.30	339.1	76.69%	2.07	2.01	0.59
																				12.17																			
Catnip Crescent	270	267	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	54.8	300	300	CIRCULAR	PVC	SDR 35	2.00	136.0	0.00%	1.93	0.00	0.00
Catnip Crescent	267	266	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.4	300	300	CIRCULAR	PVC	SDR 35	2.00	136.0	0.00%	1.93	0.00	0.00
L266A (Catnip Crescent)	266	265	0.55	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.400	0.400	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	85.4	93.4	375	375	CIRCULAR	PVC	SDR 35	0.40	111.7	76.46%	1.01	0.98	1.59
																				11.59																			
L265B, L265A (Tincture Place)	265	263	0.66	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.399	1.426	0.000	0.000	0.000	0.000	0.000	0.296	12.17	69.38	93.99	110.13	160.92	0.0	0.0	407.3	94.0	450	450	CIRCULAR	CONCRETE	100-D	2.70	488.7	83.35%	2.98	2.97	0.53
																				12.69																			
C264A (Tincture Place)	264	263	0.00	1.01	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.000	0.000	0.404	0.404	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	116.9	13.9	375	375	CIRCULAR	PVC	SDR 35	1.00	176.6	66.20%	1.59	1.48	0.16
																				10.16																			
L263A (Tincture Place)	263	261	0.27	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.195	1.621	0.000	0.404	0.000	0.000	0.000	0.296	12.69	67.81	91.83	107.59	157.19	0.0	0.0	537.8	67.0	675	675	CIRCULAR	CONCRETE	100-D	1.55	1091.8	49.26%	2.96	2.50	0.45
																				13.14																			
C261A, C261B (Leone Farrell Street)	261	251	0.00	0.74	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.000	1.621	0.288	0.785	0.000	0.000	0.000	0.296	13.14	66.54	90.09	105.54	154.18	0.0	0.0	623.1	73.5	750	750	CIRCULAR	CONCRETE	100-D	0.70	971.7	64.13%	2.13	1.97	0.62
																				13.76																			
L256A (Weecay Circle)	256	255	0.44	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.247	0.247	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	52.7	56.8	375	375	CIRCULAR	PVC	SDR 35	0.25	88.3	59.68%	0.80	0.72	1.32
L255A (Weecay Circle)	255	254	0.30	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.216	0.463	0.000	0.000	0.000	0.000	0.000	0.000	11.32	72.08	97.70	114.49	167.33	0.0	0.0	92.7	11.4	450	450	CIRCULAR	CONCRETE	100-D	0.20	133.0	69.69%	0.81	0.76	0.25
L254A (Weecay Circle)	254	253	0.26	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.191	0.654	0.000	0.000	0.000	0.000	0.000	0.000	11.57	71.27	96.58	113.17	165.39	0.0	0.0	129.5	84.8	525	525	CIRCULAR	CONCRETE	100-D	0.20	200.6	64.53%	0.90	0.83	1.71
L253A (Weecay Circle)	253	252	0.27	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.198	0.852	0.000	0.000	0.000	0.000	0.000	0.000	13.28	66.16	89.58	104.94	153.29	0.0	0.0	156.6	83.0	525	525	CIRCULAR	CONCRETE	100-D	0.20	200.6	78.07%	0.90	0.88	1.57
																				14.85																			
Weecay Circle	256	257	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	12.5	300	300	CIRCULAR	PVC	SDR 35	0.35	56.9	0.00%	0.81	0.00	0.00
L257A (Weecay Circle)	257	260	0.38	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.277	0.277	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	59.0	80.7	375	375	CIRCULAR	PVC	SDR 35	0.25	88.3	66.83%	0.80	0.74	1.81
L260A (Weecay Circle)	260	259	0.30	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.213	0.490	0.000	0.000	0.000	0.000	0.000	0.000	11.81	70.50	95.53	111.94	163.57	0.0	0.0	95.9	78.3	450	450	CIRCULAR	CONCRETE	100-D	0.20	133.0	72.12%	0.81	0.77	1.69
Weecay Circle	259	258	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.490	0.000	0.000	0.000	0.000	0.000	0.000	13.49	65.57	88.76	103.98	151.88	0.0	0.0	89.2	11.5	450	450	CIRCULAR	CONCRETE	100-D	0.20	133.0	67.07%	0.81	0.76	0.25
L258A (Weecay Circle)	258	252	0.31	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.225	0.715	0.000	0.000	0.000	0.000	0.000	0.000	13.75	64.90	87.84	102.89	150.29	0.0	0.0	128.8	64.9	525	525	CIRCULAR	CONCRETE	100-D	0.20	200.6	64.20%	0.90	0.83	1.31
																				15.05																			
C252A, L252B (Weecay Circle)	252	251	0.19	0.26	0.00	0.00	0.00	0.56	0.75	0.00	0.00	0.108	1.675	0.196	0.196	0.000	0.000	0.000	0.000	15.05	61.65	83.39	97.66	142.61	0.0	0.0	332.1	70.5	825	825	CIRCULAR	CONCRETE	100-D	0.40	947.1	35.07%	1.72	1.32	0.89
																				15.94																			
Leone Farrell Street	251	246	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	3.296	0.000	0.981	0.000	0.000	0.000	0.296	15.94	59.63	80.63	94.41	137.85	0.0	0.0	879.2	68.0	1200	1200	CIRCULAR	CONCRETE	100-D	0.30	2227.8	39.46%	1.91	1.52	0.75
																				16.69																			
L246B, C246A (Calendula Place)	246	221	0.47	0.25	0.00	0.00	0.00	0.56	0.75	0.00	0.00	0.264	4.230	0.189	1.652	0.000	0.000	0.000	0.296	16.69	58.05	78.47	91.87	134.12	0.0	0.0	1152.7	70.5	1200	1200	CIRCULAR	CONCRETE	100-D	0.30	2227.8	51.74%	1.91	1.65	0.71
																				17.40																			
Zingiber Terrace	245	244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.5	300	300	CIRCULAR	PVC	SDR 35	0.35	56.9	0.00%	0.81	0.00	0.00
L244A (Zingiber Terrace)	244	221	0.07	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.048	0.048	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	10.2	40.4	300	300	CIRCULAR	PVC	SDR 35	0.35	56.9	17.86%	0.81	0.51	1.33
																				11.33																			
L221A (Calendula Place)	221	220	0.24	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.181	4.460	0.000	1.652	0.000	0.000	0.000	0.296	17.40	56.62	76.52	89.58	130.76	0.0	0.0	1160.3	57.3	1350	1200	CIRCULAR	CONCRETE	100-D	0.30	3049.8	38.04%	2.06	1.62	0.59
L220B, L220A (Calendula Place)	220	219	1.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.639	5.098	0.000	1.652	0.000	0.000	0.000	0.296	17.99	55.51	75.00	87.79	128.13	0.0	0.0	1235.8	109.9	1350	1200	CIRCULAR	CONCRETE	100-D	0.30	3049.8	40.52%	2.06	1.66	1.10
Calendula Place	219	218	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	5.098	0.000	1.652	0.000	0.000	0.000	0.296	19.09	53.54	72.31	84.63	123.49	0.0	0.0	1191.7	12.3	1500	1500	CIRCULAR	CONCRETE	100-D	0.30	4039.2	29.50%	2.21	1.62	0.13
L218A (Calendula Place)	218	202	0.25	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.179	5.277	0.000	1.652	0.000	0.000	0.000	0.296	19.22	53.32	72.01	84.28	122.98	0.0	0.0	1213.4	17.6	1500	1500	CIRCULAR	CONCRETE	100-D	0.30	4039.2	30.04%	2.21	1.62	0.18
																				19.40																			
L245A (Zingiber Terrace)	245	222	0.48	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.361	0.361	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	76.9	82.4	450	450	CIRCULAR	CONCRETE	SDR 35	0.20	133.0	57.84%	0.81	0.72	1.90
L222A (Zingiber Terrace)	222	203	0.29	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.214	0.575	0.000	0.000	0.000	0.000	0.000	0.000	11.90	70.21	95.14	111.48	162.89	0.0	0.0	112.1	84.8	450	450	CIRCULAR	CONCRETE	100-D	0.25	148.7	75.41%	0.91	0.88	1.61
																				13.51																			
L206B (Milk Thistle Way)	206	227	0.06	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.035	0.035	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	7.4	39.9	300	300	CIRCULAR	PVC	SDR 35	0.40	60.8	12.15%	0.86	0.48	1.38
Milk Thistle Way	227	226	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	11.38	71.89	97.43	114.18	166.87	0.0	0.0	6.9	11.5	300	300	CIRCULAR	PVC	SDR 35	0.40	60.8	11.37%	0.86	0.47	0.41
L226A (Milk Thistle Way)	226	225	0.43	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.321	0.356	0.000	0.000	0.000	0.000	0.000	0.000	11.78	70.57	95.63	112.05	163.74	0.0	0.0	69.7	65.7	375	375	CIRCULAR	PVC	SDR 35	0.40	111.7	62.44%	1.01	0.92	1.19
L225A (Milk Thistle Way)	225	204	0.35	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.265	0.621	0.000	0.000	0.000	0.000	0.000	0.000	12.97	67.01	90.73	106.30	155.29	0.0	0.0	115.5	100.8	450	450	CIRCULAR	CONCRETE	100-D	0.40	188.1	61.40%	1.15	1.04	1.61
																				14.59																			
Alembic Way	233	229	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.5	300	300	CIRCULAR	PVC	SDR 35	0.40	60.8	0.00%	0.86	0.00	0.00
L229A (Alembic Way)	229	206	0.20	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.147	0.147	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	31.5	69.9	300	300	CIRCULAR	PVC	SDR 35	0.40	60.8	51.75%	0.86	0.75	1.56
																				11.56																			
L238A (Beet Root Crescent)	238	237	0.47	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.344	0.344	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	73.4	114.4	300	300	CIRCULAR	PVC	SDR 35	3.00	166.5	44.07%	2.37	1.94	0.98
L237A (Beet Root Crescent)	237	236	0.43	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.315	0.659	0.000	0.000	0.000	0.000	0.000	0.000	10.98	73.24	99.29	116.36	170.07	0.0	0.0	134.1	99.6	375	375	CIRCULAR	PVC	SDR 35	2.00	249.7	53.69%	2.25	1.96	0.85
Beet Root Crescent	236	235	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.659	0.000	0.000	0.000	0.000	0.000	0.000	11.83	70.43	95.44	111.83	163.41	0.0	0.0	128.9	11.5	375	375	CIRCULAR	PVC	SDR 35	0.85	162.8	79.21%	1.47	1.44	0.13
L235B, C235A (Beet Root Crescent)	235	207	0.62	0.56	0.00	0.00	0.00	0.55	0.73	0.00	0.00	0.344	1.003	0.408	0.408	0.000	0.000	0.000	0.000	11.96	70.01	94.86	111.15	162.42	0.0	0.0	302.4	69.9	525	525	CIRCULAR	CONCRETE	100-D	0.85	413.6	73.11%	1.85	1.78	0.65
																				12.62																			
Beet Root Crescent	238	234	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	11.5	300	300	CIRCULAR	PVC	SDR 35	1.00	96.2	0.00%	1.37	0.00	0.00
L234A (Beet Root Crescent)	234	210	0.15	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.107	0.107	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	22.7	69.3	300	300	CIRCULAR	PVC	SDR 35	1.00	96.2	23.64%	1.37	0.93	1.24
																				11.24																			
A216A, A216B, C216B, C216A, C216C (Linseed Road)	216	215	0.00	3.04	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.000	0.000	2.568	2.568	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	743.1	66.4	900	900	CIRCULAR	CONCRETE	100-D	0.50	1335.4	55.65%	2.03	1.80	0.61
Linseed Road	215	214	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.568	0.000	0.000	0.000	0.000	10.61	74.53	101.06	118.45	173.14	0.0	0.0	720.8	44.0	900	900	CIRCULAR	CONCRETE	100-D	0.50	1335.4	53.97%	2.03	1.79	0.41
C214A, L214C, L214B (Linseed Road)	214	213	0.33	0.29	0.00	0.00	0.00	0.57	0.68	0.00	0.00	0.186	0.186	0.196	2.763	0.000	0.000	0.000	0.000	11.02	73.08	99.08	116.11	169.71	0.0	0.0	798.3	44.8	900	900	CIRCULAR	CONCRETE	100-D	0.50	1335.4	59.78%	2.03	1.83	0.41
																				11.43																			
Tonic Crescent	243	239	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	10.8	300	300	CIRCULAR	PVC	SDR 35	0.70	80.4	0.00%	1.14	0.00	0.00
L239A (Tonic Crescent)	239	213	0.21	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.152	0.152	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	32.3	69.8	300	300	CIRCULAR	PVC	SDR 35	0.70	80.4	40.21%	1.14	0.91	1.28
																				11.28																			
L286A (Tincture Place)	286	285	0.46	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.330	0.330	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	70.4	71.8	375	375	CIRCULAR	PVC	SDR 35	0.30	96.7	72.74%	0.87	0.83	1.44

Northwoods Phase 6 (Block 454) Boundary Conditions at STM MH 215

Backwater elevations

Date/Time	Head	Date/Time	Head	Date/Time	Head
M/d/yyyy	m	M/d/yyyy	m	M/d/yyyy	m
6/11/2024 12:01:00 AM	76.82	6/11/2024 1:08:00 AM	77.56	6/11/2024 2:15:00 AM	76.98
6/11/2024 12:02:00 AM	76.82	6/11/2024 1:09:00 AM	77.56	6/11/2024 2:16:00 AM	76.98
6/11/2024 12:03:00 AM	76.82	6/11/2024 1:10:00 AM	77.56	6/11/2024 2:17:00 AM	76.98
6/11/2024 12:04:00 AM	76.82	6/11/2024 1:11:00 AM	77.56	6/11/2024 2:18:00 AM	76.98
6/11/2024 12:05:00 AM	76.82	6/11/2024 1:12:00 AM	77.56	6/11/2024 2:19:00 AM	76.98
6/11/2024 12:06:00 AM	76.82	6/11/2024 1:13:00 AM	77.56	6/11/2024 2:20:00 AM	76.98
6/11/2024 12:07:00 AM	76.82	6/11/2024 1:14:00 AM	77.53	6/11/2024 2:21:00 AM	76.98
6/11/2024 12:08:00 AM	76.82	6/11/2024 1:15:00 AM	77.48	6/11/2024 2:22:00 AM	76.97
6/11/2024 12:09:00 AM	76.82	6/11/2024 1:16:00 AM	77.48	6/11/2024 2:23:00 AM	76.97
6/11/2024 12:10:00 AM	76.82	6/11/2024 1:17:00 AM	77.47	6/11/2024 2:24:00 AM	76.97
6/11/2024 12:11:00 AM	76.82	6/11/2024 1:18:00 AM	77.47	6/11/2024 2:25:00 AM	76.97
6/11/2024 12:12:00 AM	76.82	6/11/2024 1:19:00 AM	77.47	6/11/2024 2:26:00 AM	76.97
6/11/2024 12:13:00 AM	76.82	6/11/2024 1:20:00 AM	77.47	6/11/2024 2:27:00 AM	76.97
6/11/2024 12:14:00 AM	76.82	6/11/2024 1:21:00 AM	77.46	6/11/2024 2:28:00 AM	76.97
6/11/2024 12:15:00 AM	76.82	6/11/2024 1:22:00 AM	77.45	6/11/2024 2:29:00 AM	76.97
6/11/2024 12:16:00 AM	76.82	6/11/2024 1:23:00 AM	77.44	6/11/2024 2:30:00 AM	76.97
6/11/2024 12:17:00 AM	76.82	6/11/2024 1:24:00 AM	77.44	6/11/2024 2:31:00 AM	76.97
6/11/2024 12:18:00 AM	76.82	6/11/2024 1:25:00 AM	77.22	6/11/2024 2:32:00 AM	76.96
6/11/2024 12:19:00 AM	76.82	6/11/2024 1:26:00 AM	77.15	6/11/2024 2:33:00 AM	76.96
6/11/2024 12:20:00 AM	76.82	6/11/2024 1:27:00 AM	77.14	6/11/2024 2:34:00 AM	76.96
6/11/2024 12:21:00 AM	76.82	6/11/2024 1:28:00 AM	77.14	6/11/2024 2:35:00 AM	76.96
6/11/2024 12:22:00 AM	76.82	6/11/2024 1:29:00 AM	77.13	6/11/2024 2:36:00 AM	76.96
6/11/2024 12:23:00 AM	76.82	6/11/2024 1:30:00 AM	77.13	6/11/2024 2:37:00 AM	76.96
6/11/2024 12:24:00 AM	76.82	6/11/2024 1:31:00 AM	77.12	6/11/2024 2:38:00 AM	76.96
6/11/2024 12:25:00 AM	76.82	6/11/2024 1:32:00 AM	77.10	6/11/2024 2:39:00 AM	76.96
6/11/2024 12:26:00 AM	76.83	6/11/2024 1:33:00 AM	77.09	6/11/2024 2:40:00 AM	76.96
6/11/2024 12:27:00 AM	76.84	6/11/2024 1:34:00 AM	77.08	6/11/2024 2:41:00 AM	76.96
6/11/2024 12:28:00 AM	76.86	6/11/2024 1:35:00 AM	77.08	6/11/2024 2:42:00 AM	76.96
6/11/2024 12:29:00 AM	76.88	6/11/2024 1:36:00 AM	77.07	6/11/2024 2:43:00 AM	76.96
6/11/2024 12:30:00 AM	76.90	6/11/2024 1:37:00 AM	77.07	6/11/2024 2:44:00 AM	76.96
6/11/2024 12:31:00 AM	76.92	6/11/2024 1:38:00 AM	77.07	6/11/2024 2:45:00 AM	76.95
6/11/2024 12:32:00 AM	76.93	6/11/2024 1:39:00 AM	77.07	6/11/2024 2:46:00 AM	76.95
6/11/2024 12:33:00 AM	76.95	6/11/2024 1:40:00 AM	77.06	6/11/2024 2:47:00 AM	76.95
6/11/2024 12:34:00 AM	76.96	6/11/2024 1:41:00 AM	77.06	6/11/2024 2:48:00 AM	76.95
6/11/2024 12:35:00 AM	76.97	6/11/2024 1:42:00 AM	77.05	6/11/2024 2:49:00 AM	76.95
6/11/2024 12:36:00 AM	76.97	6/11/2024 1:43:00 AM	77.05	6/11/2024 2:50:00 AM	76.95
6/11/2024 12:37:00 AM	76.98	6/11/2024 1:44:00 AM	77.04	6/11/2024 2:51:00 AM	76.95
6/11/2024 12:38:00 AM	76.98	6/11/2024 1:45:00 AM	77.04	6/11/2024 2:52:00 AM	76.95
6/11/2024 12:39:00 AM	76.98	6/11/2024 1:46:00 AM	77.03	6/11/2024 2:53:00 AM	76.95
6/11/2024 12:40:00 AM	76.99	6/11/2024 1:47:00 AM	77.03	6/11/2024 2:54:00 AM	76.95
6/11/2024 12:41:00 AM	76.99	6/11/2024 1:48:00 AM	77.03	6/11/2024 2:55:00 AM	76.95
6/11/2024 12:42:00 AM	77.00	6/11/2024 1:49:00 AM	77.03	6/11/2024 2:56:00 AM	76.95
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6/11/2024 12:45:00 AM	77.02	6/11/2024 1:52:00 AM	77.02	6/11/2024 2:59:00 AM	76.95
6/11/2024 12:46:00 AM	77.03	6/11/2024 1:53:00 AM	77.02	6/11/2024 3:00:00 AM	76.95
6/11/2024 12:47:00 AM	77.03	6/11/2024 1:54:00 AM	77.01	6/11/2024 3:01:00 AM	76.95
6/11/2024 12:48:00 AM	77.03	6/11/2024 1:55:00 AM	77.01	6/11/2024 3:02:00 AM	76.95
6/11/2024 12:49:00 AM	77.03	6/11/2024 1:56:00 AM	77.01	6/11/2024 3:03:00 AM	76.95
6/11/2024 12:50:00 AM	77.04	6/11/2024 1:57:00 AM	77.01	6/11/2024 3:04:00 AM	76.94
6/11/2024 12:51:00 AM	77.05	6/11/2024 1:58:00 AM	77.01	6/11/2024 3:05:00 AM	76.94
6/11/2024 12:52:00 AM	77.09	6/11/2024 1:59:00 AM	77.01	6/11/2024 3:06:00 AM	76.94
6/11/2024 12:53:00 AM	77.12	6/11/2024 2:00:00 AM	77.00	6/11/2024 3:07:00 AM	76.94
6/11/2024 12:54:00 AM	77.14	6/11/2024 2:01:00 AM	77.00	6/11/2024 3:08:00 AM	76.94
6/11/2024 12:55:00 AM	77.16	6/11/2024 2:02:00 AM	77.00	6/11/2024 3:09:00 AM	76.94
6/11/2024 12:56:00 AM	77.16	6/11/2024 2:03:00 AM	77.00	6/11/2024 3:10:00 AM	76.94
6/11/2024 12:57:00 AM	77.17	6/11/2024 2:04:00 AM	76.99	6/11/2024 3:11:00 AM	76.94
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6/11/2024 1:03:00 AM	77.55	6/11/2024 2:10:00 AM	76.99	6/11/2024 3:17:00 AM	76.90
6/11/2024 1:04:00 AM	77.55	6/11/2024 2:11:00 AM	76.99	6/11/2024 3:18:00 AM	76.89
6/11/2024 1:05:00 AM	77.55	6/11/2024 2:12:00 AM	76.99	6/11/2024 3:19:00 AM	76.89
6/11/2024 1:06:00 AM	77.55	6/11/2024 2:13:00 AM	76.98	6/11/2024 3:20:00 AM	76.89
6/11/2024 1:07:00 AM	77.56	6/11/2024 2:14:00 AM	76.98	6/11/2024 3:21:00 AM	76.88

Northwoods Phase 6 (Block 454) Boundary Conditions at STM MH 215

Date/Time	Head	Date/Time	Head	Date/Time	Head
M/d/yyyy	m	M/d/yyyy	m	M/d/yyyy	m
6/11/2024 3:22:00 AM	76.88	6/11/2024 4:30:00 AM	76.83	6/11/2024 5:38:00 AM	76.83
6/11/2024 3:23:00 AM	76.88	6/11/2024 4:31:00 AM	76.83	6/11/2024 5:39:00 AM	76.83
6/11/2024 3:24:00 AM	76.88	6/11/2024 4:32:00 AM	76.83	6/11/2024 5:40:00 AM	76.83
6/11/2024 3:25:00 AM	76.87	6/11/2024 4:33:00 AM	76.83	6/11/2024 5:41:00 AM	76.83
6/11/2024 3:26:00 AM	76.87	6/11/2024 4:34:00 AM	76.83	6/11/2024 5:42:00 AM	76.83
6/11/2024 3:27:00 AM	76.87	6/11/2024 4:35:00 AM	76.83	6/11/2024 5:43:00 AM	76.83
6/11/2024 3:28:00 AM	76.87	6/11/2024 4:36:00 AM	76.83	6/11/2024 5:44:00 AM	76.83
6/11/2024 3:29:00 AM	76.86	6/11/2024 4:37:00 AM	76.83	6/11/2024 5:45:00 AM	76.83
6/11/2024 3:30:00 AM	76.86	6/11/2024 4:38:00 AM	76.83	6/11/2024 5:46:00 AM	76.83
6/11/2024 3:31:00 AM	76.86	6/11/2024 4:39:00 AM	76.83	6/11/2024 5:47:00 AM	76.83
6/11/2024 3:32:00 AM	76.86	6/11/2024 4:40:00 AM	76.83	6/11/2024 5:48:00 AM	76.83
6/11/2024 3:33:00 AM	76.86	6/11/2024 4:41:00 AM	76.83	6/11/2024 5:49:00 AM	76.83
6/11/2024 3:34:00 AM	76.86	6/11/2024 4:42:00 AM	76.83	6/11/2024 5:50:00 AM	76.83
6/11/2024 3:35:00 AM	76.86	6/11/2024 4:43:00 AM	76.83	6/11/2024 5:51:00 AM	76.83
6/11/2024 3:36:00 AM	76.86	6/11/2024 4:44:00 AM	76.83	6/11/2024 5:52:00 AM	76.83
6/11/2024 3:37:00 AM	76.85	6/11/2024 4:45:00 AM	76.83	6/11/2024 5:53:00 AM	76.83
6/11/2024 3:38:00 AM	76.85	6/11/2024 4:46:00 AM	76.83	6/11/2024 5:54:00 AM	76.83
6/11/2024 3:39:00 AM	76.85	6/11/2024 4:47:00 AM	76.83	6/11/2024 5:55:00 AM	76.83
6/11/2024 3:40:00 AM	76.85	6/11/2024 4:48:00 AM	76.83	6/11/2024 5:56:00 AM	76.83
6/11/2024 3:41:00 AM	76.85	6/11/2024 4:49:00 AM	76.83	6/11/2024 5:57:00 AM	76.83
6/11/2024 3:42:00 AM	76.85	6/11/2024 4:50:00 AM	76.83	6/11/2024 5:58:00 AM	76.83
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6/11/2024 3:44:00 AM	76.85	6/11/2024 4:52:00 AM	76.83	6/11/2024 6:00:00 AM	76.83
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6/11/2024 3:47:00 AM	76.85	6/11/2024 4:55:00 AM	76.83	6/11/2024 6:03:00 AM	76.83
6/11/2024 3:48:00 AM	76.85	6/11/2024 4:56:00 AM	76.83	6/11/2024 6:04:00 AM	76.83
6/11/2024 3:49:00 AM	76.85	6/11/2024 4:57:00 AM	76.83	6/11/2024 6:05:00 AM	76.83
6/11/2024 3:50:00 AM	76.85	6/11/2024 4:58:00 AM	76.83	6/11/2024 6:06:00 AM	76.83
6/11/2024 3:51:00 AM	76.85	6/11/2024 4:59:00 AM	76.83	6/11/2024 6:07:00 AM	76.83
6/11/2024 3:52:00 AM	76.84	6/11/2024 5:00:00 AM	76.83	6/11/2024 6:08:00 AM	76.83
6/11/2024 3:53:00 AM	76.84	6/11/2024 5:01:00 AM	76.83	6/11/2024 6:09:00 AM	76.83
6/11/2024 3:54:00 AM	76.84	6/11/2024 5:02:00 AM	76.83	6/11/2024 6:10:00 AM	76.83
6/11/2024 3:55:00 AM	76.84	6/11/2024 5:03:00 AM	76.83	6/11/2024 6:11:00 AM	76.83
6/11/2024 3:56:00 AM	76.84	6/11/2024 5:04:00 AM	76.83	6/11/2024 6:12:00 AM	76.83
6/11/2024 3:57:00 AM	76.84	6/11/2024 5:05:00 AM	76.83	6/11/2024 6:13:00 AM	76.83
6/11/2024 3:58:00 AM	76.84	6/11/2024 5:06:00 AM	76.83	6/11/2024 6:14:00 AM	76.83
6/11/2024 3:59:00 AM	76.84	6/11/2024 5:07:00 AM	76.83	6/11/2024 6:15:00 AM	76.83
6/11/2024 4:00:00 AM	76.84	6/11/2024 5:08:00 AM	76.83	6/11/2024 6:16:00 AM	76.83
6/11/2024 4:01:00 AM	76.84	6/11/2024 5:09:00 AM	76.83	6/11/2024 6:17:00 AM	76.83
6/11/2024 4:02:00 AM	76.84	6/11/2024 5:10:00 AM	76.83	6/11/2024 6:18:00 AM	76.83
6/11/2024 4:03:00 AM	76.84	6/11/2024 5:11:00 AM	76.83	6/11/2024 6:19:00 AM	76.83
6/11/2024 4:04:00 AM	76.84	6/11/2024 5:12:00 AM	76.83	6/11/2024 6:20:00 AM	76.83
6/11/2024 4:05:00 AM	76.84	6/11/2024 5:13:00 AM	76.83	6/11/2024 6:21:00 AM	76.83
6/11/2024 4:06:00 AM	76.84	6/11/2024 5:14:00 AM	76.83	6/11/2024 6:22:00 AM	76.83
6/11/2024 4:07:00 AM	76.84	6/11/2024 5:15:00 AM	76.83	6/11/2024 6:23:00 AM	76.83
6/11/2024 4:08:00 AM	76.84	6/11/2024 5:16:00 AM	76.83	6/11/2024 6:24:00 AM	76.83
6/11/2024 4:09:00 AM	76.84	6/11/2024 5:17:00 AM	76.83	6/11/2024 6:25:00 AM	76.83
6/11/2024 4:10:00 AM	76.84	6/11/2024 5:18:00 AM	76.83	6/11/2024 6:26:00 AM	76.83
6/11/2024 4:11:00 AM	76.84	6/11/2024 5:19:00 AM	76.83	6/11/2024 6:27:00 AM	76.83
6/11/2024 4:12:00 AM	76.84	6/11/2024 5:20:00 AM	76.83	6/11/2024 6:28:00 AM	76.83
6/11/2024 4:13:00 AM	76.84	6/11/2024 5:21:00 AM	76.83	6/11/2024 6:29:00 AM	76.83
6/11/2024 4:14:00 AM	76.84	6/11/2024 5:22:00 AM	76.83	6/11/2024 6:30:00 AM	76.83
6/11/2024 4:15:00 AM	76.84	6/11/2024 5:23:00 AM	76.83	6/11/2024 6:31:00 AM	76.83
6/11/2024 4:16:00 AM	76.84	6/11/2024 5:24:00 AM	76.83	6/11/2024 6:32:00 AM	76.83
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6/11/2024 4:18:00 AM	76.84	6/11/2024 5:26:00 AM	76.83	6/11/2024 6:34:00 AM	76.83
6/11/2024 4:19:00 AM	76.84	6/11/2024 5:27:00 AM	76.83	6/11/2024 6:35:00 AM	76.83
6/11/2024 4:20:00 AM	76.84	6/11/2024 5:28:00 AM	76.83	6/11/2024 6:36:00 AM	76.83
6/11/2024 4:21:00 AM	76.84	6/11/2024 5:29:00 AM	76.83	6/11/2024 6:37:00 AM	76.83
6/11/2024 4:22:00 AM	76.84	6/11/2024 5:30:00 AM	76.83	6/11/2024 6:38:00 AM	76.83
6/11/2024 4:23:00 AM	76.84	6/11/2024 5:31:00 AM	76.83	6/11/2024 6:39:00 AM	76.82
6/11/2024 4:24:00 AM	76.83	6/11/2024 5:32:00 AM	76.83	6/11/2024 6:40:00 AM	76.82
6/11/2024 4:25:00 AM	76.83	6/11/2024 5:33:00 AM	76.83	6/11/2024 6:41:00 AM	76.82
6/11/2024 4:26:00 AM	76.83	6/11/2024 5:34:00 AM	76.83	6/11/2024 6:42:00 AM	76.82
6/11/2024 4:27:00 AM	76.83	6/11/2024 5:35:00 AM	76.83	6/11/2024 6:43:00 AM	76.82
6/11/2024 4:28:00 AM	76.83	6/11/2024 5:36:00 AM	76.83	6/11/2024 6:44:00 AM	76.82
6/11/2024 4:29:00 AM	76.83	6/11/2024 5:37:00 AM	76.83	6/11/2024 6:45:00 AM	76.82

Appendix D Geotechnical Report Excerpts

Geotechnical Investigation

Proposed Residential Development Northridge Subdivision

1020 and 1070 March Road
Ottawa, Ontario

Prepared for 1384341 Ontario Ltd.

Report PG6009-1 Revision 3 dated August 24, 2022

3.0 Method of Investigation

3.1 Field Investigation

Field Program

A geotechnical investigation was carried out on December 6, 2019. A total of 14 test pits were excavated to a maximum depth of 3.9 m below existing grade using a rubber-tired backhoe. It should be noted that previous investigations were conducted by this firm within the subject property in 2011, consisting of a total of 13 test pits excavated to a maximum depth of 4.6 m below existing grade. A follow-up Investigation was conducted by others and consisted of excavating 21 test pits to a maximum depth of 4.4 m below existing grade. The test holes were distributed in a manner to provide general coverage of the subject site.

All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test pit procedure consisted of excavating to the required depths at the selected locations and sampling the overburden. The approximate locations of the test holes are shown on Drawing PG6009-1 - Test Hole Location Plan included in Appendix 2.

A supplemental geotechnical investigation was carried out between September 30 and October 4, 2021. During that time, a total of 82 probeholes were advanced into the bedrock using an Air Track pneumatic crawler drill. The probeholes were completed for the purpose of bedrock delineation and the generation of bedrock elevation contours. Refer to Drawing PG6009-4 - Bedrock Contour Plan included in Appendix 2.

Sampling and In Situ Testing

Soil samples from the test pits from the current investigation were recovered from the side walls of the open excavation and all soil samples were initially classified on site. All samples were transported to our laboratory for further examination and classification. The depths at which the grab samples were recovered from the test holes are shown as G on the Soil Profile and Test Data sheets in Appendix 1.

Undrained shear strength testing, using a hand held vane apparatus, was carried out at regular intervals of depth in cohesive soils.

The subsurface conditions observed at the test pits were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets and Test Pit Logs by Others in Appendix 1.

4.0 Observations

4.1 Surface Conditions

The subject site is currently occupied by agricultural lands, with the exception of the east portion of 1020 March Road being occupied by trees and dense brush. The ground surface across the west portion of the subject site is relatively flat with a slight upward slope from the March Road to the central portion of the site, followed by a downward slope and grade lowering across the east portion of the subject site. An existing agricultural homestead building was noted within the central portion of 1070 March Road. A ditch was noted running north-south along March Road and the west portion of the site extending from the south neighbouring site. The site is bordered to the north by residential dwellings, to the east by an existing rail corridor running north-south, to the south by vacant agricultural lands, and to the west by March Road.

4.2 Subsurface Profile

Overburden

1020 March Road

Generally, the subsoil profile encountered at the test hole locations consists of topsoil overlying silty clay or silty sand within the west and east portion of the site, respectively. A glacial till layer was noted at all test pit locations east of TP 3-19 and TP 9-19 of the current investigation. Practical refusal to excavation was encountered between 0.3 and 2.4 m depth at test pits TP 4-19, TP 5-19, TP 11-19, TP 11B-19 and TP 12-19. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the soil profiles encountered at each test hole location.

1070 March Road

Generally, the subsoil profile encountered at the test hole locations consists of topsoil overlying silty clay or silty sand within the west and east portion of the site, respectively. A glacial till layer was noted at all test pit locations. Practical refusal to excavation was encountered between 0.9 and 3.7 m depth at all test pit locations completed by Paterson, with the exception of TP 6 from Paterson's 2010 investigation, which was extended to a depth of 4.6 m below existing ground surface.

Based on the bedrock delineation program, bedrock was generally encountered between 3.5 and 5 m below existing ground surface in the southwest side of the site, with local undulations from approximately 2 to 7 m below existing ground surface. In the northeast side of the site, bedrock was encountered from ground surface to 3.5 m below existing ground surface.

Bedrock outcrops were observed at the ground surface in the northeast portion of the site. The estimated bedrock depths are presented on Drawing PG6009-4 – Bedrock Contour Plan in Appendix 2.

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

Bedrock

Based on available geological mapping, the subject site is underlain by interbedded sandstone and dolomite of the March Formation extending from the west to center of the property, followed by dolomite of the Oxford formation extending from the center of the property to the east with an overburden drift thickness varying between 0 to 5 m.

Laboratory Testing

Atterberg limits testing, as well as associated moisture content testing, were completed on the recovered silty clay samples at selected locations throughout the subject site. The results of the Atterberg limits tests are presented in Table 1 and on the Atterberg Limits' Results sheet in Appendix 1.

The results of the shrinkage limit test indicate a shrinkage limit of 17% and a shrinkage ratio of 1.85.

All test holes were generally observed to be dry upon completion of the sampling program, with the exception of minor infiltration noted along the test pit sidewalls at the above-noted depths. Based on the moisture levels and colouring of the recovered soil samples, and our experience with the local area, the long-term groundwater table is expected at depths between 4 to 5 m below ground surface. The recorded groundwater levels are noted on the applicable Soil Profile and Test Data sheet presented in Appendix 1.

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

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. It is recommended that the proposed residential dwellings be founded on conventional spread footings placed on an undisturbed, very stiff silty clay, compact silty sand, compact glacial till, engineered fill and/or surface-sounded bedrock bearing surface.

Due to the presence of a silty clay deposit, a permissible grade raise restriction is required for the subject site.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil, and any deleterious fill, such as those containing organic materials, should be stripped from under any buildings 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 having to sub-excavate the disturbed material and the placement of additional suitable fill material.

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

Bedrock Removal

It is expected that line-drilling in conjunction with hoe-ramming or controlled blasting may be required to remove the bedrock. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings and other structures should be addressed.

A pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be carried out prior to commencing site activities.

5.5 Basement Slab / Slab on Grade Construction

With the removal of all topsoil and deleterious materials within the footprint of the proposed building, the bedrock surface, approved by Paterson personnel at the time of construction, is considered to be an acceptable subgrade surface on which to commence backfilling for the floor slab construction.

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

For structures with slab-on-grade construction, the upper 200 mm of sub-slab fill is recommended to consist of OPSS Granular A crushed stone. All backfill material within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

For structures with basement slabs, it is recommended that the upper 200 mm of sub-floor fill consists of 19 mm clear crushed stone.

5.8 Pavement Design

For design purposes, the pavement structures presented in the following tables could be used for the design of car only parking areas and local roadways.

Table 5 - Recommended Pavement Structure – Driveways/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 approved fill, in situ soil or OPSS Granular B Type I and II material placed over in situ soil or approved fill. **Note**: Minimum Performance Grade (PG) 58-34 asphalt cement should be used for driveways.	

Table 6 - Recommended Pavement Structure – Local Residential Roadways

Thickness (mm)	Material Description
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either approved fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or approved fill. **Note**: Minimum Performance Grade (PG) 58-34 asphalt cement should be used for local roadways.	

Table 7 - Recommended Pavement Structure – Roadways with Bus Traffic

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
550	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil or OPSS Granular B Type II material placed over in situ soil. **Note:** Minimum Performance Grade (PG) 64-34 asphalt cement should be used for roadways with bus traffic.	

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

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for driveways and local roadways and (PG) 64-34 asphalt cement should be used for roadways with bus traffic. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

7.0 Recommendations

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

- Grading plan review from a geotechnical perspective, once the final grading plan is available.
- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials.
- Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- Observation of all subgrades prior to backfilling.
- Field density tests to determine the level of compaction achieved.
- Sampling and testing of the bituminous concrete including mix design reviews.

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

8.0 Statement of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should also be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and the test hole logs are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

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 to be notified immediately in order to permit reassessment of the recommendations.

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 1384341 Ontario Ltd. or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Fernanda Carozzi, PhD Geoph.

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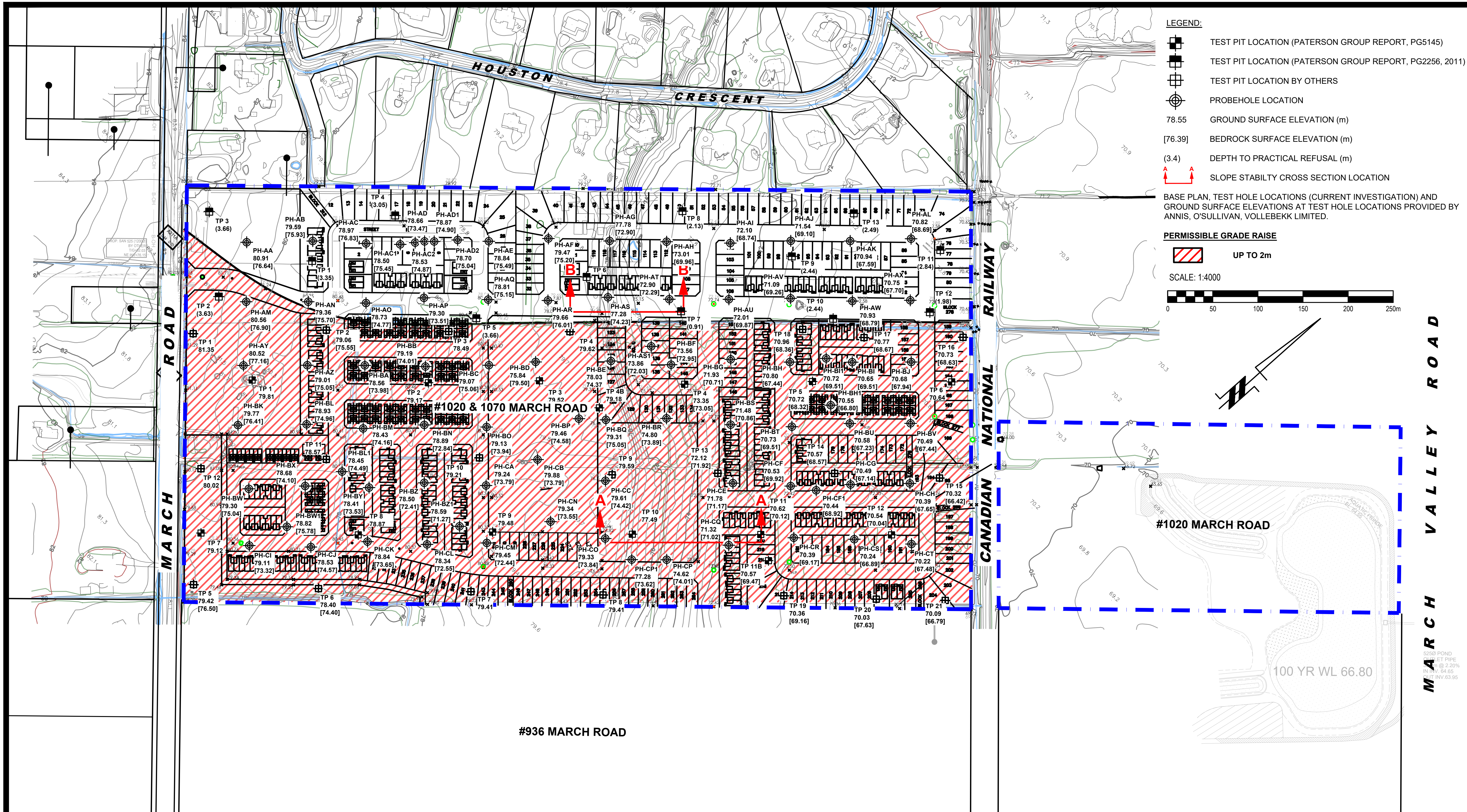

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NO.	REVISIONS	DATE	INITIAL

CAVANAGH CONSTRUCTION
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
PART OF LOT 13 CONCESSION 4

OTTAWA, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN

Scale: 1:4000	Date: 10/2021
Drawn by: RG	Report No.: P6009-1
Checked by: OC	Dwg. No.: PG6009-2
Approved by: DJG	Revision No.:

11x17

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