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Future Mixed-Use and Institutional Blocks
1015 March Road
Ottawa, Ontario

Site Servicing & Stormwater Management Report

Prepared for: 13533441 Canada Inc.

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FUTURE MIXED-USE AND INSTITUTIONAL BLOCKS
1015 March Road
Site Servicing and Stormwater Management Report

Prepared for:

13533441 Canada Inc.

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

Dated: February 1, 2022

Ref: R-2022-010
Novatech File No. 121247

February 1, 2022

Planning, Infrastructure, and Economic Development Department
City of Ottawa
110 Laurier Ave. West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: Lisa Stern, MCIP, RPP – Planner II

Re: Future Mixed-Use and Institutional Blocks
1015 March Road
Site Servicing and Stormwater Management Report
Novatech File No.: 121247

Novatech is pleased to submit the following Site Servicing and Stormwater Management Report on behalf of 13533441 Canada Inc. in support of a Draft Plan of Subdivision and Zoning By-law Amendment applications for Future Mixed-Use and Institutional Blocks at 1015 March Road.

13533441 Canada Inc. intends to develop a subdivision with a public street, a mixed-use block, and an institutional block. The subdivision is located in the northwest quadrant of the Kanata North Community Design Plan.

The attached Site Servicing and Stormwater Management Report will address how the proposed development will be serviced with sanitary sewer, storm sewers, watermain and stormwater management.

If you have any questions or comments, please do not hesitate to contact us.

Sincerely,

NOVATECH

Drew Blair, P. Eng.
Senior Project Manager

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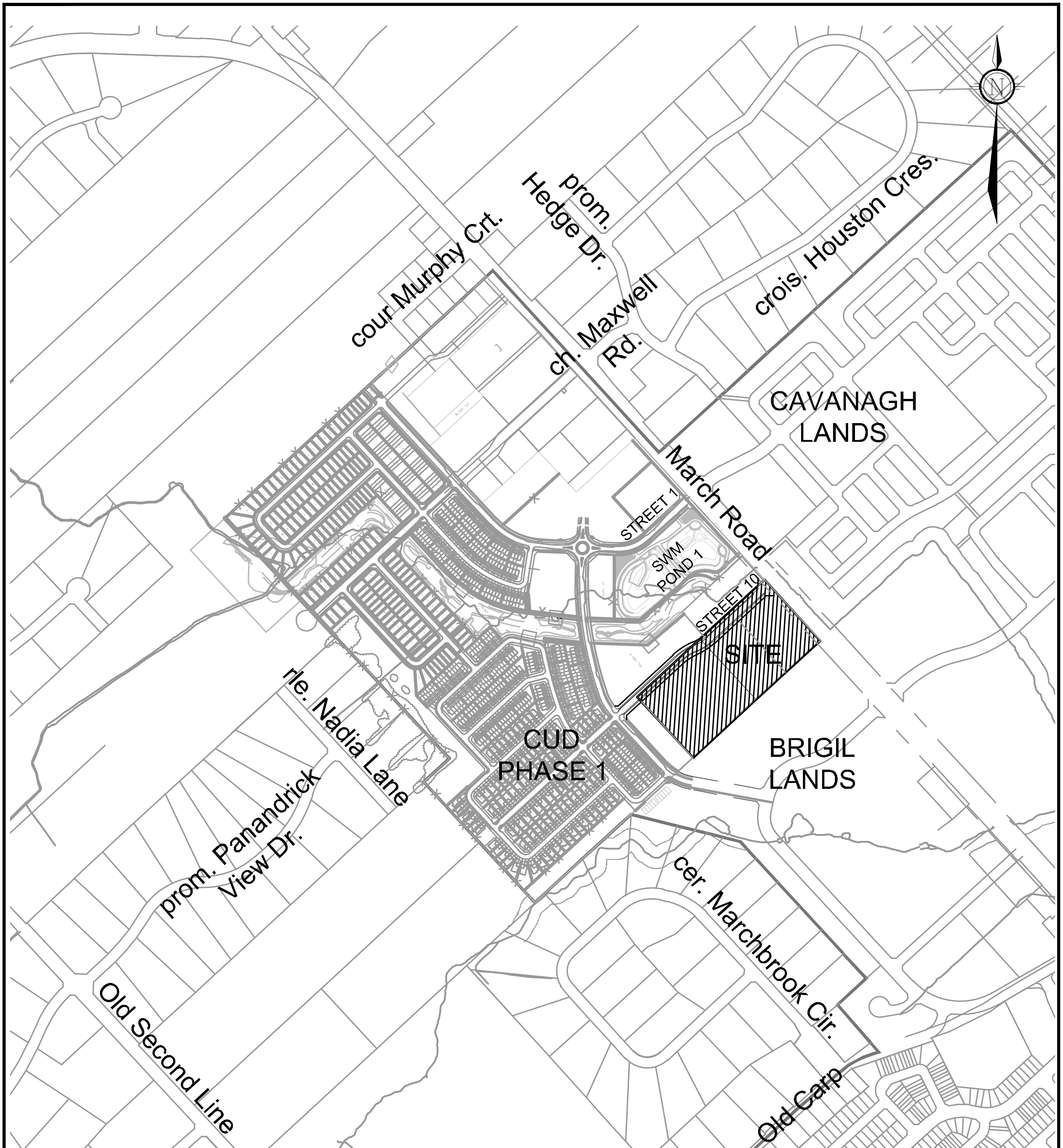
1.0 Introduction

Novatech has been retained by 13533441 Canada Inc. to prepare a Site Servicing and Stormwater Management Report in support of the application for a Draft Plan of Subdivision and Zoning By-Law Amendment (ZBLA) to allow for the development of lands known as 1015 March Road in Kanata North (the "Subject Lands"). This report outlines the onsite and offsite servicing and proposed storm drainage and stormwater management strategy for the site.

1.1 Location and Context

The Subject Lands – legally described as Part of Lot 13, Concession 3, Township of March – are owned by 13533441 Canada Inc. and encompass approximately 4.9 hectares under the municipal address 1015 March Road. The Subject Lands are located roughly in the center of the Kanata North Urban Expansion Area (KNUEA), which is subject to the Kanata North Community Design Plan (KNCDP) that was approved by Council on July 13, 2016. Refer to **Figure 1** – KNUEA Context and Site Location and **Figure 2** – Key Plan which highlight the site's location.

Figure 1 – Kanata North Urban Expansion Area (KNUEA) Context and Site Location



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1015 MARCH ROAD

KEY PLAN

SCALE 1 : 10000 (0 100 200 300 400)

DATE	JOB	FIGURE
FEB 2022	121247	FIGURE 2

SHT8X11.DWG - 216mmx279mm

1.2 Kanata North Urban Expansion Area (KNUEA)

The KNCDP was completed in June of 2016 to establish a community-wide land-use framework for the KNUEA that reflects the principles, objectives and policies for community development as directed by the City of Ottawa Official Plan.

The KNUEA is approximately 181 hectares in area. It was established as one of the City's Urban Expansion Areas during the 2009 Official Plan review through Official Plan Amendment 76 (OPA 76) to accommodate the projected population growth to 2031. The major landowners in the area, known collectively as the *Kanata North Land Owners Group (KNLOG)*, then initiated a Community Design Plan process to fulfill the requirements of the Official Plan to permit the review of development applications in the KNUEA. The KNLOG represent approximately 87% of the land holdings within the KNUEA. They include the following Sponsoring Landowners:

- The Minto Group
  - *Formerly Metcalfe Realty Company Ltd.*
- Brigil (3223701 Canada Inc.)
- Cavanagh Developments
  - *Formerly Valecraft (8409706 Canada Inc.) / JG Rivard Ltd.*
- CU Developments Inc.
  - *Formerly Junic / Multivesco (7089121 Canada Inc.)*

Early in the KNCDP process, formal invitations were sent to other landowners to participate; however, none other than the group listed above chose to join the KNLOG. Non-participating landowners have been involved in the KNCDP process through consultation and opportunities to comment as the plan evolved.
The KNCDP process produced the following guiding documents for the future development of the KNUEA:

- *Kanata North Community Design Plan (KNCDP)*
  Novatech, June 28, 2016; Report No. R-2016-020
- *Kanata North Master Servicing Study (KNMSS)*
  Novatech, June 28, 2016; Report No. R-2016-041
- *Kanata North Environmental Management Plan (KNEMP)*
  Novatech, June 28, 2016; Report No. R-2016-017
- *Kanata North Transportation Master Plan (KNTMP)*
  Novatech, June 28, 2016; Report No. R-2015-161

The proposed development of the Subject Lands is consistent with the KNMSS.

Figure 3 – KNUEA Boundaries and Properties of Sponsoring Landowners, provides a map showing the ownership of lands within the KNUEA and highlights the Subject Site.

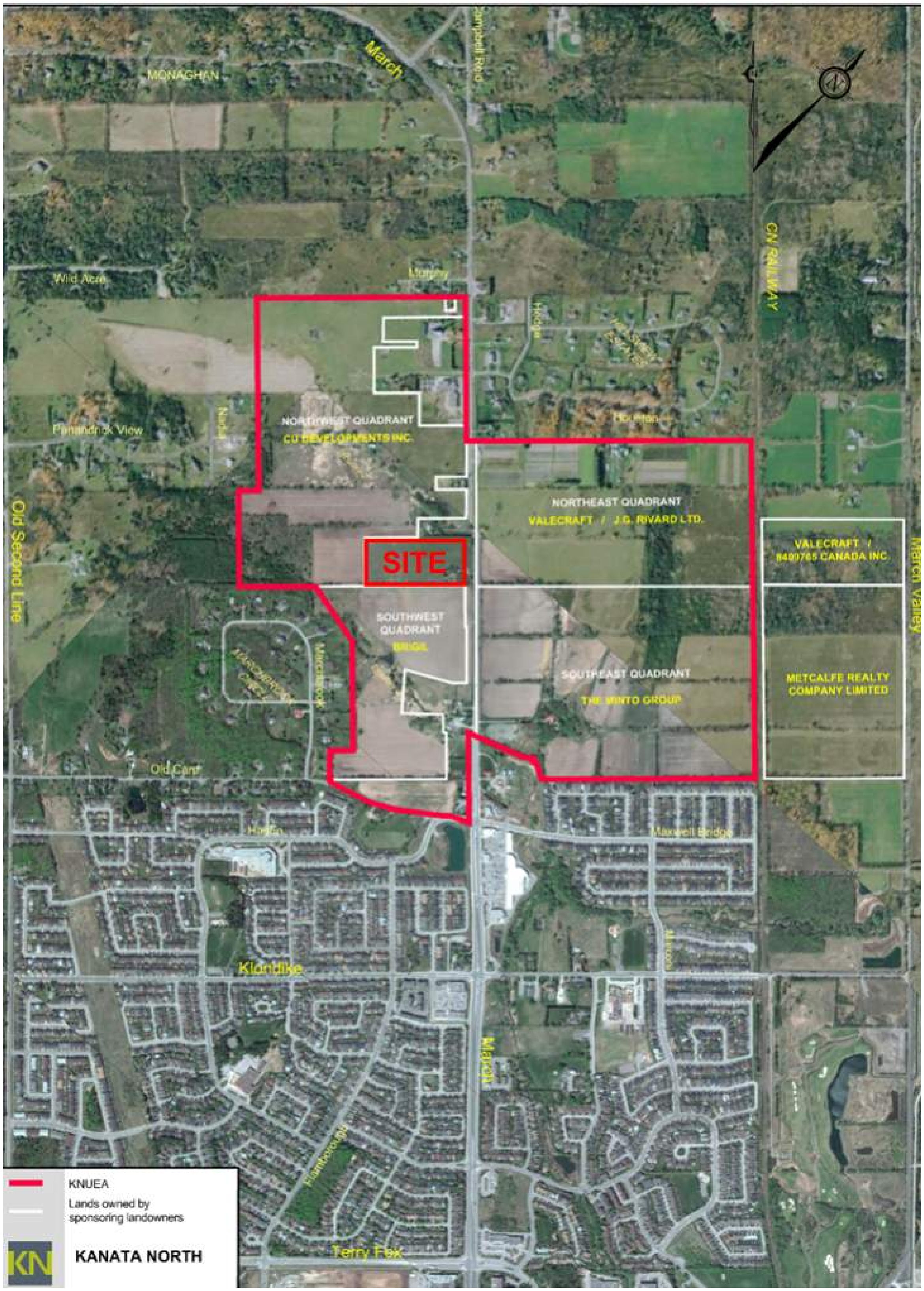


Figure 3 - KNUEA Boundaries and Properties of Sponsoring Landowners

1.3 Proposed Development

The proposed development of the Subject Lands consists of one (1) future mixed-use block, one (1) future institutional block, and the extension of Street No. 10 (Collector) from Street 12 to March Road. Refer to **Figure 4** – Concept Plan for proposed layout.

The future mixed-use block shown as Block 2 on the Draft Plan of Subdivision will provide future residents of the Kanata North community with convenient access to local services and retail.

The future institutional block identified as Block 3 on the Draft Plan of Subdivision is anticipated to be developed as a future school by Conseil des Écoles Publiques de l'Est de l'Ontario (C.E.P.E.O.). The future school will provide an additional institutional facility within the overall Kanata North community.

Pedestrian sidewalks will be provided on both sides of the Street No. 10 extension which will connect with the future pedestrian sidewalks of the CU Developments subdivision located to the west. The future road widening block shown as Block 1 on the Draft Plan of subdivision will be dedicated to the City of Ottawa for the ultimate road widening of March Road.

1.4 Planning Context

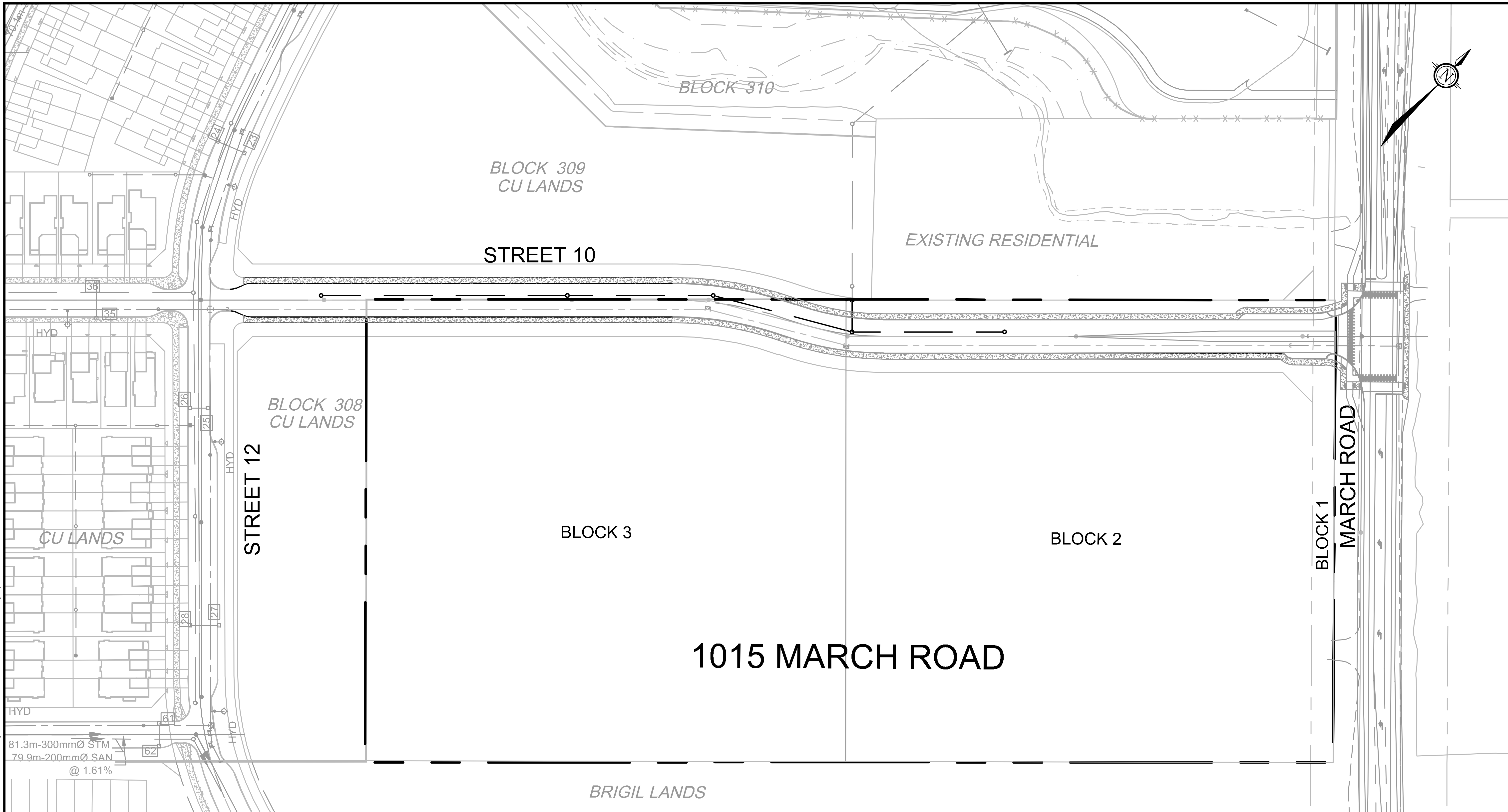
Under the new *Official Plan,* the Subject Site is now designated as a *Corridor – Mainstreet* measured 220 meters from the centreline of March Road with the remaining portion designated as *Neighbourhood*. The Subject Site is located within the *Suburban (West) Transect* of *Schedule B5* of the City of Ottawa's Official Plan.

The Subject Site is currently dual zoned *RC[388r] – Rural Commercial Zone, Rural Exception 338*, and *RU – Rural Countryside Zone* under the *City of Ottawa's Zoning By-law 2008-250*.

1.5 Additional Reports

This report provides information on the considerations and approach by which Novatech has designed and evaluated the proposed servicing for the 1015 March Road development. This report should be read in conjunction with the following:

- *Planning Rationale & Integrated Environmental Review Statement, prepared by Novatech.*
- *Geotechnical Investigation, Proposed Commercial Development, 1015 March Road, Ottawa, Ontario, Kanata United, Paterson Group Inc., October 5, 2020, Report: PG5014-1,*
- *1053, 1075 and 1145 March Road Site Servicing and Stormwater Management Report, CU Developments Inc., dated November 13, 2020, prepared by Novatech.*
- *1053, 1075 AND 1145 March Road Copperwood Estate, Detailed Site Servicing and Stormwater Management Report (Phase 1), CU Developments Inc., dated December 23, 2021, prepared by Novatech.*



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1015 MARCH ROAD

CONCEPT PLAN

SCALE	DATE	JOB	FIGURE
1 : 1250	FEB 2022	121247	FIGURE 4

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2.0 Existing Conditions

2.1 Land Use

The Subject Lands are currently developed with a single detached dwelling and accessory structure. The remaining portion of the Subject Site has been tilled for agricultural related purposes and were largely undeveloped. It is anticipated that the existing single detached dwelling and accessory structure will be removed on the Subject Site at a later date for the construction of the commercial block.

The following describes the existing and planned land uses surrounding the Subject Lands:

North: A single detached dwelling is situated at 1035 March Road abutting the Subject Site to the north. CU Developments is proposing to subdivide the land at 1053, 1075, and 1145 March Road that will consist of five hundred ninety (590) detached and townhouse dwellings north of the Subject Site *(City File Nos.: D07-16-18-0023 and D02-02-18-0076)*. The future residential development will also include a portion of land dedicated for the school block proposed on the Subject Site, neighbourhood park, OC Transpo park and ride, and open space for the realignment of the Shirley’s Brook (Tributary 2). A future emergency service (fire station) is also planned further north of the Subject Site.

East: Cavanagh Developments is proposing to subdivide the land at 1020-1070 March Road that will consist of seven hundred ninety (790) detached, semi-detached and townhouse dwellings east of the Subject Site *(City File Nos.: D02-02-19-0090 and D07-16-19-0020)*. The future residential development will also include a school, neighbourhood park, as well as neighbourhood mixed use for the lands fronting March Road. Open space blocks for realignment of the Shirley’s Brook (Tributary 2) also forms part of these applications. Minto Communities *(City File Nos.: D02-02-18-0109 and D07-16-18-0032)* is proposing to subdivide the lands at 936 March Road that will consist of eight hundred fifty-four (854) detached, semi-detached and townhouse dwellings. The future residential development will include a school, neighbourhood park, and community mixed use for the lands fronting March Road.

South: Brigil is proposing to subdivide the land at 927 March Road that will consist of one thousand eight hundred sixty-one (1,861) detached, townhouse, and apartment dwellings *(City File Nos.: D01-01-20-0027, D02-02-20-0138, D07-16-20-0034)*. The future development will also include a school, neighbourhood park, open space for the Shirley’s Brook (Tributary 3), and community mixed use for the lands fronting March Road.

West: Future land to be developed as part of the CU Developments subdivision abut the Subject Site to the west. A combination of country lot estate subdivisions and rural lands are situated further west of the Subject Site.

2.3 Topography and Drainage

The topography of the site generally slopes west to east towards March Road. There is roughly a 5m grade elevation change from the west to east side of the Subject Lands. Under existing conditions, the subject lands are comprised primarily of agricultural fields which drain to the March Road ditch.

Refer to **Figure 5** – Existing Conditions for more details.

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1015 MARCH ROAD

EXISTING CONDITIONS PLAN

SCALE 1 : 2500 (0, 25, 50, 75, 100)

DATE	JOB	FIGURE
FEB 2022	121247	FIGURE 5

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2.3 Geotechnical Investigation

Paterson Group Inc. conducted a geotechnical investigation in support of the proposed 1015 March Road development. To perform this investigation, ten (10) boreholes were advanced to a maximum depth of 4.5 m below the existing surface level. The principal findings of the geotechnical investigation are as follows:

- The site's existing ground surface level is somewhat flat at a slightly lower elevation than that of March Road but rises heading westerly;
- Surficial soil on site is generally topsoil with organic content, varying in thickness between 0.15m and 0.4m;
- The topsoil is mostly underlain by a stiff to hard weathered brown silty clay crust extending to depths between 2.3m to 4.1m below surface elevation;
- The silty clay is generally underlain by a compact to dense glacial till consisting of a brown silty sand with clay, gravel, cobbles, and occasional boulders;
- Based on available geological mapping, the bedrock in the area has an overburden thickness ranging from 2m to 5m;
- The long-term groundwater levels were estimated to be at depth of 2m to 3m.

The report provides engineering guidelines based on Paterson Group's interpretation of the geotechnical information and project requirements. Refer to the Geotechnical Report for complete details.

3.0 STORM SERVICING & STORMWATER MANAGEMENT

The storm servicing and stormwater management strategy for 1015 March Road builds on the *1053, 1075 and 1145 March Road Copperwood Estate Detailed Site Servicing and Stormwater Management Report* (Novatech, December 2021) and conforms to the recommendations from the Kanata North Master Servicing Study (MSS) and Environmental Management Plan (EMP).

Storm servicing will be provided using a dual drainage system. Runoff from frequent events will be conveyed by storm sewers (minor system), while flows from large storm events, which exceed the capacity of the minor system, will be conveyed overland along defined overland flow routes (major system).

The storm sewer network and subcatchments are shown on **Figure 6** – Storm Sewer Layout (Interim) and **Figure 7** – Storm Sewer Layout (Ultimate). The Storm Sewer Design Sheets are provided in **Appendix B**.

As shown in **Figure 6** – Storm Sewer Layout (Interim) and **Figure 7** – Storm Sewer Layout (Ultimate), the stormwater management for the west side of the Subject Lands will be provided by a Stormwater Management (SWM) Facility (SWM Pond 1) located at the northwest intersection of Tributary 2 and March Road within the CU Lands. The SWM Facility will provide water quality and quantity control before outletting to Tributary 2. The layout of the proposed pond can be found in the detail design for CU Lands. The east side of the Subject Lands will continue to flow to the March Road ditch in the interim as per existing conditions. When March Road is urbanized and storm sewers are installed, the east side of Block 2 and lower east portion of Street 10 will be connected to these storm sewers in the ultimate condition. The March Road storm sewers are to be accommodated through the Minto Lands to SWM Pond 3 that will provide quality and quantity control for the upstream lands including the east portion of Street 10 and Block 2.

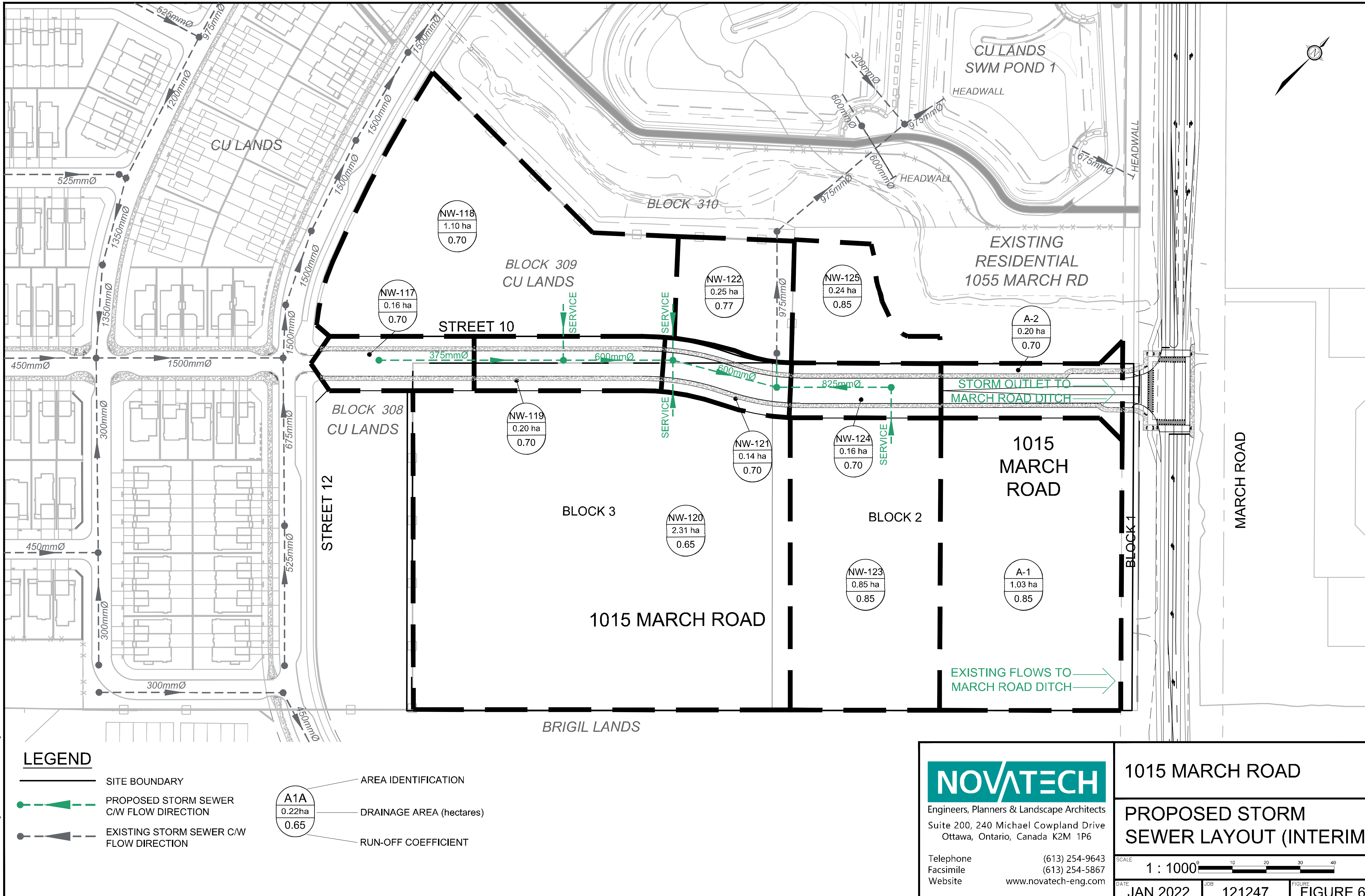
3.1 Lands Adjacent Street 10

A storm sewer will service the upper west half of Street 10 and the adjacent future development lands and outlet to the lower cell of the CU Lands SWM Pond 1. A proposed upstream oil-grit separator is located within a servicing easement within Block 292 on CU Lands. The storm sewers, oil-grit separator and SWM Pond 1 on CU Lands are to be constructed by others.

Due to the steep gradient of Street 10, it has been designed as having a continuous grade. To capture stormwater runoff each inlet is represented as double catchbasins (2x inlets / side) without inlet control devices (ICDs). This provides a 100-year inlet capture rate to prevent overland flow along the roadway from spilling downstream to March Road. The remainder of Street 10 and Block 2 of the site have been designed assuming a 5-year inlet capture rate. The 100-year event for Block 2 will be stored on-site via surface storage. Further information on release rates and storage assumptions are provided in **Appendix B**.

<u>Future School Site (Block 3)</u>

A future school site (Block 3) is proposed in the southwest corner of the development area. The PCSWMM model from the CU Lands draft servicing report indicates that the 100-year hydraulic grade line (HGL) elevations are dictated by the water levels in the lower SWM Pond 1, as shown below:



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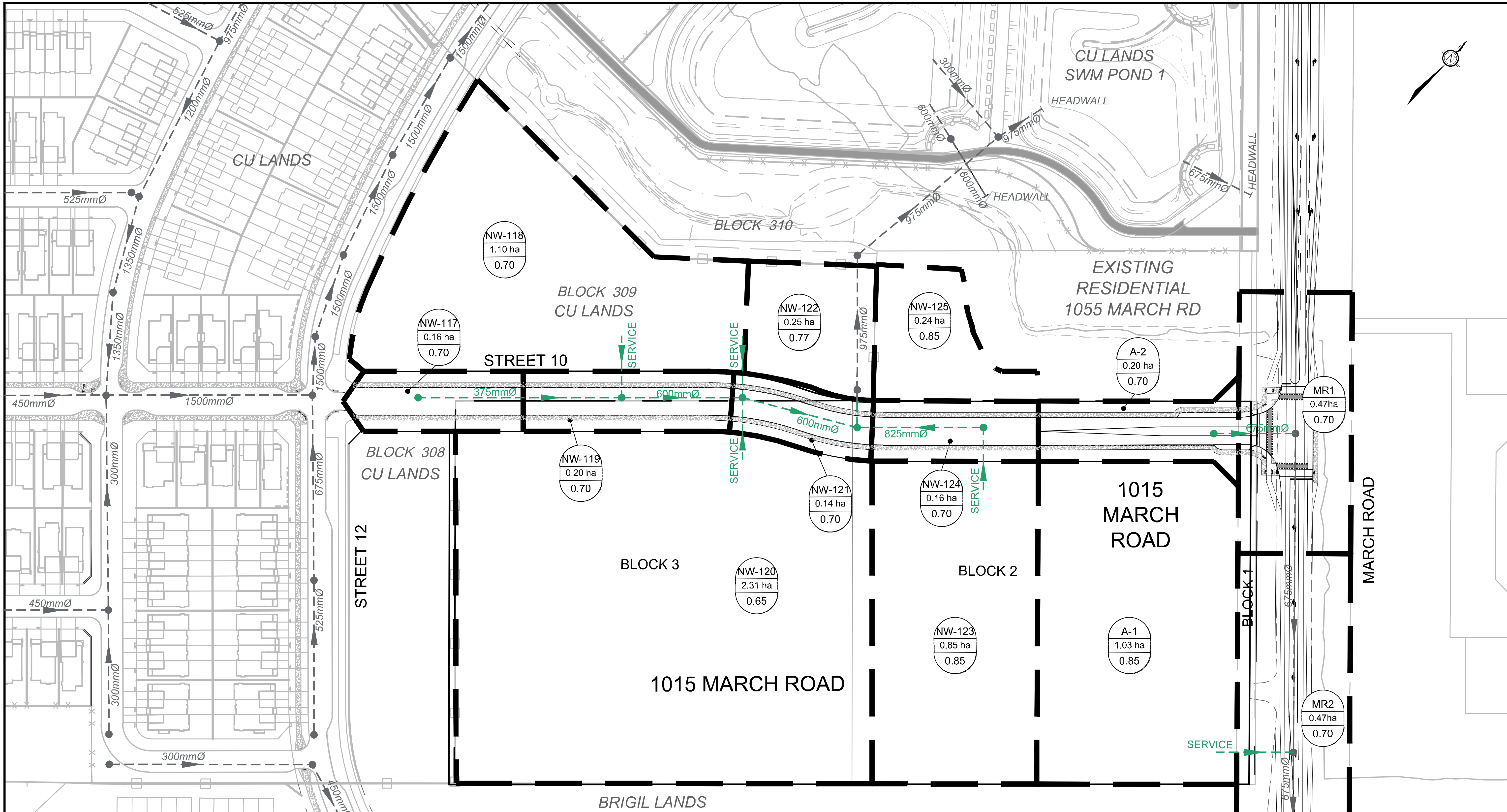
1015 MARCH ROAD

PROPOSED STORM SEWER LAYOUT (INTERIM)

SCALE 1 : 1000

DATE JAN 2022 | JOB 121247 | FIGURE FIGURE 6

SHT11X17.DWG - 279mmX432mm



LEGEND

- SITE BOUNDARY
- PROPOSED STORM SEWER C/W FLOW DIRECTION
- EXISTING STORM SEWER C/W FLOW DIRECTION
- A1A — AREA IDENTIFICATION
- 0.22ha — DRAINAGE AREA (hectares)
- 0.65 — RUN-OFF COEFFICIENT

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1015 MARCH ROAD

PROPOSED STORM SEWER LAYOUT (ULTIMATE)

SCALE	DATE	JOB	FIGURE
1 : 1000	JAN 2022	121247	FIGURE 7

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Estimated 100-year HGL	*3-hour Chicago*	*24-hour SCS*
Lower Pond (overflow weir = 82.00m)	81.72m	**81.99m**
MH914 (Street 10 – before diversion)	81.72m	**81.99m**
MH918 (Street 10 – eastern MH)	81.72m	**81.99m**

At the southeast corner of the school site on Block 3, and the west half of Block 2, the HGL is expected to rise from the SWM pond HGLs above to an elevation of approximately 82.20m. The finished floor elevation of the slab-on-grade building should be a minimum 0.30m above the 100-year HGL at a minimum elevation of 82.50m. The finished ground elevation in this area should also have a minimum elevation of 82.50m to prevent any drainage spilling onto adjacent properties. The east and a portion of the south property limits may require retaining walls to accommodate the finished ground and finished floor elevations in this area.

These design conditions should be reviewed and confirmed during detail design of 1015 March Road. Furthermore, the design conditions and recommendations set forth in the detailed design SWM report will need to be reviewed and confirmed when site plan applications for the future mixed-use site (Block 2) and the future school site (Block 3) are brought forward.

Runoff Coefficients

The KNMSS identified runoff coefficients for various proposed land use types in the KNUEA; refer to **Table 3.1** below.

Table 3.1: Typical Runoff Coefficients (KNMSS)

Parameter	Runoff Coef.
Cemetery	0.20
Open Space	0.20
Church (DME SWM Report, 2010)	0.35
Parks	0.40
Schools / Institutional	0.65
Street Oriented Residential	0.65
Multi / Unit Residential	0.70
Roads	0.70
SWM Facility	0.55
Mixed Use / Commercial	0.85
Park and Ride	0.85

3.2 March Road

Under existing conditions drainage from March Road is conveyed via roadside ditches to Tributary 2 of the Northwest Branch of Shirley's Brook.

The KNMSS developed a conceptual design for the future widening of March Road. The ultimate cross-section is a 44.5m right-of-way (ROW) including a central Bus-Rapid Transit corridor. Due to the width of the ROW, storm servicing will be provided by two (2) separate storm sewers for the northbound and southbound lanes:

- Storm sewer for the east side of the ROW (northbound lanes) will outlet to Pond 3.
- Storm sewer for the west side of the ROW (southbound lanes) will outlet to Pond 1.

Pond 1 is the proposed SWM Facility for the west half of the subject site and for CU Developments (by others) and Pond 3 is the outlet for the east half of the subject site and is part of the Minto development (by others).

3.3 Storm Servicing Strategy

3.3.1 Kanata North Master Servicing Study (KNMSS)

The KNMSS identified the proposed servicing for the Subject Site, Street 10, and March Road:

1) Storm drainage for Block 3 (future school), west half of Block 2 (commercial block), upper west half of Street 10 (Street D in KNMSS) and CU Lands (residential Block 309) shall be conveyed to a storm sewer on Street 10 and directed to SWM Pond 1. Refer to excerpt from the KNMSS, STM Drainage Area Plan-(112117-1) in **Appendix B**.
2) Storm drainage from the lower east half of Block 2 and Street 10 shall be conveyed to a future storm sewer on March Road and ultimately to SWM Pond 3 through the downstream Minto Lands. Refer to attached excerpt from the KNMSS, STM Drainage Area Plan-(112177-1).

The existing topography slopes from Street 12 to March Road with sheet drainage outletting to the existing March Road ditch.

The servicing option presented in the KNMSS was based on Pond 1 as a single cell SWM Facility. To reduce rock excavation, Pond 1 is being proposed as a two-cell SWM facility by CU Lands; with the upper cell 2.5m higher than the lower cell. Based on the two-cell design approach for Pond 1, the proposed servicing from the KNMSS is no longer applicable and a revised storm sewer layout was developed:

- The minor storm flows from Block 3 (future school), west half of Block 2 (mixed-use block), upper west half of Street 10 (Street D in KNMSS) and CU Lands (residential Block 309) will be conveyed by storm sewers in Street 10, across CU Lands to an OGS unit then outlet into the lower cell of SWM Pond 1.
- The lower east half of Block 2 and lower east half of Street 10 will outlet to the future storm sewer in March Road.

The design approach for the lower east half of Block 2 and Street 10 is dependent on the timing of the urbanization of March Road and the development of the Subject Site. The two (2) storm servicing scenarios take into account the interim and ultimate condition of March Road as well as pre-development and post development conditions of the existing / future lands. The detailed design of these lands will be subject to a separate site plan application.

3.3.2 Storm Servicing Strategy – Interim

The interim servicing includes the development of Street 10 in advance of the remaining Blocks. Blocks 2 and 3 will continue to sheet drain to the existing March Road ditch as occurs currently until such time as the Blocks are developed.

The storm sewer outlet servicing the west half of Street 10 will be constructed and extended over the CU Lands and under the proposed creek realignment to the lower cell of SWM Pond 1 (by others). The future school (Block 3) will be serviced by the sewer in the upper west half of Street 10 once the school block is developed.

The storm sewer from Street 10 to the lower cell of SWM Pond 1 is sized to convey 100-year peak flows as Street 10 is proposed to be a continuous grade. Intercepting the 100-year flow will reduce the storm flows to March Road right-of-way as per CU Lands design.

The lower east half of Street 10 will be graded to have a surface outlet to the existing March Road west side ditch. Storm catchbasins and sewers will be provided in the lower half of Street 10 but will not be connected until the future storm sewer is constructed in March Road.

The lower east half of Block 2 will continue to sheet drain to the March Road ditch as per current conditions in the interim. If Block 2 advances prior to March Road storm sewer upgrades, then onsite catchbasins, sewers, and dry pond storage will be installed that will outlet at the maximum 5-year storm event rate, as designed in the KNMSS, to the existing March Road west side ditch. The detailed designed will be required as part of a separate site plan application for Block 2.

Refer to **Figure 6** – Storm Sewer Layout (Interim)

The SWM criteria for all the future / existing lands used to develop this servicing scenario is outlined **Table 3.2**.

3.4.4 Storm Servicing Strategy – Ultimate

The ultimate storm servicing consists of the upper half of Street 10 and the school (Block 3) outletting to SWM Pond 1 as designed in the interim servicing and the lower half of Street 10 outletting through a storm sewer to new storm sewers constructed in March Road when March Road is expanded / urbanized. The storm sewer system including dry pond servicing the lower east half of mixed-use Block 2 would also connect into and outlet to the March Road storm sewer from the southeast corner of Block 2.

Refer to **Figure 7** – Storm Sewer Layout (Ultimate)

The SWM criteria for all the future / existing lands used to develop this servicing scenario is outlined in **Table 3.2**.

Table 3.2: Stormwater Management Criteria

Area	Description	Runoff Coefficient	SWM Criteria		
			Minor System	Major System (100yr)	Emergency Overland (>100yr)
Lands Owned by the Applicant					
Block 1	Post-development conditions	0.70 (proposed – KNMSS)	• Lands dedicated to the City of Ottawa for future road widening.	• Lands dedicated to the City of Ottawa for future road widening.	• Emergency overland flows will be directed to March Road.
Block 2	Post-development conditions	0.70 (proposed – KNMSS)	• Proposed 5-year on-site storm sewer directed to March Road storm sewer via. sewers.	• 100-year controlled and stored on-site (within parking areas and underground) and released to minor system.	• Emergency overland flows will be directed to March Road.
Block 3	Post-development conditions	0.65 (proposed – KNMSS)	• Proposed 5-year on-site storm sewer directed to Street 10 storm sewer via. sewers.	• 100-year controlled and stored on-site (within parking areas and underground) and released to minor system.	• Emergency overland flows will be directed to March Road.
Lands Not Owned by the Applicant					
Armitage Site 1035 March Road	Remain per ex. conditions	0.69 (existing - KNMSS)	NA	Flows overland to: 1) March Road (urbanized); or 2) March Road southside ditch.	• Same as Major System.
Future Development Sites					
Block 291 (CU Lands)	Post-development conditions	0.65 (proposed – KNMSS)	• Proposed 5-year on-site storm sewer directed to Street 12 storm sewer.	• 100-year controlled and stored (underground) and released to minor system.	• Emergency overland flows will be directed to Street 12.
Block 292 (CU Lands)	Post-development conditions	0.69 (proposed – KNMSS)	• Proposed 5-year on-site storm sewer directed to Street 10 storm sewer via. sewer.	• 100-year controlled and stored (underground) and released to minor system.	• Emergency overland flows will be directed to March Road and SWM Pond 1.
Future Road Widening					
March Road	Interim: Remains as existing 4-lane rural cross-section Ultimate: Roadway urbanized 2-lane urban cross section	0.70 (existing and proposed – KNMSS)	Interim: Existing flows to March Road ditch. Ultimate: Storm sewer sized to service lower half of Street 10 and Block 2 (5-year flow) plus March Road (10-year flow).	• Major overland flow conveyed and ultimately outletting to SWM Pond 1 or SWM Pond 3.	• Emergency overland flow conveyed to Tributary 2 for both options.

3.5 Stormwater Management Criteria

The following stormwater management criteria for the Subject Lands are based on the criteria presented in the KNEMP & KNMSS, which were developed through consultation with the MVCA and the City of Ottawa.

Minor System (Storm Sewers)

- Inlet control devices (ICDs) are to be installed in road and rear yard catchbasins to control inflows to the storm sewers based on the following levels of service:
  - Collector Roads: 1:5 year
  - Arterial Roads: 1:10 year
- Storm sewers are to be sized based on the Rational Method, based on the above return periods, with an initial time of concentration of 10-minutes. The minimum / maximum velocity in the pipe is to be between 0.8 – 3.0 m/s. The minimum pipe diameter (size) is 250mm.
- Ensure that the 100-year hydraulic grade line in the storm sewer is at least 0.3 m below the underside of footing (USF) elevations for the proposed development.

Major System (Overland Flow)

- Overland flows are to be confined within the right-of-way and/or defined drainage easements for all storms up to and including the 1:100-year event.
  - Maximum depth of flow (static + dynamic) on local and collector streets shall not exceed 0.35 m during the 100-year event. The depth of flow may extend adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the ‘stress test’ event (i.e. 100-year +20%).
  - Maximum depth of flow on arterial roads shall not overtop the barrier curb and shall leave one lane free of water in each direction. There is to be no flow overland across arterial roads.
- Runoff that exceeds the available storage in the right-of-way will be conveyed overland along defined major system flow routes towards the proposed major system outlet to the SWM Facilities.
  - There must be at least 15cm of vertical clearance between the spill elevation on the street and the ground elevation at the building envelope that is in the proximity of the flow route or ponding area.
- Although rear yard storage cannot be accounted for in computer modeling, the effect of flow attenuation can be accounted for by assuming a constant slope ditch/swale draining to the street with the following geometry:
  - A minimum slope of 1.5%
  - A depth ranging between 150mm (min) and 600mm (max)
  - Maximum side slopes of 3H:1V
- The product of the 100-year flow depth (m) on street and flow velocity (m/s) shall not exceed 0.60.

Water Quality & Quantity Control

- Provide an *Enhanced* (80% long-term TSS removal) level of water quality control.
- Post-development peak flows to Tributary 2 of Shirley's Brook are not to exceed pre-development peak flows for all storms up to and including the 100-year event.
- Ensure no adverse impacts on erosion in the watercourses resulting from future development within the KNUEA.

Low Impact Development / Green Stormwater Infrastructure

- Adhere to guidance from the KNEMP on opportunities to promote installation of LID techniques on the project site.
- Implement lot level and conveyance Best Management Practices to promote infiltration and treatment of storm runoff.

3.6 Low-Impact Development Techniques

Hydrologic conditions within KNUEA will be altered by the proposed development. The introduction of impervious areas will increase runoff volumes and decrease infiltration. The KNEMP included a water budget (balance) analysis. The results indicated that there are no areas of significant groundwater recharge or discharge or sensitive species identified within the KNUEA. As such, there are no specific targets for infiltration and baseflow from the site.

The proposed development of the Subject Lands is generally consistent with the Demonstration Plan presented in the KNCDP. As such, the post-development water balance presented in the KNEMP would still be applicable for the Subject Lands.

The KNEMP recommends that infiltration best management practices (BMPs) or low-impact development (LID) techniques be considered where suitable. The intent is to mitigate the impacts of increased runoff and decrease in infiltration by managing post-development runoff as close to its source as possible. The following LID techniques are recommended for the roadway inlets, and site plans.

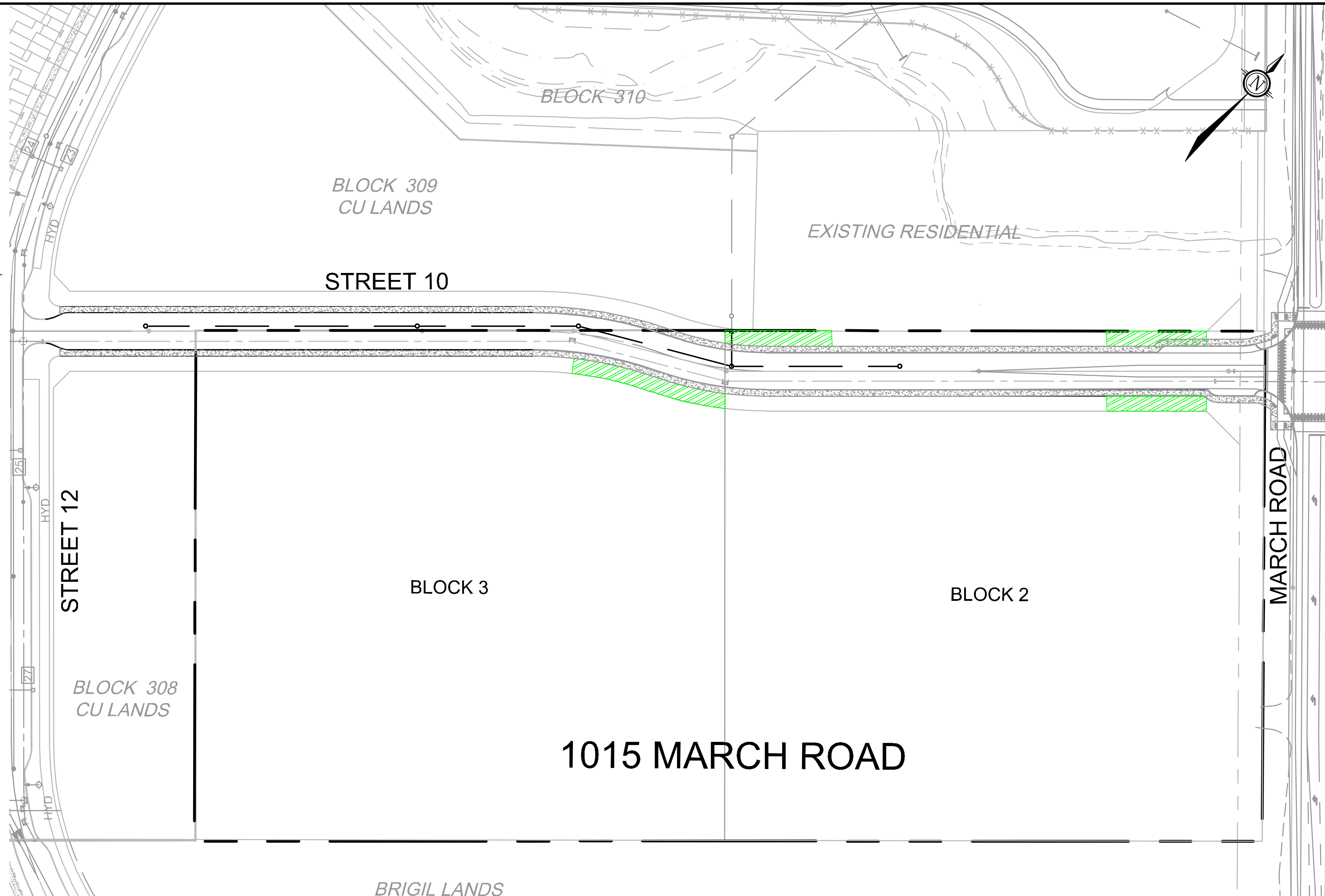
Roadways

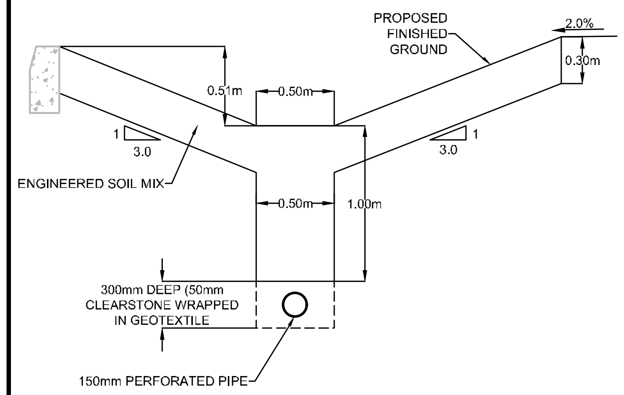
Figure 8 provides a conceptual overview of potentially suitable locations for the implementation of LID features within the rights-of-way. At the detailed design stage, suitable LID locations will be selected based on a variety of factors, such as: surficial soil types, groundwater elevation, road grading / CB locations, driveway locations, utilities locations, design ratio (LID area vs. drainage area), etc.

Potential LID techniques could include bioretention areas within the boulevards. Bioretention includes the use vegetation and amended soils to filter, treat and attenuate storm runoff. Typical components of bioretention facilities include an underlying gravel drainage and a perforated pipe (overflow) connection to the storm sewer.

Site Plans

The subject lands include blocks set aside for a mixed-use block and a school block. LID design opportunities for these locations should be considered as part of individual Site Plan applications. Suitable LID features for these areas can include (but are not limited to):





TYPICAL LID CROSS SECTION

LEGEND

POTENTIAL LOCATIONS FOR LIDS

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1015 MARCH ROAD

POTENTIAL LOCATIONS FOR LIDS

SCALE 1 : 1250

DATE FEB 2022 | JOB 121247 | FIGURE FIGURE 8 bioretention cells; rain gardens; infiltration systems; permeable pavement; green roofs; amended topsoil; and, enhanced tree canopy.

For preliminary design purposes, peak flow and runoff volume reduction benefits from LIDs have not been accounted for in the sizing of the storm sewers and the CU Lands SWM Facility. At the detailed design stage, candidate locations for LIDs will be reviewed and selected in consultation with the City of Ottawa.

3.7 Stormwater Management Modelling (PCSWMM)

The performance of the preliminary storm drainage and stormwater management system for the northwest quadrant of the KNUEA was evaluated using PCSWMM. The PCSWMM model was also used to evaluate the performance of the proposed SWM Facility.

In the CU Lands Detailed Design Report, two (2) future servicing scenarios were developed for the future / existing lands adjacent to March Road, north of Street 1; 1) Existing condition and 2) Post development condition, which is dependant on the urbanization of March Road and development of these lands.

The PCSWMM model includes the Subject Site (specifically Block 3, and the upper west half of both Street 10 and Block 2), CU Lands, Future Development Lands, March Road and Nadia Lane storm sewers. PCSWMM Model schematics and 100-year model output are provided in **Appendix B**.

Design Storms

The PCSWMM model uses synthetic design storms created using the IDF parameters provided in the City of Ottawa Sewer Design Guidelines (October 2012). A 3-hour Chicago storm distribution and 24-hour SCS Type II storm distribution was chosen for the analysis. The model was run for the 2-year, 5-year, and 100-year return periods. The model was ‘stress tested’ using a 100-year (+20%) storm event that corresponds to a 100-year storm with a 20% increase in rainfall intensity and volume.

The 3-hour Chicago distribution generated the highest peak flows for the individual subcatchments and governs the design of the storm sewers and ICDs. The 24-hour SCS Type II storm generated higher total runoff volumes and governs the storage requirements for the proposed SWM Facility.

Subcatchment Parameters

The hydrologic parameters for each subcatchment were developed based on the preliminary Grading Plans (Drawing 121247-GR and CU Lands drawings), **Figure 6** – Storm Sewer Layout (Interim) and **Figure 7** – Storm Sewer Layout (Ultimate). A summary of the subcatchment parameters and model input data is provided in **Appendix B**.

Storm Sewers

The storm sewer network (pipes / MH’s) was created using Autodesk Civil3D and imported into the PCSWMM model as a LandXML file. Losses at each maintenance hole are defined based on the geometry and orientation of the inlet and outlet pipes.

Catchbasins & Inlet Control Devices (ICDs)

Catchbasins are represented in the PCSWMM model as nodes:

- ICDs for road catchbasins on-grade are represented using inlet rating curves (approach flow vs. captured flow).
- ICDs for road catchbasins at low points are represented as orifices.
- For rearyard catchbasins in series, the PCSWMM model represents only the most downstream catchbasin, which is connected to the storm sewer using an ICD.

ICD sizes have been defined using the PCSWMM model based on the minor system peak flow at each inlet. They will be refined during detailed design.

Major System (Overland Flow)

Storm runoff conveyed on the road surface is represented in the PCSWMM model as open channel flow. The elevations used to define the road network in the model are based on the Grading Plans. Model input includes:

- Roadway cross-sections.
- The location, elevation, and type of all storm inlets.
- Length, slope and cross-fall of road sections connecting each inlet.

Release Rate / Storage Assumptions for Future Development Areas

The release rates (theoretical orifice sizes) for the future development areas were based on providing a 5-year inlet capture rate with an assumed head of 1.40m. An additional 0.35m of head is assumed for the 100-year storm event. Surface storage to attenuate the 100-year storm event on-site is provided at a depth of 0.35m; therefore, 100-year release rates are slightly higher than the 5-year peak flow due to the additional 0.35m of head. Storm events that exceed the 100-year are conveyed to the roadway.

Refer to theoretical ICD sizing calculations, release rates and assumed 100-year surface storage volumes provided in **Appendix B**. Calculations are based on the 3-hour Chicago storm distribution.

3.7.1 PCSWMM Model Results

The PCSWMM model was used to evaluate the performance of the preliminary storm drainage and stormwater management design for the northwest quadrant of the KNUEA including the Subject Site.

The results of the hydrologic and hydraulic analysis demonstrate that the overall stormwater management strategies for the northwest quadrant is feasible and will conform to the stormwater management criteria outlined in this report. Refer to **Appendix B** for PCSWMM model results.

Hydraulic Grade Line (HGL)

The PCSWMM model has been used to perform a preliminary HGL analysis of the proposed storm sewer network for CU Lands including the Subject Site. The results of the HGL analysis demonstrate that the proposed storm sewers have sufficient capacity to convey the controlled minor system flows during the 100-year design event. Preliminary HGL information for each scenario is summarized in **Appendix B**.

At the detailed design stage, the PCSWMM model will be used to refine the storm sewer design and establish minimum USF elevations. The storm sewer sizes may be adjusted as required to maintain a minimum 0.30 m of freeboard below the proposed USF elevations.

While the 3-hour Chicago distribution generates higher minor system peak flows, the 24-hour SCS Type II distribution generates larger runoff volumes and storage depths in the SWM pond. Therefore, the detailed design HGL analysis should use both storm distributions to evaluate the maximum 100-year HGL elevations.

4.0 STORMWATER MANAGEMENT FACILITY

4.1 SWM Pond 1 Facility Location and Configuration

4.1.1 Kanata North Community Design Plan (KNCDP)

The KNCDP included a conceptual design for a proposed SWM Facility (Pond 1) to service the northwest quadrant of the KNUEA. The proposed SWM facility was presented in the KNEMP as a single wet pond with a single storm inlet at the northwest corner of the SWM block, and an outlet to Shirley's Brook Tributary 2 at March Road.

The proposed SWM Pond 1 has been sized to provide water quality and quantity control for a total tributary drainage area of 56.31 ha from the KNUEA northwest quadrant including the west half of the Subject Site. Refer to Figure 6.1 from KNCDP in **Appendix B**.

4.1.2 Proposed Layout

Due to geotechnical and grading considerations, the proposed SWM facility for the Northwest Quadrant has been designed as two (2) separate wet ponds within the proposed SWMF block. The two-pond layout was discussed with the City and agreed upon as an acceptable solution for the design of the SWM facility - refer to Meeting Minutes, dated April 4, 2019 provided in **Appendix A**.

Storm runoff from the eastern portion of the CU Development lands, including Block 3, the west half of Street 10 and the west half of Block 2, will be directed to the lower pond cell (SWM Pond 1).

The elevation of the west (upper) pond will be 2.5m higher than the east (lower) pond. Controlled outflows from both ponds will be directed into Shirley's Brook Northwest Branch Tributary 2. The upper pond will outlet to the realigned section of Tributary 2. The lower pond will outlet to Tributary 2 at March Road.

4.2 SWM Pond 3 Location and Configuration

4.2.1 Kanata North Community Design Plan (KNCDP)

The KNCDP included a conceptual design for a proposed SWM Facility (Pond 3) to service the northeast quadrant of the KNUEA. The proposed SWM facility was presented in the KNEMP as a single wet pond with dual storm inlets at the northeast corner outside of the urban boundary, with an outlet to Shirley's Brook.

The proposed SWM facility has been sized to provide water quality and quantity control for a total tributary drainage area of 94.3 ha from the KNUEA northeast quadrant. The subject site at 1015 March Road including the east half of Block 2 and Street 10 is included in the drainage area to SWM Pond 3. Refer to Figure 6.4 from KNCDP in **Appendix B**.

4.2.2 Proposed Layout

Storm runoff from the lower east half of both Block 2 and Street 10 at 1015 March Road will be conveyed by storm sewers within March Road to Invention Boulevard within the Minto Development. The sewer system within the Minto development will convey the flows to SWM Pond 3 as per the KNCDP design. The storm sewers within March Road will be designed and installed in the future when March Road is widened and urbanized (by others). The interim condition flows from the lower east half of the Subject Site will outlet to the existing ditch along March Road. These flows will be conveyed across March Road by an existing 1050mm culvert to Tributary 2 of Shirley's Brook. The flows from the lower east half of the site to the March Road ditch will be less than existing conditions as all of the west half of the subject site flows will be directed to SWM Pond 1 within the CU Lands.

There will be no net negative impact to the existing March Road ditch in the interim condition.

5.0 SANITARY SERVICING

5.1 Introduction

The Subject site is within the City of Ottawa West Urban Community (former City of Kanata). This area is serviced by local gravity sewers and pump stations that discharge to a regional trunk system that carries flows to the Robert O. Pickard Environmental Centre for treatment of wastewater.

There are several trunk sanitary sewers and pump stations servicing the West Urban Community including the East March Trunk, Marchwood Trunk, Kanata Lakes Trunk, North Kanata Trunk, March Pump Station, and the Briar Ridge Pump Station. These all drain into the Watt's Creek Relief Sewer that provides service to the entire West Urban Community and flows into the Acres Road Pump Station. An Existing Wastewater Collection System Schematic (Figure 2) from the 2013 Infrastructure Master Plan and Figure 6.2 from the KNMSS and supplementary information is included in **Appendix C** for reference.

The ultimate outlet for the KNUEA is the existing March Pump Station. As requested by the City during the KNCDP process, the KNMSS provided sanitary flow analysis up to the March Pump Station and has established sufficient capacity including the entire KNUEA.

For the purposes of this report, sanitary flow analysis will focus on the subject site and the contributing flows to the March Road Trunk sewer.

The 1015 March Road development will be serviced by a 250mm gravity sanitary sewer on Street 10. This sewer will service the adjacent residential, mixed use , and institutional lands on Street 10 and outlet to the March Road trunk sewer. Refer to **Figure 9** – Proposed Sanitary Layout for details.

5.2 Proposed Onsite Sanitary Servicing

The proposed sanitary servicing for 1015 March Road builds on the sanitary servicing design provided in the *1053, 1075 and 1145 March Road Copperwood Estate Detailed Site Servicing and Stormwater Report*, and conforms to the recommendations from the KNMSS, KNEMP, the *Ottawa Sewer Design Guidelines* (October 2012) and technical bulletin *ISTB-2018-01* (March 2018). It also addresses the correspondence received from the City of Ottawa regarding amendments to the KNMSS.

5.2.1 Onsite Servicing

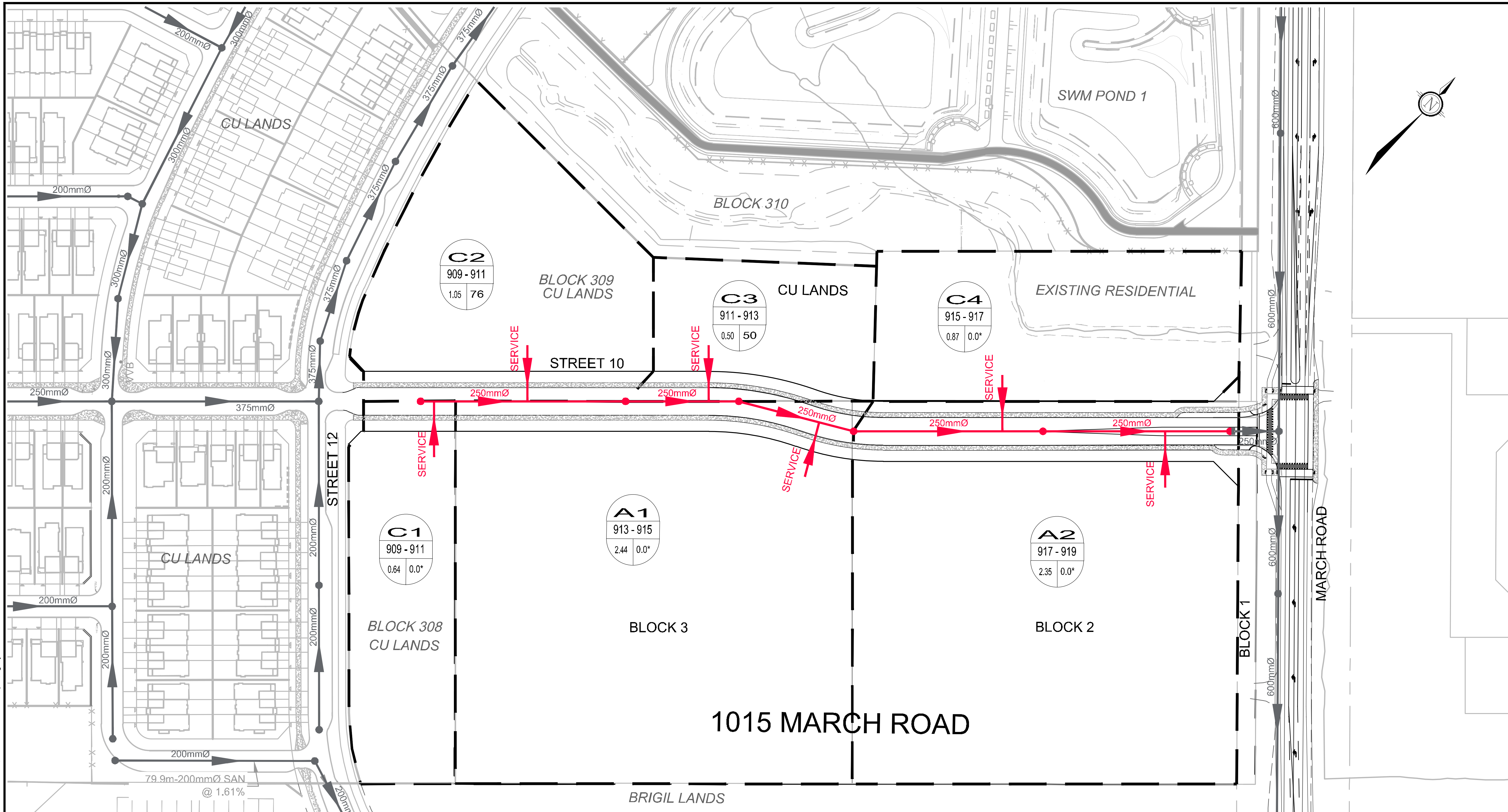
Design Criteria

Sanitary sewers, for the proposed development, are designed based on criteria established by the City of Ottawa in the following documents:

- Section 4.0 of the *City of Ottawa Sewer Design Guidelines* (October 2012).
- Technical Bulletin ISTB-2018-01 from the City of Ottawa regarding new sanitary design parameters. Design parameters from this technical bulletin will supersede values within the Sewer Design Guidelines (2012).

The resulting design parameters are summarized as follows:

- Commercial/Institutional flows = 28,000 L/ha/day
- Industrial flows = 35,000 L/ha/day



LEGEND

SITE BOUNDARY

PROPOSED SANITARY SEWER C/W FLOW DIRECTION

EXISTING SANITARY SEWER C/W FLOW DIRECTION

AREA 1 — AREA ID

815-813 — MANHOLE TO MANHOLE

89.1 — POPULATION EQUIVALENT

0.81 — AREA IN HECTARES

*INSTITUTIONAL / COMMERCIAL AREAS

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Facsimile	(613) 254-5867
Website	www.novatech-eng.com

1015 MARCH ROAD

PROPOSED SANITARY LAYOUT

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE	JOB	FIGURE
FEB 2022	121247	FIGURE 9

SHT11X17.DWG - 279mmX432mm

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- Population Flow = 280 L/capita/day
- Infiltration = 0.33 L/s/ha
- Single Family Home = 3.4 persons per unit
- Townhouse = 2.7 persons per unit
- Apartment = 1.8 persons per unit
- Maximum Residential Peak Factor = 4.0
- Harmon Correction Factor = 0.8
- Commercial/Institutional Peak Factor:
  - 1.0, if area is <20% of total contributing area
  - 1.5, if area is >20% of total contributing area
- Industrial Peak Factor = per MOE/City of Ottawa graph (included in **Appendix C**)
- Minimum velocity = 0.6m/s
- Manning's n = 0.013

<u>*Sanitary Flows*</u>

The peak sanitary flows for the 1015 March Road development is 6.09 L/s, as summarized below in **Table 5.1.**

Table 5.1: Proposed 1015 March Road Development Sanitary Flows

Development Condition	Pop.	Area (ha)	Peak Res. / Inst. Flow [1] (L/s)	Peak Ext. Flow (L/s)	Peak Design Flow (L/s)
Outlet – Street 10 and March Road					
Residential	126	1.55	1.46	0.51	1.97
Institutional/Commercial/Mixed Use		6.30	2.04	2.08	4.12
Park		-	-	-	-
Total Flow	**126**	**7.85**	**3.50**	**2.59**	**6.09**

[1] Peaking Factor for residential and institutional/commercial areas as per Section 6.2.1

As demonstrated in the CU Detailed Serviceability report, the sanitary sewer design sheet for Street 10 calculated a sanitary flow of 5.77 L/s to outlet to the March Road trunk sewer. Refer to **Appendix C** for Street 10 design sheet and sanitary drainage area plan. Overall, the sanitary flows generated from the 1015 March Road development and Street 10 have increased approximately 5.5% from the estimated flows from the Detailed CU Development Serviceability Report. The minor increase is due to a decrease of population in CU Block 309 and an increase in commercial/institutional land usage. This increase of outlet flow will not negatively impact the flow in the March Road trunk sewer.

The proposed sanitary sewer alignment and drainage areas are shown on **Figure 9** - Proposed Sanitary Layout. Design sheets can be found in **Appendix C.**

5.3.2 Deviations

There are no deviations to the Ottawa Sewer Design Guidelines (2012) or City of Ottawa Technical Bulletins.

6.0 WATER DISTRIBUTION

6.1 Existing Water Infrastructure

Currently, the KNUEA is located at the north end of Kanata in the West Urban Community (WUC). The KNUEA is bounded by residential estate lots and farmland lots to the northeast and northwest. These properties are serviced by individual/private wells. There are existing urban residential developments to the southeast and southwest of the KNUEA. These properties are within the 2W2C pressure zone. Refer to excerpts from the 2013 IMP in **Appendix D**. The Morgan's Grant pressure zone is approximately 250m to the southwest. The Britannia Filtration Plant and Pumping Station services this community from a large diameter feedermain routed through Bells Corners. A second feedermain was recently constructed through Crystal Beach and the NCC Greenbelt to improve system reliability and capacity. Assisted by the Carlington Heights Pumping Station, these two pumping facilities supply water to the WUC.

A north-south feedermain generally follows the Teron Road / March Road corridor towards North Kanata. Between Shirley's Brook Drive and Klondike Road, the water main is reduced to a 400mm pipe and continues north to the Zone 22C boundary at Old Carp Road.

The Morgan's Grant Pressure Zone is an isolated parcel located west of March Road and south of the Study Area. There is a small local pump station at the intersection of Klondike Road and Wimbledon Way to meet pressure servicing requirements in this area. The station is needed due to local high topography with ground elevations between 91m and 109m. The Morgan's Grant Pump Station (MGPS) operates with discharge HGL values from 138m to 151m.

An existing water distribution schematic taken from the 2013 Infrastructure Master Plan is attached in **Appendix D** and depicts a skeletonized system for the entire City of Ottawa. Most of the features discussed above can be identified on this high-level drawing. Figure 3 from Stantec's '*Kanata North Urban Expansion Potable Water Assessment Report' is* included in **Appendix D** and highlights the North Kanata area and depicts the Morgan's Grant Pressure Zone and part of the 2W2C Pressure Zone, in relation to the Study Area.

6.2 Future Planned Water Infrastructure

The City has identified several projects in the 2013 Infrastructure Master Plan to reinforce the current water distribution system. Specific to the WUC, some of these projects will directly affect the KNUEA, and have been listed below:

March Road Pipe Upgrades: March Road Watermain is predominantly a 600mm feedermain system with several short sections of 400mm pipe including a 400mm on Solandt connecting to March Road. These smaller pipe segments restrict capacity and reduce system pressure in North Kanata. Replacement of the undersized pipes with 600mm conduit is proposed and construction is expected between 2019-2024 in the 2013 IMP. The timing of these upgrades is based on demand due to growth.

Morgan's Grant Secondary Supply and PRV: Objective of this project is to provide a secondary link between the 3W pressure zone and the Morgan's Grant pressure zone. This infrastructure would improve system reliability in the event of mechanical failure at the MGPS. Staff advises this project has not been scheduled. This project is only relevant to the Study Area if it's determined a connection is needed to this pressure zone.

Glen Cairn Pump Station Upgrades & Reservoir Expansion: Two distinct projects. City staff advises some pump improvements were done recently at the same time as the Campeau Drive facility works. Additional upgrades are expected in the future, the timing and need for which will be strongly linked to growth in the WUC.

No work is currently scheduled on the reservoir expansion. City staff has indicated work on the reservoir will be needed around 2019.

6.3 Recommendations in the KNMSS

Stantec Consulting was retained to analyze the regional-level impact to the water distribution system associated with development of the Kanata North Urban Expansion Area. Their analysis and findings are presented subsequently. Stantec's '*Kanata North Urban Expansion Potable Water Assessment Report'* is contained in **Appendix D** for reference.

The preferred servicing option is to service the development through connection to the Zone 2W2C pressure distribution zone as per the KNCDP (June 28, 2016) based on recommendations from Stantec's report. It is preferable to connect to the Zone 2W2C pressure zone since it is at comparable elevations to the subject property. This will allow for servicing of all of the development area to be within tolerable servicing limits. Pressure reducing valves would be required if the development were serviced from the Morgan's Grant Pressure Zone because of excessively high pressures within the watermain system for the majority of the development (KNUEA). A full list of recommendations can be found in **Appendix D**.

Based on the modelling completed by Stantec, the following recommendations were made:

- The Kanata North Urban Expansion should be serviced entirely from the Zone 2W2C pressure zone due to topography and location.
- Site grading should not exceed 93m to maintain minimum pressures greater than 40 psi.
- Services installed in areas where the grade is less than 74m will need pressure reducing valves to keep the maximum pressure below 80 psi.
- To improve minimum pressures, two sections of off-site 406mm diameter watermain could be upgraded to reduce headloss from full buildout demands. The upgrade along March Road and Solandt Drive would be required if any development within the KNUEA is proposed above the 93m elevation.
- A secondary connection from Old Carp Road is the preferred secondary connection over the Celtic Ridge connection. However, either connection will adequately service the development.

6.4 Proposed Watermain System

The site serviceability and stormwater management report builds on the preliminary watermain servicing design provided in the KNMSS, and conforms to the recommendations from the KNEMP, the *Ottawa Sewer Design Guidelines* (October 2012) and technical bulletin *ISTB-2018-02* (March 2018). It also addresses the correspondence received from the City of Ottawa regarding amendments to the KNMSS.

The ultimate connection locations to the 2W2C pressure distribution zone are consistent with the KNMSS and Stantec's report. It is proposed to connect and extend the existing 406mm diameter watermain at the March Road / Maxwell Bridge Road intersection and a secondary connection will be provided to the existing 200mm watermain at Celtic Ridge Crescent by The Minto Group as per the KNMSS. Figure 2-1 from the Stantec Report, provided in **Appendix D**, shows the preliminary proposed watermain system and connection points to the existing system.

It is our understanding that future plan of subdivision applications from adjacent landowners within the KNUEA may be forthcoming. It is anticipated the application for The Minto Group will progress concurrently with the CU development. The Minto Group application will have a 300mm backbone watermain connecting to the 200mm Celtic Ridge Crescent watermain and the 400mm March Road watermain extension to serve their development. The 300mm watermain from The Minto Group connecting to March Road will serve as a secondary connection to the existing watermain system. The 300mm will continue adjacent to the Brigil site and connect to Street 12 at the CU development. The 300mm watermain will continue through the CU development and connect to the March Road 400mm watermain north of 1015 March Road to provide a looped watermain system for the Subject Site.

A 200mm watermain will be installed on Street 10 from Street 12 within CU Lands to the 400mm watermain on March Road in order to provide a looped system. The blocks adjacent to Street 10 will be serviced from this 200mm watermain.

Future and existing lands adjacent to March Road have been accounted for in the onsite demand and servicing. A watermain system will service future and existing lands along Street 10. Refer to **Figure 10** – Watermain Layout for details.

Boundary conditions were based on two connections; One at March Road / Maxwell Bridge Road and one at Old Carp Road. As per Stantec's Potable Water Assessment, a secondary connection at Old Carp Road or Celtic Ridge Crescent provides similar and adequate results, therefore, it was assumed the boundary condition at Old Carp Road was equal to the boundary condition at Celtic Ridge.

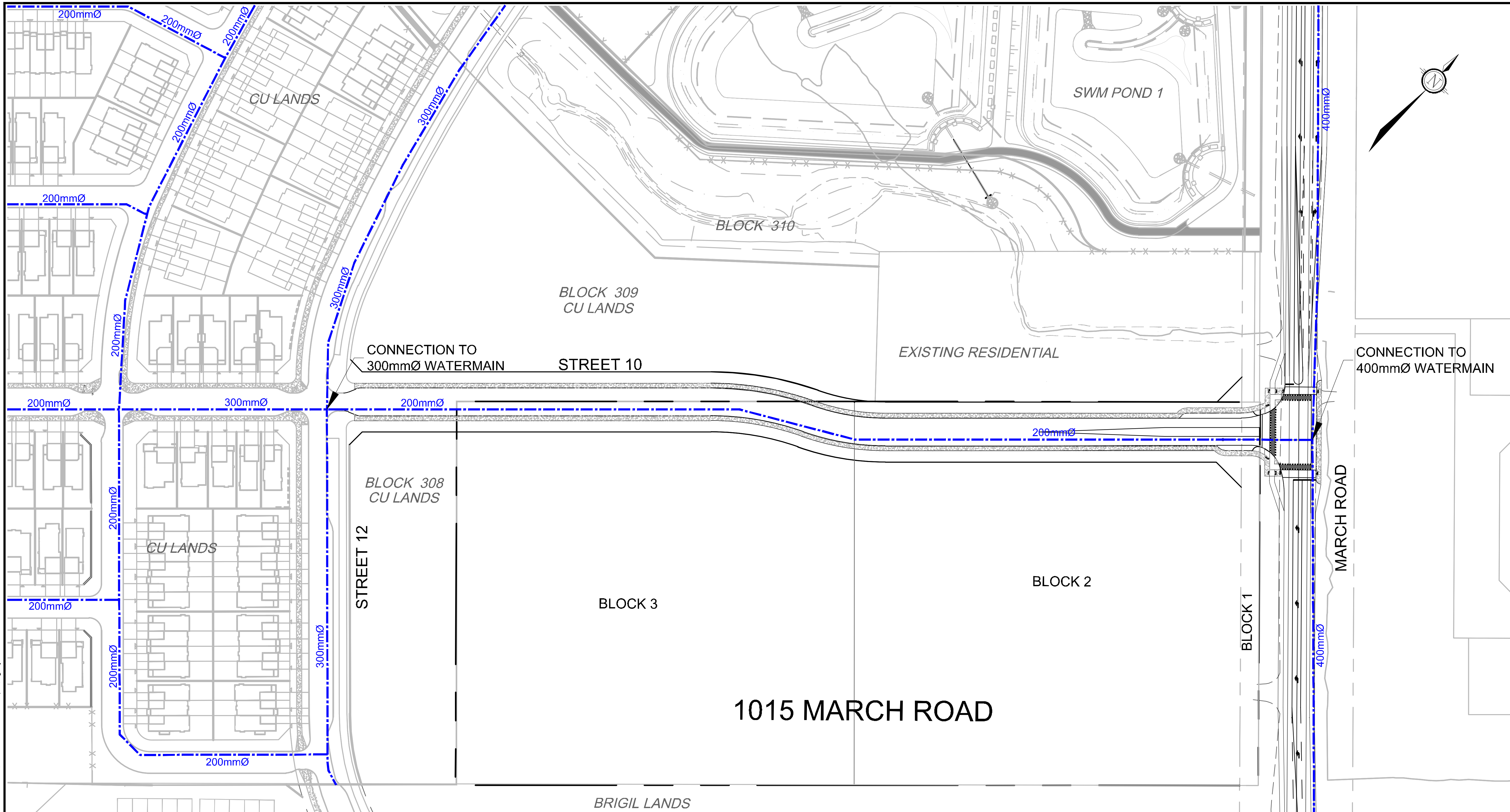
Boundary Conditions for the 1015 March Rd development have been taken from the CU development watermain design. Scenario 1 from the CU development serviceability report utilizes a single connection to the 400mm existing watermain on March Rd as a boundary condition. Refer to **Appendix D** for boundary conditions provided by the City of Ottawa.

6.5 Watermain Design Criteria

As per the City of Ottawa Watermain Design Guidelines for Water Distribution, preliminary watermain analysis of the proposed development was completed based on the following criteria:

Demand Values:

- Residential Demand = 280L/capital/day
- Residential Max Day = 2.5 x Avg. Day
- Residential Peak Hour = 2.2 x Max. Day
- Commercial/Institutional Demand = 28,000/gross ha/day
- Commercial/Institutional Max Day = 1.5 x Avg. Day



LEGEND

———	SITE BOUNDARY
—·—·—	PROPOSED WATERMAIN

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Website www.novatech-eng.com

1015 MARCH ROAD

PROPOSED
WATERMAIN LAYOUT

SCALE 1 : 1500 (0 15 30 45 60)

DATE FEB 2022 | JOB 121247 | FIGURE FIGURE 10

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- Commercial/Institutional Peak Hour = 1.8 x Max. Day
- Population Density
  - 3.4 persons/unit (Single)
  - 2.7 persons/unit (Street Town, Multi-Unit Town)
  - 1.8 persons/unit (Apartment)
- Fireflows
  - Calculation method as per Technical Bulletin ISTB-2018-02.

System Requirements

• Max. Pressure (Unoccupied Areas)	690 kPa (100 psi)
• Max. Pressure (Occupied Areas)	552 kPa (80 psi)
• Min. Pressure	276 kPa (40 psi) excluding fire flows
• Min. Pressure (Fire)	139 kPa (20 psi) including fire flows
• Max. Age (Quality)	192 hours (onsite)

Friction Factors

Watermain Size	C-Factor
• 200-250 mm	110
• 300-400 mm	120

Fireflow Analysis

To analyze the proposed watermain under fireflow conditions, an iterative process has been utilized to determine a maximum allowable fireflow for Blocks 2 and 3. To perform this analysis, a flowrate point load is applied to each node until the watermain reaches its minimum allowable pressure (139 kPa (20 psi) for fire flows). The flowrate load applied will then be taken as the maximum allowable fireflow at each node and its corresponding block.

6.6 Watermain Analysis

Hydraulic modelling of the 1015 March Road development was completed using EPANET 2.0. EPANET is public domain software capable of modeling municipal water distribution systems by performing simulations of the water movement within a pressurized system.

To match the Boundary conditions used in the CU development draft servicing report, demands have been allocated from future phases of the CU development, including phases 1, 2 and 3. The demands allocated from future phases include residential and institutional development. CU development phase 1 water demands have been allocated to nodes N3a and KNE07. Demands for phases 2, 3 and future phases of the CU development have been allocated to node KNE25. Refer to **Figure-WM** – Watermain Network Node Locations for details about the node and pipe network in **Appendix D.**

6.6.1 Results

Table 6.1 summarizes the watermain operating conditions during the high pressure, maximum daily demand and fire flow, and peak hour demands. Results of the hydraulic analysis are included in **Appendix D.**

Table 6.1: Water Analysis Summary

Condition	Street No. 10 Demand (L/s)	Remainder CU Development Demand (L/s)	Min/Max Allowable Pressure (kPa/psi)	Min/Max Operating Pressure (kPa/psi)	Max. Age (hrs)
High Pressure (Avg. Daily)	2.08	9.46	689.5/100 (Max)	492.5/71.4 (Max)	7.3
Maximum Daily Demand (c/w Fire Flow) Node N48	3.52 (227.0)	22.00	137.9/20.0 (Min)	137.9/20.0 (Min)	N/A
Maximum Daily Demand (c/w Fire Flow) Node N50	3.52 (241.0)	22.00	137.9/20.0 (Min)	137.9/20.0 (Min)	N/A
Peak Hour	6.74	47.41	275.8/40.0 (Min)	344.9/50.0 (Min)	N/A

The table above indicates that the proposed watermain can service the proposed 1015 March Rd development under all operating conditions using a series of 200mm pipes. The maximum allowable fire flows for Blocks 2 and 3 are, 241.0 L/s and 227.0 L/s, respectively. Both fire flows are conservatively calculated to accommodate the proposed development. The fire flow demands for the individual blocks are to be confirmed during the site plan application process for each block.

6.6.4 Deviations

Deviations from the City of Ottawa Design Guidelines – Water Distribution (2010) include:

- Isolation valves are to be located 2.0m away from the intersection, from the point where the projection of the property line intersects the watermain. This distance has been increased to accommodate intersection narrowing along the collector road to improve pedestrian crossings and to ensure no valve chamber is located under curb and located within the roadway. This occurs in the Street 10/Street 12 intersection.

7.0 UTILITY INFRASTRUCTURE

Select utility companies were circulated a copy of the KNUEA, along with a general description of the intended land use during the KNCDP process. The purpose of the circulation was to:

- Establish the limits of existing utility infrastructure near the study area; and,
- Identify any known constraints for extending utility services.

7.1 Hydro One

Hydro One protects an easement for an aerial transmission line that traverses the western edge of the Morgan's Grant community. The line crosses near the roadway intersection of Old Carp and Second Line, continuing generally in an east-west direction. This infrastructure is approximately 1km west of the KNUEA and will not be affected by development of the KNUEA. Hydro One does not service this area.

7.2 Hydro Ottawa

Hydro Ottawa provides service to this area. Pole mounted Hydro Ottawa infrastructure was recently upgraded on March Road between Klondike Road and Old Carp Road in conjunction with the City-initiated March Road widening. This is a 27kV aerial line located on the east side of March Road, that continues northward past the KNUEA. The existing pole line along the east side of March Road will require upgrading to service this size of development. Taller poles with two circuits and larger conductors would be required back to Klondike Road.

7.3 Enbridge Gas

Enbridge reports a 6" high-pressure gas main is located on the west side of March Road in the vicinity of KNUEA. This is the service main for Constance Bay, and is well suited to service the study area lands. Some pressure reducing stations would be installed to service the development otherwise there are no known constraints for gas service.

7.4 Communications

Bell Canada has fibre-optic cable at the intersection of March Road and Old Carp Road. This existing infrastructure would require reinforcing to service the KNUEA. The existing infrastructure would be extended north on March Road with a number of splitting points within the development.

Rogers Ottawa has fibre-optic cable along March Road with larger cable up to the Old Carp Road intersection. This existing infrastructure would require upgrading to service the proposed development.

7.5 Utilities Summary

This information was developed in consultation with the respective utility companies, all of whom have indicated that there is adequate proximity and supply to service future development within the study area. The development will be serviced by hydro, phone, gas and cable, which will be constructed in a four-party trench, as per the cross sections laid out in the KNMSS and utility standard right-of-way cross-sections. Canada Post will service the site with community mailboxes. Site lighting will be provided along roadways, sidewalks and walkways as per attached cross section.

8.0 TRAFFIC IMPACT BRIEF

An analysis of the effect from the proposed development on the existing traffic patterns has been performed and detailed in the report *Proposed Development 1015 March Road Transportation Impact Assessment, Novatech, February, 2022; Report No.: R-2021-133 (*submitted under a separate cover). Please refer to this report for more details.

9.0 PHASING

The proposed subdivision will be constructed in one phase for Street 10 and the adjacent blocks will follow as each of the separate site plans are approved.

10.0 ROADWAYS

10.1 Proposed Road Infrastructure

The proposed development will consist of a collector roadway with a 24.0m right of way (ROW). The proposed cross section will conform to the cross section developed for Street 10 within the adjacent CU Lands and City of Ottawa Standards. Refer to **Figure 11** – 24.0m Street 10 ROW. The proposed grading from the CU Lands at Street 12 to the March Road ROW will match to the existing elevations at the perimeter of the site and to the future widening elevations for the March Road ROW. The proposed grading along Street 10 and the perimeter of the site is shown on the Preliminary Grading Plan (Drawing 121247-GR).

11.0 EROSION AND SEDIMENT CONTROL

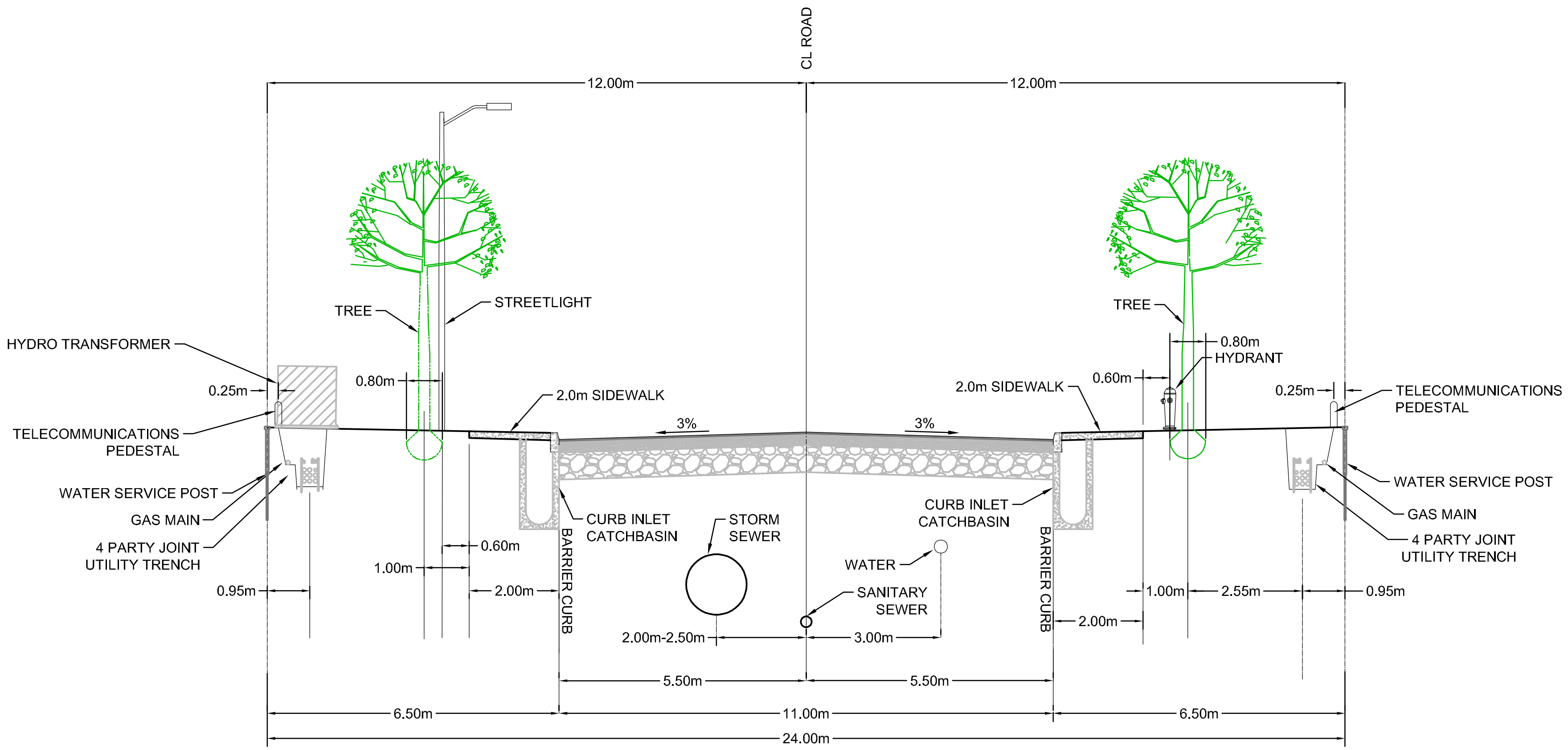
Erosion and sediment control measures will be implemented during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987).

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), catch basin inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), straw bale check dams (OPSD 219.180), rock check dams (219.210 or OPSD 219.211), riprap (OPSS 511), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent Lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work. A copy of the City of Ottawa Special Provision F-1004 will become part of any contract and which outlines the contractual requirements which includes preparation of a detailed erosion and sediment control plan.

General

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.



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NOVATECH
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Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
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1015 MARCH ROAD

STREET 10 - TYPICAL 24.0m CROSS SECTION w/ 2.0m SIDEWALK

SCALE 1 : 150 (0 2 4 6)

DATE JAN 2022 | JOB 121247 | FIGURE FIGURE 11

SHT8X11.DWG - 216mmx279mm

- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accordance with the design drawings and that mitigation measures are being implemented as specified.
    - A light duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
    - Straw bale barriers are to be installed in drainage ditches.
    - Catch basin inserts are to be placed under the grates of all proposed and existing catchbasins and structures.
    - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.

The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory age.

12.0 CONCLUSIONS

This Site Serviceability and Stormwater Management Report has evaluated the servicing (storm, sanitary and water servicing) for the Subject Site at 1015 March Road within the northwest quadrant of the KNUEA. The principal findings and conclusions of this study are as follows:

General

- The 1015 March Road site reflected in this Site Serviceability Report can be adequately serviced by extending existing municipal water, sanitary and storm infrastructure. Also, the CU development stormwater management facility can be utilized to service the west half of the Subject Site. March Road will service the east half of the site with the existing ditches in the interim condition and future storm sewers to SWM Pond 3 in the Minto Lands for the ultimate condition when Mach Road is urbanized
- The proposed servicing strategy for the 1015 March Road development is generally consistent with the recommendations of the KNUEA Environmental Management Plan and the KNUEA Master Servicing Study. Any deviations from the KNEMP and KNMSS are considered minor and will not require an amendment to the EA.

Storm Drainage

- Two (2) servicing phases were developed for the Subject Site. Block 3 and the upper west half of Block 2 and west section of Street 10 outlet to SWM Pond 1 within CU Lands. The lower east half of Block 2 and Street 10 outlet to the existing March Road ditch in the interim. Once March Road is urbanized, the lower east half of Street 10 and Block 2 will each connect to storm sewers in March Road and be conveyed to the Minto Lands and ultimately to SWM Pond 3.
- SWM Pond 1 will provide the upper west half of the proposed subdivision with adequate quantity control up to the 100-year event and will release outflows to Tributary 2 of Shirley's Brook at slightly less than pre-development conditions.
- SWM Pond 3 will provide the lower east half of Street 10 and Block 2 with adequate quantity control up to the 100-year event and will release outflows to Shirley's Brook.
- The stormwater quality control criteria of 'enhanced' water quality control criteria corresponding to 80% removal of Total Suspended Solids (TSS) will be achieved by attenuating site runoff within the SWM Pond 1 and SWM Pond 3 facilities.
- Inlet control devices will be used to restrict inflows to the storm sewer system to the 1:5-year peak flow for collector roads.
- Adequate pipe capacity will be provided at the detailed design stage to contain the 100-year hydraulic grade line to within 0.30m of all pipe obverts.
- Potential locations for the implementation of low impact development features will be selected in consultation with the City of Ottawa during the detailed design stage.

Sanitary Collection

- The March Pump Station is to be the ultimate sanitary outlet for the KNUEA. Sufficient capacity has been determined as part of the KNMSS.

- Sanitary flows will be conveyed to the March Pump Station via the East March Trunk with the connection point at the intersection of Shirley's Brook Drive and Sandhill Road just east of March Road. A new 600mm gravity sanitary sewer is currently under construction in March Road and includes the future outlet connection to the Subject Site at Street 10 and March Road intersection.
- Servicing for the lands adjacent to Street 10, including the 1015 March Road development will consist of 250mm gravity sewers. The total sanitary flow from Street 10 was calculated to be 6.09 L/s.
- The sanitary flows from the Subject Site have increased marginally 6% compared to the estimated sanitary flows for the same area in the CU Lands detailed design. This is mainly due to changes in the design criteria as per Technical Bulletin ISTB-2018-01. Therefore, no further analysis is required, and the downstream infrastructure can accommodate the proposed development.
- No further upgrades to the existing sanitary system are required to accommodate the Subject Site.

Water Distribution

- The development will be serviced entirely from the Zone 2W2C pressure zone due to topography and location as per the KNMSS and Stantec's recommendations.
- The existing 406mm diameter watermain along March Road north will be extended to service the KNUEA area including this development. A secondary connection from Old Carp Road will be completed to provide a loop system for the area.
- Site grading will not exceed 92.65m to maintain minimum pressures greater than 40 psi under the peak hour condition and maintain minimum pressures greater than 20 psi under the fire flow condition.
- Based on the proposed layout, the 1015 March Road development can be serviced with a 200mm diameter watermain under all operating conditions. A detailed hydraulic analysis of the watermain will be completed as part of the detailed engineering design.
- Once individual building details (footprint, building materials, exposure, etc.) have been finalized during detailed design, area specific fire flows will be applied throughout the site to determine whether the localized 200mm watermain will provide sufficient fire flows.
- The proposed 1015 March Road site can be serviced with the existing watermain infrastructure, no upgrades are required.

Utility Infrastructure

- Each utility company (Hydro Ottawa, Enbridge Gas, Bell Canada, Rogers Ottawa) has confirmed their plant is in reasonable proximity to the 1015 March Road site, and that this development can be serviced.

Roadways

- The roadway will conform to cross sections developed for Street 10 Collector within the CU Lands development. Site grading will match to existing or future proposed grades at the perimeter of the site.

13.0 CLOSURE

Novatech respectfully requests the City of Ottawa accept the findings of this Site Serviceability and Stormwater Management Report and provide clearance for the draft plan submission for the Future Mixed-Use and Institutional Blocks at 1015 March Road.

NOVATECH

Prepared by:

Billy McEwen, EIT.

Reviewed by:

Drew Blair, P. Eng.
Senior Project Manager

APPENDIX A
Correspondence

NOVATECH
Engineers, Planners & Landscape Architects

Kanata North

CU Developments Inc. Subdivision

MEETING NOTES

Project:	CU Developments Inc. – Kanata North
Novatech File No.:	116132
City File Nos.:	D07-16-18-0023/D02-02-18-0076
Location:	City Hall, Rm 4102E
Date/Time:	Thursday, April 4, 2019 / 9:30am-10:30am
Purpose:	Stormwater Management Pond Design, MVCA Comments and Shirley's Brook Realignment Update

Attendance:

Team	Name	Title
MVCA	Niall Oddie	Environmental Planner
	John Price	Director, Water Resource Engineering
City	Natasha Baird	Ops Engineer, Stormwater Infrastructure
	Julie Candow	Project Manager, Infrastructure Approvals
	Stream Shen	Planner II (File Lead)
Novatech	John Riddell	President
	Greg Winters	Senior Project Manager, Planning & Development
	Marc St. Pierre	Senior Project Manager, Land Development Engineering
	Mike Petepiece	Senior Project Manager, Water Resources
	Ellen Potts	Planner
Paterson Group	David Gilbert	Senior Geotechnical Engineer
	Michael Laflamme	P. Geo

Distribution:
All in Attendance

POR = Point of Record (Agreed to status of discussion point, no action required)

Description of Discussion		Action
1. Stormwater Management Facility (SWMF)		
Novatech	Updates to the SWMF design: • Each pond (the upper and the lower) has its own outlet; they function as independent ponds within the same SWM block. • The second inlet pipe to the lower pond (i.e. crossing beneath Tributary #2) has been reduced in size from 1500mm to 900mm. The size of this pipe is to be confirmed for the next submission to the City. The alignment beneath the creek, rather than running the pipe around Streets #12 and #1, avoids the need to blast deep into the bedrock and deep sewers. • The design currently shows two forebays in the lower pond for the two inlets, but the intent is to merge the forebays into a single forebay after the stormwater enters through the separate inlets.	POR

	• The lower pond collects stormwater from the eastern (lower) portion of the subdivision lands, Block 312 and the back halves of the St. Isadore Church and St. Isadore School properties, and outlets into the March Road culvert. • The upper pond collects stormwater from the western (upper) portion of the subdivision lands (west of Street 1/Street 12) and outlets into Tributary #2. • In major storm events, both ponds can overflow into Tributary #2. • The same volume of flow is entering Shirley's Brook from the SWMF but is generally split in half between the upper and lower ponds. • The grade difference between the upper and lower ponds is 2.5m. The perimeter pathway/access road around the two ponds provides a maximum 7% slope to make the transition between the grades. • The section of pathway that ran between the two ponds was removed to create a 3:1 slope down into the ponds to eliminate retaining walls.	
City	• The City is not opposed to the two-pond design, especially since it avoids the need for significant blasting activities. The key concerns are maintenance and cost. • Can one pond temporarily accommodate all the stormwater while the other pond is being maintained?	POR
Novatech	• There is not a significant cost difference between maintaining one pond vs. two ponds; the same amount of sediment would accumulate in either scenario. Aesthetically, the two-pond design will be more of a feature for the community. • Lower pond maintenance: the stormwater can be pumped into the forebay of the upper pond where it will be treated before it outlets into Tributary #2. • Upper Pond Maintenance: a maintenance pipe/draw-down structure can be installed to enable the stormwater from the upper pond to drain into the forebay of the lower pond.	***Novatech***
City	• How is the creek alignment in the Armitage's property (1053 March Road) being addressed?	
Novatech	• The subdivision must be designed independently of 1053 March Road as it is not within the subdivision boundary. The creek will be realigned up to the property line.	POR
City	• Reinstating the pathway/access road in between the upper and lower ponds would be helpful for maintenance operations.	POR

Novatech	• The lower pond could possibly be shifted towards March Road to widen the space between the ponds for the pathway/access road with 1m retaining walls. The previous design had 1.8m retaining walls.	***Novatech***
City	• Two accesses from the public road to the perimeter pathway (one directly to the lower pond and one directly to the upper pond) would be beneficial so maintenance vehicles do not need to drive up and down the grade change between the ponds.	POR
Novatech	• A second access can be included in the design.	***Novatech***
City	• Will the lower pond be constructed at the same time as the upper pond even if it is not required with the first phase of construction? The City does not want stagnant ponds.	POR
Novatech	• Blasting for both ponds will be done at the same time to limit disruptions to the surrounding residents. The aforementioned maintenance drain/draw-down structure could be kept opened slightly to allow a steady stream of water to flow through the lower pond until it is needed for stormwater collection.	POR
City	• Where does Block 312 drain to? What is the plan for its development?	
Novatech	• Block 312 currently drains to March Road. There are many moving parts in and around this Block regarding ownerships. Nothing will be happening in this Block before Draft Plan approval. The future storm pipe from this area would run between St. Isadore school and Block 311 (multi-unit residential block) as blocks conveyed to the City.	POR
City	• The requirements for blocks to the City for the future storm pipe from Block 312 will be included as conditions for Draft Plan approval.	***City***
2. MVCA Comments – Floodplain Discussion		
Novatech	• What restrictions are on Minto's lands? Will draft plan approval for their subdivision be delayed until the floodplain mapping has been updated and the constructability of CUD's SWM ponds has been confirmed?	
MVCA	• No. The MVCA recognizes that the floodplain regulatory mapping is wider than it ultimately will be, but the MVCA cannot determine how much of Minto's lands are within hazard limits until the detailed design of the SWMF is complete.	POR

	• The MVCA requires the detailed design and the ECA application started to have some comfort with Minto's lands.	
Novatech	• Detailed design will not be complete until approximately Fall 2019. Will Minto be unable to get Draft Plan approval until CUD's detailed design is approved?	POR
MVCA	• The detailed SWMF design will not hold up Draft Plan approval for CUD's or Minto's subdivisions. The MVCA is working on a set of draft plan conditions, and considering applying holding zones to parts of the subdivision lands, to address concerns with lands located within the existing floodplain regulatory limit so that the subdivisions can proceed with Draft Plan approval.	***MVCA/City***
MVCA	• The physical relocation of Tributary #2 needs to occur before the MVCA will update the floodplain regulatory mapping.	POR
Novatech	• Can the creek relocation and regulatory mapping updates occur in phases corresponding with the subdivision phasing?	
MVCA	• The regulatory mapping can likely be updated in phases to allow for the phased registration of the subdivision. The MVCA need to ensure that residential lots are outside of the floodplain before they are registered.	POR
Novatech	• Novatech will provide the phasing plan for construction/registration for CUD's subdivision with the floodplain overlay so the MVCA can review this proposal.	***Novatech***
3. Shirley's Brook Realignment Update		
Novatech	• Novatech and Andrew McKinley (McKinley Environmental Solutions) attended a pre-application consultation meeting with the NCC and Public Services and Procurement Canada (PSPC) to discuss the proposed realignment of Shirley's Brook into the DND's lands for the Federal Land use, Design and Transaction approval permit (FLUDA). • The NCC provided a list of required plans and studies to support the FLUDA application, which included a Cumulative Impact Study. • Novatech believes that most of the information required for a Cumulative Impact Study already exists within other documents such as the Kanata North Environmental Management Plan and the Shirley's Brook Subwatershed Study. • The NCC is also requiring new additional requirements including an Unexploded Ordinances Study and an investigation for possible soil contamination.	***Novatech***

	• The Kanata North Landowners Group and Novatech are reviewing and may consider dropping the project due to the extensive and costly list of additional requirements for the FLUDA. • Two other options for the outlet into Shirley's Brook were proposed in Novatech's 2015 memo to the NCC. The NCC had agreed that Option 3 (i.e. realigning Shirley's brook into the DND's lands) was the most preferable since it would provide a net benefit to the natural habitat. Nevertheless, the other two options are still viable: 1. The roadside ditch on the west side of March Valley Road can be re-graded to provide a storm outlet to Shirley's Brook further downstream where the watercourse leaves the right-of-way; and 2. Improvements can be made to Shirley's Brook within the March Valley Road right-of-way to stabilize the banks and improve the channel morphology.	

End of Notes
Please report any Errors and/or Omissions to the Undersigned.

Prepared by:

Novatech

Ellen Potts, BES(Pl)
Planner

MEMORANDUM

MORRISON HERSHFIELD

TO:	City of Ottawa	**FROM:**	Kelly Roberts
	Julie Candow	**PROJECT No.:**	2160090
RE:	Kanata North Development Area Master Plan Modifications - SWMP	**DATE:**	9/13/2019

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Background

The Kanata North Development Area Master Servicing Study (MSS) identified the following projects, considered and developed, under the Master Planning Approach of the Municipal Class Environmental Assessment Process:

Stormwater Management Projects
• Storm sewers (Schedule B)
• Pond #1 and associated storm sewers (Schedule B)
• Pond #2 and associated storm sewers (Schedule B)
• Pond #3 and associated storm sewers (Schedule B)
• Pond #4 and associated storm sewers (Schedule B)
• Pond #5 and associated storm sewers (Schedule B)

The Environmental Management Plan (EMP) considered and developed watercourse channelization projects in association with the drainage requirements for Kanata North including:

- Realignment of Shirley's Brook Tributary 2 (Schedule B)
- Realignment of a portion of Shirley's Brook Main Branch (Schedule B).

Additional approvals were recognized as required as part of these approved projects including:

- Ontario Water Resources Act
- Drainage Act
- Fisheries Act
- Conservation Authorities Act
- City of Ottawa Official Plan
- Species at Risk

The Master Plans objectives were to develop a municipal servicing design for storm drainage that would support development of the Demonstration Plan. The MSS / EMP created a blueprint for development while maintaining sufficient flexibility to allow for future changes to the land use plan. They also recognized that due to unforeseen circumstances, it may not be feasible to implement the projects as described in the environmental assessment reports. The following sets out the process to deal with changes which occur after filing and obtaining approval of the environmental assessments and prior to construction.

Major changes were defined as those which change the intent of the EAs or appreciably change the expected net impacts associated with the project. An example of a major change would result from a proposed shift in a preferred design alignment or configuration which would warrant changes in mitigation as described in the EA and affect 3 or more landowners. If the proposed modification is major, the recommendations and conclusions in this report would require updating. An addendum to the EA would be required to document the change, identify the associated impacts and mitigation measures and allow related concerns to be addressed and reviewed by the appropriate stakeholders.

As the area development is now proceeding from the planning phase to the design and construction, the following influences need to be considered and are the basis of the considerations in this memo.

Stormwater Management Pond (SWMP) #1 (Claridge/Uniform)
To avoid issues with rock excavation, SWMP #1 has been proposed to be split into two cells in the same location as the original single pond. The drainage area is identical but the overall drainage area has been split in two and directed it to two separate cells. A second crossing of Tributary 1 has also been included to improve the drainage scheme. The City has asked for clarification regarding the designation of this as a major or minor change.

The following key factors have been taken into consideration:

- The two SWMP would essentially act as 2 cells of a larger pond and impact a similar footprint as well as serve the same drainage area
- The second tributary crossing is also in the same general area and would be guided by the same mitigation measures
- The Class EA Schedule remains as a Schedule B

Based on this, these changes should not be considered as a Major Changes/Significant Modification requiring an amendment of the Master Plans, but documented and included in the on-going permitting process for City approvals and ECAs.

Kelly Roberts
Digitally signed by Kelly Roberts
Date: 2019.09.16 16:46:22 -04'00'

Kelly Roberts
Senior Environmental Planner
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APPENDIX B
Storm Drainage and Stormwater Management Calculations

1015 March Road

Project No.: 121247

STORM SEWER DESIGN SHEET
1015 March Road Servicing Strategy
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)			FLOW								TOTAL FLOW	SEWER DATA								
Catchment ID	From Manhole	To Manhole	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Rainfall Intensity 100 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
EAST HALF OF STREET 10 STORM SEWER SYSTEM OUTLETTING TO MARCH ROAD																							
AREA 2	Street 10	104			0.00	0.000	0.000	10.00						41	0.686	675	Conc	0.15	30.0	339.4	0.92	0.54	12%
			0.20	0.70	0.14	0.389	0.389	10.00		104.19			41										
					0.00	0.000	0.000	10.00															
					0.00	0.000	0.000	10.00															
March Road North MR1	104	105			0.00	0.000	0.000	10.54						148	0.686	675	Conc	0.15	99.0	339.4	0.92	1.80	44%
					0.00	0.000	0.389	10.54		101.40			39										
			0.47	0.70	0.33	0.915	0.915	10.54			118.86		109										
					0.00	0.000	0.000	10.54															
								12.34															
AREA 1	Block 2	105			0.00	0.000	0.000	10.00						254	0.610	600	Conc	0.20	30.0	286.3	0.98	0.51	89%
			1.03	0.85	0.88	2.434	2.434	10.00		104.19			254										
					0.00	0.000	0.000	10.00															
					0.00	0.000	0.000	10.00															
								10.51															
March Road North MR2	105	106			0.00	0.000	0.000	12.34						200	0.686	675	Conc	0.15	95.0	339.4	0.92	1.72	59%
					0.00	0.000	2.823	12.34															
			0.47	0.70	0.33	0.915	1.829	12.34			109.28		200										
					0.00	0.000	0.000	12.34															
March Road North MR3	106	107			0.00	0.000	0.000	14.06						279	0.686	675	Conc	0.15	95.0	339.4	0.92	1.72	82%
					0.00	0.000	2.823	14.06															
			0.47	0.70	0.33	0.915	2.744	14.06			101.56		279										
					0.00	0.000	0.000	14.06															
								15.79															
March Road South	101	102			0.00	0.000	0.000	10.00						107	0.610	600	Conc	0.35	99.0	378.7	1.30	1.27	28%
					0.00	0.000	0.000	10.00															
			0.45	0.70	0.32	0.876	0.876	10.00			122.14		107										
					0.00	0.000	0.000	10.00															
March Road South	102	103			0.00	0.000	0.000	11.27						201	0.610	600	Conc	0.20	99.0	286.3	0.98	1.68	70%
					0.00	0.000	0.000	11.27															
			0.45	0.70	0.32	0.876	1.751	11.27			114.76		201										
					0.00	0.000	0.000	11.27															
March Road South	103	107			0.00	0.000	0.000	12.95						284	0.610	600	Conc	0.20	103.0	286.3	0.98	1.75	99%
					0.00	0.000	0.000	12.95															
			0.47	0.70	0.33	0.915	2.666	12.95			106.38		284										
					0.00	0.000	0.000	12.95															
								14.70															
Invention Boulevard Outlet	107	Minto Lands			0.00	0.000	0.000	15.79						743	0.914	900	Conc	1.71	47.4	2,468.4	3.76	0.21	30%
					0.00	0.000	2.823	15.79		81.10			229										
					0.00	0.000	5.410	15.79			94.96		514										
					0.00	0.000	0.000	15.79															

STORM SEWER DESIGN SHEET
1015 March Road Servicing Strategy
FLOW RATES BASED ON RATIONAL METHOD

Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)			FLOW								TOTAL FLOW	SEWER DATA								
Catchment ID	From Manhole	To Manhole	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Rainfall Intensity 100 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
WEST HALF OF STREET 10 STORM SEWER SYSTEM OUTLETTING TO SWM POND 1 THROUGH CU LANDS OUTLET #3 (lower cell, independent inlet c/w OGS unit)																							
NW-117	908	910			0.00	0.000	0.000	15.00						224	0.381	375	PVC	1.74	81.5	241.1	2.11	0.64	93%
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.000	15.00															
			0.16	0.70	0.11	0.311	0.311	15.00				145.31	45										
NW-118					0.00	0.000	0.000	15.00															
			1.10	0.70	0.77	2.141	2.141	15.00		83.56			179										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.311	15.00				145.31	45										
NW-119	910	912			0.00	0.000	0.000	15.64						614	0.610	600	Conc	1.84	48.3	868.4	2.98	0.27	71%
					0.00	0.000	2.141	15.64		81.54			175										
					0.00	0.000	0.000	15.64															
			0.20	0.70	0.14	0.389	0.701	15.64				141.80	99										
NW-120					0.00	0.000	0.000	15.64															
			2.31	0.65	1.50	4.174	6.315	15.64		81.54			515										
					0.00	0.000	0.000	15.64															
					0.00	0.000	0.701	15.64				141.80	99										
NW-122	912	914			0.00	0.000	0.000	15.91						651	0.610	600	Conc	1.71	47.4	837.1	2.87	0.28	78%
			0.25	0.77	0.19	0.535	6.850	15.91		80.72			553										
					0.00	0.000	0.000	15.91															
					0.00	0.000	0.701	15.91				140.37	98										
								16.19															
NW-121	918	914			0.00	0.000	0.000	15.00						300	0.838	825	Conc	0.20	50.5	669.4	1.21	0.69	45%
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.000	15.00															
			0.14	0.70	0.10	0.272	0.272	15.00				145.31	40										
NW-123					0.00	0.000	0.000	15.00															
			0.85	0.85	0.72	2.009	2.009	15.00		83.56			168										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.272	15.00				145.31	40										
NW-124					0.00	0.000	0.000	15.00															
					0.00	0.000	2.009	15.00		83.56			168										
					0.00	0.000	0.000	15.00															
			0.16	0.70	0.11	0.311	0.584	15.00				145.31	85										
NW-125					0.00	0.000	0.000	15.00															
			0.24	0.85	0.20	0.567	2.576	15.00		83.56			215										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.584	15.00				145.31	85										
								15.69															

Project No.: 121247

STORM SEWER DESIGN SHEET
1015 March Road Servicing Strategy
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)			FLOW								TOTAL FLOW	SEWER DATA								
Catchment ID	From Manhole	To Manhole	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Rainfall Intensity 100 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
	914	351			0.00	0.000	0.000	16.19						932	0.914	900	Conc	0.36	68.9	1,132.6	1.72	0.67	82%
					0.00	0.000	9.426	16.19		79.90			753										
					0.00	0.000	0.000	16.19															
					0.00	0.000	1.284	16.19				138.96	178										
	351	920			0.00	0.000	0.000	16.85						910	0.991	975	Conc	0.36	64.2	1,402.1	1.82	0.59	65%
					0.00	0.000	9.426	16.85		78.01			735										
					0.00	0.000	0.000	16.85															
					0.00	0.000	1.284	16.85				135.66	174										
	920	349			0.00	0.000	0.000	17.44						891	0.991	975	Conc	0.59	9.5	1,795.0	2.33	0.07	50%
					0.00	0.000	9.426	17.44		76.42			720										
					0.00	0.000	0.000	17.44															
					0.00	0.000	1.284	17.44				132.89	171										
	349	INLET 3 SWM Pond 1			0.00	0.000	0.000	17.51						889	0.991	975	Conc	0.38	22.3	1,440.5	1.87	0.20	62%
					0.00	0.000	9.426	17.51		76.24			719										
					0.00	0.000	0.000	17.51															
					0.00	0.000	1.284	17.51				132.58	170										
								17.71															

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr), 5 year storm
C = Runoff Coefficient

Consultant:	**Novatech**	
Issued Date:	January 20, 2022	
Design By:	BM	
Client:	**Dwg. Reference:**	**Checked By:**
13533441 Canada Inc.	121247-Figure 7 (Ultimate) 116132-STM	DDB

Legend:
10.00 Storm sewers designed to the 2 year event (without ponding) for local roads
10.00 Storm sewers designed to the 5 year event (without ponding) for collector roads
10.00 Storm sewers designed to the 10 year event (without ponding) for arterial roads
10.00 Storm sewers designed to the 100 year event (without ponding)

1053, 1075 and 1145 March Road
Copperwood Estate
Project No.: 116132

STORM SEWER DESIGN SHEET
Copperwood Estate c/w Scenario 1 Servicing Strategy for Future / Existing Lands
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

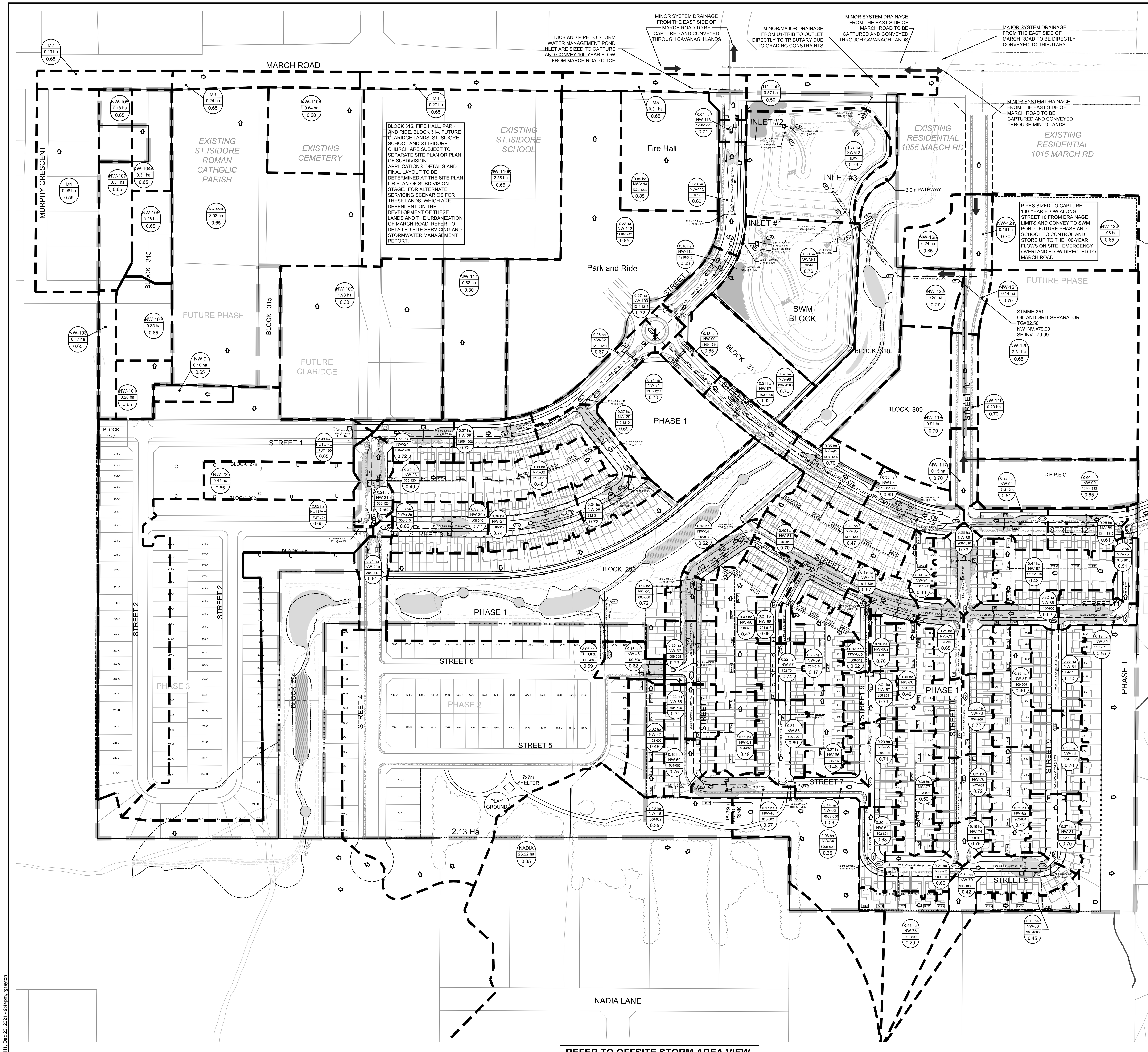
LOCATION			AREA (ha)			FLOW								TOTAL FLOW	SEWER DATA								
Catchment ID	From Manhole	To Manhole	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Concentration	Rainfall Intensity 2 Year (mm/hr)	Rainfall Intensity 5 Year (mm/hr)	Rainfall Intensity 10 Year (mm/hr)	Rainfall Intensity 100 Year (mm/hr)	Peak Flow (L/s)	Total Peak Flow, Q (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
FUTURE BLOCK / EXISTING LANDS ACCOUNTED FOR IN STORM SEWER SYSTEM OUTLETTING TO THE SWM POND THROUGH OUTLET #3 (lower cell, independent inlet c/w OGS unit)																							
FUTURE FLOW TO SWM VIA FUTURE PHASE STREET 10	STREET 10	914			0.00	0.000	0.000	15.00						482									
					0.00	0.000	4.708	15.00		83.56			393										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.610	15.00				145.31	89										
								16.34															
	914	920			0.00	0.000	0.000	16.34						1,022	0.914	900	Conc	0.36	68.9	1,132.6	1.72	0.67	90%
					0.00	0.000	10.621	16.34		79.46			844										
					0.00	0.000	0.000	16.34															
					0.00	0.000	1.292	16.34				138.18	178										
	920	351			0.00	0.000	0.000	17.01						998	0.914	900	Conc	0.36	64.2	1,132.6	1.72	0.62	88%
					0.00	0.000	10.621	17.01		77.58			824										
					0.00	0.000	0.000	17.01															
					0.00	0.000	1.292	17.01				134.92	174										
	351	349			0.00	0.000	0.000	17.63						977	0.914	900	Conc	0.59	9.5	1,449.9	2.21	0.07	67%
					0.00	0.000	10.621	17.63		75.93			806										
					0.00	0.000	0.000	17.63															
					0.00	0.000	1.292	17.63				132.04	171										
	349	INLET 3			0.00	0.000	0.000	17.70						975	0.914	900	Conc	0.38	22.3	1,163.6	1.77	0.21	84%
					0.00	0.000	10.621	17.70		75.74			804										
					0.00	0.000	0.000	17.70															
					0.00	0.000	1.292	17.70				131.71	170										
								17.91															
NADIA LANE			26.11	0.35	9.14	25.405	25.405	132.00				30.53	776	776	0.914	900	Conc	0.35	259.6	1,116.8	1.70	2.54	69%

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr), 5 year storm
C = Runoff Coefficient

Consultant:	Novatech
Issued Date:	December 23, 2021
Design By:	Steve Zorgel
Client:	
CU Developments Inc.	

Dwg. Reference:	**Checked By:**
116132-STM	DDB

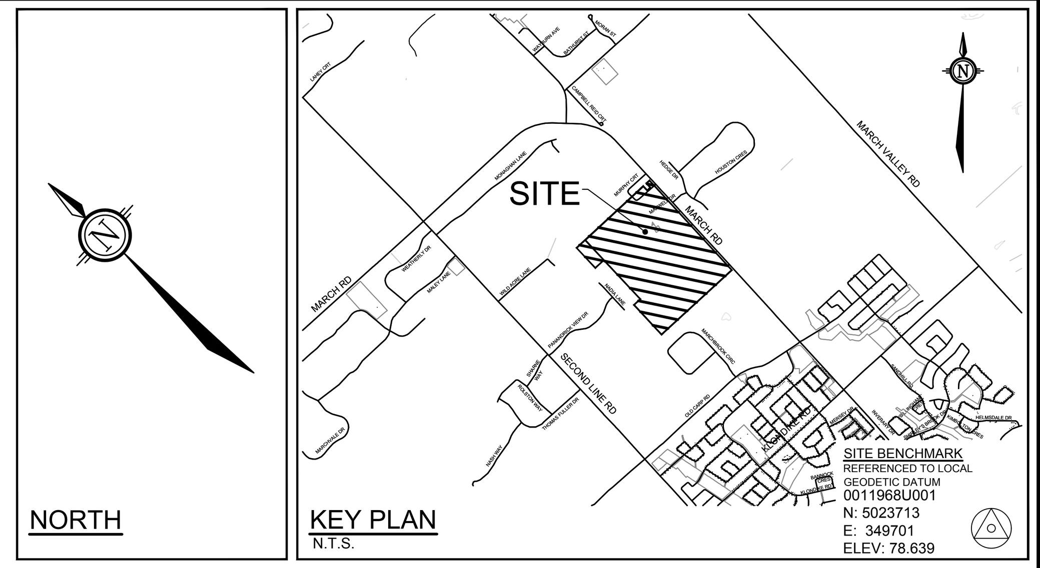
Legend:
10.00 Storm sewers designed to the 2 year event (without ponding) for local roads
10.00 Storm sewers designed to the 5 year event (without ponding) for collector roads
10.00 Storm sewers designed to the 10 year event (without ponding) for arterial roads
10.00 Storm sewers designed to the 100 year event (without ponding)



PROPOSED STORM SEWER HGL WITHIN THE FUTURE SCHOOL PROPERTY (BLOCK 308) IS EXPECTED TO BE APPROXIMATELY 82.20m. A MINIMUM FINISHED FLOOR ELEVATION BASED ON A SLAB ON GRADE BUILDING SHOULD BE A MINIMUM ELEVATION OF 82.50m INCLUDING 0.3m FREEBOARD.

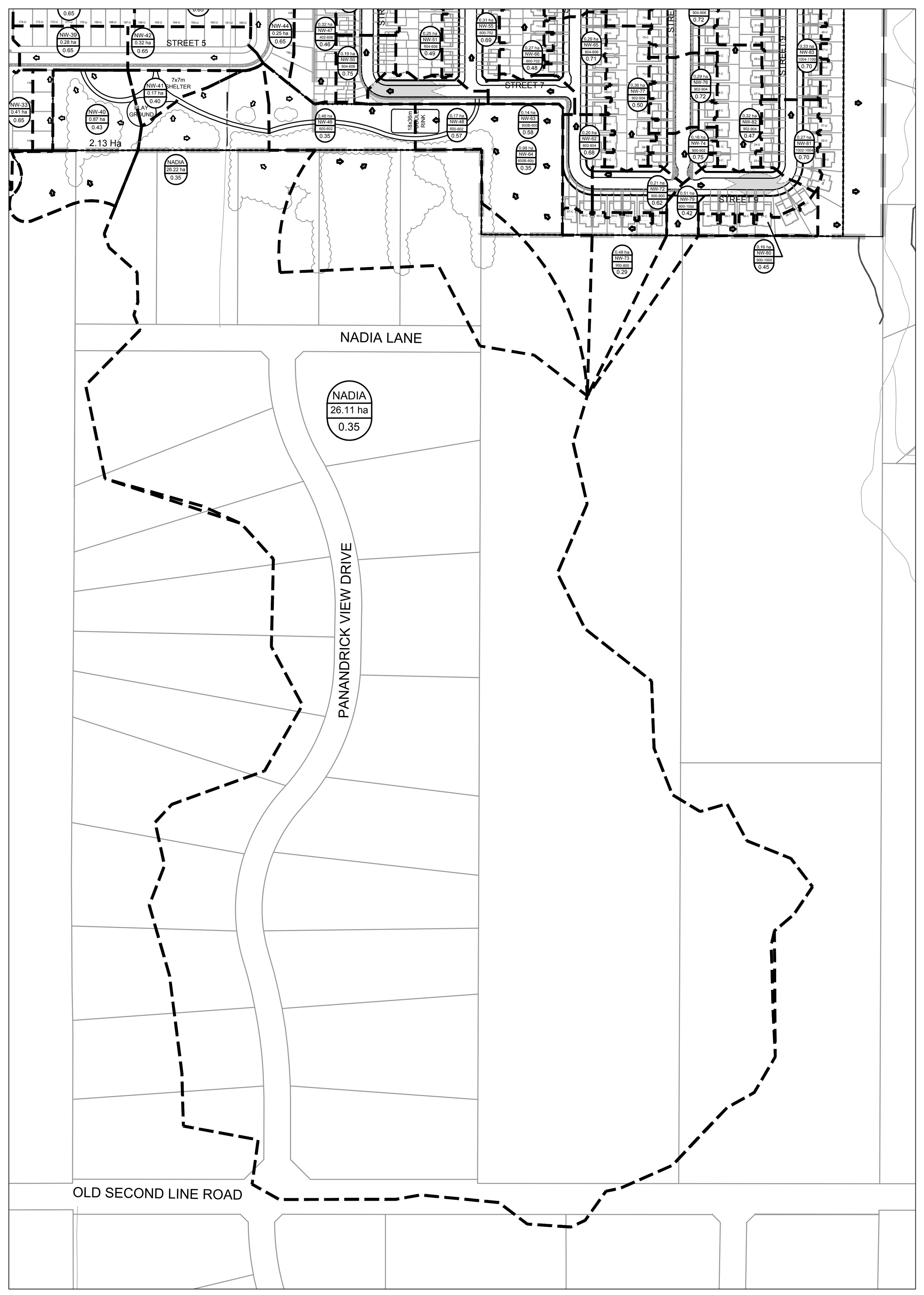
TO PREVENT DRAINAGE FROM SPILLING ONTO ADJACENT PROPERTIES, THE FINISHED GROUND SHOULD BE A MINIMUM ELEVATION OF 82.50.

A RETAINING WALL MAY BE REQUIRED ALONG THE EASTERN AND SOUTHERN PROPERTY LINES TO TIE INTO ADJACENT PROPERTIES



LEGEND

- DRAINAGE AREA BOUNDARY
- 304 — 675mmØ — PROPOSED STORM MANHOLE & SEWER
- OS-1 — 675mmØ — PROPOSED STORM MANHOLE & SEWER CONVEYING OFFSITE DRAINAGE
- CB 224 — 250mmØ — PROPOSED CATCHBASIN/MANHOLE & LEAD
- CB 34 — PROPOSED CATCHBASIN & LEAD
- RYCB 6 — 250mmØ — PROPOSED REAR YARD CATCHBASIN & SUB-DRAIN
- DIRECTION OF FUTURE STORM MINOR FLOW
- EXISTING / PROPOSED MAJOR OVERLAND FLOW DIRECTION
- 1.00 ha — DRAINAGE AREA (hectares)
- NW-100 — AREA IDENTIFICATION
- 105-103 — MANHOLE TO MANHOLE
- 0.50 — RUN-OFF COEFFICIENT



OFFSITE STORM AREA
SCALE 1:3000

REFER TO OFFSITE STORM AREA VIEW

REFER TO 116132-NL FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PRELIMINARY NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
5.	ISSUED TO MISSISSIPPI VALLEY CONSERVATION AUTHORITY FOR REVIEW	DEC 22/21	SAZ
4.	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP
3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP
2.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP
1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP

SCALE 1:1500
1:1500 — 0 15 30 45 60

DESIGN SAZ
CHECKED DDB
DRAWN RBG
CHECKED SAZ
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.A.N. ZORGEL 100191487 Dec 22/21 PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
COPPERWOOD ESTATE
1053, 1075 AND 1145 MARCH ROAD

DRAWING NAME
STORM DRAINAGE AREA PLAN
PHASE 1

PROJECT No. 116132-00
REV # 5
DRAWING No. 116132-STM

D07-16-18-0023

M:\2016\116132\CAD\Design\116132-STM.dwg, STM PH1, Dec 22, 2021 - 9:44pm, grayton

PLANB1.DWG - 1000mmx707mm
#17801

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

	LOCATION		AREA (Ha)																FLOW						SEWER DATA									
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min)	Q/Q full
GISBORNE PLACE																																	
			0.11	0.59	0.18	0.18			0.00	0.00			0.00	0.00			0.00	0.00															
			0.28	0.59	0.46	0.64			0.00	0.00			0.00	0.00			0.00	0.00															
			0.29	0.76	0.61	1.25			0.00	0.00			0.00	0.00			0.00	0.00															
	146	147	0.29	0.78	0.63	1.88			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	144	450	450	CONC	0.45	116.0	191.26	1.20	1.61	0.76
	147	148			0.00	1.88			0.00	0.00			0.00	0.00			0.00	0.00	11.61	71.14	96.40	112.97	165.09	134	450	450	CONC	0.40	11.5	180.32	1.13	0.17	0.74
			0.07	0.76	0.15	2.03			0.00	0.00			0.00	0.00			0.00	0.00															
	148	149	0.09	0.78	0.20	2.22			0.00	0.00			0.00	0.00			0.00	0.00	11.78	70.60	95.66	112.09	163.80	157	450	450	CONC	0.95	45.0	277.89	1.75	0.43	0.57
To ELSIE MACGILL WALK, Pipe 149 - 150						2.22				0.00				0.00				0.00	12.21														
ELSIE MACGILL WALK																																	
Contribution From STREET 3-5, Pipe 310 - 141						2.17				0.00				0.00				0.00	11.20														
			0.08	0.59	0.13	2.30			0.00	0.00			0.00	0.00			0.00	0.00															
			0.10	0.59	0.16	2.47			0.00	0.00			0.00	0.00			0.00	0.00															
			0.15	0.59	0.25	2.71			0.00	0.00			0.00	0.00			0.00	0.00															
	141	142	0.36	0.74	0.74	3.45			0.00	0.00			0.00	0.00			0.00	0.00	11.20	72.49	98.26	115.16	168.30	250	450	450	CONC	1.90	120.0	392.99	2.47	0.81	0.64
			0.12	0.76	0.25	3.71			0.00	0.00			0.00	0.00			0.00	0.00															
			0.16	0.59	0.26	3.97			0.00	0.00			0.00	0.00			0.00	0.00															
			0.25	0.59	0.41	4.38			0.00	0.00			0.00	0.00			0.00	0.00															
			0.30	0.74	0.62	4.99			0.00	0.00			0.00	0.00			0.00	0.00															
	142	143	0.33	0.59	0.54	5.54			0.00	0.00			0.00	0.00			0.00	0.00	12.01	69.87	94.66	110.92	162.07	387	600	600	CONC	0.55	118.0	455.36	1.61	1.22	0.85
	143	144			0.00	5.54			0.00	0.00			0.00	0.00			0.00	0.00	13.23	66.29	89.75	105.14	153.59	367	750	750	CONC	0.20	13.5	497.87	1.13	0.20	0.74
			0.27	0.78	0.59	6.12			0.00	0.00			0.00	0.00			0.00	0.00															
	144	145	0.33	0.76	0.70	6.82			0.00	0.00			0.00	0.00			0.00	0.00	13.43	65.74	89.00	104.26	152.30	448	750	750	CONC	0.25	67.0	556.64	1.26	0.89	0.81
	145	149			0.00	6.82			0.00	0.00			0.00	0.00			0.00	0.00	14.32	63.43	85.84	100.53	146.83	433	825	825	CONC	0.15	65.0	555.94	1.04	1.04	0.78
Contribution From GISBORNE PLACE, Pipe 148 - 149						2.22				0.00				0.00				0.00	12.21														
	149	150	0.28	0.76	0.59	9.63			0.00	0.00			0.00	0.00			0.00	0.00	15.36	60.94	82.42	96.52	140.94	587	900	900	CONC	0.20	69.5	809.60	1.27	0.91	0.73
To INVENTION BOULEVARD, Pipe 150 - HW 1						9.63				0.00				0.00				0.00	16.27														
GOSLING CRESCENT																																	
			0.14	0.59	0.23	0.23			0.00	0.00			0.00	0.00			0.00	0.00															
	132	133	0.25	0.74	0.51	0.74			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	57	300	300	PVC	0.65	59.5	77.96	1.10	0.90	0.73
			0.20	0.59	0.33	1.07			0.00	0.00			0.00	0.00			0.00	0.00															
	133	1330	0.51	0.74	1.05	2.12			0.00	0.00			0.00	0.00			0.00	0.00	10.90	73.52	99.67	116.82	170.74	156	525	525	CONC	0.35	110.5	254.43	1.18	1.57	0.61
	1330	134			0.00	2.12			0.00	0.00			0.00	0.00			0.00	0.00	12.47	68.48	92.75	108.67	158.77	145	525	525	CONC	0.25	9.5	215.03	0.99	0.16	0.68
To JENNIE TROUT TERRACE, Pipe 134 - 139						2.12				0.00				0.00				0.00	12.63														
	132	135			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.35	13.5	57.21	0.81	0.28	0.00
			0.34	0.59	0.56	0.56			0.00	0.00			0.00	0.00			0.00	0.00															
	135	136	0.38	0.74	0.78	1.34			0.00	0.00			0.00	0.00			0.00	0.00	10.28	75.75	102.75	120.44	176.06	101	450	450	CONC	0.35	59.0	168.67	1.06	0.93	0.60
	136	137			0.00	1.34			0.00	0.00			0.00	0.00			0.00	0.00	11.21	72.47	98.23	115.12	168.24	97	450	450	CONC	0.25	12.5	142.55	0.90	0.23	0.68
	137	138	0.07	0.74	0.14	1.48			0.00	0.00			0.00	0.00			0.00	0.00	11.44	71.69	97.17	113.87	166.40	106	450	450	CONC	0.25	85.0	142.55	0.90	1.58	0.75
			0.47	0.59	0.77	2.25			0.00	0.00			0.00	0.00			0.00	0.00															
	138	139	0.59	0.74	1.21	3.47			0.00	0.00			0.00	0.00			0.00	0.00	13.02	66.88	90.56	106.09	154.99	232	675	675	CONC	0.15	95.5	325.56	0.91	1.75	0.71
To ELSIE MACGILL WALK, Pipe 139 - 140						3.47				0.00				0.00				0.00	14.77														
STREET 2-9																																	
			0.27	0.76	0.57	0.57																											
	231	232	0.24	0.59	0.39	0.96			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	74	375	375	PVC	0.65	49.0	141.36	1.28	0.64	0.52
			0.27	0.76	0.57	1.53			0.00	0.00			0.00	0.00			0.00	0.00															
			0.25	0.59	0.41	1.94			0.00	0.00			0.00	0.00			0.00	0.00															
	232	233	0.32	0.78	0.69	2.64			0.00	0.00			0.00	0.00			0.00	0.00	10.64	74.44	100.94	118.31	172.93	196	525	525	CONC	0.45	116.5	288.49	1.33	1.46	0.68
To STREET 2-5, Pipe 233 - 131						2.64				0.00				0.00				0.00	12.10														
PARKETTE BLOCK																																	
	STM CTRL MH 2	125			0.00	0.00	0.48	0.40	0.53	0.53			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	56	450	450	CONC	0.30	11.0	156.16	0.98	0.19	0.36
To GALARNEAU WAY, Pipe 125 - 126						0.00				0.53				0.00				0.00	10.19														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: CPB
Checked: SLM
Dwg. Reference: 76-80
PROJECT: Minto - Kanata North
LOCATION: City of Ottawa
File Ref: 17-982
Date: 23 Dec 2021
Sheet No. SHEET 1 OF 6

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021-12-23
PROVINCE OF ONTARIO

JOB # 17-982

Ottawa

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW Time of Conc.	Intensity 2 Year	Intensity 5 Year	Intensity 10 Year	Intensity 100 Year	Peak Flow	SEWER DATA DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	RATIO
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	(min)	Q/Q full
STREET 2-6																																	
			0.22	0.78	0.48	0.48			0.00	0.00			0.00	0.00			0.00	0.00															
	234	127	0.21	0.76	0.44	0.92			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	71	375	375	PVC	0.65	95.5	141.36	1.28	1.24	0.50
	127	128			0.00	0.92			0.00	0.00			0.00	0.00			0.00	0.00	11.24	72.34	98.05	114.91	167.94	67	375	375	PVC	0.30	10.0	96.03	0.87	0.19	0.69
To JENNIE TROUT TERRACE, Pipe 128 - 129						0.92				0.00				0.00				0.00	11.44														
Contribution From GALARNEAU WAY, Pipe 125 - 126						0.31				0.53				0.00				0.00	10.67														
	126	128			0.00	0.31			0.00	0.53			0.00	0.00			0.00	0.00	10.67	74.34	100.81	118.15	172.70	77	525	525	CONC	0.65	4.5	346.73	1.60	0.05	0.22
To JENNIE TROUT TERRACE, Pipe 128 - 129						0.31				0.53				0.00				0.00	10.71														
BLOCK 160																																	
	2221	222	0.38	0.59	0.62	0.62			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	48	300	300	PVC	0.50	37.0	68.38	0.97	0.64	0.70
To STREET 2-5, Pipe 222 - 223						0.62				0.00				0.00				0.00	10.64														
STREET 2-5																																	
Contribution From BLOCK 160, Pipe 2221 - 222						0.62				0.00				0.00				0.00	10.64														
			0.32	0.59	0.52	1.15			0.00	0.00			0.00	0.00			0.00	0.00															
	223	224	0.56	0.76	1.18	2.33			0.00	0.00			0.00	0.00			0.00	0.00	10.64	74.44	100.94	118.31	172.93	174	600	600	CONC	0.25	116.0	307.01	1.09	1.78	0.57
To JENNIE TROUT TERRACE, Pipe 224 - 128						2.33				0.00				0.00				0.00	12.42														
	222	227			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	2.10	9.0	140.13	1.98	0.08	0.00
			0.05	0.43	0.06	0.06			0.00	0.00			0.00	0.00			0.00	0.00															
			0.23	0.59	0.38	0.44			0.00	0.00			0.00	0.00			0.00	0.00															
	227	228	0.37	0.76	0.78	1.22			0.00	0.00			0.00	0.00			0.00	0.00	10.08	76.52	103.79	121.67	177.87	93	450	450	CONC	0.20	68.5	127.50	0.80	1.42	0.73
	228	229	0.38	0.76	0.80	2.02			0.00	0.00			0.00	0.00			0.00	0.00	11.50	71.49	96.89	113.54	165.92	145	525	525	CONC	0.20	114.0	192.33	0.89	2.14	0.75
	229	230	0.28	0.59	0.46	2.48			0.00	0.00			0.00	0.00			0.00	0.00	13.64	65.18	88.23	103.35	150.96	162	525	525	CONC	0.25	9.5	215.03	0.99	0.16	0.75
	230	233	0.35	0.76	0.74	3.22			0.00	0.00			0.00	0.00			0.00	0.00	13.80	64.76	87.65	102.67	149.97	209	525	525	CONC	0.40	62.0	272.00	1.26	0.82	0.77
Contribution From STREET 2-9, Pipe 232 - 233						2.64				0.00				0.00				0.00	12.10														
			0.21	0.76	0.44	6.30			0.00	0.00			0.00	0.00			0.00	0.00															
	233	131	0.24	0.78	0.52	6.82			0.00	0.00			0.00	0.00			0.00	0.00	14.62	62.68	84.81	99.32	145.05	428	675	675	CONC	0.35	116.0	497.30	1.39	1.39	0.86
To JENNIE TROUT TERRACE, Pipe 131 - 134						6.82				0.00				0.00				0.00	16.01														
STREET 2-3																																	
	210	211			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	3.80	25.0	188.50	2.67	0.16	0.00
	211	212	0.60	0.74	1.23	1.23			0.00	0.00			0.00	0.00			0.00	0.00	10.16	76.21	103.37	121.18	177.14	94	375	375	PVC	2.00	120.0	247.95	2.25	0.89	0.38
To STREET 2-1, Pipe 212 - 216						1.23				0.00				0.00				0.00	11.05														
STREET 2-1																																	
	213	214			0.00	0.00	0.51	0.65	0.92	0.92			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	96	375	375	PVC	0.50	11.5	123.98	1.12	0.17	0.77
	214	215	0.20	0.74	0.41	0.41			0.00	0.92			0.00	0.00			0.00	0.00	10.17	76.16	103.30	121.09	177.01	127	375	375	PVC	3.40	69.5	323.29	2.93	0.40	0.39
	215	216	0.21	0.74	0.43	0.84			0.00	0.92			0.00	0.00			0.00	0.00	10.57	74.70	101.29	118.73	173.54	156	375	375	PVC	2.10	66.5	254.08	2.30	0.48	0.62
	217	218	0.03	0.75	0.06	0.06			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	5	300	300	PVC	1.00	19.0	96.70	1.37	0.23	0.05
	218	219	0.16	0.74	0.33	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.23	75.93	102.99	120.72	176.47	30	300	300	PVC	2.60	72.5	155.93	2.21	0.55	0.19
	219	220			0.00	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.78	73.94	100.25	117.50	171.74	29	375	375	PVC	1.90	24.5	241.68	2.19	0.19	0.12
	220	221			0.00	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.97	73.29	99.35	116.44	170.19	29	375	375	PVC	0.35	11.0	103.73	0.94	0.20	0.28
To JENNIE TROUT TERRACE, Pipe 221 - 224						0.39				0.00				0.00				0.00	11.16														
	202	203	0.07	0.74	0.14	0.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	11	300	300	PVC	2.00	34.0	136.76	1.93	0.29	0.08
	203	204			0.00	0.14			0.00	0.00			0.00	0.00			0.00	0.00	10.29	75.70	102.67	120.35	175.92	11	300	300	PVC	1.65	17.5	124.21	1.76	0.17	0.09
	204	205	0.31	0.74	0.64	0.78			0.00	0.00			0.00	0.00			0.00	0.00	10.46	75.09	101.83	119.36	174.47	59	375	375	PVC	0.30	37.5	96.03	0.87	0.72	0.61
	205	206			0.00	0.78			0.00	0.00			0.00	0.00			0.00	0.00	11.18	72.56	98.36	115.27	168.47	57	375	375	PVC	0.30	15.5	96.03	0.87	0.30	0.59
			0.15	0.59	0.25	1.03			0.00	0.00			0.00	0.00			0.00	0.00															
	206	207	0.29	0.74	0.60	1.62			0.00	0.00			0.00	0.00			0.00	0.00	11.47	71.57	97.00	113.67	166.11	116	375	375	PVC	3.40	88.0	323.29	2.93	0.50	0.36
			0.28	0.74	0.58	2.20			0.00	0.00			0.00	0.00			0.00	0.00															
	207	208	0.32	0.59	0.52	2.73			0.00	0.00			0.00	0.00			0.00	0.00	11.98	69.97	94.80	111.08	162.31	191	600	600	CONC	0.20	85.0	274.59	0.97	1.46	0.69

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: CPB	PROJECT: Minto - Kanata North			
Checked: SLM	LOCATION: City of Ottawa			
Dwg. Reference: 76-80	File Ref: 17-982	Date: 23 Dec 2021	Sheet No. SHEET 2 OF 6	

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	208	209			0.00	2.73			0.00	0.00			0.00	0.00			0.00	0.00	13.43	65.73	88.98	104.23	152.26	179	600	600	CONC	0.20	12.5	274.59	0.97	0.21	0.65
			0.32	0.59	0.52	3.25			0.00	0.00			0.00	0.00			0.00	0.00															
	209	212	0.38	0.74	0.78	4.03			0.00	0.00			0.00	0.00			0.00	0.00	13.65	65.15	88.19	103.30	150.90	263	675	675	CONC	0.20	65.0	375.92	1.05	1.03	0.70
Contribution From STREET 2-3, Pipe 211 - 212						1.23				0.00				0.00				0.00	11.05														
			0.21	0.74	0.43	5.70			0.00	0.00			0.00	0.00			0.00	0.00															
	212	216	0.35	0.59	0.57	6.27			0.00	0.00			0.00	0.00			0.00	0.00	14.68	62.53	84.60	99.08	144.70	392	750	750	CONC	0.20	69.5	497.87	1.13	1.03	0.79
	216	221			0.00	7.12			0.00	0.92			0.00	0.00			0.00	0.00	15.71	60.15	81.34	95.24	139.06	503	825	825	CONC	0.25	47.0	717.72	1.34	0.58	0.70
To JENNIE TROUT TERRACE, Pipe 221 - 224						7.12				0.92				0.00				0.00	16.29														
JENNIE TROUT TERRACE																																	
					0.00	0.00	2.72	0.40	3.02	3.02			0.00	0.00			0.00	0.00	13.00														
	STM CTRL MH 3	221	0.10	0.75	0.21	0.21			0.00	3.02			0.00	0.00			0.00	0.00	13.00	66.93	90.63	106.17	155.11	288	525	525	CONC	0.95	15.5	419.17	1.94	0.13	0.69
Contribution From STREET 2-1, Pipe 216 - 221						7.12				0.92				0.00				0.00	16.29														
Contribution From STREET 2-1, Pipe 220 - 221						0.39				0.00				0.00				0.00	11.16														
			0.16	0.59	0.26	7.98			0.00	3.95			0.00	0.00			0.00	0.00															
	221	224	0.21	0.74	0.43	8.41			0.00	3.95			0.00	0.00			0.00	0.00	16.29	58.88	79.60	93.20	136.07	809	900	900	CONC	0.35	69.5	1070.99	1.68	0.69	0.76
Contribution From STREET 2-5, Pipe 223 - 224						2.33				0.00				0.00				0.00	12.42														
			0.22	0.74	0.45	11.19			0.00	3.95			0.00	0.00			0.00	0.00															
			0.27	0.59	0.44	11.64			0.00	3.95			0.00	0.00			0.00	0.00															
	224	128	0.33	0.59	0.54	12.18			0.00	3.95			0.00	0.00			0.00	0.00	16.98	57.46	77.66	90.92	132.73	1006	975	975	CONC	0.35	72.5	1325.82	1.78	0.68	0.76
Contribution From STREET 2-6, Pipe 126 - 128						0.31				0.53				0.00				0.00	10.71														
Contribution From STREET 2-6, Pipe 127 - 128						0.92				0.00				0.00				0.00	11.44														
	128	129	0.06	0.75	0.13	13.53			0.00	4.48			0.00	0.00			0.00	0.00	17.66	56.13	75.84	88.78	129.59	1099	975	975	CONC	0.45	39.5	1503.34	2.01	0.33	0.73
	129	131	0.75	0.78	1.63	15.16			0.00	4.48			0.00	0.00			0.00	0.00	17.99	55.51	75.00	87.79	128.14	1178	1050	1050	CONC	0.35	85.0	1615.52	1.87	0.76	0.73
Contribution From STREET 2-5, Pipe 233 - 131						6.82				0.00				0.00				0.00	16.01														
			0.02	0.59	0.03	22.01			0.00	4.48			0.00	0.00			0.00	0.00															
			0.13	0.59	0.21	22.23			0.00	4.48			0.00	0.00			0.00	0.00															
	131	134	0.21	0.76	0.44	22.67			0.00	4.48			0.00	0.00			0.00	0.00	18.75	54.14	73.13	85.59	124.91	1555	1200	1200	CONC	0.30	73.5	2135.42	1.89	0.65	0.73
Contribution From SILICON WAY, Pipe 122-134						0.44				0.00				0.00				0.00	11.06														
Contribution From GOSLING CRESCENT, Pipe 133 - 134						2.12				0.00				0.00				0.00	12.63														
	134	139	0.15	0.74	0.31	25.55			0.00	4.48			0.00	0.00			0.00	0.00	19.40	53.03	71.61	83.80	122.29	1675	1535 x 975 HOR. Elliptical		CONC	0.30	74.5	2135.42	1.888128	0.66	0.78
To ELSIE MACGILL WALK, Pipe 139 - 140						25.55				4.48				0.00				0.00	20.05						Equivalent to 1200 Circular Pipe								
ELSIE MACGILL WALK																																	
Contribution From JENNIE TROUT TERRACE, Pipe 134 - 139						25.55				4.48				0.00				0.00	20.05														
Contribution From GOSLING CRESCENT, Pipe 138 - 139						3.47				0.00				0.00				0.00	14.77														
			0.31	0.59	0.51	29.52			0.00	4.48			0.00	0.00			0.00	0.00															
	139	140	0.35	0.74	0.72	30.24			0.00	4.48			0.00	0.00			0.00	0.00	20.05	51.95	70.14	82.07	119.75	1885	1650	1650	CONC	0.10	69.0	2882.24	1.35	0.85	0.65
	140	150	0.20	0.74	0.41	30.65			0.00	4.48			0.00	0.00			0.00	0.00	20.91	50.62	68.32	79.95	116.63	1858	1650	1650	CONC	0.10	71.5	2882.24	1.35	0.88	0.64
To INVENTION BOULEVARD, Pipe 150 - HW 1						30.65				4.48				0.00				0.00	21.79														
STREET 2-2																																	
	225	2226	0.29	0.74	0.60	0.60			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	300	300	PVC	0.65	85.0	77.96	1.10	1.28	0.59
	2226	2260	0.35	0.74	0.72	1.32			0.00	0.00			0.00	0.00			0.00	0.00	11.28	72.20	97.87	114.69	167.61	95	450	450	CONC	0.35	52.5	168.67	1.06	0.83	0.56
To OSLER STREET, Pipe 2226 - 121						1.32				0.00				0.00				0.00	12.11														
OSLER STREET																																	
Contribution From STREET 2-2, Pipe 226 - 2226						1.32				0.00				0.00				0.00	12.11														
	2260	121	0.21	0.76	0.44	1.76			0.00	0.00			0.00	0.00			0.00	0.00	12.11	69.55	94.23	110.41	161.33	122	450	450	CONC	0.35	67.5	168.67	1.06	1.06	0.73
			0.24	0.59	0.39	2.15			0.00	0.00			0.00	0.00			0.00	0.00															
	121	123	0.39	0.76	0.82	2.98			0.00	0.00			0.00	0.00			0.00	0.00	13.17	66.45	89.98	105.40	153.98	198	600	600	CONC	0.35	120.0	363.25	1.28	1.56	0.54
To SILICON WAY, Pipe 123 - 124						2.98				0.00				0.00				0.00	14.73														
SILICON WAY																																	
	123	1220			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.85	32.0	89.15	1.26	0.42	0.00
	1220	122			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.42	75.22	102.01	119.57	174.78	0	300	300	PVC	0.40	16.5	61.16	0.87	0.32	0.00
	122	134	0.21	0.76	0.44	0.44			0.00	0.00			0.00	0.00			0.00	0.00	10.74	74.07	100.44	117.72	172.06	33	300	300	PVC	0.35	15.5	57.21	0.81	0.32	0.57
To JENNIE TROUT TERRACE, Pipe 134-139						0.44				0.00				0.00				0.00	11.06														
Contribution From OSLER STREET, Pipe 121 - 123						2.98				0.00				0.00				0.00	14.73														
			0.30	0.59	0.49	3.47			0.00	0.00			0.00	0.00			0.00	0.00															
	123	124	0.27	0.76	0.57	4.04			0.00	0.00			0.00	0.00			0.00	0.00	14.73	62.42	84.45	98.90	144.43	252	600	600	CONC	0.50	76.0	434.17	1.54	0.82	0.58
To INVENTION BOULEVARD, Pipe 124 - 150						4.04				0.00				0.00				0.00	15.55														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: CPB	PROJECT: Minto - Kanata North			
Checked: SLM	LOCATION: City of Ottawa			
Dwg. Reference: 76-80	File Ref: 17-982	Date: 23 Dec 2021	Sheet No. SHEET 3 OF 6	

982_STM.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning 0.013

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Ottawa

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA								
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc. (min)	Intensity 2 Year (mm/h)	Intensity 5 Year (mm/h)	Intensity 10 Year (mm/h)	Intensity 100 Year (mm/h)	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min)	RATIO Q/Q full
SCHOOL BLOCK																																	
					0.00	0.00	2.51	0.65	4.54	4.54			0.00	0.00			0.00	0.00	12.00														
	STM CTRL MH1	1200			0.00	0.00			0.00	4.54			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	429	600	600	CONC	0.80	14.5	549.19	1.94	0.12	0.78
To INVENTION BOULEVARD, Pipe 1200 - 124						0.00				4.54				0.00				0.00	12.12														
GALARNEAU WAY																																	
			0.17	0.59	0.28	0.28			0.00	0.00			0.00	0.00			0.00	0.00															
	1119	119	0.26	0.74	0.53	0.81			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	62	300	300	PVC	1.35	37.5	112.36	1.59	0.39	0.56
To INVENTION BOULEVARD, Pipe 119 - 120						0.81				0.00				0.00				0.00	10.39														
Contribution From PARKETTE BLOCK, Pipe STM CTRL MH 2 - 125						0.00				0.53				0.00				0.00	10.19														
	125	126	0.15	0.74	0.31	0.31			0.00	0.53			0.00	0.00			0.00	0.00	10.19	76.10	103.22	120.99	176.87	79	450	450	CONC	0.65	41.5	229.86	1.45	0.48	0.34
To STREET 2-6, Pipe 126 - 128						0.31				0.53				0.00				0.00	10.67														
STREET 3-5																																	
	311	312			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.40	60.5	61.16	0.87	1.17	0.00
			0.09	0.59	0.15	0.15			0.00	0.00			0.00	0.00			0.00	0.00															
			0.36	0.76	0.76	0.91			0.00	0.00			0.00	0.00			0.00	0.00															
	312	314	0.52	0.59	0.85	1.76			0.00	0.00			0.00	0.00			0.00	0.00	11.17	72.60	98.42	115.34	168.56	128	450	450	PVC	0.80	72.5	255.01	1.60	0.75	0.50
To STREET 3-4, Pipe 314 - 315						1.76				0.00				0.00				0.00	11.92														
	311	309			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	1.60	11.5	122.32	1.73	0.11	0.00
	309	310	0.10	0.76	0.21	0.21			0.00	0.00			0.00	0.00			0.00	0.00	10.11	76.38	103.61	121.46	177.55	16	300	300	PVC	2.90	66.0	164.68	2.33	0.47	0.10
			0.23	0.59	0.38	0.59			0.00	0.00			0.00	0.00			0.00	0.00															
			0.32	0.59	0.52	1.11			0.00	0.00			0.00	0.00			0.00	0.00															
	310	141	0.50	0.76	1.06	2.17			0.00	0.00			0.00	0.00			0.00	0.00	10.58	74.64	101.21	118.63	173.40	162	450	450	CONC	1.30	75.5	325.07	2.04	0.62	0.50
To ELSIE MACGILL WALK, Pipe 141 - 142						2.17				0.00				0.00				0.00	11.20														
STREET 3-4																																	
			0.10	0.76	0.21	0.21			0.00	0.00			0.00	0.00			0.00	0.00															
	313	314	0.15	0.74	0.31	0.52			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	40	300	300	PVC	3.95	34.0	192.19	2.72	0.21	0.21
Contribution From STREET 3-5, Pipe 312 - 314						1.76				0.00				0.00				0.00	11.92														
	314	315	0.24	0.76	0.51	2.79			0.00	0.00			0.00	0.00			0.00	0.00	11.92	70.15	95.04	111.37	162.73	196	450	450	PVC	2.00	118.0	403.20	2.54	0.78	0.49
	315	118	0.27	0.76	0.57	3.36			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.80	91.83	107.58	157.18	228	525	525	CONC	0.70	31.5	359.82	1.66	0.32	0.63
To LEONE FARRELL ROAD, Pipe 118 - 119						3.36				0.00				0.00				0.00	13.01														
STREET 3-6																																	
	316	117	0.58	0.76	1.23	1.23			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	94	450	450	CONC	3.00	112.5	493.82	3.10	0.60	0.19
To LEONE FARRELL ROAD, Pipe 117 - 118						1.23				0.00				0.00				0.00	10.60														
LEONE FARRELL ROAD																																	
					0.00	0.00	0.07	0.76	0.15	0.15			0.00	0.00			0.00	0.00															
	116	117	0.34	0.59	0.56	0.56			0.00	0.15			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	58	300	300	PVC	1.00	34.5	96.70	1.37	0.42	0.60
Contribution From STREET 3-6, Pipe 316 - 117						1.23				0.00				0.00				0.00	10.60														
					0.00	1.78	0.24	0.76	0.51	0.65			0.00	0.00			0.00	0.00															
	117	118	0.35	0.59	0.57	2.36			0.00	0.65			0.00	0.00			0.00	0.00	10.60	74.56	101.11	118.51	173.22	242	525	525	CONC	0.80	72.5	384.66	1.78	0.68	0.63
Contribution From STREET 3-4, Pipe 315 - 118						3.36				0.00				0.00				0.00	13.01														
					0.00	5.72	0.29	0.76	0.61	1.27			0.00	0.00			0.00	0.00															
	118	119	0.19	0.59	0.31	6.03			0.00	1.27			0.00	0.00			0.00	0.00	13.01	66.90	90.59	106.12	155.04	518	675	675	CONC	0.60	68.5	651.12	1.82	0.63	0.80
To INVENTION BOULEVARD, Pipe 119 - 120						6.03				1.27				0.00				0.00	13.64														
STREET 3-3																																	
			0.06	0.74	0.12	0.12			0.00	0.00			0.00	0.00			0.00	0.00															
			0.12	0.59	0.20	0.32			0.00	0.00			0.00	0.00			0.00	0.00															
	301	302	0.20	0.59	0.33	0.65			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	50	300	300	PVC	0.90	57.5	91.74	1.30	0.74	0.54
	302	303	0.11	0.74	0.23	0.87			0.00	0.00			0.00	0.00			0.00	0.00	10.74	74.08	100.45	117.73	172.08	65	300	300	PVC	0.75	11.5	83.75	1.18	0.16	0.77
	303	304	0.20	0.74	0.41	1.29			0.00	0.00			0.00	0.00			0.00	0.00	10.90	73.51	99.67	116.81	170.73	95	375	375	PVC	0.90	69.0	166.33	1.51	0.76	0.57

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021-12-23
PROVINCE OF ONTARIO

Designed:	PROJECT:	
CPB	Minto - Kanata North	
Checked:	LOCATION:	
SLM	City of Ottawa	
Dwg. Reference: 76-80	File Ref: 17-982	Date: 23 Dec 2021 / Sheet No. SHEET 4 OF 6

JOB # 17-982

982_STM.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

Ottawa

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA								
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc. (min)	Intensity 2 Year (mm/h)	Intensity 5 Year (mm/h)	Intensity 10 Year (mm/h)	Intensity 100 Year (mm/h)	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min)	RATIO Q/Q full
	304	308	0.12	0.74	0.25	1.53			0.00	0.00			0.00	0.00			0.00	0.00	11.66	70.96	96.16	112.68	164.66	109	375	375	PVC	1.40	62.5	207.45	1.88	0.55	0.52
	301	305			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.60	11.5	74.90	1.06	0.18	0.00
	305	306	0.40	0.74	0.82	0.82			0.00	0.00			0.00	0.00			0.00	0.00	10.18	76.12	103.25	121.03	176.92	63	375	375	PVC	0.60	112.0	135.81	1.23	1.52	0.46
	306	307			0.00	0.82			0.00	0.00			0.00	0.00			0.00	0.00	11.70	70.84	96.00	112.49	164.39	58	375	375	PVC	1.65	10.0	225.22	2.04	0.08	0.26
			0.32	0.59	0.52	1.35			0.00	0.00			0.00	0.00			0.00	0.00															
	307	308	0.38	0.74	0.78	2.13			0.00	0.00			0.00	0.00			0.00	0.00	11.78	70.58	95.64	112.07	163.77	150	450	450	CONC	1.10	68.5	299.02	1.88	0.61	0.50
	308	114	0.21	0.74	0.43	4.09			0.00	0.00			0.00	0.00			0.00	0.00	12.39	68.71	93.07	109.05	159.33	281	450	450	CONC	1.75	69.0	377.16	2.37	0.48	0.75
To INVENTION BOULEVARD, Pipe 114 - 115						4.09				0.00				0.00				0.00	12.87														
COMMERCIAL																																	
					0.00	0.00	3.67	0.85	8.67	8.67			0.00	0.00			0.00	0.00	14.00														
	STM CTRL MH 4	110			0.00	0.00			0.00	8.67			0.00	0.00			0.00	0.00	14.00	64.23	86.93	101.82	148.72	754	975	975	CONC	0.20	14.5	1002.23	1.34	0.18	0.75
To INVENTION BOULEVARD, Pipe 110 - 111						0.00				8.67				0.00				0.00	14.18														
					0.00	0.00	5.68	0.85	13.42	13.42			0.00	0.00			0.00	0.00	15.00														
	STM CTRL MH 5	110			0.00	0.00			0.00	13.42			0.00	0.00			0.00	0.00	15.00	61.77	83.56	97.85	142.89	1121	1200	1200	CONC	0.20	16.0	1743.57	1.54	0.17	0.64
To INVENTION BOULEVARD, Pipe 110 - 111						0.00				13.42				0.00				0.00	15.17														
MARCH ROAD																																	
	101	102			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	0	300	300	PVC	0.35	99.0	57.21	0.81	2.04	0.00
	102	103			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	12.04	69.77	94.53	110.76	161.85	0	450	450	CONC	0.20	99.0	127.50	0.80	2.06	0.00
	103	107			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	14.10	63.98	86.59	101.42	148.14	0	525	525	CONC	0.20	103.0	192.33	0.89	1.93	0.00
To INVENTION BOULEVARD, Pipe 107 - 108						0.00				0.00				0.00				0.00	16.03														
	104	105			0.00	0.00	1.24	0.70	2.41	2.41			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	251	675	675	CONC	0.15	99.0	325.56	0.91	1.81	0.77
	105	106			0.00	0.00			0.00	2.41			0.00	0.00			0.00	0.00	11.81	70.48	95.50	111.90	163.52	230	675	675	CONC	0.15	99.0	325.56	0.91	1.81	0.71
	106	107			0.00	0.00			0.00	2.41			0.00	0.00			0.00	0.00	13.63	65.21	88.27	103.40	151.03	213	675	675	CONC	0.15	95.0	325.56	0.91	1.74	0.65
To INVENTION BOULEVARD, Pipe 107 - 108						0.00				2.41				0.00				0.00	15.37														
INVENTION BOULEVARD																																	
Contribution From MARCH ROAD, Pipe 103 - 107						0.00				0.00				0.00				0.00	16.03														
Contribution From MARCH ROAD, Pipe 106 - 107						0.00				2.41				0.00				0.00	15.37														
					0.00	0.00			0.00	2.41	2.78	0.70	5.41	5.41			0.00	0.00	14.00														
	107	108			0.00	0.00			0.00	2.41			0.00	5.41			0.00	0.00	16.03	59.44	80.37	94.11	137.40	703	900	900	CONC	0.25	76.5	905.16	1.42	0.90	0.78
	108	109			0.00	0.00	0.14	0.80	0.31	2.72			0.00	5.41			0.00	0.00	16.93	57.57	77.81	91.10	132.98	705	900	900	CONC	0.25	56.5	905.16	1.42	0.66	0.78
	109	110			0.00	0.00	0.17	0.80	0.38	3.10			0.00	5.41			0.00	0.00	17.59	56.27	76.03	89.01	129.92	717	900	900	CONC	0.25	57.5	905.16	1.42	0.67	0.79
Contribution From COMMERCIAL, Pipe STM CTRL MH 4 - 110						0.00				8.67				0.00				0.00	14.18														
Contribution From COMMERCIAL, Pipe STM CTRL MH 5 - 110						0.00				13.42				0.00				0.00	15.17														
	110	111			0.00	0.00	0.17	0.80	0.38	25.57			0.00	5.41			0.00	0.00	18.26	55.01	74.32	86.99	126.95	2371	1200	1200	CONC	0.60	58.5	3019.94	2.67	0.37	0.79
	111	112			0.00	0.00	0.17	0.80	0.38	25.95			0.00	5.41			0.00	0.00	18.63	54.35	73.42	85.93	125.41	2370	1200	1200	CONC	0.60	51.5	3019.94	2.67	0.32	0.78
					0.00	0.00	0.31	0.74	0.64	26.59			0.00	5.41			0.00	0.00															
	112	113	0.33	0.59	0.54	0.54			0.00	26.59			0.00	5.41			0.00	0.00	18.95	53.79	72.65	85.03	124.08	2421	1200	1200	CONC	0.75	79.0	3376.40	2.99	0.44	0.72
	113	114			0.00	0.54	0.15	0.74	0.31	26.90			0.00	5.41			0.00	0.00	19.39	53.04	71.62	83.82	122.31	2409	1200	1200	CONC	0.75	29.5	3376.40	2.99	0.16	0.71
Contribution From STREET 3-3, Pipe 308 - 114						4.09				0.00				0.00				0.00	12.87														
					0.00	4.64	0.11	0.74	0.23	27.13			0.00	5.41			0.00	0.00															
	114	1140			0.00	4.64	0.11	0.76	0.23	27.36			0.00	5.41			0.00	0.00	19.55	52.76	71.25	83.38	121.67	2645	1200	1200	CONC	0.75	63.0	3376.40	2.99	0.35	0.78
	1140	115			0.00	4.64			0.00	27.36			0.00	5.41			0.00	0.00	19.90	52.19	70.46	82.46	120.31	2616	1200	1200	CONC	0.75	50.0	3376.40	2.99	0.28	0.77
					0.00	4.64	0.20	0.74	0.41	27.77			0.00	5.41			0.00	0.00															
					0.00	4.64	0.21	0.76	0.44	28.21			0.00	5.41			0.00	0.00															
			0.35	0.59	0.57	5.21			0.00	28.21			0.00	5.41			0.00	0.00															
	115	119	0.37	0.59	0.61	5.82			0.00	28.21			0.00	5.41			0.00	0.00	20.18	51.74	69.85	81.74	119.26	2714	1350	1350	CONC	0.50	101.0	3774.11	2.64	0.64	0.72
Contribution From GALARNEAU WAY, Pipe 1119 - 119						0.81				0.00				0.00				0.00	10.39														
Contribution From LEONE FARRELL ROAD, Pipe 118 - 119						6.03				1.27				0.00				0.00	13.64														
			0.18	0.59	0.30	12.95			0.00	29.48			0.00	5.41			0.00	0.00															
	119	120			0.00	12.95	0.28	0.76	0.59	30.07			0.00	5.41			0.00	0.00	20.82	50.75	68.50	80.15	116.93	3151	1500	1500	CONC	0.30	90.5	3871.78	2.19	0.69	0.81
	120	1200			0.00	12.95	0.19	0.76	0.40	30.47			0.00	5.41			0.00	0.00	21.51	49.72	67.10	78.51	114.53	3114	1500	1500	CONC	0.30	69.5	3871.78	2.19	0.53	0.80

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021-12-23
PROVINCE OF ONTARIO

Designed: CPB	PROJECT: Minto - Kanata North		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 23 Dec 2021	Sheet No. SHEET 5 OF 6

JOB # 17-982

982_STM.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

LOCATION			AREA (Ha)																FLOW						SEWER DATA									
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min)	Q/Q full
Contribution From SCHOOL BLOCK, Pipe STM CTRL MH 1 - 1200						0.00				4.54				0.00				0.00	12.12														
	1200	124			0.00	12.95			0.00	35.01			0.00	5.41			0.00	0.00	22.04	48.97	66.07	77.30	112.75	3366	1500	1500	CONC	0.35	18.5	4182.00	2.37	0.13	0.80
Contribution From SILICON WAY, Pipe 123 - 124						4.04				0.00				0.00				0.00	15.55														
			0.02	0.59	0.03	17.03			0.00	35.01			0.00	5.41			0.00	0.00															
	124	150			0.00	17.03	0.27	0.76	0.57	35.58			0.00	5.41			0.00	0.00	22.17	48.78	65.82	77.01	112.32	3589	1920 x 1220 HOR. Elliptical		CONC	0.35	72.5	4182.00	2.366527	0.51	0.86
Contribution From ELSIE MACGILL WALK, Pipe 140 - 150						30.65				4.48				0.00				0.00	21.79						Equivalent to 1500 Circular Pipe								
Contribution From ELSIE MACGILL WALK, Pipe 149 - 150						9.63				0.00				0.00				0.00	16.27														
	150	HW 1			0.00	57.31	0.09	0.74	0.19	40.24			0.00	5.41			0.00	0.00	22.68	48.08	64.87	75.89	110.68	5777	3000	3000	CONC	0.10	69.5	14193.73	2.01	0.58	0.41
To POND INLET (SOUTH, Pipe HW 2 - HW 3						57.31				40.24				5.41				0.00	23.26														
POND INLET (SOUTH)																																	
Contribution From INVENTION BOULEVARD, Pipe 150 - HW 1						57.31				40.24				5.41				0.00	23.26														
	HW 2	HW 3	0.99	0.32	0.88	58.19			0.00	40.24			0.00	5.41			0.00	0.00	23.26	47.32	63.83	74.67	108.89	5726	3000	3000	CONC	0.10	20.5	14193.73	2.01	0.17	0.40
To POND Outlet, Pipe HW 1 - HW 2						58.19				40.24				5.41				0.00	23.43														
Fut. Subdivision																																	
	201(B.O.)	182(B.O.)	37.87	0.66	69.48	127.68			0.00	0.00			0.00	0.00			0.00	0.00	23.91	46.49	62.69	73.33	106.94	5935	1950	1950	CONC	0.30	42.9	7793.98	2.61	0.27	0.76
	182(B.O.)	182A(B.O.)			0.00	127.68			0.00	0.00			0.00	0.00			0.00	0.00	24.18	46.15	62.23	72.79	106.14	5892	1950	1950	CONC	0.30	16.0	7793.98	2.61	0.10	0.76
	182A(B.O.)	HW(B.O.)			0.00	127.68			0.00	0.00			0.00	0.00			0.00	0.00	24.29	46.02	62.06	72.59	105.85	5876	1950	1950	CONC	0.30	28.3	7793.98	2.61	0.18	0.75
To POND INLET (NORTH), Pipe HW 5 - HW 6						127.68				0.00				0.00				0.00	24.29														
POND INLET (NORTH)																																	
Contribution From Fut. Subdivision, Pipe 182A (B.O.) - HW (B.O.)						127.68				0.00				0.00				0.00	24.29														
			0.86	0.25	0.60	128.28			0.00	0.00			0.00	0.00			0.00	0.00															
	HW 5	HW 6			0.00	128.28			0.00	0.00			0.00	0.00			0.00	0.00	24.29	46.02	62.06	72.59	105.85	5903	1950	1950	CONC	0.30	19.5	7793.98	2.61	0.12	0.76
To POND Outlet, Pipe HW 1 - HW 2						128.28				0.00				0.00				0.00	24.41														
POND OUTLET																																	
					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00					359									
	OUTLET STRUCT	502			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	359	675	675	CONC	0.20	5.5	375.92	1.05	0.09	0.95
	502	503			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	359	675	675	CONC	0.20	94.0	375.92	1.05	1.49	0.95
	503	HW 7			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	359	675	675	CONC	0.20	12.5	375.92	1.05	0.20	0.95
	HW 8	HW 9			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	359	1800x900 Box Pipe		CONC	1.00	11.5	5690.80	3.60	0.05	0.06

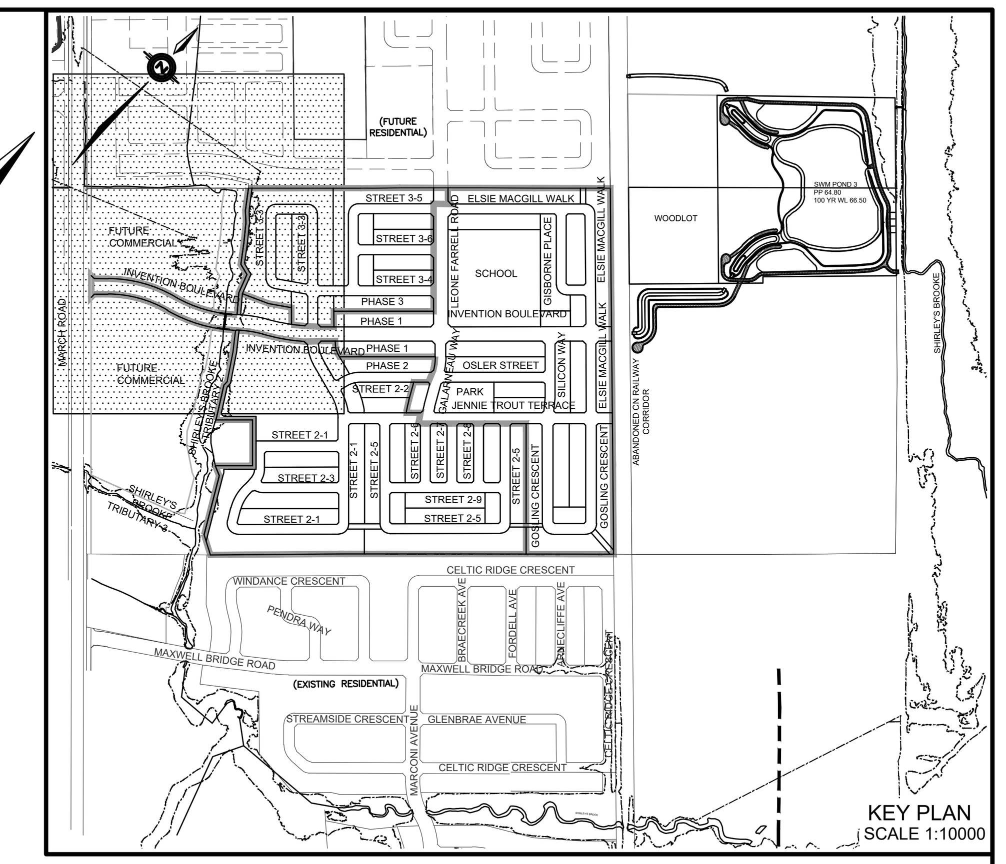
LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021-12-23
PROVINCE OF ONTARIO

JOB # 17-982

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: CPB	PROJECT:	Minto - Kanata North		
Checked: SLM	LOCATION:	City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 23 Dec 2021	Sheet No. SHEET 6 OF 6	



LEGEND

- STORM DRAINAGE BOUNDARY
- EXTERNAL STORM DRAINAGE BOUNDARY
- STORM DRAINAGE BOUNDARY (OTHER PHASES)
- STORM FREQUENCY
- UPSTREAM MH TO DOWNSTREAM MH
- AREA IN HECTARES
- RUNOFF COEFFICIENT
- EXTERNAL STORM FREQUENCY
- EXTERNAL UPSTREAM MH TO DOWNSTREAM MH
- EXTERNAL AREA IN HECTARES
- EXTERNAL RUNOFF COEFFICIENT
- STREET CATCHBASIN & LEAD
- STREET CATCHBASIN WITH CLOSED LID & LEAD
- MAINTENANCE HOLE
- CURB INLET CATCHBASIN & LEAD
- CATCHBASIN/ MAINTENANCE HOLE
- INTERCONNECTED CATCH BASIN & LEADS
- CAP
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION
- EMERGENCY OVERLAND FLOW DIRECTION

2Yr 43 - 44 0.37 0.51

2 YR 303 - 305 7.86 0.75

MH202

CBMH201

NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION
3	S.L.M.	21-12-23	1ST RE-SUBMISSION
2	S.L.M.	21-08-18	1ST RE-SUBMISSION
1	S.L.M.	21-01-22	1ST SUBMISSION

TOPOGRAPHIC INFORMATION
STANTEC GEOMATICS LIMITED PROJECT NUMBER 161613877-111 DATED MARCH 30, 2021.

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD, PROJECT NUMBER 161613877-132 PHASE 1 & PHASE 2, RECEIVED SEPTEMBER 29, 2021

BENCH MARK
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT: OTTAWA ELEVATION= 95.23 METRES.

MINTO GROUP

KANATA NORTH
PHASE 1 & 2

DSEL

120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
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LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021.12.23
PROVINCE OF ONTARIO
Job 17-982

Ottawa CITY OF OTTAWA

STORM DRAINAGE PLAN

DRAWN BY: G.G.G.	CHECKED BY: S.L.M.	PROJECT No.	17-982
DESIGNED BY: G.G.G.	CHECKED BY: S.L.M.		
SCALE: HORIZ. 1:2500 (0 25 50 75 100)		SHEET No.	76

CITY PLAN No. XXXXXX

CITY FILE No. D07-XX-XX-XXXX

PAVEMENT DESIGN

40mm SUPERPAVE 12.5 ASPHALTIC CONCRETE
100mm SUPERPAVE 19.0 ASPHALTIC CONCRETE BINDER COURSE
150mm OPSS GRANULAR A CRUSHED STONE
600mm OPSS GRANULAR B TYPE II

NOTE:
ALL EXISTING BUILDINGS, BARNS, POST & WIRE FENCES, TREES, UTILITY WIRES, POLES AND CULVERTS WITHIN LOTS AND BLOCKS TO BE REMOVED, UNLESS OTHERWISE NOTED

ANY DISTURBED AREA DURING CONSTRUCTION TO BE RESTORED TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION

WRITTEN PERMISSION REQUIRED FOR WORK ON ADJACENT LANDS

NOTE
FOR WATERMAIN STUBS, 2.4m MIN. COVER TO BE PROVIDED

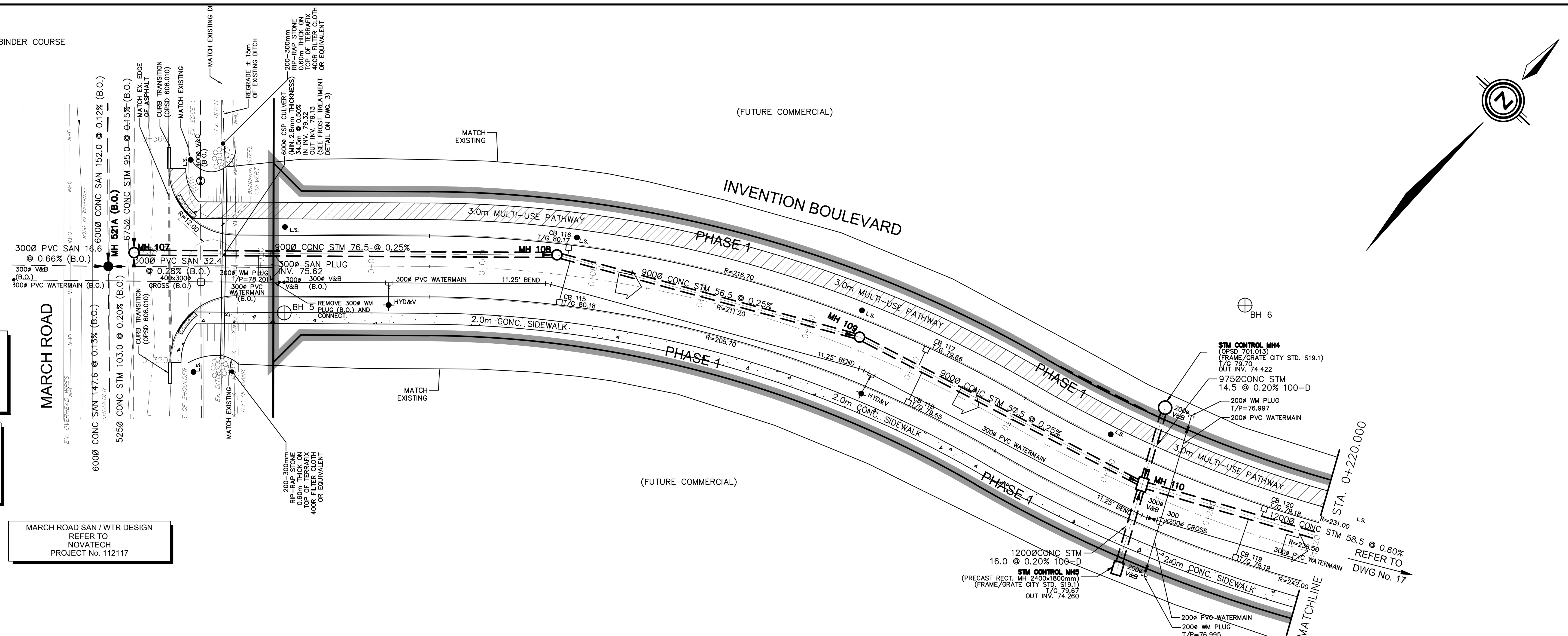
NOTE:
ALL WATERMAIN CONNECTIONS AND DECOMMISSIONING OF EXISTING WATERMAINS TO BE COMPLETED BY CITY FORCES. TRENCH BACKFILL/REINSTATEMENT TO BE COMPLETED BY THE CONTRACTOR TO THE SATISFACTION OF THE CITY OF OTTAWA.

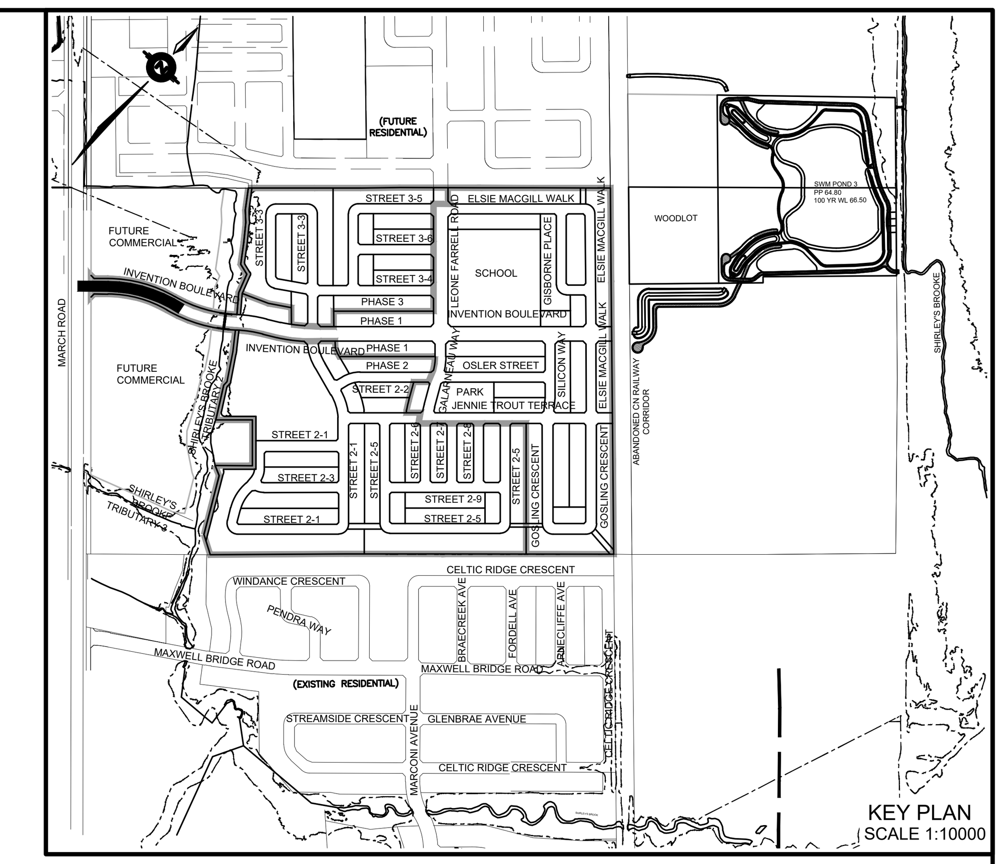
NOTE: RE: TEST PIT/BOREHOLE EXCAVATIONS
ANY DISTURBED MATERIAL ENCOUNTERED BELOW THE SUBGRADE LEVEL WITHIN A BUILDING FOOTPRINT TO BE SUB-EXCAVATED AND BACKFILLED WITH COMPACTED ENGINEERED FILL AS PER GEOTECHNICAL ENGINEERS RECOMMENDATION.

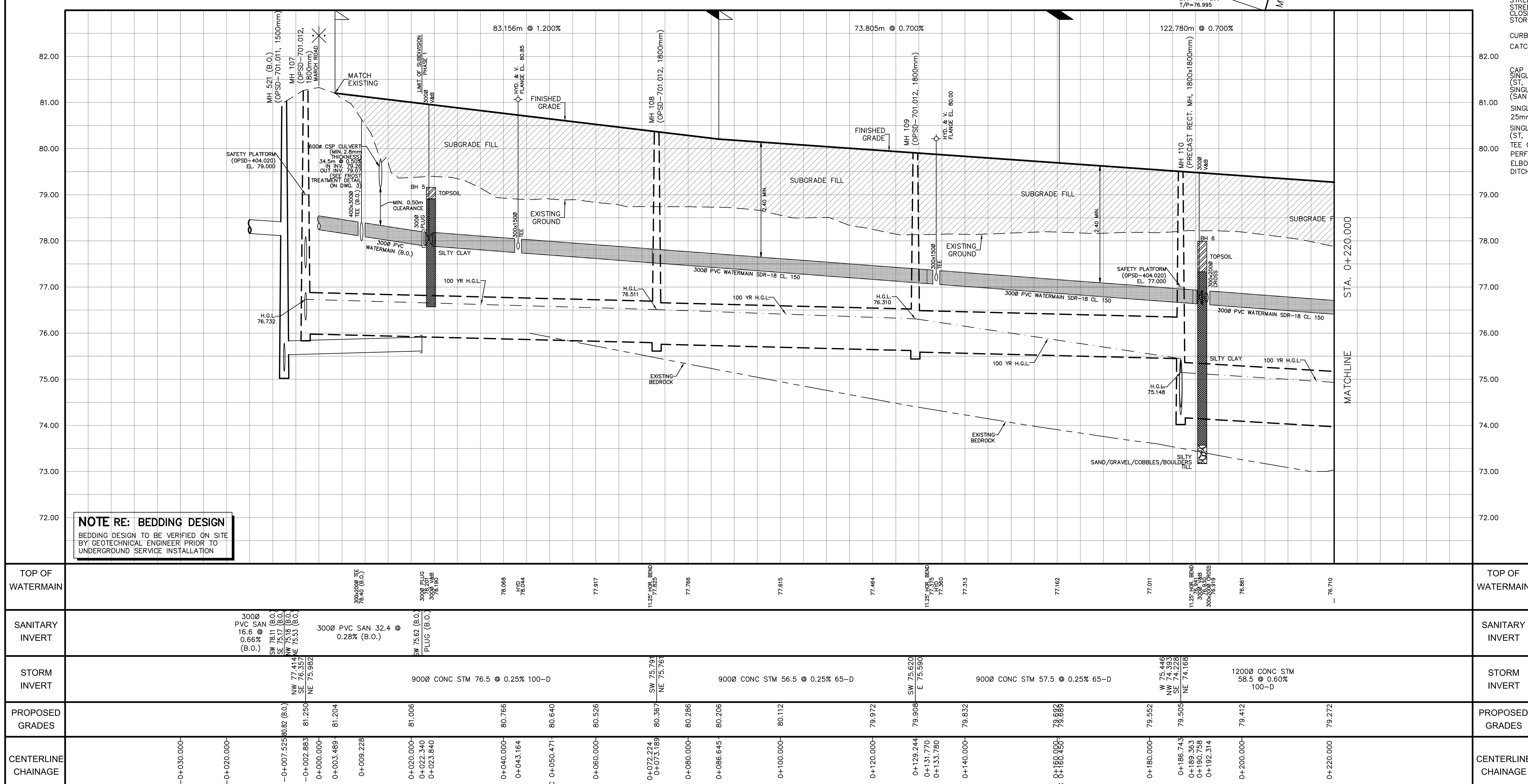
CONTRACTOR TO VERIFY THE PRECISE LOCATIONS AND INVERT ELEVATIONS OF Ex. UNDERGROUND SERVICES AND Ex. UTILITIES PRIOR TO STARTING CONSTRUCTION

NOTE: ICD
FOR CATCHBASIN INFO AND ICD INFORMATION, REFER TO DRAWING No. 3 FOR DETAIL.

MARCH ROAD SAN / WTR DESIGN REFER TO NOVATECH PROJECT No. 112117







LEGEND

CROSS
45° BEND
LATERAL
HYDRANT, VALVE & VB
TEE
VALVE & VC
VALVE & VB
22.5° BEND
11.25° BEND
REDUCER
CAP
SANITARY MAINTENANCE HOLE
CAP
STREET CATCHBASIN & LEAD
STREET CATCHBASIN WITH CLOSED LID & LEAD
STORM MAINTENANCE HOLE
CURB INLET CATCHBASIN & LEAD
CATCHBASIN/ MAINTENANCE HOLE
INTERCONNECTED CATCH BASIN & LEADS
CAP
SINGLE SERVICE LOCATION (ST, SAN & WM)
SINGLE SERVICE LOCATION (SAN & WM)
SINGLE SERVICE LOCATION (ST, SAN & 25mmø PEX TUBING AWWA C-904 WM)
SINGLE SERVICE LOCATION (ST, SAN & WM)
TEE CATCHBASIN
PERFORATED PIPE
ELBOW CATCHBASIN
DITCH AND CULVERT
HYDRO TRANSFORMER
STREET LIGHT STANDARD
CONCRETE SIDEWALK
CURB & DEPRESSED CURB
ASPHALT SIDEWALK
CHAINLINK FENCE (1.5m UNLESS OTHERWISE NOTED)
NOISE BARRIER (2.5m UNLESS OTHERWISE NOTED)
DECORATIVE FENCE (SEE LANDSCAPE DWGS FOR DETAIL)
CONSTRUCTION FENCE
POST AND RAIL FENCE
PHASING LIMITS
PROPERTY BOUNDARY
BOREHOLE (BH)
TEST PIT (TP)
AUGER HOLE (AH)
MONITORING WELL LOCATION
CONCEPTUAL WELL LOCATION
AS PER GEOTECHNICAL REPORT
TOP OF FOUNDATION ELEVATION
FINISHED FLOOR ELEVATION
UNDERSIDE OF FOOTING ELEVATION
NUMBER OF RISERS
UNITS REQUIRING PRESSURE REDUCING VALVES
WALKOUT UNITS
SLAB ON GRADE
OVERLAND FLOW DIRECTION
EXTERNAL OVERLAND FLOW DIRECTION
EMERGENCY OVERLAND FLOW DIRECTION
TACTILE WALKING SURFACE INDICATOR (AS PER CITY OF OTTAWA STD. SC6, SC7, SC7.1, SC7.2, SC7.3)
FUTURE PHASES
SPEED HUMP (AS PER CITY OF OTTAWA STD. R19)
RAISED CROSSWALK (AS PER CITY STD. R15)

NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION
3	S.L.M.	21-12-23	1ST RE-SUBMISSION
2	S.L.M.	21-08-18	1ST RE-SUBMISSION
1	S.L.M.	21-01-22	1ST SUBMISSION

TOPOGRAPHIC INFORMATION
STANTEC GEOMATICS LIMITED PROJECT NUMBER 161613877-111 DATED MARCH 30, 2021.

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LTD, PROJECT NUMBER 161613877-132 PHASE 1 & PHASE 2, RECEIVED SEPTEMBER 29, 2021

BENCH MARK
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MINTO GROUP

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120 Iber Road Unit 103
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LICENSED PROFESSIONAL ENGINEER S.L. MERRICK 100186523 2021-12-23 PROVINCE OF ONTARIO

CITY OF OTTAWA

PLAN AND PROFILE OF

INVENTION BOULEVARD

(STA. 0+000.000 TO STA. 0+220.000)

DRAWN BY: G.G.G.	CHECKED BY: S.L.M.	PROJECT No.	17-982
DESIGNED BY: G.G.G.	CHECKED BY: S.L.M.	SHEET No.	16
SCALE: VERT. 1:50 HORZ. 1:500			

CITY PLAN No. XXXXXX

CITY FILE No. D07-XX-XX-XXXX

KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

STORM SEWER DESIGN SHEET

TABLE B-1c:
CONCEPUTAL DESIGN FOR EAST SWMF
FLOW RATES BASED ON RATIONAL METHOD

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (ha)			FLOW					SEWER DATA								
Catchment ID	From Node	To Node	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Conc.	Intensity (mm/hr)	Peak Flow (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
NE-1	NE-1	NE-3	0.44	0.70	0.31	0.856	0.856	15.00	97.85*	84	0.610	600	Conc	0.20	74.0	286.3	0.98	1.26	29%
NE-2	NE-2	NE-3	0.80	0.70	0.56	1.557	1.557	15.00	97.85*	152	0.610	600	Conc	0.20	147.0	286.3	0.98	2.50	53%
NE-3	NE-3	NE-4	8.87	0.73	6.48	18.001	20.414	17.50	76.27	1,557	0.914	900	Conc	1.00	326.0	1,887.7	2.87	1.89	82%
NE-4	NE-4	NE-5	9.21	0.65	5.99	16.642	37.056	19.39	71.62	2,654	1.372	1350	Conc	0.45	199.0	3,733.9	2.53	1.31	71%
NE-5	NE-5	RAIL	6.76	0.65	4.39	12.215	49.272	20.70	68.75	3,387	1.524	1500	Conc	0.45	253.0	4,945.4	2.71	1.56	68%
NE-6	NE-6	NE-7	4.60	0.65	2.99	8.312	8.312	15.00	83.56	695	0.762	750	Conc	0.70	218.0	971.2	2.13	1.71	72%
NE-7	NE-7	NE-8	4.35	0.55	2.39	6.651	14.963	16.71	78.42	1,173	1.067	1050	Conc	0.30	79.0	1,559.7	1.74	0.75	75%
NE-8	NE-8	RAIL	3.48	0.65	2.26	6.288	21.252	17.46	76.37	1,623	1.372	1350	Conc	0.20	308.0	2,489.3	1.68	3.05	65%
	RAIL	E-SWMF			0.00	0.000	70.523	22.26	65.66	4,631	1.956	1950	Conc	0.20	75.0	6,412.8	2.13	0.59	72%
SE-1	SE-1	SE-3	2.71	0.70	1.90	5.274	5.274	15.00	97.85*	516	0.838	825	Conc	0.25	300.0	748.4	1.36	3.69	69%
SE-2	SE-2	SE-3	1.37	0.70	0.96	2.666	2.666	15.00	97.85*	261	0.610	600	Conc	0.25	230.0	320.1	1.10	3.50	82%
SE-3	SE-3	SE-4	9.23	0.85	7.85	21.810	29.750	18.69	73.27	2,180	1.219	1200	Conc	0.90	423.0	3,857.1	3.30	2.13	57%
SE-4	SE-4	SE-5	10.76	0.63	6.78	18.845	48.595	20.82	68.50	3,329	1.372	1350	Conc	1.20	194.0	6,097.5	4.13	0.78	55%

KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

STORM SEWER DESIGN SHEET

TABLE B-1c:
CONCEPUTAL DESIGN FOR EAST SWMF
FLOW RATES BASED ON RATIONAL METHOD

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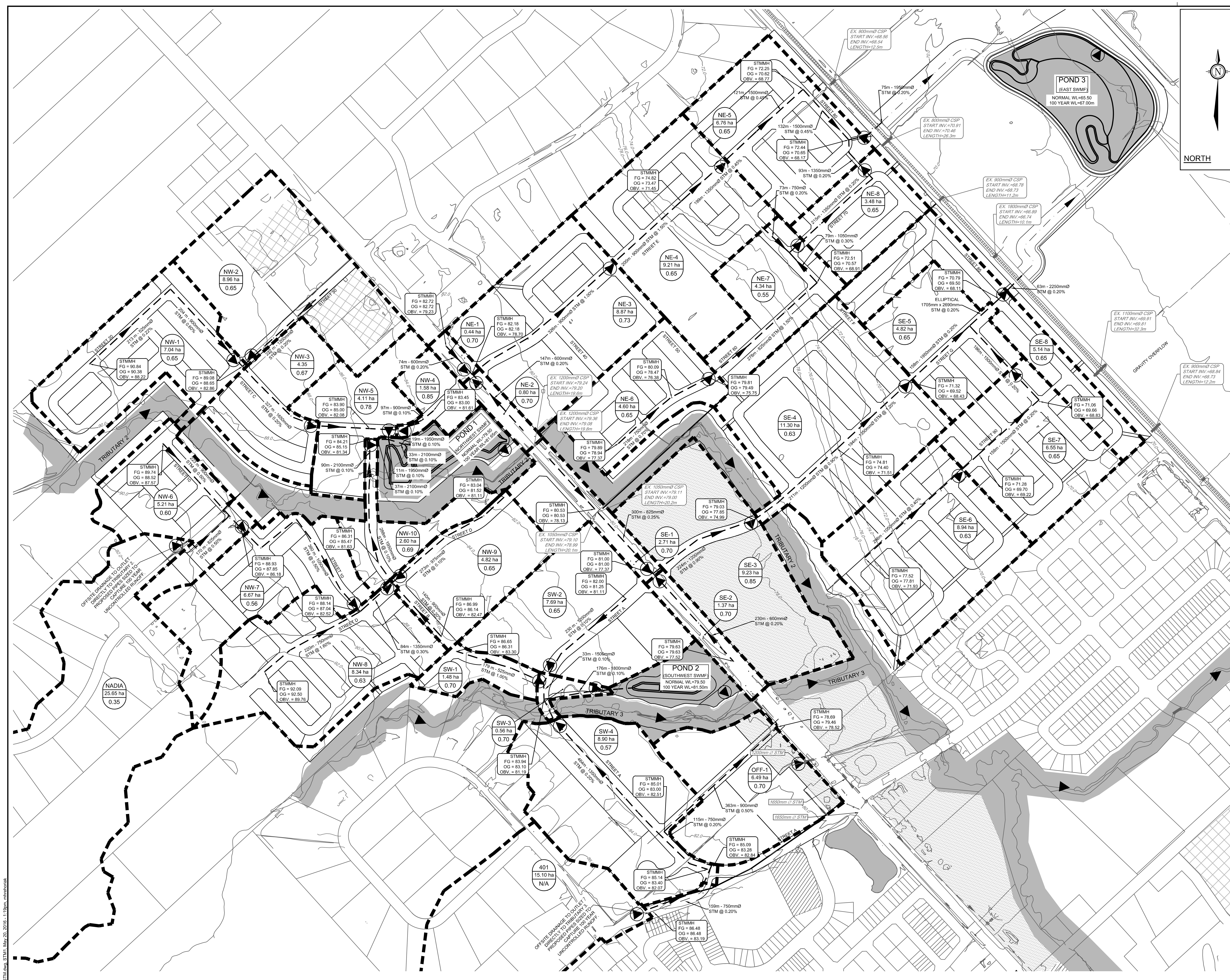
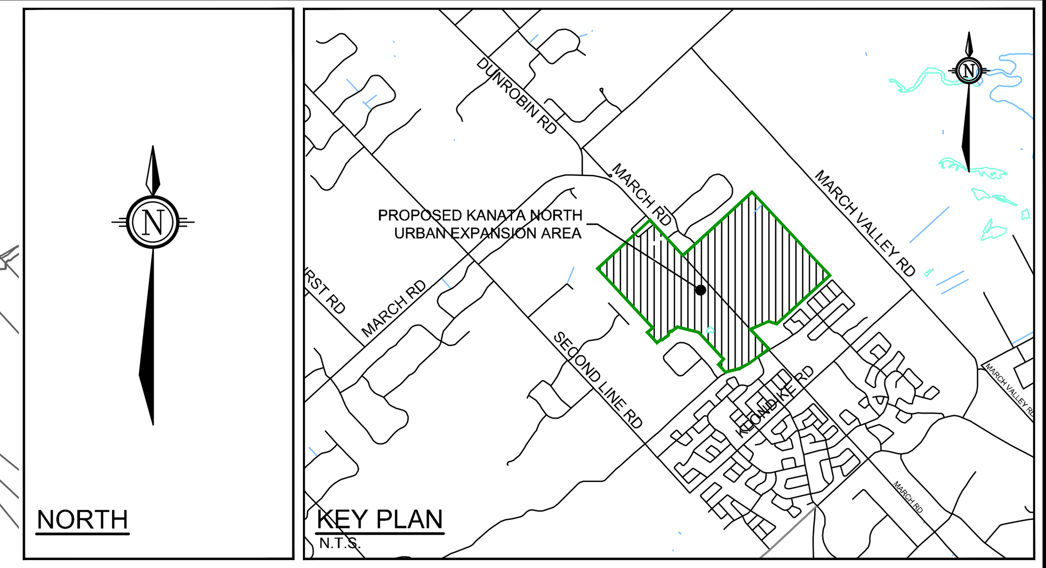
LOCATION			AREA (ha)			FLOW					SEWER DATA									
Catchment ID	From Node	To Node	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Conc.	Intensity (mm/hr)	Peak Flow (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
SE-6	SE-6	SE-7	9.41	0.63	5.93	16.481	16.481	15.00	83.56	1,377	1.067	1050	Conc	0.40	296.0	1,800.9	2.01	2.45	76%
SE-7	SE-7	SE-5	6.92	0.65	4.50	12.504	28.985	17.45	76.40	2,214	1.524	1500	Conc	0.20	360.0	3,296.9	1.81	3.32	67%
SE-5	SE-5	SE-8	4.53	0.65	2.94	8.186	85.766	21.60	66.92	5,739	2.108	2100	Conc **	0.20	236.0	7,833.6	2.24	1.75	73%
													** 2100mm or 1705mmx2690mm Elliptical						
SE-8	SE-8	E-SWMF	5.14	0.65	3.34	9.288	95.054	23.36	63.65	6,050	2.261	2250	Conc	0.20	63.0	9,436.3	2.35	0.45	64%

Q = 2.78 AIC, where
Q = Peak Flow in Litres per Second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/hr), 5 year storm
C = Runoff Coefficient

Note:
* Indicates 10 Year intensity for March Road storm sewers

Consultant:	**Novatech Engineering Consultants Ltd.**	
Date:	May, 2016	
Design By:	Alex McAuley	
Client:	**Dwg. Reference:**	**Checked By:**
Kanata North Land Owners	112117-STM1, 112117-STM2	CJR





LEGEND

- A-10 — AREA ID
- 1.14 ha — AREA IN HECTARES
- 0.40 — RUNOFF COEFFICIENT
- DRAINAGE AREA
- DRAINAGE AREA OUTLET
- STMMH — STM ID
- FG = 71.69 — FINISHED GROUND ELEVATION
- OG = 69.52 — ORIGINAL GROUND ELEVATION
- OBV. = 68.22 — OBVERT ELEVATION
- CREEK CORRIDOR
- PROPOSED OUTLET DITCH
- PROPOSED STORM SEWER & FLOW DIRECTION
- *EXISTING STORM SEWER & FLOW DIRECTION*

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3.	ISSUED WITH DRAFT MASTER SERVICING STUDY	MAY 20/16	JLS
2.	ISSUED WITH DRAFT MASTER SERVICING STUDY	APR 4/16	JLS
1.	ISSUED WITH DRAFT MASTER SERVICING STUDY	FEB 26/16	JLS

SCALE 1:3000

DESIGN ARM / TB
CHECKED ARM
DRAWN TB
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

NOVATECH
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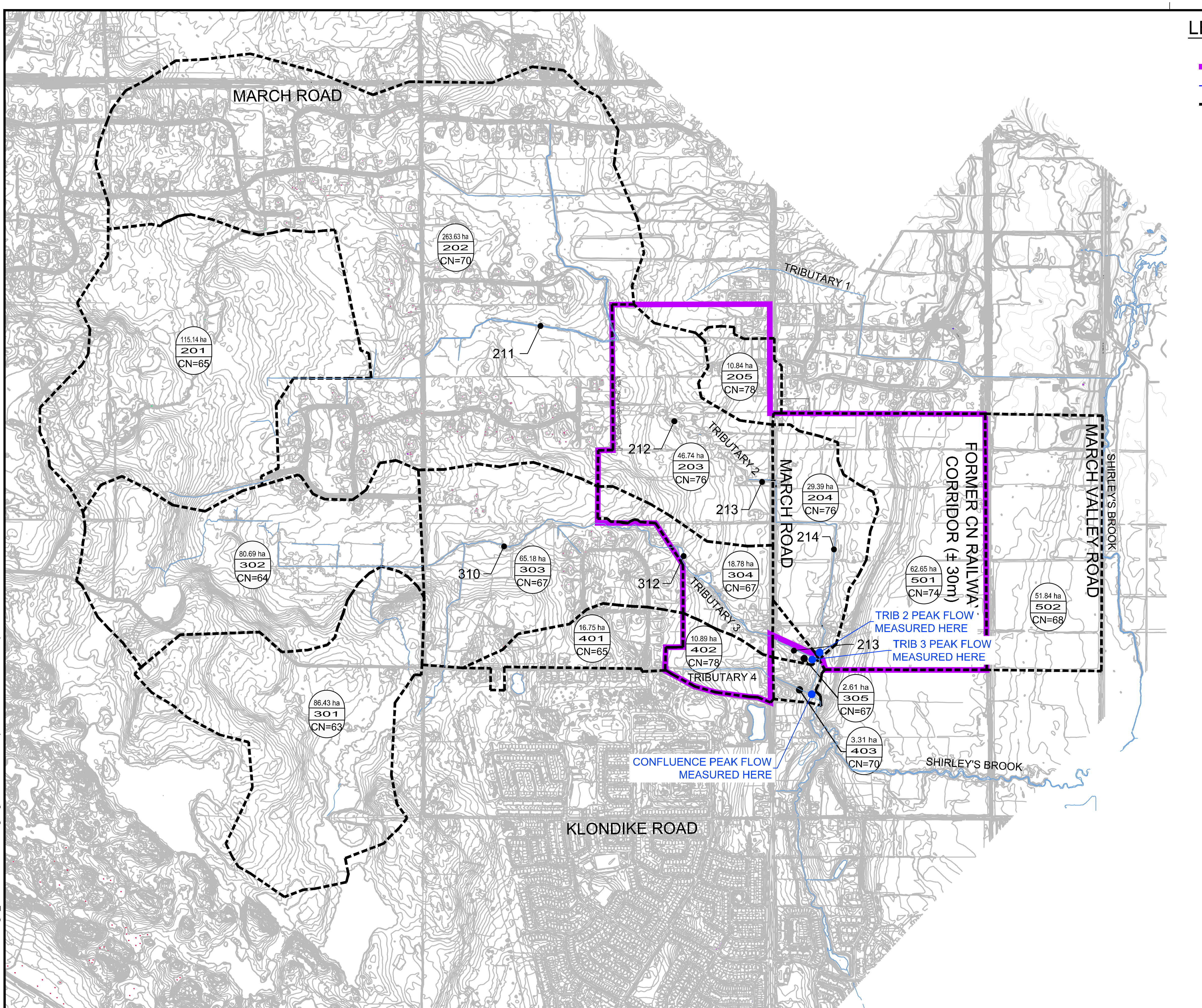
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
STORM DRAINAGE AREA PLAN
MINOR SYSTEM DRAINAGE

PROJECT No. 112117-04
REV # 3
DRAWING No. 112117-STM1

PLANB1.DWG - 1000mmx707mm



KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 3.15
PRE-DEVELOPMENT DRAINAGE AREAS

DATE JUN 2016
JOB 112117
SCALE NTS

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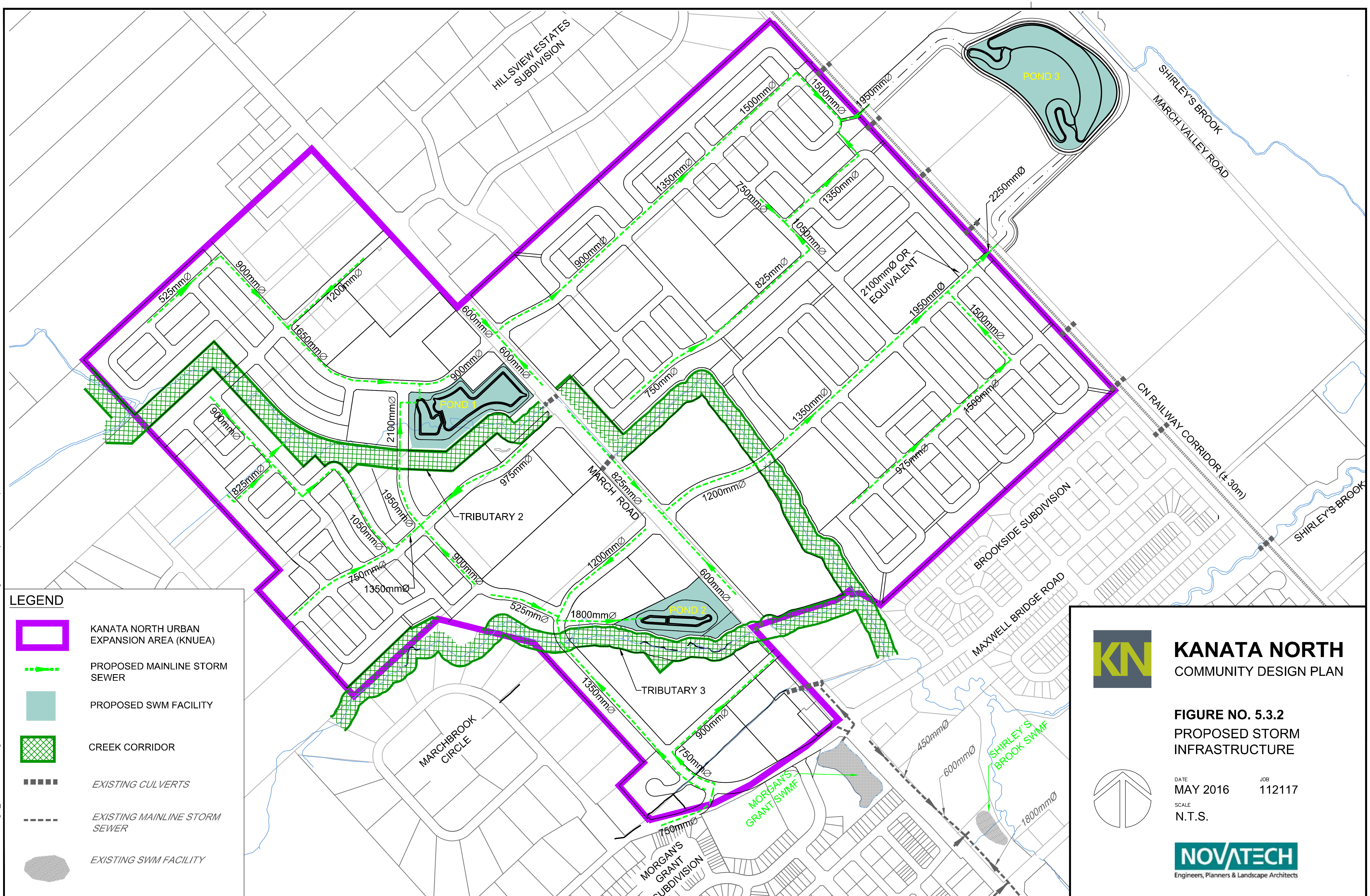
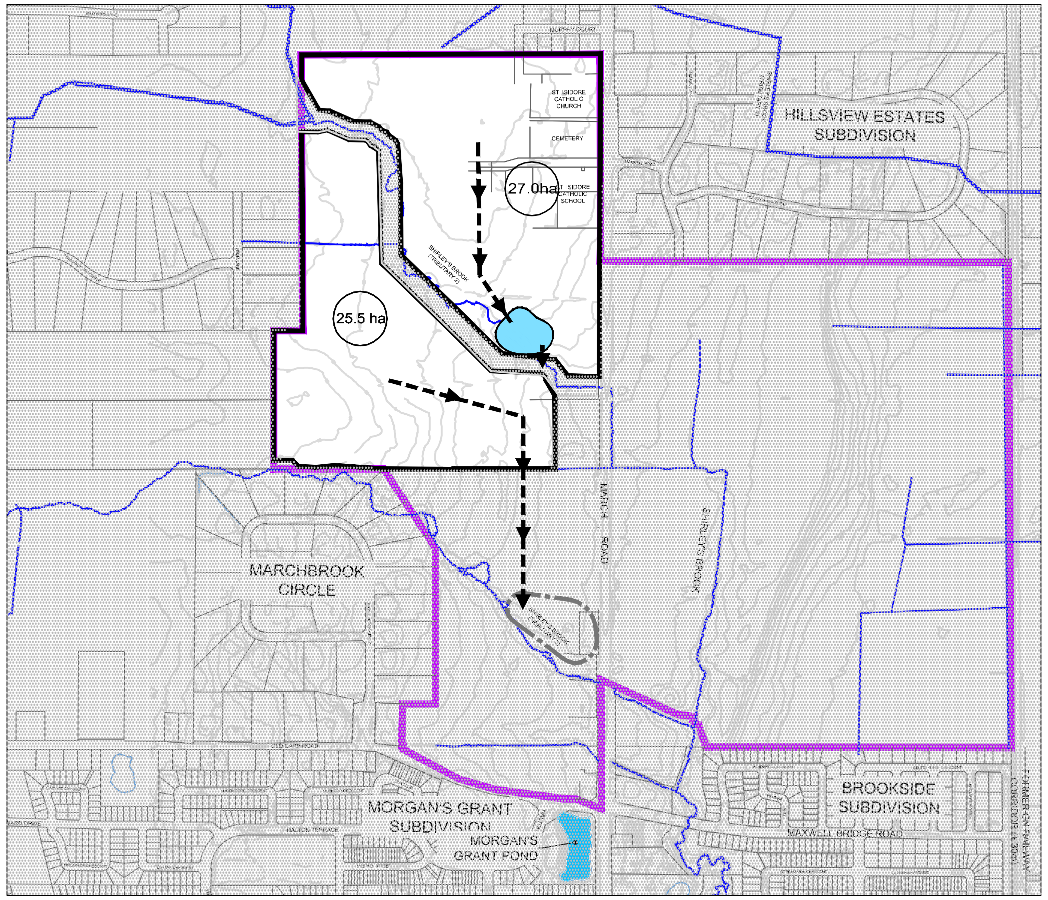
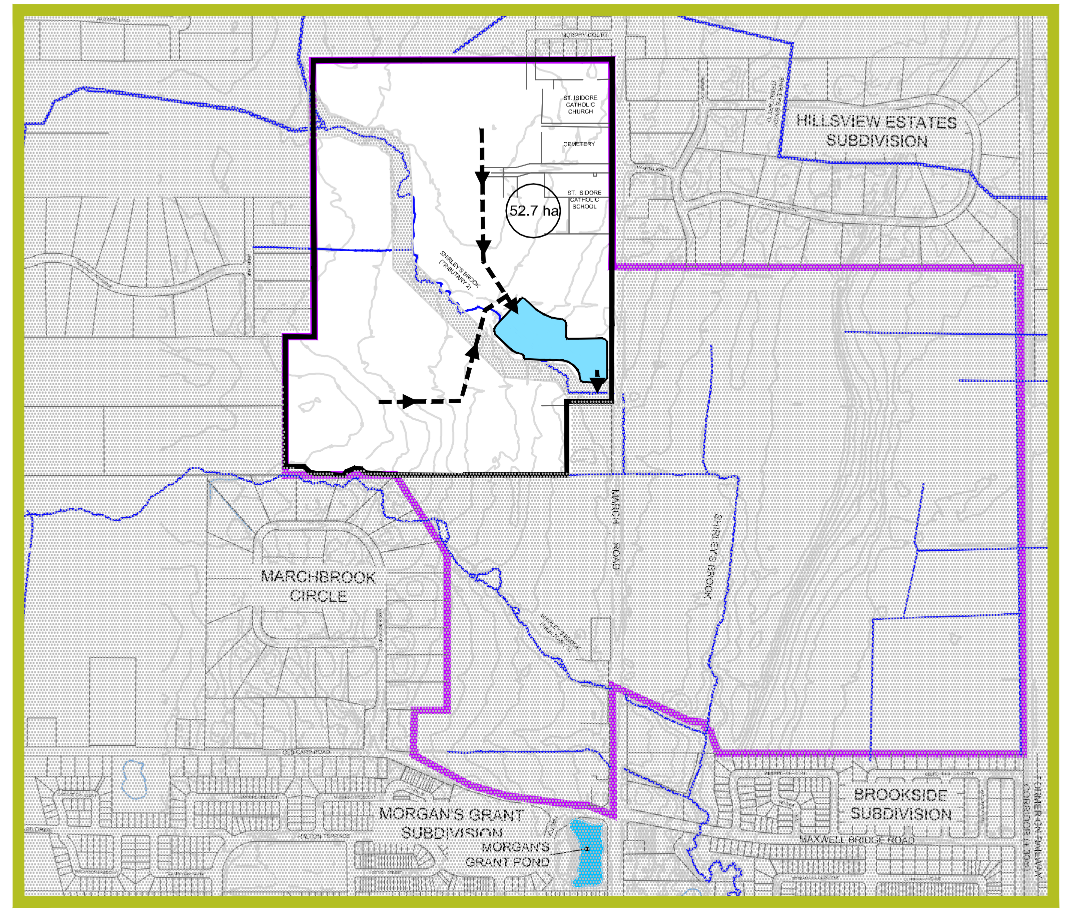
M:\2012\112117\CAD\Design_EMP\112117-SWM.dwg, Figure 3.15 PreDevelopment, Jun 23, 2016 - 5:07pm, kbanks



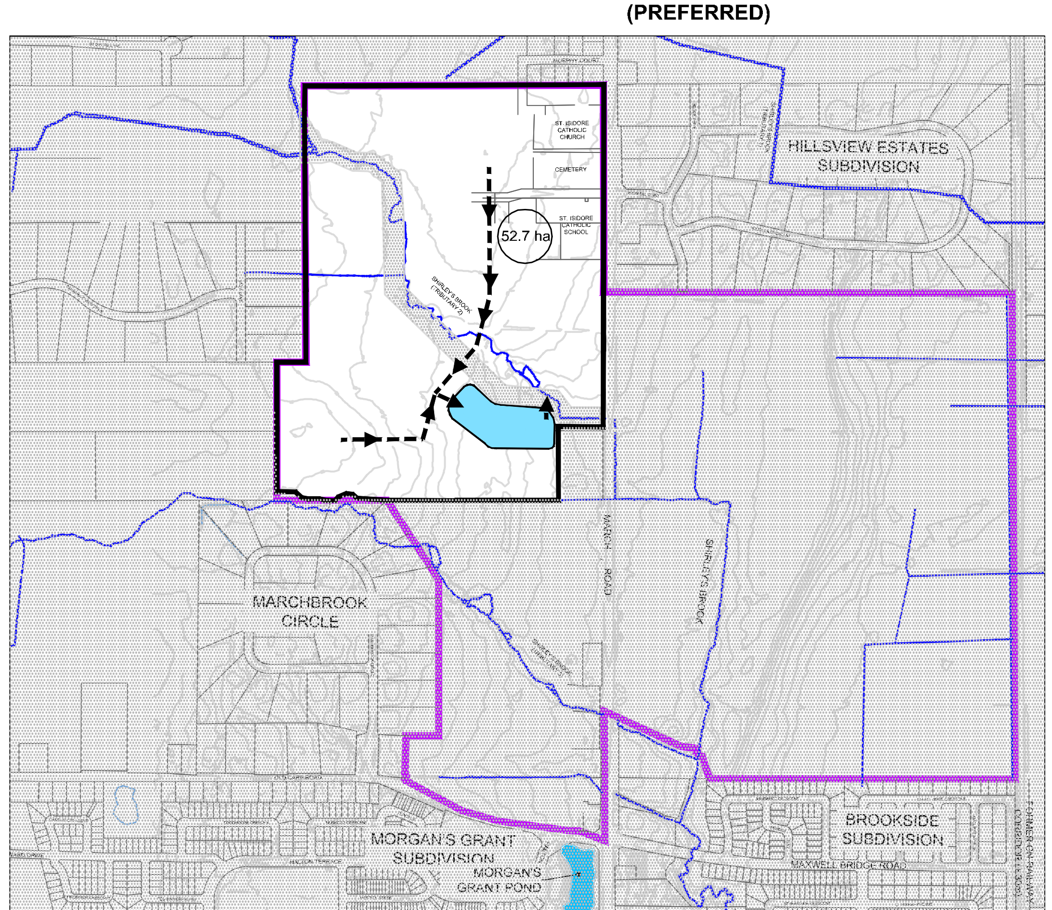
M:\2012\112117\CAD\Design_MSS\FIGURES\Figure 5.3.2-PROP STORM INFRASTRUCTURE.dwg, FIG 5, May 18, 2016 - 3:15pm, mhrehoriak



OPTION 1 - ONE SWM FACILITY NORTH OF TRIBUTARY 2, NO TRIBUTARY CROSSING



OPTION 2 - ONE SWM FACILITY NORTH OF TRIBUTARY 2, CROSSING OF TRIBUTARY 2 (PREFERRED)



OPTION 3 - ONE SWM FACILITY SOUTH OF TRIBUTARY 2, CROSSING OF TRIBUTARY 2

LEGEND

- KNUEA
- DRAINAGE CHANNEL
- LANDS SERVICED BY SWM OPTION
- LANDS NOT SERVICED BY SWM OPTION
- AREA (HECTARES) (23.9 ha)
- STORM SEWER

KANATA NORTH

COMMUNITY DESIGN PLAN

FIGURE NO. 6.1

SWMF ALTERNATIVES
NORTHWEST QUADRANT

DATE	JOB
JUN 2016	112117

SCALE
NTS

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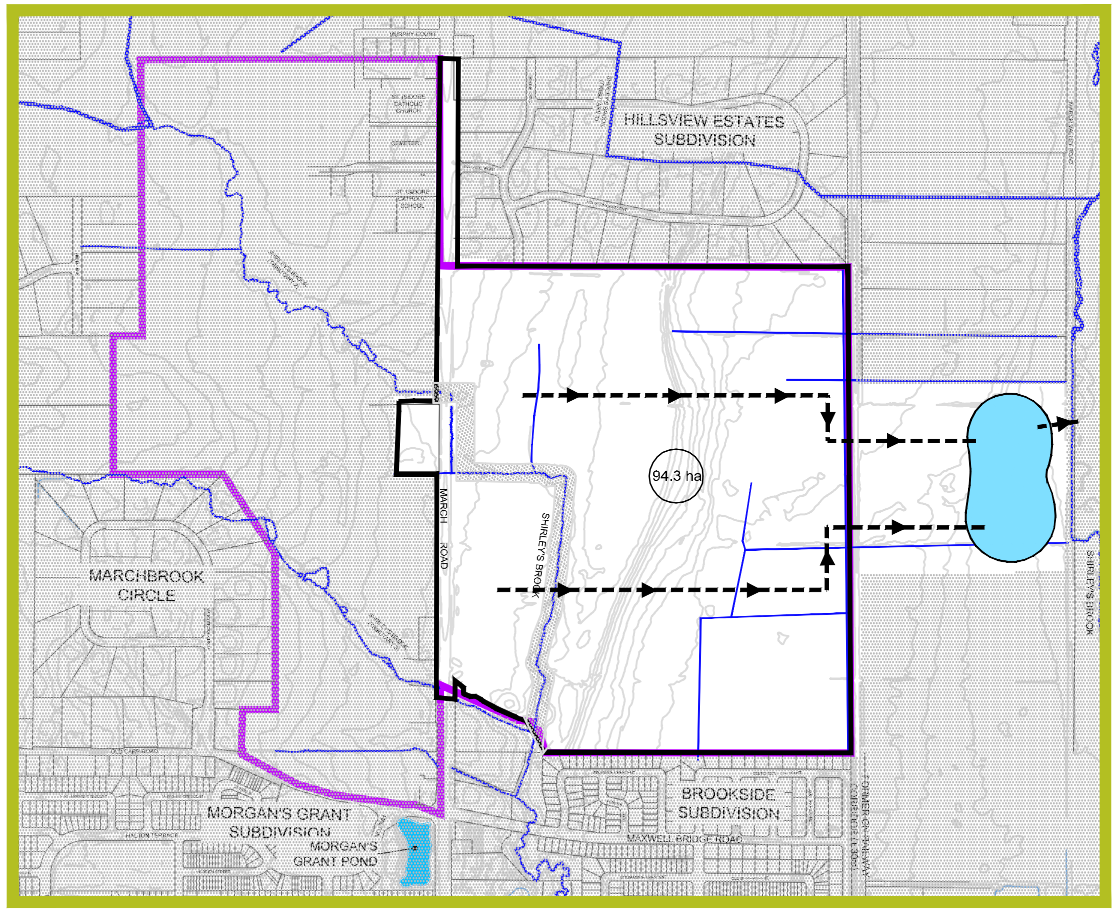
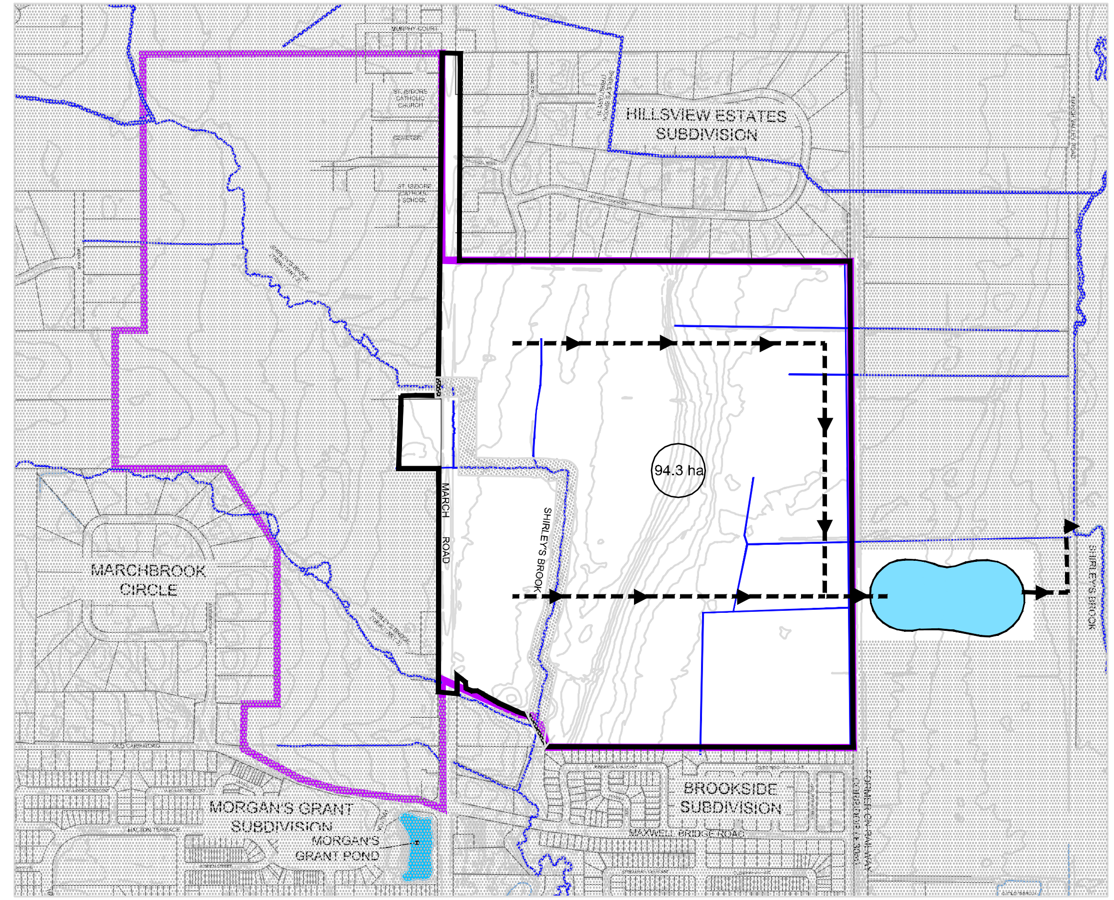
M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\Figure 6.1-6.4 SWMF Alternatives.dwg, 6.1 Northwest Quad, Jun 23, 2016 - 3:20pm, kbanks

LEGEND

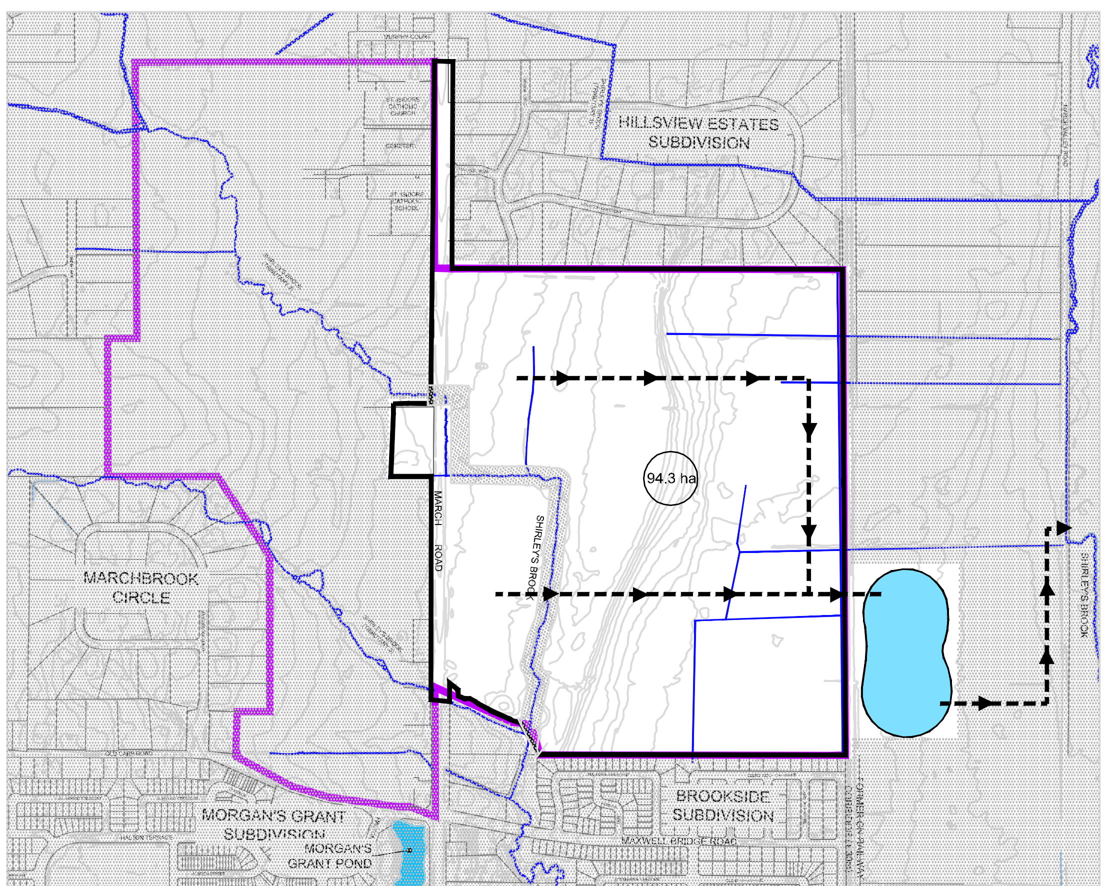
- KNUEA
- DRAINAGE CHANNEL
- LANDS SERVICED BY SWM OPTION
- LANDS NOT SERVICED BY SWM OPTION
- (23.9 ha) AREA (HECTARES)
- STORM SEWER



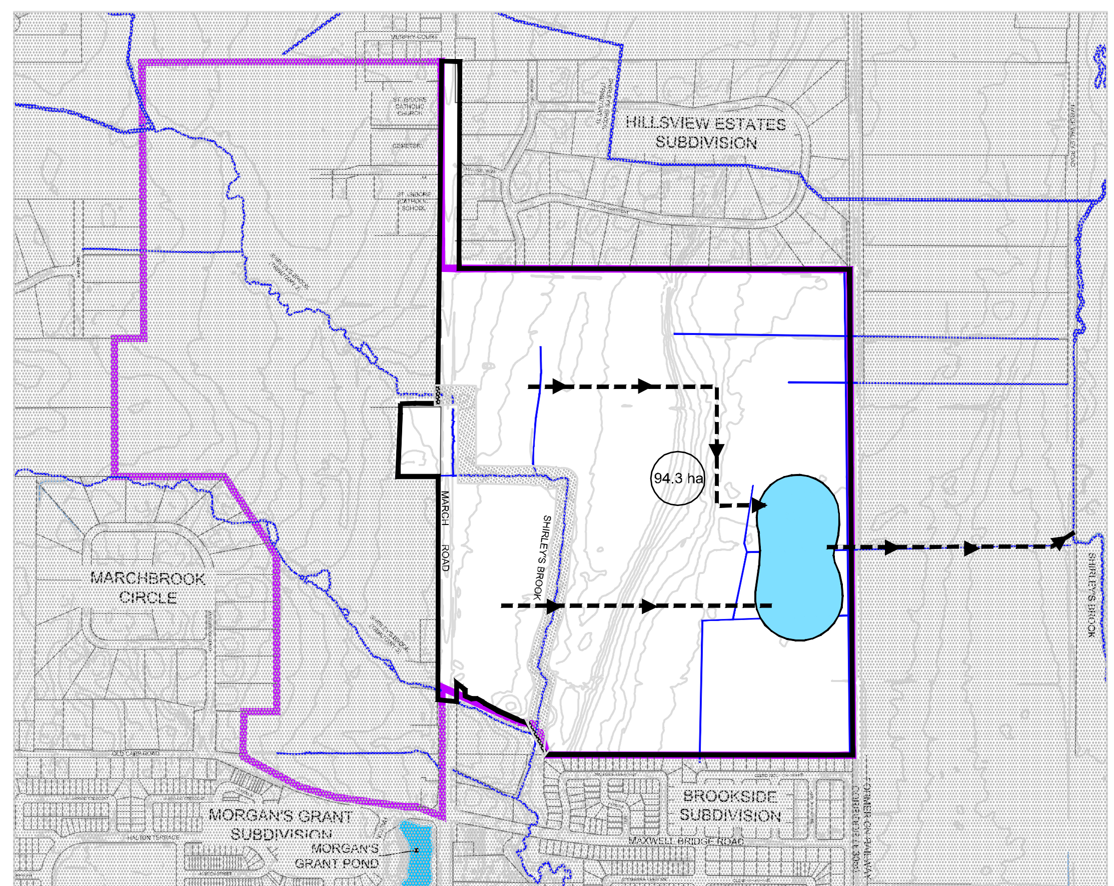
OPTION 1 - SWM FACILITY OUTSIDE URBAN BOUNDARY, INTEGRATED WITHIN WOODED AREA (PREFERRED)



OPTION 2 - SWM FACILITY OUTSIDE URBAN BOUNDARY, PERPENDICULAR TO RAIL LINE & MARCH VALLEY RD.



OPTION 3 - SWM FACILITY OUTSIDE URBAN BOUNDARY, PARALLEL TO RAIL LINE & MARCH VALLEY RD.



OPTION 4 - SWM FACILITY INSIDE URBAN BOUNDARY, INTEGRATED WITHIN DEVELOPMENT

KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 6.4
SWMF ALTERNATIVES - EAST OF MARCH

DATE JUN 2016
JOB 112117
SCALE NTS

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M:\2012\112117\CAD\Design_EMP\MEMO (KJA)\Figure 6.1-6.4 SWMF Alternatives.dwg, 6.4 SWMF EAST, Jun 23, 2016 - 3:20pm, kbanks

SHT11x17.DWG - 279mmx432mm

116132 (Kanata North - Northwest Quadrant)
Water Quality Treatment Volumes (SWM Facility)

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Parameter	Upper Pond	Lower Pond	Total
Subcatchment Parameters			
Drainage Area (ha)	29.72	22.59	**52.31**
Imperviousness (%)	64.0%	67.3%	**65.4%**
Required Water Quality Treatment Volumes			
Treatment Volume(1) (m^3/ha)	201	205	**202.7**
Required Permenent Pool Volume (m^3)	4,785	3,727	**8,512**
Required Extended Detention Volume(2) (m^3)	1,189	904	**2,092**
Provided Water Quality Treatment Volumes			
Provided Permenent Pool Volume (m^3)	6,387	4,340	**10,727**
Provided Extended Detention Volume(3) (m^3)	1,190	907	**2,097**

(1) *Enhanced protection - 80% Long-Term TSS removal) from Table 3.2 MOE SWM Planning and Design Manual (2003)*

(2) *Required extended detention volume = 40 m^3/ha.*

(3) *Provided extended detention volume (see stage-storage tables).*

116132 (Kanata North - Northwest Quadrant)
Forebay Lengths (SWM Facility)

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Parameter	Upper Pond	Lower Pond
Settling Lengths		
Forebay Length to Width Ratio	8.0	8.0
Peak Outflow (25mm - 4-hour Chicago Storm) (m^3/s)	0.024	0.020
Target Particle Size (mm)	150	150
Settling Velocity (m/s)	0.0003	0.0003
Min. Required Forebay Settling Length (m)	**25**	**23**
Dispersion Lengths		
Desired Velocity in Forebay (m/s)	0.5	0.5
Inlet Flow Rate (2-year - 3-hour Chicago Storm) (m^3/s)	3.34	2.74
Depth of Forebay (m)	1.50	1.50
Min. Required Forebay Settling Length (m)	**36**	**29**
Provided Lengths		
Min. Required Forebay Length[1] (m)	**36**	**29**
Provided Forebay Length (m)	**40**	**35**

[1] Minimum dispersion length governs forebay length.

116132 Kanata North - Northwest Quadrant)

Summary of Hydraulic Grade Line (HGL) Elevations - Scenario 1

NOVATECH
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MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)
CB109/CB110	91.71	91.36	90.75	0.00	0.61
CB16/CB15	88.90	89.55	89.04	0.14	0.51
CB86/CB87	89.22	89.87	89.32	0.10	0.55
MH1000	89.87	92.04	89.61	0.00	2.43
MH1002	89.38	92.03	89.15	0.00	2.88
MH1004	87.62	90.25	87.52	0.00	2.73
MH1100	85.76	88.49	85.77	0.02	2.72
MH1102	85.96	88.50	85.83	0.00	2.67
MH1204	86.47	88.79	86.20	0.00	2.59
MH1206	85.73	88.19	85.52	0.00	2.67
MH1208	85.48	88.08	85.25	0.00	2.83
MH1210	85.28	87.60	85.08	0.00	2.52
MH1212	84.86	87.37	84.92	0.06	2.45
MH1214	83.66	86.96	84.22	0.56	2.74
MH1216	83.56	85.15	84.22	0.66	0.93
MH1218	83.46	84.96	84.22	0.76	0.74
MH1220	81.14	84.43	81.56	0.42	2.87
MH1222	80.86	82.81	81.55	0.69	1.26
MH1224	89.59	82.10	81.55	0.00	0.55
MH1300	83.77	87.33	84.51	0.74	2.82
MH1302	83.87	87.53	84.72	0.85	2.81
MH1304	85.13	87.76	84.85	0.00	2.91
MH1306	85.18	87.68	84.96	0.00	2.72
MH1308	85.22	87.85	85.04	0.00	2.81
MH1310	85.29	88.05	85.10	0.00	2.95
MH1312	85.87	88.19	85.62	0.00	2.57
MH1314	86.05	88.15	85.87	0.00	2.28
MH1400	86.09	88.43	85.61	0.00	2.82
MH1600	87.82	89.93	87.70	0.00	2.23
MH1602	86.23	88.77	86.28	0.05	2.49
MH1604	85.03	87.31	84.60	0.00	2.71
MH1606	84.30	85.85	83.74	0.00	2.11
MH2000	85.17	88.64	84.87	0.00	3.77
MH2002	83.86	88.21	83.51	0.00	4.70
MH306	86.85	89.17	86.79	0.00	2.38
MH308	86.31	88.97	86.26	0.00	2.71
MH310	85.95	88.26	85.90	0.00	2.36
MH312	85.78	88.28	85.77	0.00	2.51
MH314	85.58	88.00	85.62	0.05	2.38
MH316	85.51	87.97	85.55	0.04	2.42
MH349	80.23	83.97	81.55	1.32	2.42
MH351	80.89	83.04	81.55	0.66	1.49
MH353	82.50	84.80	82.12	0.00	2.68
MH355	80.13	82.30	79.72	0.00	2.58
mh371	81.19	83.30	81.55	0.36	1.75
MH397	86.99	89.51	86.87	0.00	2.64
MH402	87.18	90.29	86.93	0.00	3.36

Date: 12/23/2021
M:\2016\116132\DATA\Reports\SWM\HGL - Scenario 1-20211223.xlsx

116132 Kanata North - Northwest Quadrant)
Summary of Hydraulic Grade Line (HGL) Elevations - Scenario 1

NOVATECH
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MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)
MH600	88.05	90.11	87.44	0.00	2.67
MH600B	88.26	90.21	88.12	0.00	2.09
MH602	87.23	89.74	86.97	0.00	2.77
MH604	87.11	89.75	86.81	0.00	2.94
MH606	86.38	89.22	86.30	0.00	2.92
MH608	86.22	88.64	86.13	0.00	2.51
MH610	86.17	88.61	86.09	0.00	2.52
MH612	86.06	88.47	85.94	0.00	2.53
MH614	86.00	88.53	85.88	0.00	2.65
MH616	85.90	88.20	85.78	0.00	2.42
MH618	85.79	88.15	85.68	0.00	2.47
MH620	85.54	88.16	85.64	0.10	2.52
MH702	86.60	89.20	86.42	0.00	2.78
MH704	86.29	88.64	86.31	0.02	2.33
MH800	89.42	91.66	89.30	0.00	2.36
MH802	89.23	91.51	89.16	0.00	2.35
MH804	88.13	90.64	87.99	0.00	2.65
MH806	86.89	89.52	86.62	0.00	2.90
MH808	85.85	88.16	85.88	0.03	2.28
MH900	90.33	92.58	89.52	0.00	3.06
MH902	88.32	91.00	88.16	0.00	2.84
MH904	86.72	89.58	86.89	0.17	2.69
MH906	85.47	88.26	85.46	0.00	2.80
MH908	85.00	87.39	84.75	0.00	2.64
MH910	83.57	85.99	83.21	0.00	2.78
MH912	82.65	85.13	82.43	0.00	2.70
MH914	80.95	83.85	81.55	0.60	2.30
MH918	81.05	82.83	81.55	0.50	1.28
MH920	80.67	82.60	81.55	0.88	1.05
MH937	82.83	86.48	84.23	1.40	2.25
OS:HW1	89.20	89.53	89.14	0.00	0.39
OS:MH1	89.03	91.20	88.92	0.00	2.28
OS:MH2	88.85	91.01	88.65	0.00	2.36
OS:MH3	87.71	90.33	87.49	0.00	2.84
SWM2	80.02	82.30	79.61	0.00	2.69
SWM3	79.96	81.53	79.54	0.00	1.99

1 Chicago 3hr_100yr

116132 Kanata North - Northwest Quadrant)
Summary of Hydraulic Grade Line (HGL) Elevations - Scenario 2

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MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)
CB109/CB110	91.71	91.36	90.75	0.00	0.61
CB16/CB15	88.90	89.55	89.04	0.14	0.51
CB86/CB87	89.22	89.87	89.32	0.10	0.55
MH1000	89.87	92.04	89.61	0.00	2.43
MH1002	89.38	92.03	89.15	0.00	2.88
MH1004	87.62	90.25	87.52	0.00	2.73
MH1100	85.76	88.49	85.78	0.03	2.71
MH1102	85.96	88.50	85.83	0.00	2.67
MH1204	86.47	88.79	86.20	0.00	2.59
MH1206	85.73	88.19	85.52	0.00	2.67
MH1208	85.48	88.08	85.25	0.00	2.83
MH1210	85.28	87.60	85.08	0.00	2.52
MH1212	84.86	87.37	84.92	0.06	2.45
MH1214	83.66	86.96	84.21	0.55	2.75
MH1216	83.56	85.15	84.21	0.65	0.94
MH1218	83.46	84.96	84.21	0.75	0.75
MH1220	81.14	84.43	81.77	0.63	2.66
MH1222	80.86	82.81	81.77	0.91	1.04
MH1224	89.59	82.10	81.77	0.00	0.33
MH1300	83.77	87.33	84.65	0.88	2.68
MH1302	83.87	87.53	84.85	0.98	2.68
MH1304	85.13	87.76	84.95	0.00	2.81
MH1306	85.18	87.68	85.05	0.00	2.63
MH1308	85.22	87.85	85.12	0.00	2.73
MH1310	85.29	88.05	85.17	0.00	2.88
MH1312	85.87	88.19	85.62	0.00	2.57
MH1314	86.05	88.15	85.87	0.00	2.28
MH1400	83.45	88.47	84.24	0.79	4.23
MH1402	83.12	87.81	84.22	1.10	3.59
MH1404	82.89	87.38	83.98	1.09	3.40
MH1406	82.46	86.97	83.65	1.19	3.32
MH1408	81.94	85.04	82.84	0.90	2.20
MH1410	81.76	85.04	82.34	0.59	2.70
MH1412	81.43	84.59	81.91	0.48	2.68
MH1500	86.15	88.87	85.90	0.00	2.97
MH1502	83.25	85.28	84.15	0.91	1.13
MH1600	87.93	90.52	87.81	0.00	2.71
MH1602	85.20	88.74	85.14	0.00	3.60
MH1604	83.84	87.36	84.26	0.43	3.10
MH1606	84.15	86.04	84.26	0.12	1.78
MH2000	85.17	88.64	84.87	0.00	3.77
MH2002	83.86	88.21	83.51	0.00	4.70
MH306	86.85	89.17	86.79	0.00	2.38
MH308	86.31	88.97	86.26	0.00	2.71
MH310	85.95	88.26	85.90	0.00	2.36
MH312	85.78	88.28	85.77	0.00	2.51

116132 Kanata North - Northwest Quadrant)
Summary of Hydraulic Grade Line (HGL) Elevations - Scenario 2

NOVATECH
Engineers, Planners & Landscape Architects

MH ID	Obvert Elevation (m)	T/G Elevation (m)	HGL Elevation[1] (m)	Surcharge (m)	Clearance from T/G (m)
MH314	85.58	88.00	85.62	0.05	2.38
MH316	85.51	87.97	85.55	0.04	2.42
MH349	80.23	83.97	81.77	1.54	2.20
MH351	80.89	83.04	81.77	0.88	1.27
MH353	82.50	84.80	82.12	0.00	2.68
MH355	80.13	82.30	79.74	0.00	2.56
mh371	81.19	83.30	81.77	0.58	1.53
MH397	86.99	89.51	86.87	0.00	2.64
MH402	87.18	90.29	86.93	0.00	3.36
MH600	88.05	90.11	87.44	0.00	2.67
MH600B	88.26	90.21	88.12	0.00	2.09
MH602	87.23	89.74	86.97	0.00	2.77
MH604	87.11	89.75	86.81	0.00	2.94
MH606	86.38	89.22	86.31	0.00	2.91
MH608	86.22	88.64	86.14	0.00	2.50
MH610	86.17	88.61	86.10	0.00	2.51
MH612	86.06	88.47	85.97	0.00	2.50
MH614	86.00	88.53	85.91	0.00	2.62
MH616	85.90	88.20	85.81	0.00	2.39
MH618	85.79	88.15	85.72	0.00	2.43
MH620	85.54	88.16	85.67	0.13	2.49
MH702	86.60	89.20	86.42	0.00	2.78
MH704	86.29	88.64	86.31	0.02	2.33
MH800	89.42	91.66	89.30	0.00	2.36
MH802	89.23	91.51	89.16	0.00	2.35
MH804	88.13	90.64	87.99	0.00	2.65
MH806	86.89	89.52	86.62	0.00	2.90
MH808	85.85	88.16	85.89	0.05	2.27
MH900	90.33	92.58	89.52	0.00	3.06
MH902	88.32	91.00	88.16	0.00	2.84
MH904	86.72	89.58	86.91	0.19	2.67
MH906	85.47	88.26	85.49	0.02	2.77
MH908	85.00	87.39	84.75	0.00	2.64
MH910	83.57	85.99	83.21	0.00	2.78
MH912	82.65	85.13	82.43	0.00	2.70
MH914	80.95	83.85	81.77	0.82	2.08
MH918	81.05	82.83	81.77	0.72	1.06
MH920	80.67	82.60	81.77	1.10	0.83
MH937	82.83	86.48	84.21	1.38	2.27
OS:HW1	89.20	89.53	89.14	0.00	0.39
OS:MH1	89.03	91.20	88.92	0.00	2.28
OS:MH2	88.85	91.01	88.65	0.00	2.36
OS:MH3	87.71	90.33	87.49	0.00	2.84
SWM2	80.02	82.30	79.63	0.00	2.67
SWM3	79.96	81.53	79.56	0.00	1.97

[1] Chicago 3hr-100yr

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Scenario 2 - Equivalent Orifice Sizing

Name	Inlet / Outlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Artificial Orific Dia.[1] (m)	5-year Peak Runoff[2] (L/s)	5-year Inlet Capture Rate[3] (L/s)	100 Year Peak Runoff (L/S)	100-year Inlet Capture Rate[3] (L/s)	Required 100-year Storage[4] (m³)
Orifices (Future Development Areas)										
O-SU110B	SU110B	NW-110B	2.58	0.35	0.45	505	440	996	457	180
O-SU118	SU118	NW-118	0.91	0.35	0.29	204	196	402	219	80
O-SU120	SU120	NW-120	2.31	0.35	0.42	452	424	892	474	181
O-SU122	SU122	NW-122	0.25	0.35	0.16	64	62	119	69	23
O-SU123	SU123	NW-123	0.86	0.35	0.26	169	166	335	180	175
O-SU2	SU2	NW-114	0.89	0.35	0.31	247	241	435	270	82
O-SU3	SU3	NW-112	2.58	0.35	0.53	710	641	1259	754	438
O-SU31	SU31	NW-31	0.94	0.35	0.29	209	200	409	221	96
O-SU4	SU4	NW-104B	3.02	0.35	0.49	614	568	1243	627	350
O-SU5	SU5	NW-109	1.98	0.35	0.22	120	116	390	130	210
O-SU90	SU90	NW-90	0.60	0.35	0.22	126	122	259	136	52
O-SU98	SU98	NW-98	0.57	0.35	0.22	122	119	236	132	52
O-SU9	SU9	NW-111	0.79	0.35	0.15	55	52	189	60	72
O-CB16/CB15	MH1202/MH1204	FUT1204/NW-9	3.08	0.35	0.37	347	352		387	185
O-MH429-MH306	304-306	FUT306	2.82	0.35	0.38	354	355		392	169
O-CB109/CB110	CB109/CB110	FUTURE	4.21	0.35	0.43	458	455		496	253

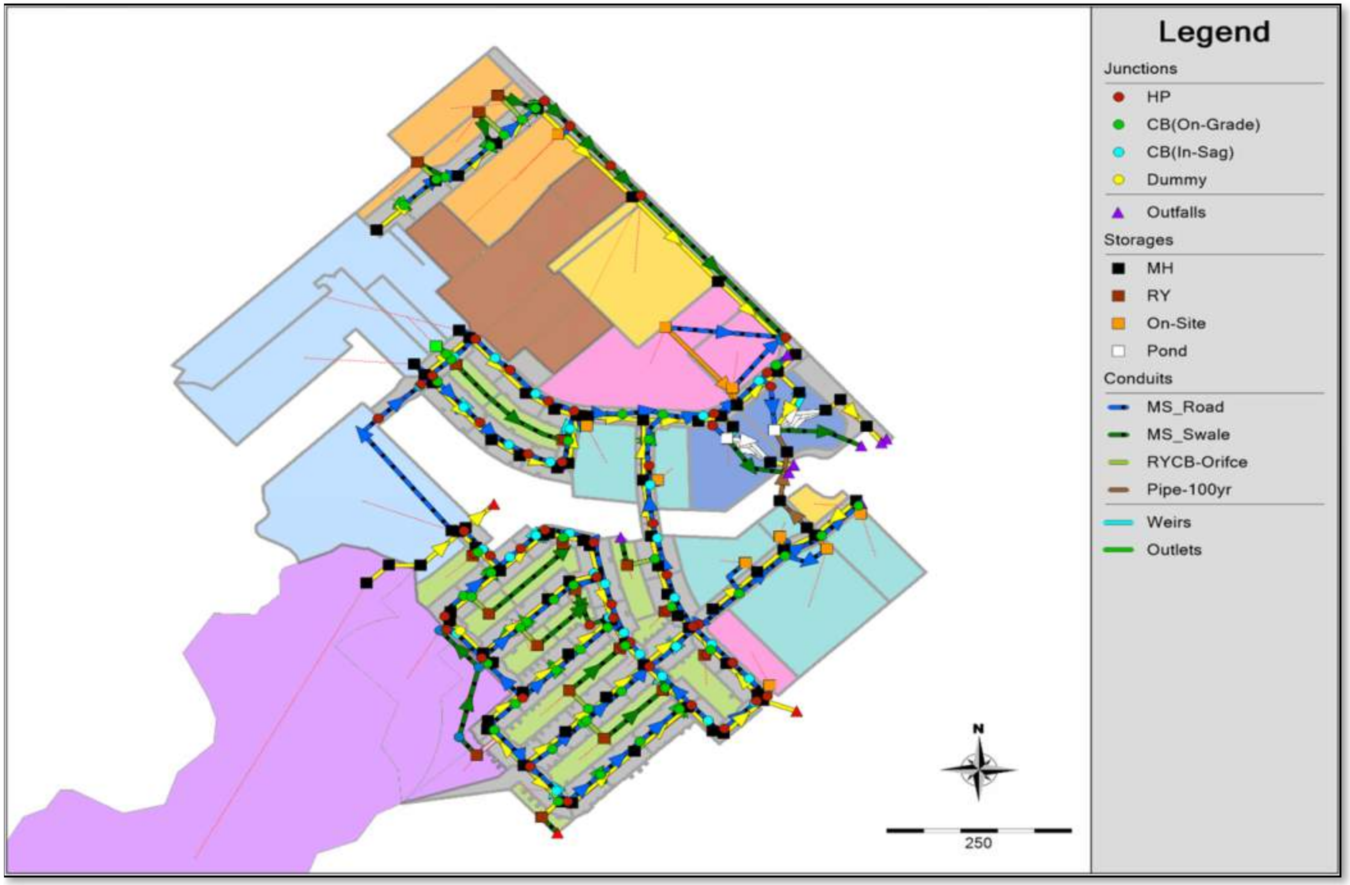
[1] Equivalent orifice diameter corresponding to 5-year peak runoff; based on 1.40m of head (CB T/G - CB Inv.).
[2] Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment.
[3] Inlet capture rate (max. flow through orifice) based on 1.40m of head (CB T/G - CB Inv.) for 5-year & 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.
[4] Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.

Scenario 1 - Equivalent Orifice Sizing for Existing St. Isidore Church (DME, 2010)

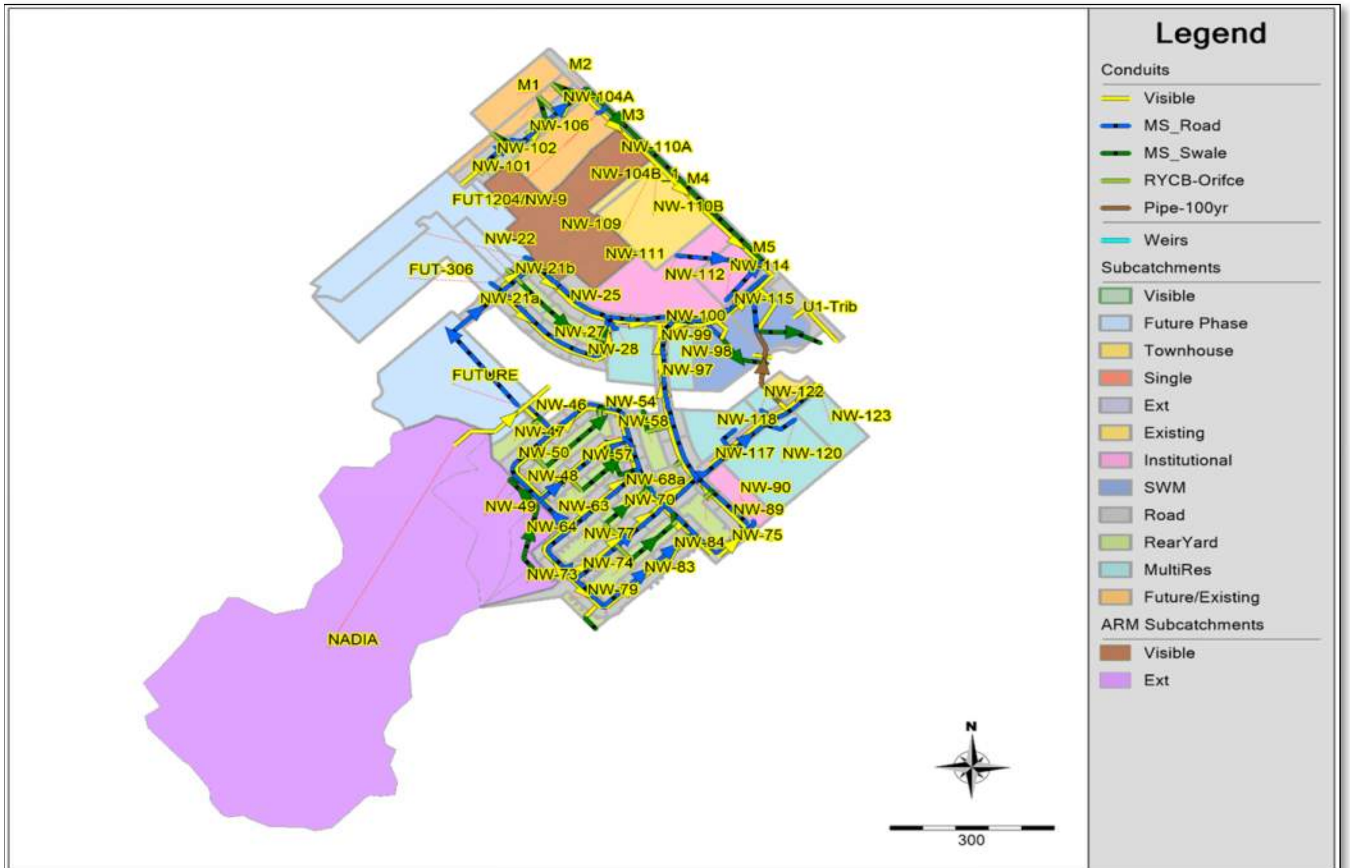
Name	Inlet / Outlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Artificial Orific Dia.[1] (m)	5-year Peak Runoff[2] (L/s)	Target 100-year Release Rate[1] (L/s)	100-year Inlet Capture Rate[3] (L/s)	Required 100-year Storage[4] (m³)
OR-SU-104B-1	SU-104B-1	NW-104B-1	1.75	0.35	0.265	125	189	189	40

[1] Equivalent orifice diameter corresponding to 100-year release rate of 189.3 L/s (per DME, 2010); based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth).
[2] Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment.
[3] Inlet capture rate (max. flow through orifice) based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.
[4] Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.

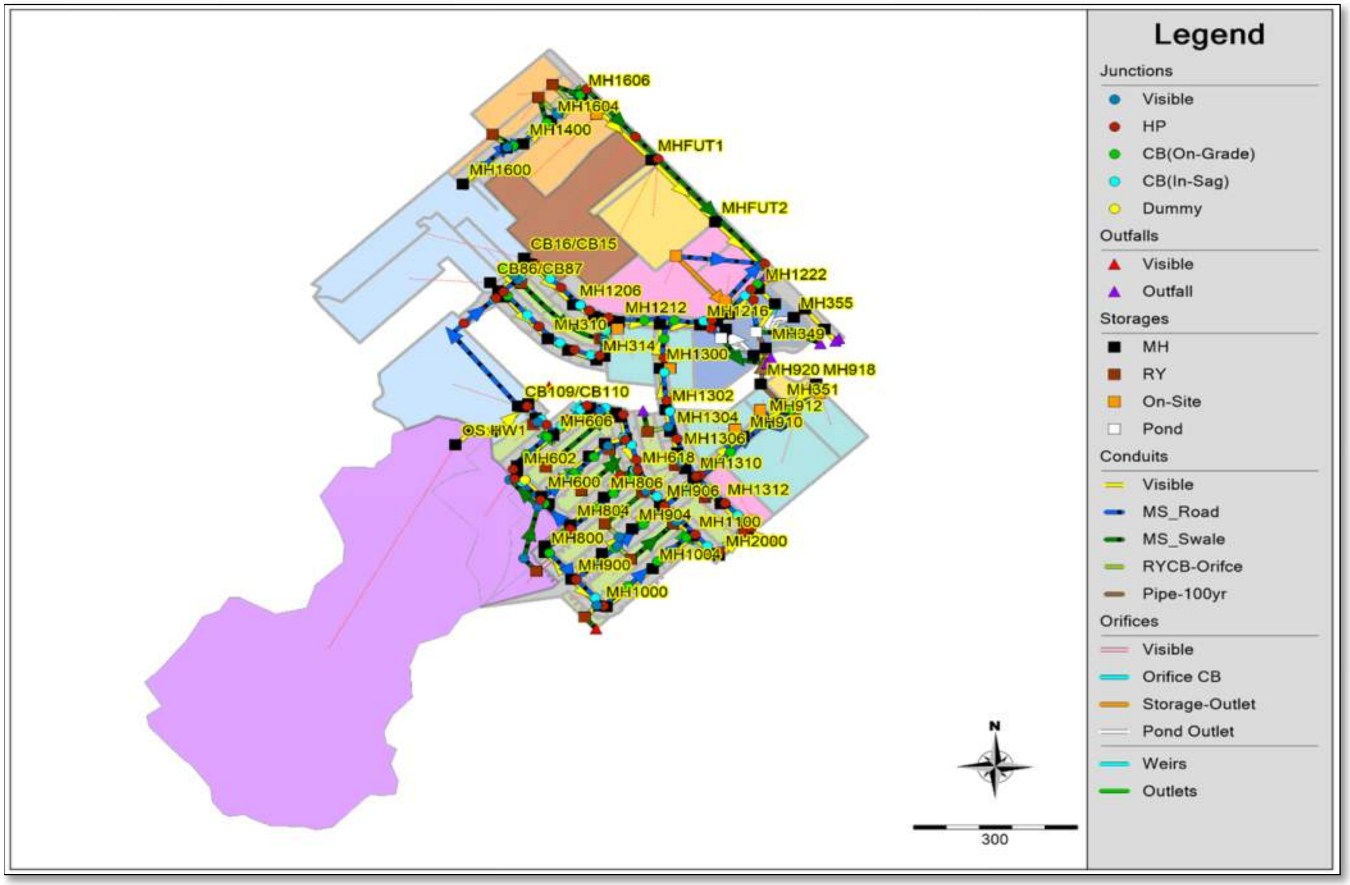
Overall Model Schematic



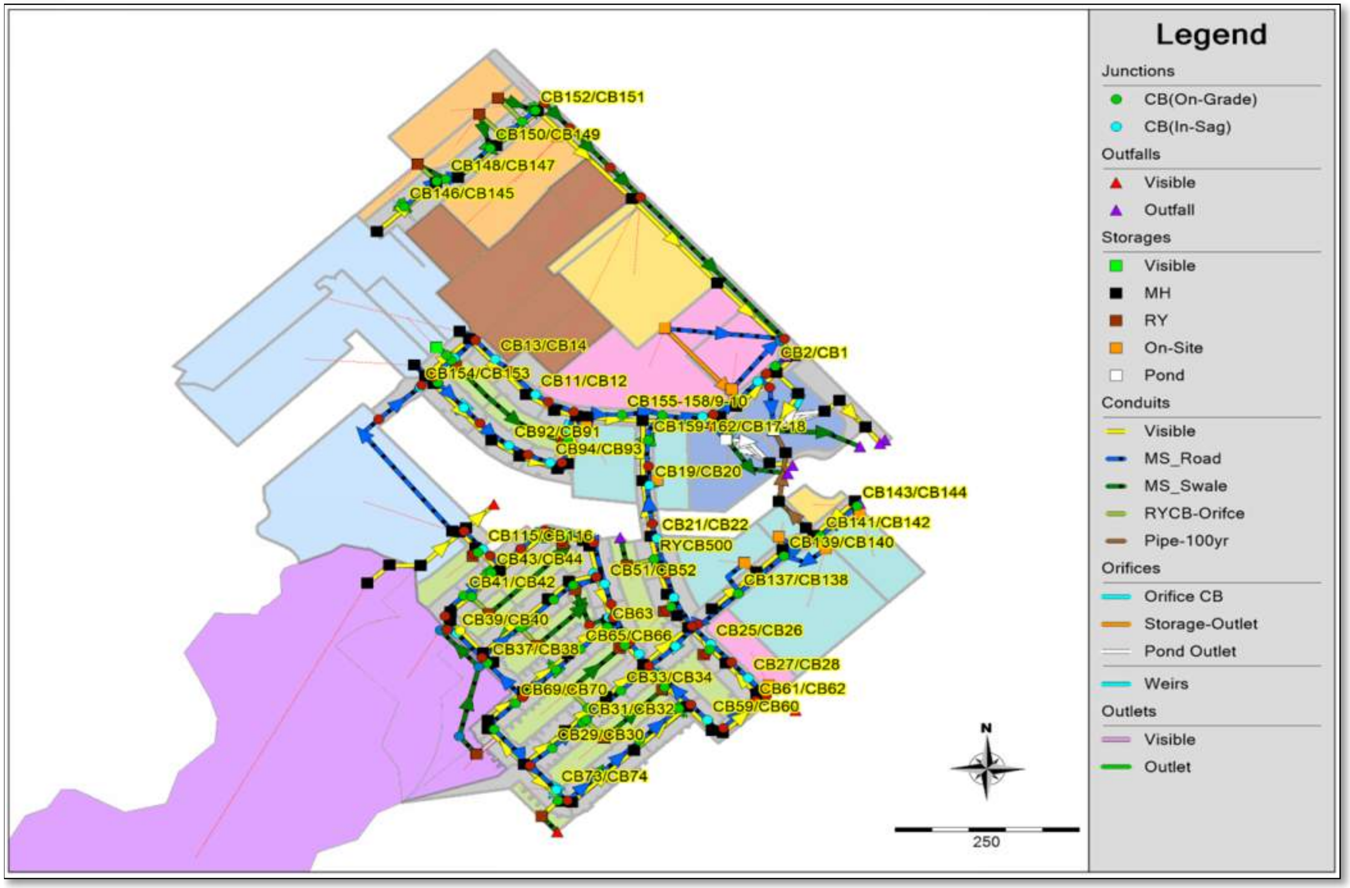
Subcatchments



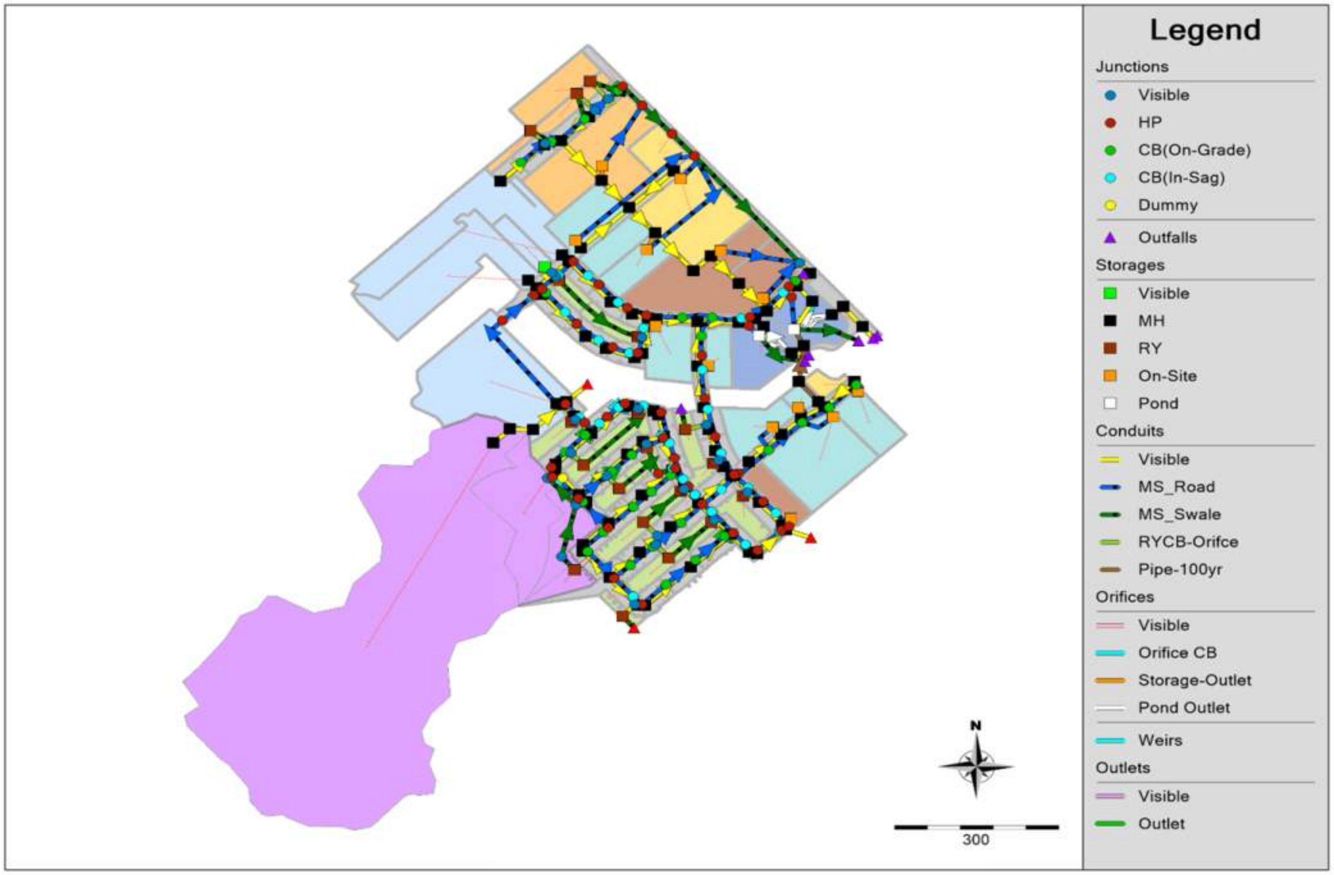
Maintenance Holes



Catchbasins



Overall Model Schematic



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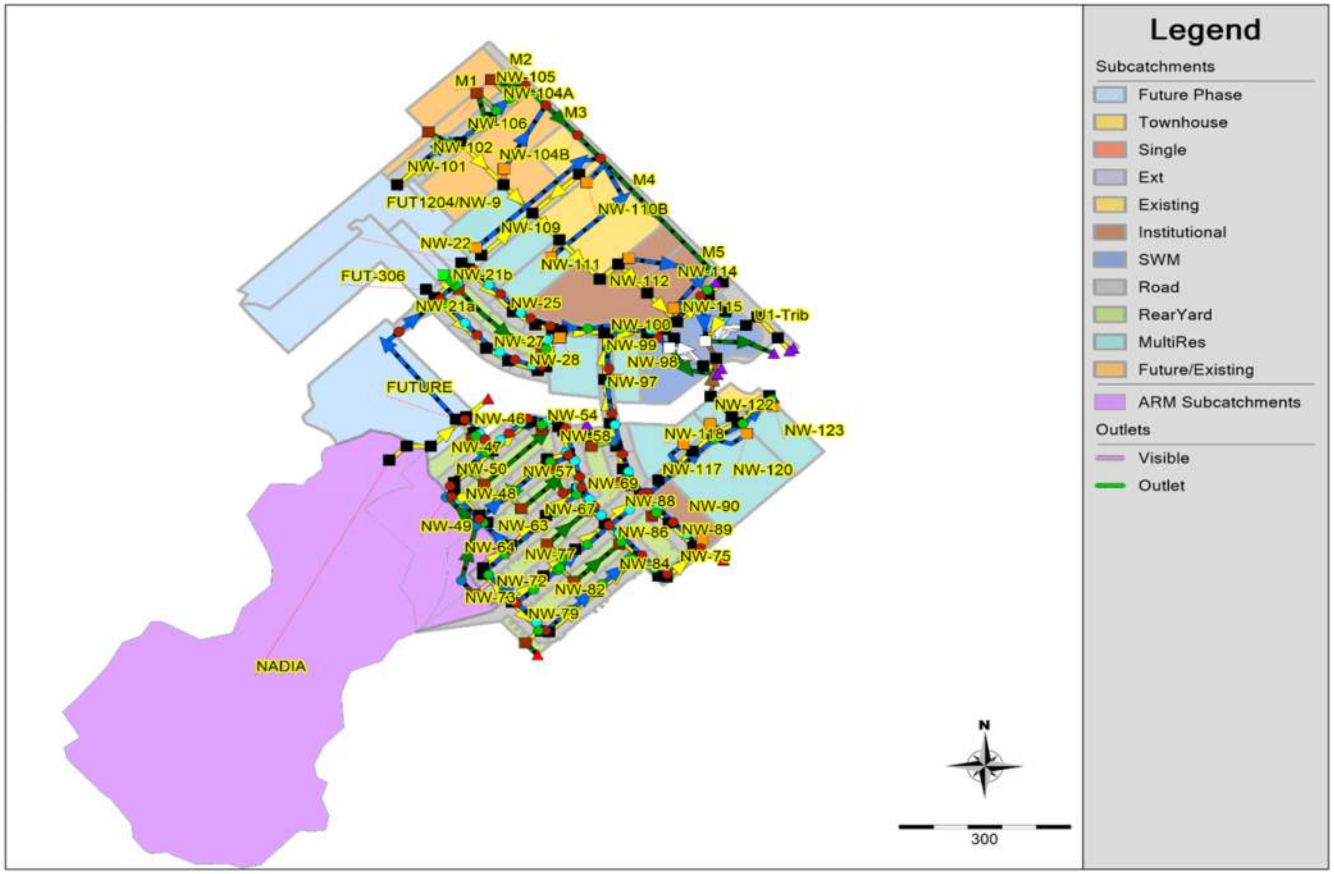
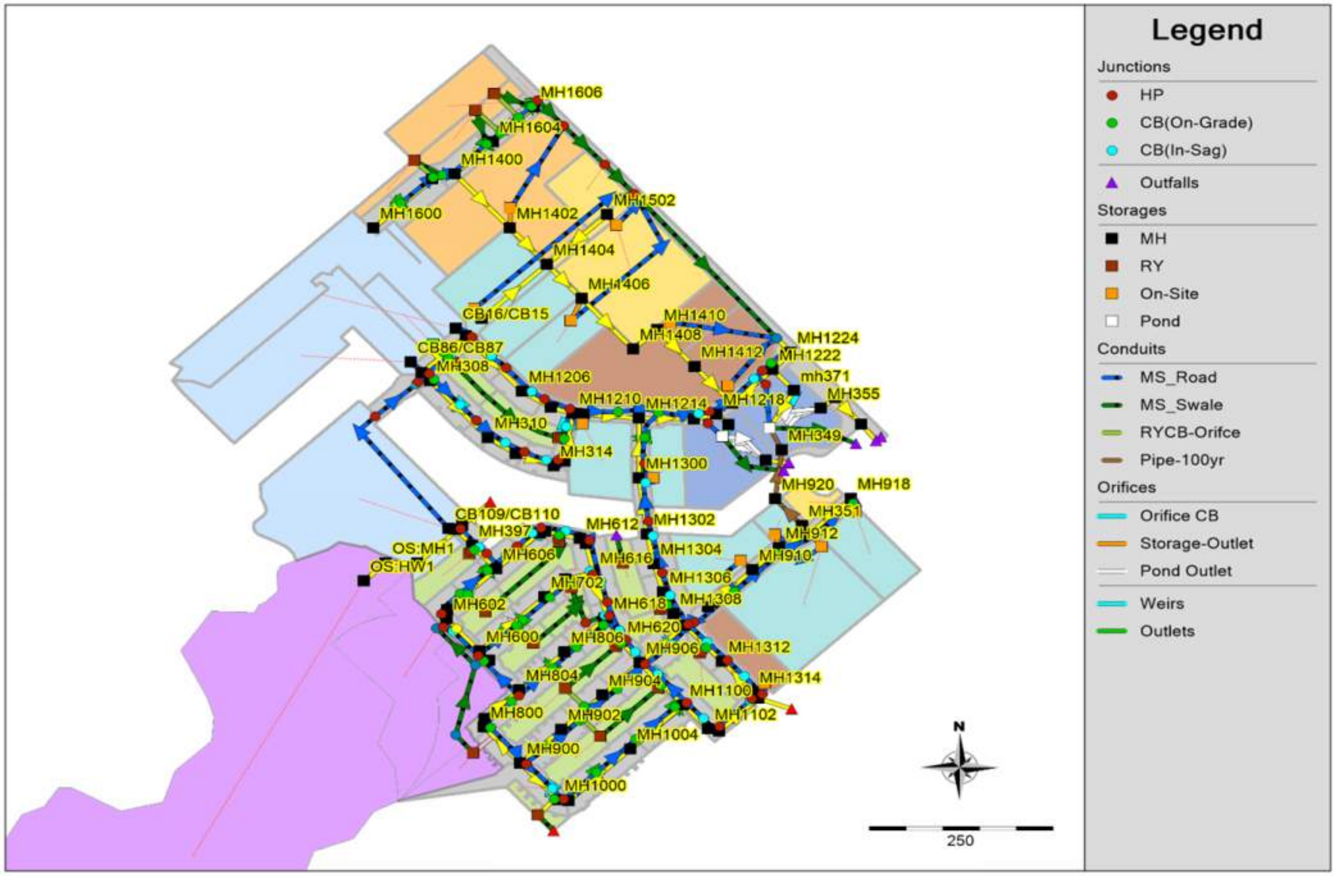
Subcatchments



Maintenance Holes



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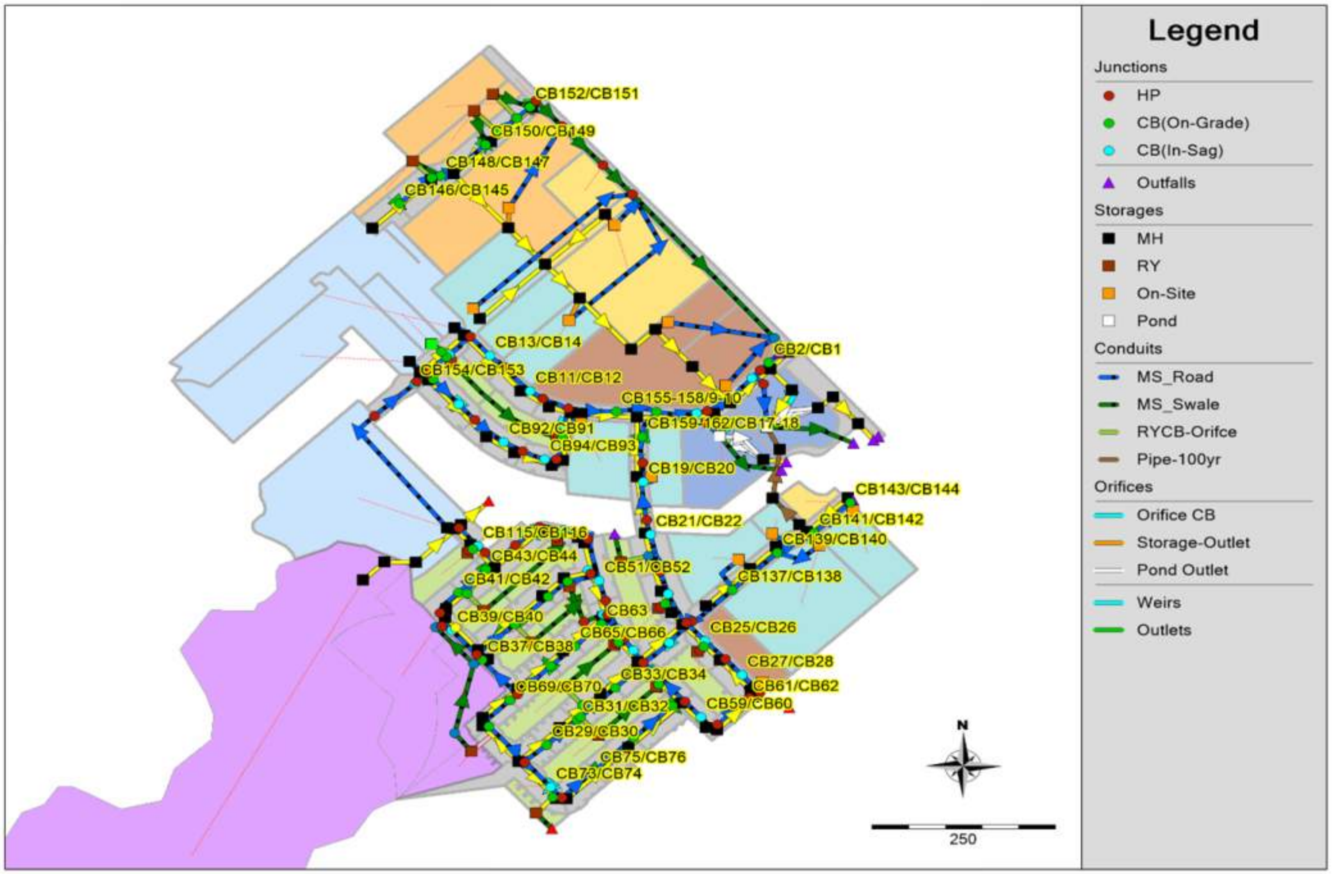

Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
U1-Trib	0.57	518	11	1.5	43	0	0.59
SWM-2	1.08	216	50	1.0	50	90	0.64
SWM-1	1.31	262	50	1.0	50	90	0.64
NW-99	0.13	163	8	1.5	64	50	0.74
NW-98	0.57	74	77	1.5	71	50	0.79
NW-97	0.21	300	7	1.5	60	50	0.72
NW-96	0.40	250	16	3.5	39	90	0.39
NW-95	0.36	171	21	3.0	71	50	0.79
NW-94	0.14	467	3	3.5	33	90	0.38
NW-93	0.39	195	20	3.5	70	50	0.79
NW-92	0.41	241	17	3.0	40	90	0.39
NW-91	0.22	220	10	3.0	59	50	0.71
NW-90	0.60	200	30	1.5	64	50	0.74
NW-89	0.24	114	21	3.5	59	50	0.71
NW-88	0.33	165	20	4.0	76	50	0.83
NW-87	0.36	212	17	4.5	37	90	0.39
NW-86	0.32	160	20	4.0	61	50	0.72
NW-85	0.19	106	18	4.0	50	50	0.65
NW-84	0.33	183	18	5.0	71	50	0.79
NW-83	0.33	183	18	5.0	71	50	0.79
NW-82	0.32	200	16	4.5	39	90	0.39
NW-81	0.27	150	18	4.5	71	50	0.79
NW-80	0.16	533	3	1.5	36	90	0.39
NW-79	0.51	283	18	5.0	31	50	0.51
NW-78	0.36	171	21	5.0	74	50	0.81
NW-77	0.35	206	17	4.5	43	90	0.40
NW-76	0.29	138	21	5.0	74	50	0.81
NW-75	0.12	150	8	1.5	44	50	0.60
NW-74	0.16	76	21	4.5	79	50	0.85
NW-72	0.21	117	18	5.0	60	50	0.72

Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-71	0.21	105	20	4.5	64	50	0.74
NW-70	0.30	188	16	5.0	41	90	0.40
NW-69	0.19	475	4	4.0	67	50	0.77
NW-68b	0.15	107	14	5.0	60	50	0.72
NW-68a	0.10	56	18	5.5	71	50	0.79
NW-67	0.21	111	19	5.5	73	50	0.81
NW-66	0.27	159	17	4.0	40	90	0.39
NW-65	0.29	153	19	5.0	73	50	0.81
NW-63	0.14	467	3	1.5	54	50	0.68
NW-62	0.20	111	18	5.0	69	50	0.78
NW-61	0.40	200	20	4.5	71	50	0.79
NW-60	0.43	239	18	3.5	39	90	0.39
NW-59	0.28	165	17	4.0	39	90	0.39
NW-58	0.22	122	18	5.0	70	50	0.79
NW-57	0.22	129	17	4.5	77	50	0.83
NW-56	0.22	550	4	4.5	73	50	0.81
NW-55	0.31	182	17	4.5	70	50	0.79
NW-54	0.15	115	13	1.5	46	50	0.62
NW-53	0.16	94	17	4.5	74	50	0.81
NW-52	0.26	153	17	4.5	76	50	0.83
NW-51	0.25	147	17	3.5	41	90	0.40
NW-50	0.19	475	4	3.5	79	50	0.85
NW-48	0.17	243	7	1.5	53	50	0.67
NW-47	0.32	200	16	3.0	37	90	0.38
NW-46	0.16	80	20	1.5	60	50	0.71
NW-32	0.26	371	7	1.5	67	50	0.77
NW-31	0.94	199	47	1.5	71	50	0.79
NW-30	0.39	229	17	4.5	40	90	0.39
NW-29	0.27	129	21	3.5	70	50	0.79
NW-28	0.24	141	17	3.5	74	50	0.81

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-27	0.36	212	17	3.0	77	50	0.83
NW-26b	0.38	224	17	4.5	74	50	0.81
NW-26a	0.03	15	20	1.5	64	50	0.74
NW-25	0.27	126	21	3.5	74	50	0.81
NW-24	0.40	116	35	4.0	74	50	0.81
NW-23	0.25	147	17	4.5	41	90	0.40
NW-22	0.44	220	20	1.5	64	25	0.74
NW-21b	0.24	218	11	1.5	51	50	0.65
NW-21a	0.21	26	82	1.5	59	50	0.70
NW-125	0.24	13	183	1.5	93	25	0.94
NW-124	0.16	533	3	1.5	71	50	0.79
NW-123	0.86	123	70	1.5	64	50	0.74
NW-122	0.25	83	30	1.5	81	50	0.86
NW-121	0.14	467	3	1.5	71	50	0.79
NW-120	2.31	308	75	1.5	64	50	0.74
NW-119	0.20	500	4	1.5	71	50	0.79
NW-118	0.91	228	40	1.5	71	50	0.79
NW-117	0.16	267	6	1.5	71	50	0.79
NW-116	0.04	67	6	1.5	73	50	0.81
NW-115	0.23	329	7	1.5	60	50	0.72
NW-114	0.89	178	50	1.5	93	50	0.94
NW-113	0.18	200	9	1.5	61	50	0.72
NW-112	2.58	430	60	1.0	93	50	0.94
NW-110B	2.57	343	75	1.5	64	50	0.74
NW-107	0.31	207	15	1.5	64	90	0.48
NW-106	0.28	140	20	1.5	64	25	0.74
NW-105	0.18	138	13	1.5	64	90	0.48
NW-104B_4	1.75	219	80	1.0	21	50	0.31
NW-104A	0.31	155	20	1.5	64	25	0.74
NW-103	0.17	243	7	1.5	64	90	0.48

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-102	0.35	175	20	1.5	64	25	0.74
NW-101	0.20	105	19	1.5	64	25	0.74
NW-100	0.07	35	20	1.5	74	50	0.81
M5	0.34	567	6	1.5	64	0	0.74
M4	0.27	300	9	1.5	64	0	0.74
M3	0.24	343	7	1.5	64	0	0.74
M2	0.20	250	8	1.5	64	0	0.74
M1	0.98	223	44	1.5	50	50	0.64
FUTURE	4.21	957	44	1.5	56	25	0.68
FUT-306	2.82	641	44	1.5	64	25	0.74
FUT1204/NW-9	3.08	700	44	1.5	64	25	0.74

ARM Subcatchments

Name	Area (ha)	Flow Length (m)	Slope (%)	Imperv. (%)	Time of Con. (min)	IA Value (mm)	SCS Curve Number	Runoff Coefficient
NADIA	26.22	1100	2	21.4	85.998	6.6	69	0.58
NW-49	2.46	70	2	21.4	10	6.7	69	0.58
NW-64	0.98	30	3	21.4	10	8	77	0.64
NW-73	0.48	20	1.5	13	10	11.6	64	0.47
NW-109	1.98	125	1	7	10	7.8	79	0.61
NW-110A	0.65	80	1	0	10	8	77	0.56
NW-111	0.63	24	1.5	14	10	8	77	0.61
NW-104B_1	0.62	80	1	64	10	8	77	0.82
NW-104B_3	0.66	60	1	0	10	8	77	0.56

Subcatchment Parameters
Scenario 2

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
U1-Trib	0.57	518	11	1.5	43	0	0.59
SWM-2	1.08	216	50	1.0	50	90	0.64
SWM-1	1.31	262	50	1.0	50	90	0.64
NW-99	0.13	163	8	1.5	64	50	0.74
NW-98	0.57	74	77	1.5	71	50	0.79
NW-97	0.21	300	7	1.5	60	50	0.72
NW-96	0.40	250	16	3.5	39	90	0.39
NW-95	0.36	171	21	3.0	71	50	0.79
NW-94	0.14	467	3	3.5	33	90	0.38
NW-93	0.39	195	20	3.5	70	50	0.79
NW-92	0.41	241	17	3.0	40	90	0.39
NW-91	0.22	220	10	3.0	59	50	0.71
NW-90	0.60	200	30	1.5	64	50	0.74
NW-89	0.24	114	21	3.5	59	50	0.71
NW-88	0.33	165	20	4.0	76	50	0.83
NW-87	0.36	212	17	4.5	37	90	0.38
NW-86	0.32	160	20	4.0	61	50	0.72
NW-85	0.19	106	18	4.0	50	50	0.64
NW-84	0.33	183	18	5.0	71	50	0.79
NW-83	0.33	183	18	5.0	71	50	0.79
NW-82	0.32	200	16	4.5	39	90	0.39
NW-81	0.27	150	18	4.5	71	50	0.79
NW-80	0.16	533	3	1.5	36	90	0.38
NW-79	0.51	283	18	5.0	31	50	0.51
NW-78	0.36	171	21	5.0	74	50	0.81
NW-77	0.35	206	17	4.5	43	90	0.40
NW-76	0.29	138	21	5.0	74	50	0.81
NW-75	0.12	150	8	1.5	44	50	0.60
NW-74	0.16	76	21	4.5	79	50	0.85
NW-72	0.21	117	18	5.0	60	50	0.71

Subcatchment Parameters
Scenario 2

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-71	0.21	105	20	4.5	64	50	0.74
NW-70	0.30	188	16	5.0	41	90	0.39
NW-69	0.19	475	4	4.0	67	50	0.77
NW-68b	0.15	107	14	5.0	60	50	0.72
NW-68a	0.10	56	18	5.5	71	50	0.79
NW-67	0.21	111	19	5.5	73	50	0.81
NW-66	0.27	159	17	4.0	40	90	0.39
NW-65	0.29	153	19	5.0	73	50	0.81
NW-63	0.14	467	3	1.5	54	50	0.67
NW-62	0.20	111	18	5.0	69	50	0.78
NW-61	0.40	200	20	4.5	71	50	0.79
NW-60	0.43	239	18	3.5	39	90	0.39
NW-59	0.28	165	17	4.0	39	90	0.39
NW-58	0.22	122	18	5.0	70	50	0.79
NW-57	0.22	129	17	4.5	77	50	0.83
NW-56	0.22	550	4	4.5	73	50	0.81
NW-55	0.31	182	17	4.5	70	50	0.79
NW-54	0.15	115	13	1.5	46	50	0.62
NW-53	0.16	94	17	4.5	74	50	0.81
NW-52	0.26	153	17	4.5	76	50	0.83
NW-51	0.25	147	17	3.5	41	90	0.39
NW-50	0.19	475	4	3.5	79	50	0.85
NW-48	0.17	243	7	1.5	53	50	0.67
NW-47	0.32	200	16	3.0	37	90	0.38
NW-46	0.16	80	20	1.5	60	50	0.71
NW-32	0.26	371	7	1.5	67	50	0.76
NW-31	0.94	199	47	1.5	71	50	0.79
NW-30	0.39	229	17	4.5	40	90	0.39
NW-29	0.27	129	21	3.5	70	50	0.79
NW-28	0.24	141	17	3.5	74	50	0.81
NW-27	0.36	212	17	3.0	77	50	0.83

Subcatchment Parameters
Scenario 2

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Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-26b	0.38	224	17	4.5	74	50	0.81
NW-26a	0.03	15	20	1.5	64	50	0.74
NW-25	0.27	129	21	3.5	74	50	0.81
NW-24	0.23	115	20	4.0	74	50	0.81
NW-23	0.25	147	17	4.5	41	90	0.39
NW-22	0.44	220	20	1.5	64	25	0.74
NW-21b	0.24	218	11	1.5	51	50	0.65
NW-21a	0.21	26	82	1.5	59	50	0.70
NW-125	0.24	13	183	1.5	93	25	0.94
NW-124	0.16	533	3	1.5	71	50	0.79
NW-123	0.86	123	70	1.5	64	50	0.74
NW-122	0.25	83	30	1.5	81	50	0.86
NW-121	0.14	467	3	1.5	71	50	0.79
NW-120	2.31	308	75	1.5	64	50	0.74
NW-119	0.20	500	4	1.5	71	50	0.79
NW-118	0.91	228	40	1.5	71	50	0.79
NW-117	0.16	267	6	1.5	71	50	0.79
NW-116	0.04	67	6	1.5	73	50	0.81
NW-115	0.23	329	7	1.5	60	50	0.72
NW-114	0.89	178	50	1.5	93	50	0.95
NW-113	0.18	200	9	1.5	61	50	0.72
NW-112	2.58	430	60	1.5	93	50	0.95
NW-111	0.79	263	30	1.5	71	50	0.79
NW-110B	2.58	344	75	1.5	64	50	0.74
NW-110A	0.64	160	40	1.5	0	50	0.27
NW-109	1.98	440	45	1.5	71	50	0.79
NW-107	0.31	207	15	1.5	64	90	0.48
NW-106	0.28	140	20	1.5	64	25	0.74
NW-105	0.18	138	13	1.5	64	90	0.48
NW-104B	3.02	671	45	1.5	64	50	0.48
NW-104A	0.31	155	20	1.5	64	25	0.74

Subcatchment Parameters

Scenario 2

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coef
NW-103	0.17	243	7	1.5	64	90	0.48
NW-102	0.35	175	20	1.5	64	25	0.74
NW-101	0.20	105	19	1.5	64	25	0.74
NW-100	0.07	35	20	1.5	74	50	0.81
M5	0.34	567	6	1.5	64	0	0.74
M4	0.27	300	9	1.5	64	0	0.74
M3	0.24	343	7	1.5	64	0	0.74
M2	0.20	250	8	1.5	64	0	0.74
M1	0.98	223	44	1.5	50	50	0.64
FUTURE	4.21	957	44	1.5	56	25	0.68
FUT-306	2.82	641	44	1.5	64	25	0.74
FUT1204/NW-9	3.08	700	44	1.5	64	25	0.74

ARM Subcatchments

Name	Area (ha)	Flow Length (m)	Slope (%)	Imperv. (%)	Time of Con. (min)	IA Value (mm)	SCS Curve Number	Runoff Coefficient
NADIA	26.22	1100	2	21.4	86	6.6	69	0.60
NW-49	2.46	70	2	21.4	10	6.7	69	0.59
NW-64	0.98	30	3	21.4	10	8.0	77	0.65
NW-73	0.48	20	1.5	13.0	10	11.6	64	0.48

APPENDIX C
Sanitary Collection

SANITARY SEWER DESIGN SHEET
1015 March Road

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
Feb. 1 2022
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 121247
DESIGNED BY : BM
CHECKED BY : DDB
DATE PREPARED : 13-Jan-22
DATE REVISED :

LOCATION					RESIDENTIAL										COMMERCIAL / INSTITUTIONAL / PARK							INFILTRATION			FLOW	PROPOSED SEWER								
					INDIVIDUAL						CUMULATIVE				COMM		INST		PARK															
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi/ Town Units	Mult-Unit Towns	Multi-Unit Apartment	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
Street 10 and March Road Outlet																																		
Street 10	909	911	C1, C2	1.69				42	0.076	1.05	0.076	1.05	3.6	0.89		0.00	0.64	0.64		0.00	0.21	1.69	1.69	0.56	1.65	82.0	250	254.00	DR 35	1.94	86.4	1.71	1.9%	
Street 10	911	913	C3	0.50				28	0.050	0.50	0.126	1.55	3.6	1.46		0.00		0.64		0.00	0.21	0.50	2.19	0.72	2.39	45.3	250	254.00	DR 35	1.94	86.4	1.71	2.8%	
Street 10	913	915	A1	2.44					0.000	0.00	0.126	1.55	3.6	1.46		0.00	2.46	3.10		0.00	1.00	2.46	4.65	1.53	4.00	47.4	250	254.00	DR 35	1.71	81.1	1.60	4.9%	
Street 10	915	917	C4	0.87					0.000	0.00	0.126	1.55	3.6	1.46	0.87	0.87		3.10		0.00	1.29	0.87	5.52	1.82	4.57	75.7	250	254.00	DR 35	1.98	87.3	1.72	5.2%	
Street 10	917	919	A2	2.35					0.000	0.00	0.126	1.55	3.6	1.46	2.33	3.20		3.10		0.00	2.04	2.33	7.85	2.59	6.09	74.9	250	254.00	DR 35	2.15	91.0	1.80	6.7%	
Street 10	919	548		0.00					0.000	0.00	0.126	1.55	3.6	1.46		3.20		3.10		0.00	2.04	0.00	7.85	2.59	6.09	18.1	250	254.00	DR 35	1.20	68.0	1.34	9.0%	
Total Flows														**1.46**							**2.04**			**2.59**	**6.09**									

Notes:
1. Q(d) = Qr(p) + Q(i) + Qc(p)
2. Q(i) = 0.33 L/sec/ha
3. Qr(p) = (PxqxM/86,400)
3. Qc(p) = (A*q*Pf)/86,400

*Assumes Block 309 to have five (5) proposed apartment building with 14 units each
**Assumes 1055 March Rd to be of commercial usage in future

Definitions:
Q(d) = Design Flow (L/sec)
Qr(p) = Population Flow (L/sec), Residential
Q(i) = Extraneous Flow (L/sec)
Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.7 persons per multi-unit townhouse unit, 1.8 persons per multi-unit apartment)
q = Average per capita flow = 280 L/cap/day - Residential
q = Average per gross ha. flow = 35000 L/gross ha/day - Light industrial
q = Average per gross ha. flow = 28000 L/gross ha/day - Commercial/Institutional
q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
M = Harmon Formula (maximum of 4.0), K = Correction Factor = 0.8
Min pipe size 200mm @ min. slope 0.32%
Mannings n = 0.013
Pf = Peak factor (Commercial/Institional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)

SANITARY SEWER DESIGN SHEET
1053, 1075 and 1145 March Road
Copperwood Estate c/w Servicing Strategy for Future / Existing Lands

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 116132
DESIGNED BY : MM/SAZ
CHECKED BY : DDB
DATE PREPARED : 6-Jun-18
DATE REVISED : 8-May-19
DATE REVISED : 20-Apr-20
DATE REVISED : 23-Dec-01

LOCATION					RESIDENTIAL										COMMERCIAL / INSTITUTIONAL / PARK							INFILTRATION			FLOW	PROPOSED SEWER								
					INDIVIDUAL						CUMULATIVE				COMM		INST		PARK															
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi/ Town Units	Mult-Unit Towns	Multi-Unit Apartment	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D_{full}
Outlet 2 - Street 10 and March Road																																		
Street 10	909	911	A1	1.60			37	37	0.167	1.60	0.167	1.60	3.5	1.91		0.00		0.00		0.00	0.00	1.60	1.60	0.53	2.44	82.0	200	203.20	DR 35	1.94	47.7	1.47	5.1%	
Street 10	911	913	A2	3.88					0.000	0.11	0.167	1.71	3.5	1.91		0.00	3.77	3.77		0.00	1.22	3.88	5.48	1.81	4.94	45.3	200	203.20	DR 35	1.94	47.7	1.47	10.4%	
Street 10	913	915	A3	0.11					0.000	0.11	0.167	1.82	3.5	1.91		0.00		3.77		0.00	1.22	0.11	5.59	1.84	4.98	47.4	200	203.20	DR 35	1.71	44.7	1.38	11.1%	
Street 10	915	917	A4	0.18					0.000	0.18	0.167	2.00	3.5	1.91		0.00		3.77		0.00	1.22	0.18	5.77	1.90	5.04	75.7	200	203.20	DR 35	1.98	48.1	1.48	10.5%	
Street 10	917	919	A5	1.22					0.000	0.20	0.167	2.20	3.5	1.91	1.02	1.02		3.77		0.00	1.55	1.22	6.99	2.31	5.77	74.9	200	203.20	DR 35	2.15	50.2	1.55	11.5%	
Total Flows - Outlet 2														1.91							1.55			2.31	5.77									

Notes:
1. Q(d) = Qr(p) + Q(i) + Qc(p)
2. Q(i) = 0.33 L/sec/ha
3. Qr(p) = (PxqxM/86,400)
3. Qc(p) = (A*q*Pf)/86,400

*Assumes existing single lot along roadway will ultimately become 2 single units.
**Assumes north half of property is 50% towns and 50% singles at same density as CU lands (25 singles/ha, 47 towns/ha), south half of property assumed to be multi unit residential at same density as CU lands (62.8units/ha).

Definitions:
Q(d) = Design Flow (L/sec)
Qr(p) = Population Flow (L/sec), Residential
Q(i) = Extraneous Flow (L/sec)
Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.7 persons per multi-unit townhouse unit, 1.8 persons per multi-unit apartment)
q = Average per capita flow = 280 L/cap/day - Residential
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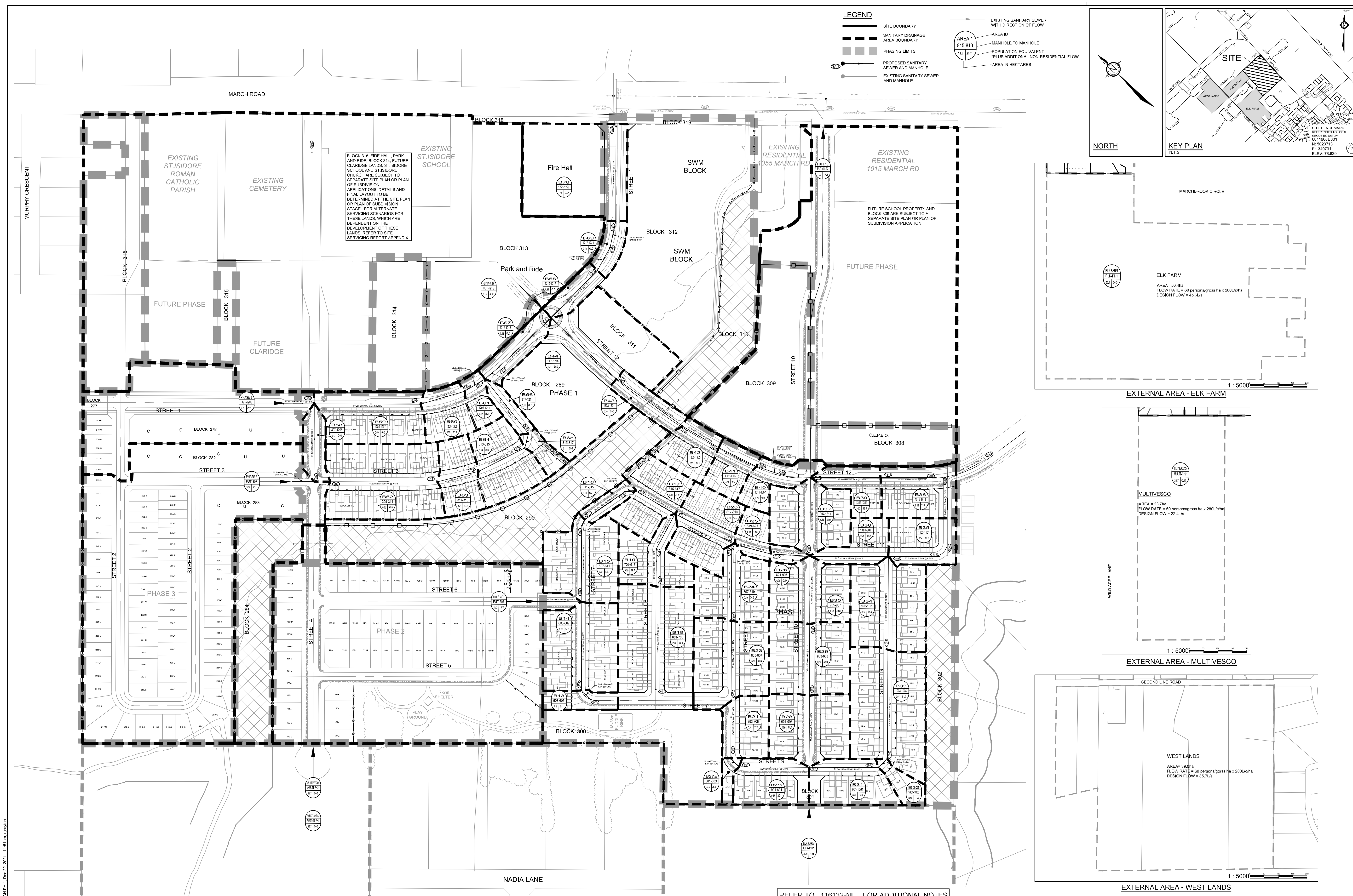
q = Average per gross ha. flow = 28000 L/gross ha/day - Commercial/Institutional
q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
M = Harmon Formula (maximum of 4.0), K = Correction Factor = 0.8
Min pipe size 200mm @ min. slope 0.32%
Mannings n = 0.013
Pf = Peak factor (Commercial/Institional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)



REFER TO 116132-NL FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PRELIMINARY NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
5.	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP
4.	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP
3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP
2.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP
1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP

SCALE 1:1500

DESIGN TJM
CHECKED SAZ
DRAWN MTM
CHECKED SAZ
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.A.N. ZORGEL 100191487 Dec 23/21 PROVINCE OF ONTARIO

CITY OF OTTAWA
COPPERWOOD ESTATE
1053, 1075 AND 1145 MARCH ROAD

DRAWING NAME
SANITARY DRAINAGE AREA PLAN
PHASE 1

PROJECT No. 116132-00
REV REV # 5
DRAWING No. 116132-SAN

D07-16-18-0023

#17801

KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

TABLE C-6b:
SANITARY SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION				RESIDENTIAL AREA AND POPULATION										ICI								INFILTRATION				FLOW	PIPE					
									Cumulative					IND			COMM		INST													
Street	From	To	Total	Dwellings		Density (Net ha)		Pop.	Residential			Peak	Peak	Area	Accu.	Peak	Area	Accu.	Area	Accu.	Peak	Total	Accu. Area		Infiltration	Total	Dia	Dia	Slope	Velocity	Capacity	Ratio
	Node	Node	Area	SFH	SD/TH	Low[3]	High[4]		Area	Pop. New	Pop. Exist	Factor	Flow		Area	Factor		Area		Area	Flow	Area	New	Exist	Flow	Flow	Act	Nom		(Full)	(Full)	Q/Qfull
			(ha)	3.4	2.7	101	161		(ha)	New	Exist		(l/s)	(ha)	(ha)		(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)		(l/s)	(l/s)	(mm)	(mm)	(%)	(m/s)	(l/s)	(%)
				pers/ea	pers/ea	pers/ha	per/ha																									
EAST KNCDP																																
E-1	E-1	E-3	4.47			3.00		303.0	3.00	**303**		4.00	4.9								0.0	4.47	4.47		1.3	6.2	203	200	0.40	0.67	21.6	28%
E-2	E-2	E-3	5.91			4.29		433.3	7.29	**736**		3.88	11.6								0.0	5.91	10.38		2.9	14.5	203	200	0.35	0.62	20.2	72%
E-3	E-3	E-6	9.42			6.51		657.5	13.80	**1394**		3.70	20.9								0.0	9.42	19.80		5.5	26.4	254	250	0.40	0.77	39.2	67%
E-4	E-4	E-5	6.89			3.12	1.36	534.1	3.12	**534**		3.96	8.6								0.0	6.89	6.89		1.9	10.5	203	200	1.00	1.05	34.2	31%
E-5	E-5	E-9	4.70			1.46		147.5	4.58	**682**		3.90	10.8						**2.29**	2.29	2.0	4.70	11.59		3.2	16.0	203	200	0.35	0.62	20.2	79%
E-6	E-6	E-9	3.28			2.32		234.3	16.12	**1628**		3.65	24.1								0.0	3.28	23.08		6.5	30.6	305	300	0.25	0.69	50.4	61%
E-7	E-7	E-8	10.04			7.21		728.2	7.21	**728**		3.88	11.5								0.0	10.04	10.04		2.8	14.3	203	200	0.40	0.67	21.6	66%
E-8	E-8	E-9	4.05			2.94		296.9	10.15	**1025**		3.79	15.8								0.0	4.05	14.09		3.9	19.7	254	250	0.30	0.67	33.9	58%
E-9	E-9	*MH 209*	3.98			3.06		309.1	33.91	**3644**		3.37	49.7							2.29	2.0	3.98	52.74		14.8	66.5	381	375	0.22	0.75	85.7	78%
Total Flows From East KNUEA			**52.74**					**3644**	**33.91**	**3644**		**3.37**	**49.7**							**2.29**	**1.99**		**52.74**		**14.77**	**66.49**						
*X-1 (Brookside Subdivision)**		*MH 209*	*32.80*					*2216.1*	*26.04*		*2216*	*3.55*	*18.2*				*6.76*	*6.76*			*2.3*	*32.80*		*32.80*	*11.5*	*32.0*						
				*Population from Novatech #103106 Sanitary Sewer Design Sheet																												
	MH 209	*MH 208*						*0.0*	*59.95*	**3644**	*2216*	*3.18*	*63.3*					*6.76*		*2.29*	*7.9*	*0.00*	**52.74**	*32.80*	*26.2*	*97.4*	457	450	0.20	0.81	132.9	73%
	MH 208	*MH 207*						*0.0*	*59.95*	**3644**	*2216*	*3.18*	*63.3*					*6.76*		*2.29*	*7.9*	*0.00*	**52.74**	*32.80*	*26.2*	*97.4*	457	450	0.20	0.81	132.9	73%
X-2 (Brookside Subdivision)	*MH 207*	*MH 206*	*3.12*		*44*			*118.8*	*63.07*	**3644**	*2335*	*3.17*	*64.0*					*6.76*		*2.29*	*7.9*	*3.12*	**52.74**	*35.92*	*27.3*	*99.2*	*457*	*450*	*0.20*	*0.81*	*132.9*	*75%*
*X-3 (Brookside Subdivision)***	*MH 206*	*MH 205*	*9.81*		*244*			*658.8*	*72.88*	**3644**	*2994*	*3.13*	*67.9*					*6.76*		*2.29*	*7.9*	*9.81*	**52.74**	*45.73*	*30.8*	*106.5*	*457*	*450*	*0.21*	*0.83*	*136.2*	*78%*
				**244 TH units = 107 Units from Novatech #103106 Sanitary Sewer Design Sheet, plus future 137 units North of Klondike and West of Marconi (5.67ha @ 65pers/ha)																												
X-13 (Future Industrial Lands)	Future	*MH 205*	20.99											15.85	15.85	3.6					13.2	20.99	**20.99**		5.9	19.1						
Briar Ridge Pump Station Access Road	*MH 205*	*MH 204*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.20*	*0.81*	*132.9*	*94%*
Briar Ridge Pump Station Access Road	*MH 204*	*MH 203*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.20*	*0.81*	*132.9*	*94%*
Briar Ridge Pump Station Access Road	*MH 203*	*MH 202*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.25*	*0.91*	*148.6*	*85%*
Briar Ridge Pump Station Access Road	*MH 202*	*MH 201A*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.26*	*0.92*	*151.6*	*83%*
Briar Ridge Pump Station Access Road	*MH 201A*	*MH 201*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.25*	*0.91*	*148.6*	*85%*
Briar Ridge Pump Station Access Road	*MH 201*	*MH 200*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.25*	*0.91*	*148.6*	*85%*
Briar Ridge Pump Station Access Road	*MH 200*	*EXMH1*							*72.88*	**3644**	*2994*	*3.13*	*67.9*		*15.85*	*3.6*		*6.76*		*2.29*	*21.1*	*0.00*	**73.73**	*45.73*	*36.6*	*125.6*	*457*	*450*	*0.23*	*0.87*	*142.5*	*88%*
RIDDELL VILLAGE (X-4)***		*EXMH1*	*42.42*					*3100*			*3100*	*3.43*	*24.6*						*2.96*	*2.96*	*1.0*	*42.42*		*42.42*	*14.8*	*40.5*						
				***Population from Novatech #103106 Sanitary Sewer Design Sheet																												
	EXMH1	*EXMH2*							72.88	**3644**	*6094*	*2.97*	*85.6*		*15.85*	*3.6*		*6.76*		*5.25*	*23.6*	*0.00*	**73.73**	*88.15*	*51.5*	*160.8*	*457*	*450*	*0.30*	*0.99*	*162.8*	*99%*
	EXMH2	*EXMH4*							72.88	**3644**	*6094*	*2.97*	*85.6*		*15.85*	*3.6*		*6.76*		*5.25*	*23.6*	*0.00*	**73.73**	*88.15*	*51.5*	*160.8*	*457*	*450*	*0.30*	*0.99*	*162.8*	*99%*
X-14 (Future Industrial Lands east of Marshes Golf Course)	*EXMH4*	*EXMH5*	19.23						72.88	**3644**	*6094*	*2.97*	*85.6*	*19.23*	*35.08*	*3.1*		*6.76*		*5.25*	*35.6*	*19.23*	**92.96**	*88.15*	*56.9*	*178.1*	*457*	*450*	*0.44*	*1.20*	*197.2*	*90%*
	EXMH5	*PS*							72.88	**3644**	*6094*	*2.97*	*85.6*		*35.08*	*3.1*		*6.76*		*5.25*	*35.6*	*0.00*	**92.96**	*88.15*	*56.9*	*178.1*	*457*	*450*	*0.40*	*1.14*	*188.0*	*95%*
Briar Ridge Pump Station									72.88	**3644**	*6094*	2.97	85.6		35.08	3.1		*6.76*		5.25	35.6	0.00	**92.96**	*88.15*	56.9	178.1						
WEST KNUEA / MARCH ROAD																																
W-1	W-1	W-3	7.51			5.14		519.1	5.14	**519**		3.97	8.3								0.0	7.51	7.51		2.1	10.4	203	200	0.40	0.67	21.6	48%
													0.0																			
W-2	W-2	W-3	8.94			2.36		238.4	2.36	**238**		4.00	3.9						**4.32**	4.32	3.8	8.94	8.94		2.5	10.1	203	200	0.35	0.62	20.2	50%
													0.0																			
W-3	W-3	W-4	6.52			1.97	2.16	546.7	11.63	**1304**		3.72	19.7								0.0	6.52	22.97		6.4	26.1	254	250	0.70	1.02	51.9	50%
W-5	W-5	W-6	4.20			2.74		276.7	2.74	**277**		4.00	4.5								0.0	4.20	4.20		1.2	5.7	203	200	0.35	0.62	20.2	28%
W-6	W-6	W-8	4.29			3.04		307.0	5.78	**584**		3.94	9.3								0.0	4.29	8.49		2.4	11.7	203	200	0.35	0.62	20.2	58%
													0.0																			
W-7	W-7	W-8	7.39			4.24		428.2	4.24	**428**		4.00	6.9								0.0	7.39	7.39		2.1	9.0	203	200	1.60	1.33	43.2	21%
W-8	W-8	W-9	2.85			1.02	0.55	191.6	11.59	**1204**		3.75	18.3								0.0	2.85	18.73		5.2	23.5	254	250	0.35	0.72	36.7	64%
W-4	W-4	MR-1	3.10					0.0	23.22	**2508**		3.51	35.6				**0.35**	0.35	**0.83**	5.15	4.8	3.10	26.07		7.3	47.7	254	250	1.00	1.22	62.0	77%
													0.0																			
W-14	W-14	W-15	3.79			0.36		36.4	0.36	**36**		4.00	0.6						**2.89**	2.89	2.5	3.79	3.79		1.1	4.2	203	200	0.35	0.62	20.2	21%
W-15	W-15	W-17	3.17			2.20		222.2	2.56	**259**		4.00	4.2								0.0	3.17	6.96		1.9	6.1	203	200	0.35	0.62	20.2	30%

M:\2012\112117\DATA\Calculations\Sewer Calcs\SAN\SAN Design.xlsx

KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

TABLE C-6b:
SANITARY SEWER DESIGN SHEET

NOVATECH
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LOCATION				RESIDENTIAL AREA AND POPULATION										ICI								INFILTRATION				FLOW	PIPE					
									Cumulative					IND			COMM		INST													
Street	From Node	To Node	Total Area (ha)	Dwellings SFH 3.4	Dwellings SD/TH 2.7	Density (Net ha) Low[3] 101	Density (Net ha) High[4] 161	Pop.	Residential Area (ha)	Pop. New	Pop. Exist	Peak Factor	Peak Flow (l/s)	Area (ha)	Accu. Area (ha)	Peak Factor	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accu. Area New (ha)	Accu. Area Exist	Infiltration Flow (l/s)	Total Flow (l/s)	Dia Act (mm)	Dia Nom (mm)	Slope (%)	Velocity (Full) (m/s)	Capacity (Full) (l/s)	Ratio Q/Qfull (%)
W-16	W-16	W-17	6.55			3.17	1.78	606.8	4.95	607		3.93	9.7								0.0	6.55	6.55		1.8	11.5	203	200	0.35	0.62	20.2	57%
W-17	W-17	MR-1	3.43					0.0	7.51	865		3.84	13.5				3.05	3.05		8.04	9.6	6.48	19.99		5.6	28.7	254	250	0.30	0.67	33.9	84%
MR-1 (MARCH ROAD)	MR-1	MR-2	1.36					0.0	30.73	3373		3.40	46.4					3.40		8.04	9.9	1.36	47.42		13.3	69.6	610	600	0.10	0.69	202.4	34%
W-9	W-9	MR-2	7.17				1.13	181.9	1.13	182		4.00	2.9				1.38	1.38	3.77	3.77	4.5	7.17	25.90		7.3	14.7	203	200	1.20	1.15	37.4	39%
MR-2 (MARCH ROAD)	MR-2	MR-3	1.37					0.0	33.23	3555		3.38	48.7					4.78		11.81	14.4	1.37	74.69		20.9	84.0	610	600	0.10	0.69	202.4	41%
W-10	W-10	W-11	1.53				0.78	125.6	0.78	126		4.00	2.0								0.0	1.53	1.53		0.4	2.5	203	200	0.70	0.88	28.6	9%
W-11	W-11	MR-3	3.55				1.64	264.0	2.42	390		4.00	6.3				1.08	1.08			0.9	3.55	5.08		1.4	8.7	203	200	0.70	0.88	28.6	30%
W-18	W-18	W-19	3.90			1.21	1.82	415.2	3.03	415		4.00	6.7								0.0	3.90	3.90		1.1	7.8	203	200	0.35	0.62	20.2	39%
W-19	W-19	MR-3	9.23					0.0	3.03	415		4.00	6.7				8.83	8.83			7.7	9.23	13.13		3.7	18.1	254	250	0.25	0.61	31.0	58%
MR-3 (MARCH ROAD)	MR-3	MR-4	4.74					0.0	38.68	4360		3.30	58.3				2.06	16.75		11.81	24.8	4.74	97.64		27.3	110.4	610	600	0.10	0.69	202.4	55%
W-12	W-12	X-12	11.62			2.24	6.98	1350.0	9.22	1350		3.71	20.3						2.01	2.01	1.7	11.62	11.62		3.3	25.3	254	250	0.30	0.67	33.9	75%
X-12 (BIDGOOD / HALTON TERRACE)	X-12	MR-4	3.54				0.79	127.2	10.01	1477		3.68	22.0								0.0	3.54	15.16		4.2	26.3	254	250	1.00	1.22	62.0	42%
X-5 (760 & 788 March Road)	X-5	MR-4	1.76				1.76	283.4	1.76	283		4.00	4.6								0.0	1.76	1.76		0.5	5.1						
MR-4 (MARCH ROAD)	MR-4	*MH 186*	4.71					0.0	50.45	6120		3.16	78.4					16.75		13.82	26.5	4.71	119.27		33.4	138.3	610	600	0.10	0.69	202.4	68%
*X-6 (750 March Road, Blue Heron Co-op Homes)**** *	*X-6*	*X-8*	*1.29*		*83*			*224.1*	*1.29*		*224*	*4.00*	*2.1*								*0.0*	*1.29*		*1.29*	*0.5*	*2.5*						
			**** 83 units obtained from Co-op website (http://www.chaseo.ca/member/blue-heron-co-op/)																													
*X-7 (Morgans Grant) ***** *	*X-7*	*X-8*	*48.45*					*3188.0*	*49.74*		*3188*	*3.42*	*25.2*								*0.0*	*48.45*		*49.74*	*17.4*	*42.6*						
			***** Information obtained from JL Richards #24566, Sanitary Design Sheet, July 2012																													
X-8 (Inverary Drive)	*X-8*	*MH 186*	*4.31*	*39*	*49*			*264.9*	*54.05*		*3677*	*3.37*	*28.6*								*0.0*	*4.31*		*54.05*	*18.9*	*47.6*						
Shirley's Brooke Drive	*MH 186*	*MH 184*	*0.00*					*0.0*	*104.50*	6120	*3677*	*2.96*	*98.7*					*16.75*		*13.82*	*26.5*	*0.00*	*119.27*	*54.05*	*52.3*	*177.5*	610	600	0.10	0.69	202.4	88%
X-9 (Mckinley Drive)	*X-9*	*MH 184*	*7.84*		*117*			*315.9*			*316*	*4.00*	*2.9*				*2.73*	*2.73*			*2.4*	*7.84*		*7.84*	*2.7*	*8.0*						
Shirleys Brooke Drive	*MH 184*	*MH 182*	*0.00*					*0.0*	*104.50*	6120	*3993*	*2.95*	*100.4*					*19.48*		*13.82*	*28.9*	*0.00*	*119.27*	*61.89*	*55.1*	*184.4*	610	600	0.10	0.69	202.4	91%
Shirleys Brooke Drive	*MH 182*	*MH 1*	*0.00*					*0.0*	*104.50*	6120	*3993*	*2.95*	*100.4*					*19.48*		*13.82*	*28.9*	*0.00*	*119.27*	*61.89*	*55.1*	*184.4*	610	600	0.10	0.69	202.4	91%
X-10 (Sandhill Road)		*MH 1*	*11.62*	*9*	*60*		*5.32*	*1049.1*	*11.62*		*1049*	*3.79*	*9.2*						*2.11*	*2.11*	*1.8*	*11.62*		*11.62*	*4.1*	*15.1*						
X-11		*MH 1*	*0.87*				*0.87*	*140.1*	*0.87*		*140*	*4.00*	*1.3*								*0.0*	*0.87*		*0.87*	*0.3*	*1.6*						
Briar Ridge Pump Station	*PS*	*MH 1*							72.88	3644	6094	2.97	85.623	0	35.08	3.1	0.00	6.76	0.00	5.25	35.6	0.00	92.96	88.15	56.9	178.1						
EAST MARCH TRUNK	*MH 1*	*EMT*	0.00					0.0	189.87	9764	11276	2.63	172.7		35.08	3.1		26.24		21.18	66.3	0.00	212.23	162.53	116.3	355.3	762	750	0.10	0.80	367.1	97%

DESIGN PARAMETERS

Average Daily Flow (Future)=	350	L/cap/day
Average Daily Flow (Existing)=	200	L/cap/day
Indust/Comm/Inst Flow (Future)=	50000	L/ha/day
Indust/Comm/Inst Flow (Existing)=	20000	L/ha/day
Max Res Peak Factor=	4.00	
Comm/Inst Peak Factor=	1.50	

Industrial Peak Factor= per MOE graph		
Extraneous Flow (Future)=	0.28	L/s/ha
Extraneous Flow (Existing)=	0.35	L/s/ha (Jan 2008 monitored event)
Minimum Velocity=	0.60	m/s
Manning's n=	0.013	

Designed:	Alex McAuley
Checked:	CJR
Dwg. Reference:	112117-SAN1 112117-SAN2

PROJECT:
Kanata North Community Design Plan

CLIENT:
Kanata North Land Owners

Date: May, 2016

Notes:
1. Existing sanitary sewers tributary to, and not receiving flow from the KNUEA Trunk sewer have not been analysed for capacity
2. Existing unit counts obtained from City of Ottawa geoOttawa (2014) parcel counts, unless otherwise indicated
3. Low Density based on (16.6 Singles/net ha * 3.4pers/unit) + (16.5 Towns/net ha * 2.7pers/unit)
4. High Density based on (35.8 Towns/net ha * 2.7pers/unit) + (35.8 Apartments/net ha * 1.8pers/unit)
5. Overall unit counts for the KNCDP are based on Demonstration Plan "A-24", plus 10% to allow for flexibility in unit type distribution

Upgraded Existing Sanitary Sewers

LEGEND

E-2 / E-3 / 3.13 / 0.19	AREA ID; OUTLET AREA; EQUIVALENT POPULATION (THOUSANDS) *PLUS ADDITIONAL NON-RESIDENTIAL FLOW; AREA IN HECTARES
	PROPOSED DRAINAGE AREA
	EXISTING DRAINAGE AREA
	FLOW OUTLET
SANMH 106 / FG = 72.52 / OG = 69.52 / OBV. = 68.22	SAN ID; PRELIMINARY FINISHED GROUND ELEVATION; ORIGINAL GROUND ELEVATION; PRELIMINARY OBVERT ELEVATION
	PROPOSED SANITARY SEWER & FLOW DIRECTION
	EXISING SANITARY SEWER & FLOW DIRECTION
	LANDS TO BE SERVICED AND NOT PART OF STUDY AREA
	LANDS WHICH DO NOT GENERATE SANITARY FLOWS
	INSTIUTIONAL LANDS
	COMMERCIAL LANDS

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
3.	ISSUED WITH DRAFT MASTER SERVICING STUDY	MAY 20/16	JLS
2.	ISSUED WITH DRAFT MASTER SERVICING STUDY	APR 4/16	JLS
1.	ISSUED WITH DRAFT MASTER SERVICING STUDY	FEB 26/16	JLS

SCALE 1:3000

DESIGN ARM / TB
CHECKED ARM
DRAWN TB
CHECKED CJR
APPROVED JLS

FOR REVIEW ONLY

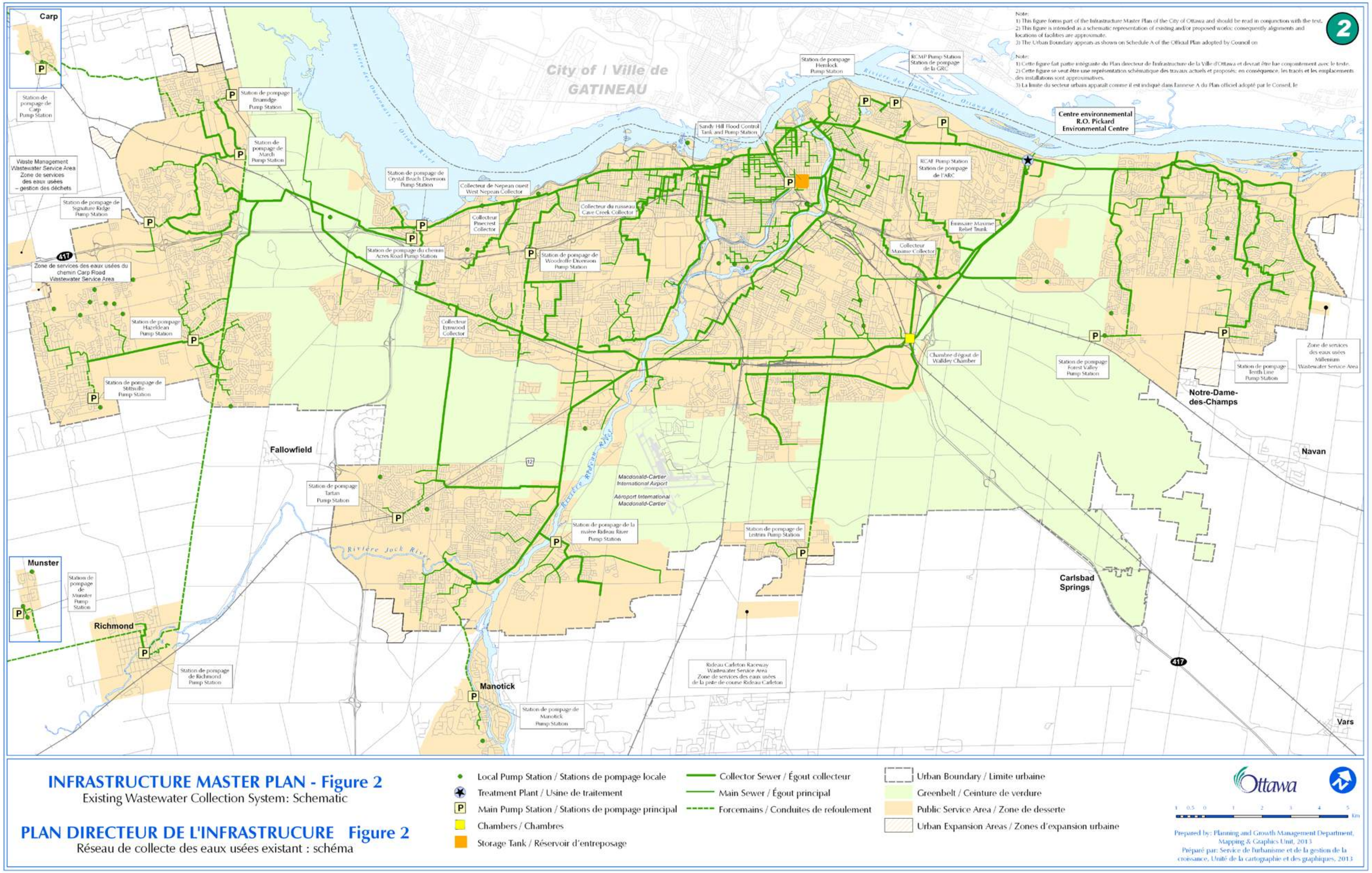
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
ONSITE SANITARY DRAINAGE AREA PLAN

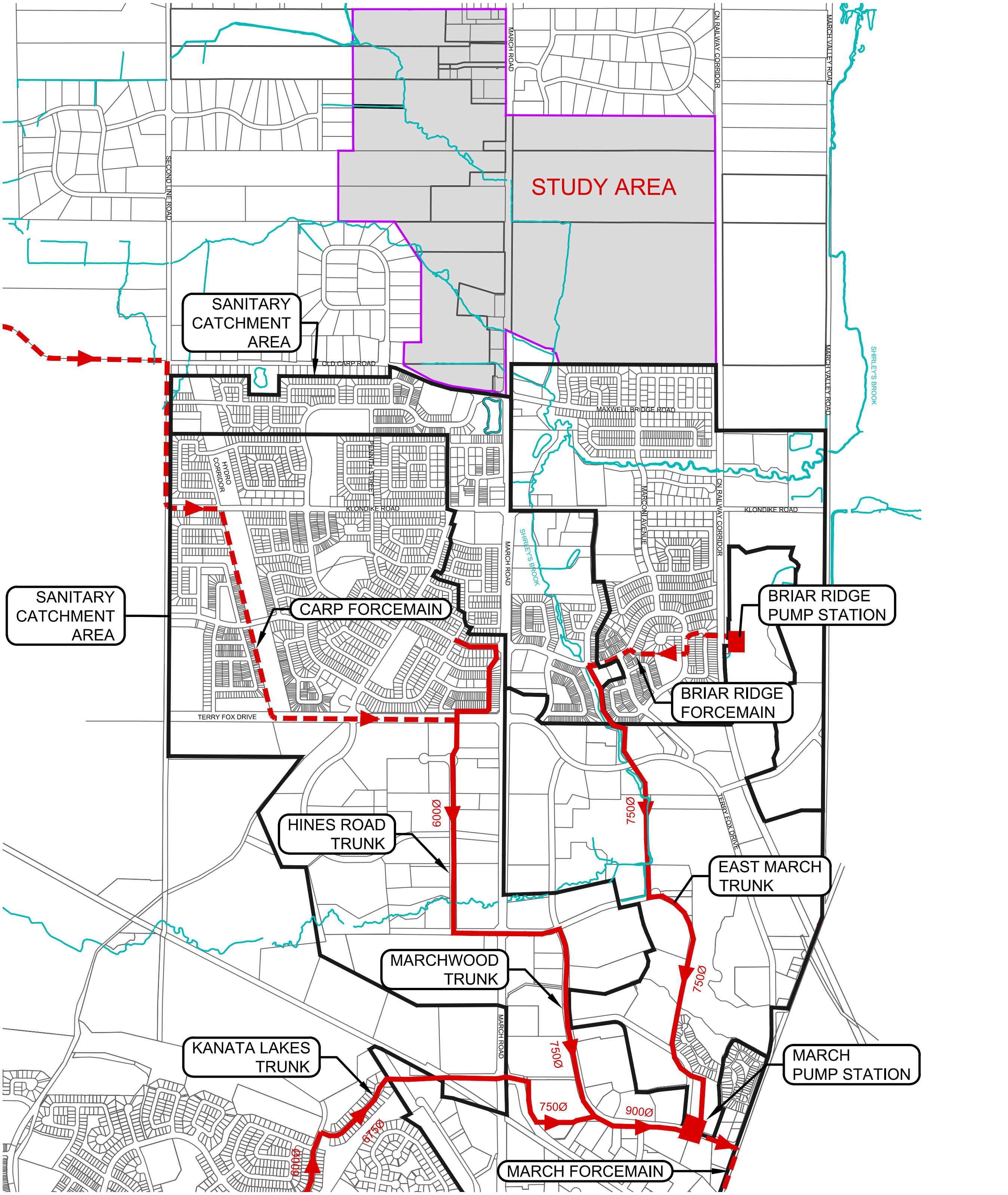
PROJECT No. 112117-04
REV REV # 3
DRAWING No. 112117-SAN1

PLAN81.DWG - 1000mmx707mm



INFRASTRUCTURE MASTER PLAN - Figure 2
Existing Wastewater Collection System: Schematic

PLAN DIRECTEUR DE L'INFRASTRUCURE Figure 2
Réseau de collecte des eaux usées existant : schéma



M:\2012\112117\CAD\Design_MSS\FIGURES\FIGURE 7.1 - WASTEWATER COLLECTION INFRASTRUCTURE.dwg, WW COLL, Feb 24, 2016 - 9:43am, lseely

KANATA NORTH
COMMUNITY DESIGN PLAN

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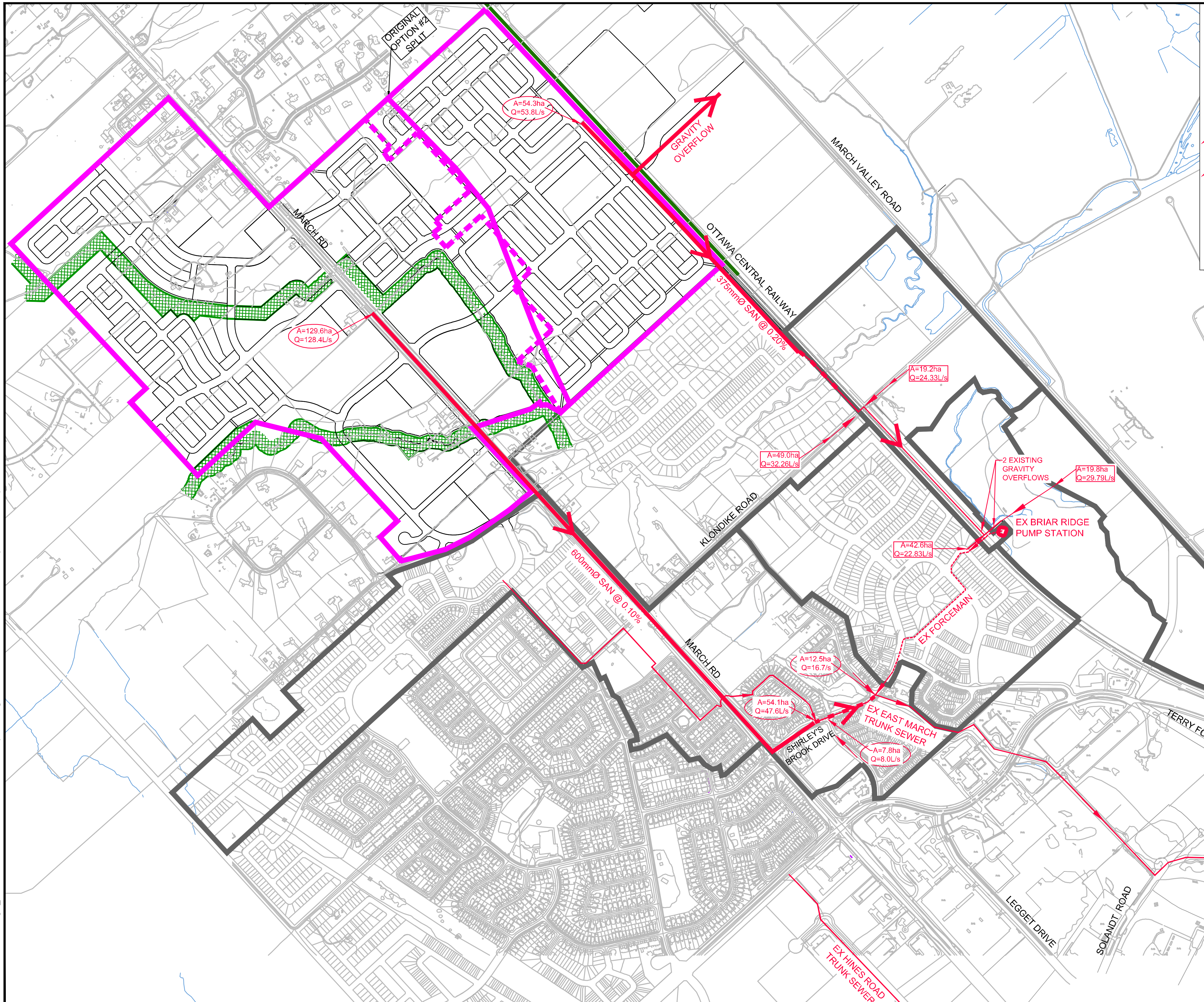
FIGURE NO. 6.2
NORTH KANATA WASTEWATER TRUNK INFRASTRUCTURE

DATE
FEB 2016

JOB
112117

SCALE
N.T.S.

SHT8x11.DWG - 216mmx279mm



M:\2012\112117\CAD\Design_MSS\FIGURES\FIGURE 6.5.1 - 6.5.5 SAN Options.dwg, FIG 6.6.1.1 PREFERRED SAN OPT, May 16, 2016 - 3:22pm, mrehoriak

KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 6.6.1.1
PREFERRED WASTEWATER OPTION #2 - DETAILED

DATE: MAY 2016
JOB: 112117
SCALE: N.T.S.

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SHT11x17.DWG - 279mmx432mm

EAST MARCH TRUNK SANITARY DRAINAGE AREA PLAN

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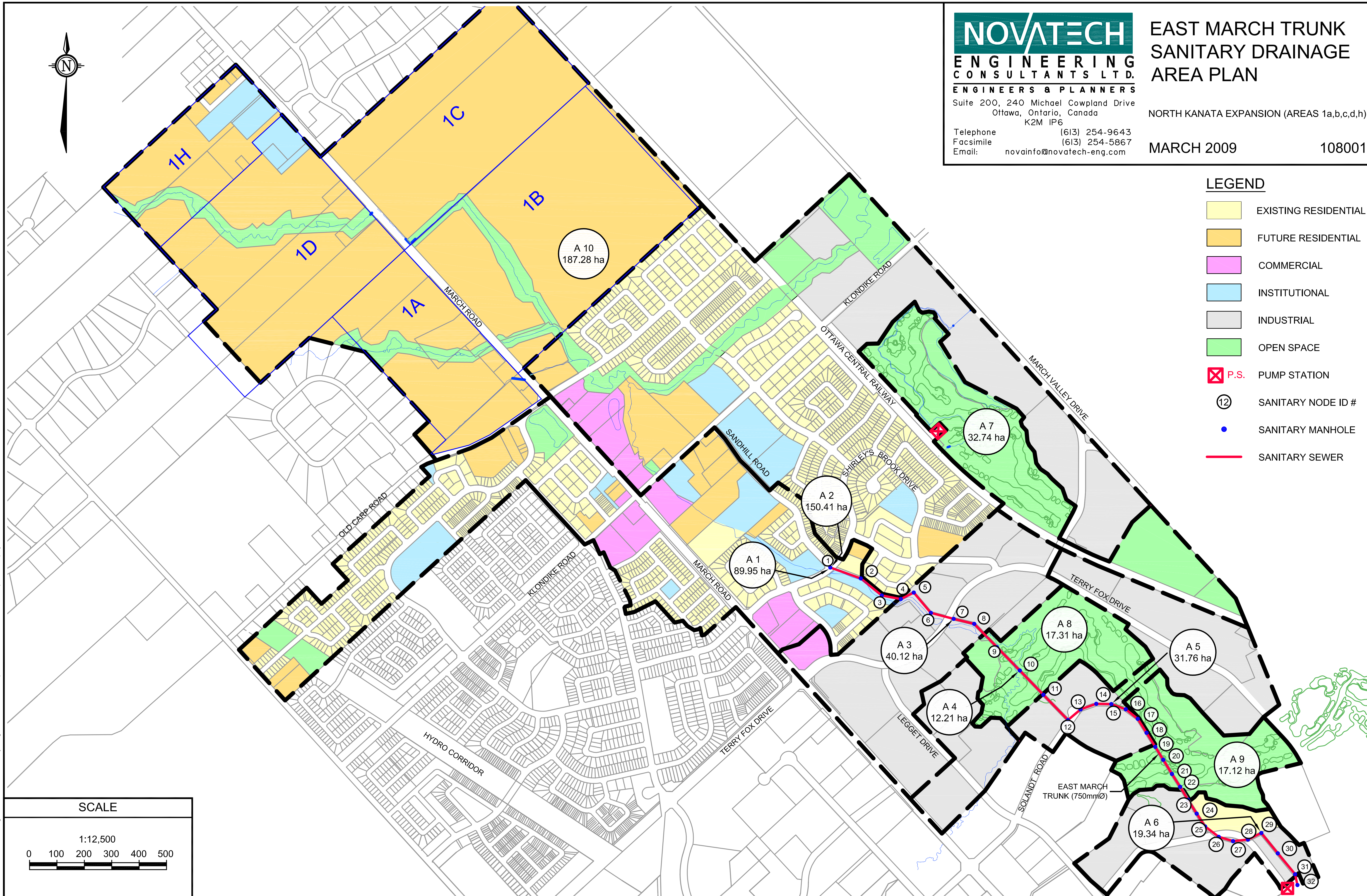
Email: novainfo@novatech-eng.com

NORTH KANATA EXPANSION (AREAS 1a,b,c,d,h)

MARCH 2009 108001



LEGEND

- EXISTING RESIDENTIAL
- FUTURE RESIDENTIAL
- COMMERCIAL
- INSTITUTIONAL
- INDUSTRIAL
- OPEN SPACE
- P.S. PUMP STATION
- 12 SANITARY NODE ID #
- SANITARY MANHOLE
- SANITARY SEWER

SCALE

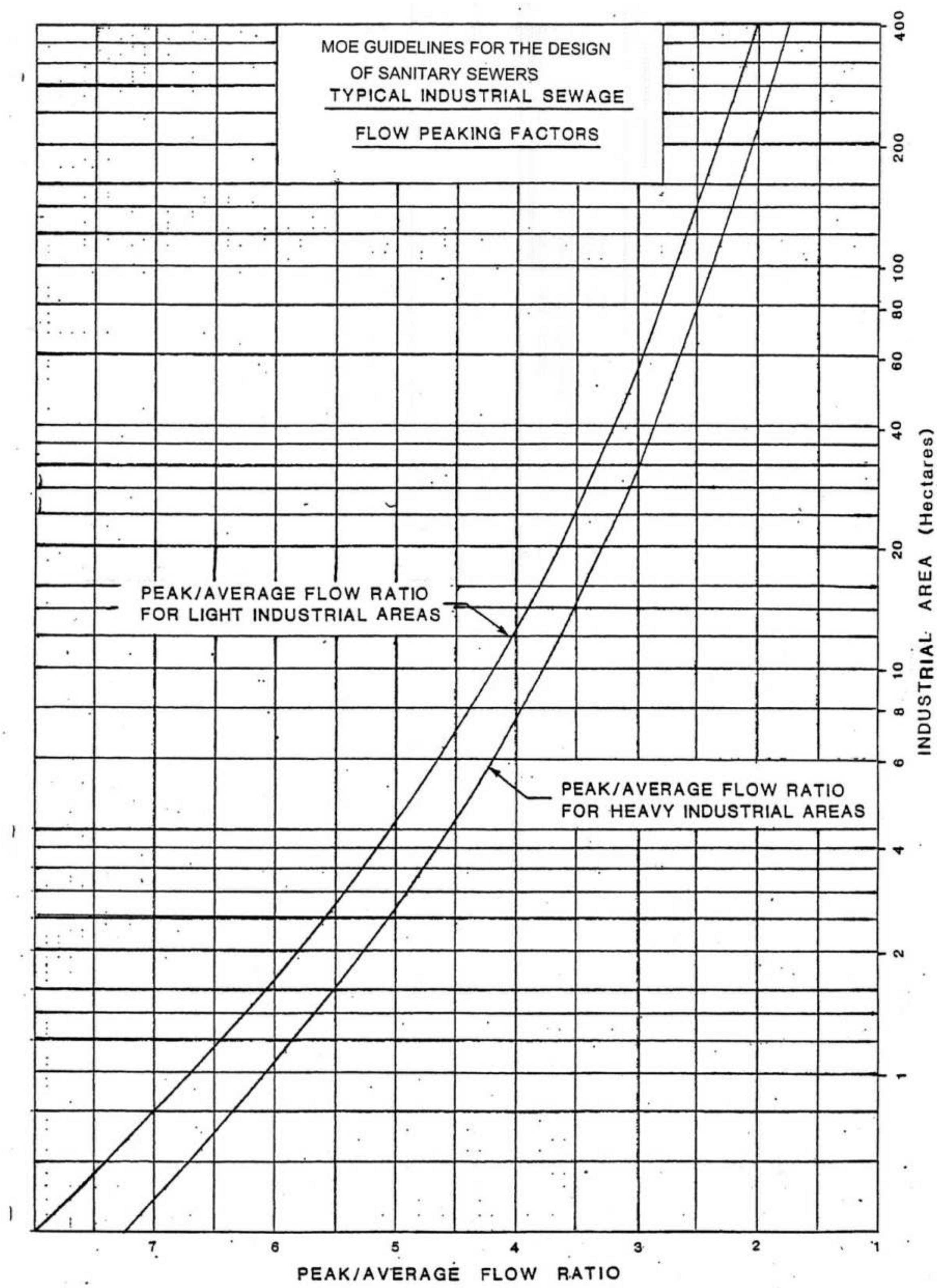
1:12,500

0 100 200 300 400 500

M:\2008\108001\CAD\design\East March Sanitary.dwg, North Kanata Expansion, Mar 18, 2009 - 4:20pm, kmurphy

SHT11X17.DWG - 279mmX432mm

APPENDIX 4-B PEAKING FACTOR FOR INDUSTRIAL AREAS



APPENDIX D
Water Distribution

Boundary Conditions
CU Development

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	796	13.26
Maximum Daily Demand	1,789	29.81
Peak Hour	3,816	63.60
Fire Flow Demand #1	10,020	167.00
Fire Flow Demand #2	13,980	233.00
Fire Flow Demand #3	18,000	300.00

Scenario 1

This scenario considers the design demand from CU development at March Rd Connection. The watermain looping through Minto land is not built. Half of Minto lands are developed with connection from March Rd watermain.

March Rd Connection 1 includes:

- Design demands from CU development,
- Half of the system demands from Minto development: Average Day Demand of 2.93 L/s Residential demand, 0.67 L/s of institutional demands,
- Half of Minto outdoor water demand 1.94 L/s
- System demands on the March Road watermain: 6.30 L/s of Minto & Brigil commercial demands.

Location

Results

Connection 1 – March Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.7	70.5
Peak Hour	123.6	60.4
Max Day plus Fire 1	119.7	54.9
Max Day plus Fire 2	114.9	48.1
Max Day plus Fire 3	109.1	39.8

Ground Elevation = 81.1 m

Scenario 2

Two connection locations are used for this scenario where the watermains from Minto development have been constructed at the time of CU Development construction. Both CU and Minto are getting developed.

March Rd Connection 1 includes:

- Half of the design demands from CU development,
- Half of the system demands from Minto development: Average Day Demand of 2.93 L/s Residential demand, 0.67 L/s of institutional demands,
- Half of Minto outdoor water demand 1.94 L/s
- System demands on the March Road watermain: 6.30 L/s of Minto & Brigil commercial demands.

Celtic Ridge Connection 2 includes:

- Half of the design demands from CU development,
- Half of the system demands from Minto development: Average Day Demand of 2.93 L/s Residential demand, 0.67 L/s of institutional demands,
- Half of Minto outdoor water demand 1.94 L/s

Location

Results

Connection 1 – March Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	70.4
Peak Hour	123.5	60.3
Max Day plus Fire 1	120.6	56.1
Max Day plus Fire 2	116.4	50.2
Max Day plus Fire 3	111.4	43.1

Ground Elevation = 81.1 m

Connection 2 – Celtic Ridge Cres.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	72.5
Peak Hour	123.3	62.1
Max Day plus Fire 1	116.8	52.9
Max Day plus Fire 2	109.7	42.8
Max Day plus Fire 3	101.0	30.4

Ground Elevation = 79.6 m

Scenario 3

This scenario considers all developments (Brigil, CU, Minto and Valecraft). CU design demands are allocated on March Rd, Connection 1. System level demands from Brigil, Minto and Valecraft as per MSS.

Results

Connection 1 – March Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.4	70.1
Peak Hour	122.3	58.6
Max Day plus Fire 1	120.3	55.7
Max Day plus Fire 2	116.4	50.1
Max Day plus Fire 3	111.8	43.6

Ground Elevation = 81.1 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

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Facsimile	(613) 254-5867
Website	www.novatech-eng.com

1015 MARCH ROAD

PROPOSED WATERMAIN NODE NETWORK

SCALE 1 : 2500 (0 25 50 75 100)

DATE	JOB	FIGURE
JAN 2022	121247	FIG-WM

SHT11X17.DWG - 279mmX432mm

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Population and Consumption Rate Calculations

Node	Number of Single Units	Number of Townhouse Units	Number of Multi-Unit Townhouse Units	Number of Multi-Unit Apartment Units	Multi-Use / Commerical Area (ha)	*Institutional Area (ha)	Residential Population	Consumption Rates (L/s)		
								Average Daily	Maximum Daily	Maximum Hourly
R1										
N_KNE01**										
N54										
N_KNE04,N_KNE05-06, N_KNE20**										
N_KNE02,11-13,21**										
N_KNE07		9					24	0.08	0.20	0.43
N2		7					19	0.06	0.15	0.34
N3a	118	135					766	2.48	6.20	13.65
N4		7					19	0.06	0.15	0.34
N_KNE18		10					27	0.09	0.22	0.48
N5a			17	17			77	0.25	0.62	1.36
N5b							0	0.00	0.00	0.00
N_KNE25	197	168	79	78			1477	4.79	11.97	26.33
						4.30	0	1.39	2.09	3.76
N6							0	0.00	0.00	0.00
N7a							0	0.00	0.00	0.00
N7b						0.83	0	0.27	0.40	0.73
N_KNE02							0	0.00	0.00	0.00
N48				42			76	0.25	0.61	1.35
						2.83	0	0.92	1.38	2.48
N49				28			50	0.16	0.41	0.90
N50					2.30		0	0.75	1.12	2.01
TOTAL	**315**	**336**	**96**	**165**	**2.30**	**7.96**	**2534**	**11.54**	**25.52**	**54.15**

*Includes Fire Halls, Schools, Existing Schools, etc.
**Values are based on Stantec report. Values represent demand from future buildouts.

Notes:
1) Nodes with prefixes N_KNE## are the Same Identification and Approximate Location of Nodes within Stantec's Kanata North Urban Expansion (KNUEA) Potable Water Assessment, dated March 28, 2016

Water Demand Parameters For Claridge / Uniform Site - As per City of Ottawa Guidelines

Single Residential Units	3.4	persons/unit
Townhouse Residential Units	2.7	persons/unit
Multi-Unit Residential (Townhouse)	2.7	persons/unit
Multi-Unit Residential (Apartment)	1.8	persons/unit

Water Demand Parameters For Claridge / Uniform Site (Local Demand as per City of Ottawa Guidelines - Water Distribution Systems)

Residential Demand - Single (low density)	280.0	L/c/day
Residential Demand - Street Town (med. density)	280.0	L/c/day
Residential Demand - Multi-Unit Town (med. density)	280.0	L/c/day
Residential Demand - Apartment (high density)	280.0	L/c/day
Residential Max Day	2.5	x Avg Day
Residential Peak Hour	2.2	x Max Day
Commercial/Intitutional Demand	28000	L/Gross ha/Day
Commerical/Institutional Max Day	1.5	x Avg Day
Commerical/Institutional Peak Hour	1.8	x Max Day

Water Demand Parameters For Offsite Allowances (System Level as per Stantec's KNUEA Potable Water Assessment)

Residential Demand - Single (low density)	180.0	L/c/day
Residential Demand - Street Town (med. density)	198.0	L/c/day
Residential Demand - Multi-Unit Town (med. density)	198.0	L/c/day
Residential Demand - Apartment (high density)	219.0	L/c/day
Residential Max Day	Avg day	+ Outdoor
Residential Peak Hour	1.7	x Max Day
Commercial/Intitutional Demand	28000	L/Gross ha/Day
Commerical/Institutional Max Day	Avg day	+ Outdoor
Commerical/Institutional Peak Hour	1.7	x Max Day

Residential Fire Flow (Typical)	133	L/s
Residential Fire Flow Cap (Typical)	167	L/s

Notes:
1) Maximum achievable fireflows have been indicated (fireflow summary).
3) Fireflow values have been applied as single point loads.

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi	Age hours
Resvr R1	130.70	-11.55	130.70	0.00	0.00	0.00	0.0
Junc N2	87.95	0.06	130.69	42.74	0.00	0.00	2.8
Junc N3a	88.12	2.48	130.69	42.57	417.61	60.57	3.0
Junc N4	87.80	0.06	130.69	42.89	420.75	61.02	3.6
Junc N5a	87.35	0.25	130.69	43.34	425.17	61.67	5.9
Junc N5b	86.80	0.00	130.69	43.89	430.56	62.45	7.3
Junc N6	86.00	0.00	130.69	44.69	438.41	63.59	3.8
Junc N7a	84.20	0.00	130.69	46.49	456.07	66.15	3.5
Junc N7b	82.39	0.27	130.69	48.30	473.82	68.72	3.2
Junc N48	86.66	1.17	130.69	44.03	431.93	62.65	3.9
Junc N49	84.50	0.16	130.69	46.19	453.12	65.72	2.6
Junc N50	82.68	0.75	130.69	48.01	470.98	68.31	2.1
Junc N54	80.50	0.00	130.70	50.20	492.46	71.43	1.5
Junc KNE01	81.00	0.00	130.70	49.70	487.56	70.71	0.1
Junc KNE02,11-13,21	81.70	0.00	130.69	48.99	480.59	69.70	3.0
Junc KNE04,5-6,20	83.65	0.00	130.69	47.04	461.46	66.93	1.5
Junc KNE07	88.25	0.08	130.69	42.44	416.34	60.38	2.4
Junc KNE18	87.60	0.09	130.69	43.09	422.71	61.31	4.8
Junc KNE25	87.00	6.18	130.69	43.69	428.60	62.16	4.7

(orange)	Maximum Pressure
(cyan)	Maximum Age

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	1.00	400	120	11.55	0.09	0.04	0.035
Pipe P2A	305.00	400	120	7.35	0.06	0.01	0.033
Pipe P2B	223.00	400	120	5.31	0.04	0.01	0.035
Pipe P3	298.00	300	120	4.20	0.06	0.02	0.035
Pipe P4	193.00	300	120	4.20	0.06	0.02	0.035
Pipe P5	91.00	300	120	4.12	0.06	0.02	0.035
Pipe P6	44.00	300	120	4.06	0.06	0.02	0.035
Pipe P7	42.00	300	120	-1.54	0.02	0.00	0.041
Pipe P8	90.00	300	120	-1.48	0.02	0.00	0.040
Pipe P9	82.00	300	120	1.39	0.02	0.00	0.042
Pipe P10A	80.00	300	120	1.14	0.02	0.00	0.042
Pipe P10B	38.00	300	120	1.14	0.02	0.00	0.045
Pipe P11	40.00	300	120	-5.04	0.07	0.03	0.034
Pipe P12A	85.00	300	120	-5.04	0.07	0.03	0.034
Pipe P12B	85.00	300	120	-5.04	0.07	0.03	0.034
Pipe P13	45.00	300	120	-5.31	0.08	0.03	0.034
Pipe P74	85.00	200	110	0.04	0.00	0.00	0.215
Pipe P75	85.00	200	110	-1.13	0.04	0.02	0.048
Pipe P76	85.00	200	110	-1.29	0.04	0.02	0.047
Pipe P77	120.00	200	110	-2.04	0.06	0.05	0.043

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	123.60	-54.16	123.60	0.00	0.00	0.00
Junc N2	87.95	0.34	123.38	35.43	347.57	50.41
Junc N3a	88.12	13.65	123.37	35.25	345.80	50.15
Junc N4	87.80	0.34	123.36	35.56	348.84	50.60
Junc N5a	87.35	1.36	123.35	36.00	353.16	51.22
Junc N5b	86.80	0.00	123.35	36.55	358.56	52.00
Junc N6	86.00	0.00	123.37	37.37	366.60	53.17
Junc N7a	84.20	0.00	123.42	39.22	384.75	55.80
Junc N7b	82.39	0.73	123.46	41.07	402.90	58.44
Junc N48	86.66	3.83	123.37	36.71	360.13	52.23
Junc N49	84.50	0.90	123.40	38.90	381.61	55.35
Junc N50	82.68	2.01	123.44	40.76	399.86	57.99
Junc N54	80.50	0.00	123.52	43.02	422.03	61.21
Junc KNE01	81.00	0.00	123.60	42.60	417.91	60.61
Junc KNE02,11-13,21	81.70	0.00	123.49	41.79	409.96	59.46
Junc KNE04,5-6,20	83.65	0.00	123.49	39.84	390.83	56.69
Junc KNE07	88.25	0.43	123.41	35.16	344.92	50.03
Junc KNE18	87.60	0.48	123.36	35.76	350.81	50.88
Junc KNE25	87.00	30.09	123.35	36.35	356.59	51.72

Minimum Pressure

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	1.00	400	120	54.16	0.43	0.59	0.025
Pipe P2A	305.00	400	120	34.17	0.27	0.25	0.027
Pipe P2B	223.00	400	120	25.26	0.20	0.14	0.028
Pipe P3	298.00	300	120	19.99	0.28	0.38	0.028
Pipe P4	193.00	300	120	19.99	0.28	0.38	0.028
Pipe P5	91.00	300	120	19.56	0.28	0.36	0.028
Pipe P6	44.00	300	120	19.22	0.27	0.35	0.028
Pipe P7	42.00	300	120	-7.74	0.11	0.07	0.032
Pipe P8	90.00	300	120	-7.40	0.10	0.06	0.032
Pipe P9	82.00	300	120	6.92	0.10	0.05	0.033
Pipe P10A	80.00	300	120	5.56	0.08	0.04	0.034
Pipe P10B	38.00	300	120	5.56	0.08	0.04	0.034
Pipe P11	40.00	300	120	-24.53	0.35	0.55	0.027
Pipe P12A	85.00	300	120	-24.53	0.35	0.55	0.027
Pipe P12B	85.00	300	120	-24.53	0.35	0.55	0.027
Pipe P13	45.00	300	120	-25.26	0.36	0.58	0.027
Pipe P74	85.00	200	110	-2.17	0.07	0.05	0.043
Pipe P75	85.00	200	110	-6.00	0.19	0.34	0.037
Pipe P76	85.00	200	110	-6.90	0.22	0.45	0.036
Pipe P77	120.00	200	110	-8.91	0.28	0.72	0.035

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	115.34	-252.52	115.34	0.00	0.00	0.00
Junc N2	87.95	0.15	111.75	23.80	233.48	33.86
Junc N3a	88.12	6.20	111.48	23.36	229.16	33.24
Junc N4	87.80	0.15	111.61	23.81	233.58	33.88
Junc N5a	87.35	0.62	112.15	24.80	243.29	35.29
Junc N5b	86.80	0.00	112.40	25.60	251.14	36.42
Junc N6	86.00	0.00	112.71	26.71	262.03	38.00
Junc N7a	84.20	0.00	113.10	28.90	283.51	41.12
Junc N7b	82.39	0.40	113.49	31.10	305.09	44.25
Junc N48	86.66	228.99	100.71	14.06	137.93	20.00
Junc N49	84.50	0.41	104.53	20.03	196.49	28.50
Junc N50	82.68	1.12	108.38	25.70	252.12	36.57
Junc N54	80.50	0.00	113.96	33.46	328.24	47.61
Junc KNE01	81.00	0.00	115.33	34.33	336.78	48.85
Junc KNE02,11-13,21	81.70	0.00	113.70	32.00	313.92	45.53
Junc KNE04,5-6,20	83.65	0.00	113.50	29.85	292.83	42.47
Junc KNE07	88.25	0.20	112.31	24.06	236.03	34.23
Junc KNE18	87.60	0.22	111.89	24.29	238.28	34.56
Junc KNE25	87.00	14.06	112.52	25.52	250.35	36.31

(orange)	Minimum Pressure
(green)	Fireflow Applied

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	1.00	400	120	252.52	2.01	10.20	0.020
Pipe P2A	305.00	400	120	162.35	1.29	4.50	0.021
Pipe P2B	223.00	400	120	77.58	0.62	1.15	0.024
Pipe P3	298.00	300	120	90.17	1.28	6.15	0.022
Pipe P4	193.00	300	120	90.17	1.28	6.15	0.022
Pipe P5	91.00	300	120	89.97	1.27	6.13	0.022
Pipe P6	44.00	300	120	89.82	1.27	6.11	0.022
Pipe P7	42.00	300	120	62.13	0.88	3.09	0.024
Pipe P8	90.00	300	120	62.28	0.88	3.10	0.024
Pipe P9	82.00	300	120	-62.50	0.88	3.12	0.024
Pipe P10A	80.00	300	120	-63.12	0.89	3.18	0.023
Pipe P10B	38.00	300	120	-63.12	0.89	3.18	0.023
Pipe P11	40.00	300	120	-77.18	1.09	4.61	0.023
Pipe P12A	85.00	300	120	-77.18	1.09	4.61	0.023
Pipe P12B	85.00	300	120	-77.18	1.09	4.61	0.023
Pipe P13	45.00	300	120	-77.58	1.10	4.66	0.023
Pipe P74	85.00	200	110	145.75	4.64	126.78	0.023
Pipe P75	85.00	200	110	-83.24	2.65	44.93	0.025
Pipe P76	85.00	200	110	-83.65	2.66	45.34	0.025
Pipe P77	120.00	200	110	-84.77	2.70	46.47	0.025

MAXIMUM DAY + FIREFLOW DEMAND AT N50

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	114.20	-266.52	114.20	0.00	0.00	0.00
Junc N2	87.95	0.15	111.71	23.76	233.09	33.81
Junc N3a	88.12	6.20	111.52	23.40	229.55	33.29
Junc N4	87.80	0.15	111.55	23.75	232.99	33.79
Junc N5a	87.35	0.62	111.69	24.34	238.78	34.63
Junc N5b	86.80	0.00	111.75	24.95	244.76	35.50
Junc N6	86.00	0.00	111.85	25.85	253.59	36.78
Junc N7a	84.20	0.00	111.99	27.79	272.62	39.54
Junc N7b	82.39	0.40	112.14	29.75	291.85	42.33
Junc N48	86.66	1.99	106.45	19.79	194.14	28.16
Junc N49	84.50	0.41	101.58	17.08	167.55	24.30
Junc N50	82.68	242.12	96.74	14.06	137.93	20.00
Junc N54	80.50	0.00	112.31	31.81	312.06	45.26
Junc KNE01	81.00	0.00	114.19	33.19	325.59	47.22
Junc KNE02,11-13,21	81.70	0.00	112.21	30.51	299.30	43.41
Junc KNE04,5-6,20	83.65	0.00	112.92	29.27	287.14	41.65
Junc KNE07	88.25	0.20	112.09	23.84	233.87	33.92
Junc KNE18	87.60	0.22	111.62	24.02	235.64	34.18
Junc KNE25	87.00	14.06	111.79	24.79	243.19	35.27

(orange)	Minimum Pressure
(green)	Fireflow Applied

MAXIMUM DAY + FIREFLOW DEMAND AT N50

Pipe Report

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Headloss m/km	Friction Factor
Pipe P1	1.00	400	120	266.52	2.12	11.27	0.020
Pipe P2A	305.00	400	120	192.51	1.53	6.17	0.021
Pipe P2B	223.00	400	120	44.95	0.36	0.42	0.026
Pipe P3	298.00	300	120	74.01	1.05	4.27	0.023
Pipe P4	193.00	300	120	74.01	1.05	4.27	0.023
Pipe P5	91.00	300	120	73.81	1.04	4.25	0.023
Pipe P6	44.00	300	120	73.66	1.04	4.23	0.023
Pipe P7	42.00	300	120	29.50	0.42	0.78	0.026
Pipe P8	90.00	300	120	29.65	0.42	0.78	0.026
Pipe P9	82.00	300	120	-29.87	0.42	0.80	0.026
Pipe P10A	80.00	300	120	-30.49	0.43	0.83	0.026
Pipe P10B	38.00	300	120	-30.49	0.43	0.83	0.026
Pipe P11	40.00	300	120	-44.55	0.63	1.67	0.025
Pipe P12A	85.00	300	120	-44.55	0.63	1.67	0.025
Pipe P12B	85.00	300	120	-44.55	0.63	1.67	0.025
Pipe P13	45.00	300	120	-44.95	0.64	1.70	0.025
Pipe P74	85.00	200	110	96.97	3.09	59.61	0.025
Pipe P75	85.00	200	110	94.98	3.02	57.36	0.025
Pipe P76	85.00	200	110	94.57	3.01	56.90	0.025
Pipe P77	120.00	200	110	-147.55	4.70	129.70	0.023

MAXIMUM DAY + FIREFLOW DEMAND SUMMARY

Maximum day plus fire flow demand was modeled for each node.
The following is a summary of the maximum allowable fireflows that maintain a minimum pressure of 20 psi.

Fire at Junction	Demand (L/s)			Minimum Pressure			
	Maximum Daily	Fire Flow	Max Day + Fire	(m)	kPa	psi	Node
N48	1.99	227.00	228.99	14.06	137.93	20.00	N48
N50	1.12	241.00	242.12	14.06	137.93	20.00	N50

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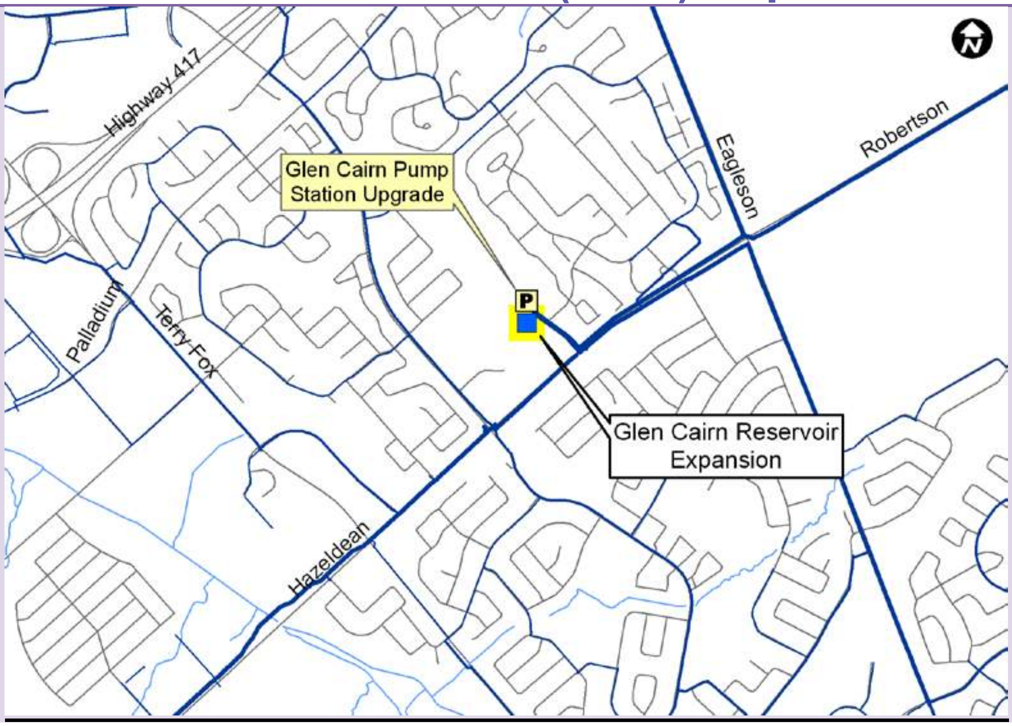
Note:
1) Iterpolation was used on given boundary conditions to determine an accurate maximum allowable fireflow.
2) Fireflow values have been assigned to nodes as a point load.

Glen Cairn Reservoir (GCR) Expansion



Scope and Justification
Add 17 ML storage volume at the GCR to defer and reduce pumping expansion needs to Zone 2W from the Carlington Heights PS and defer Water Purification Plant expansion.

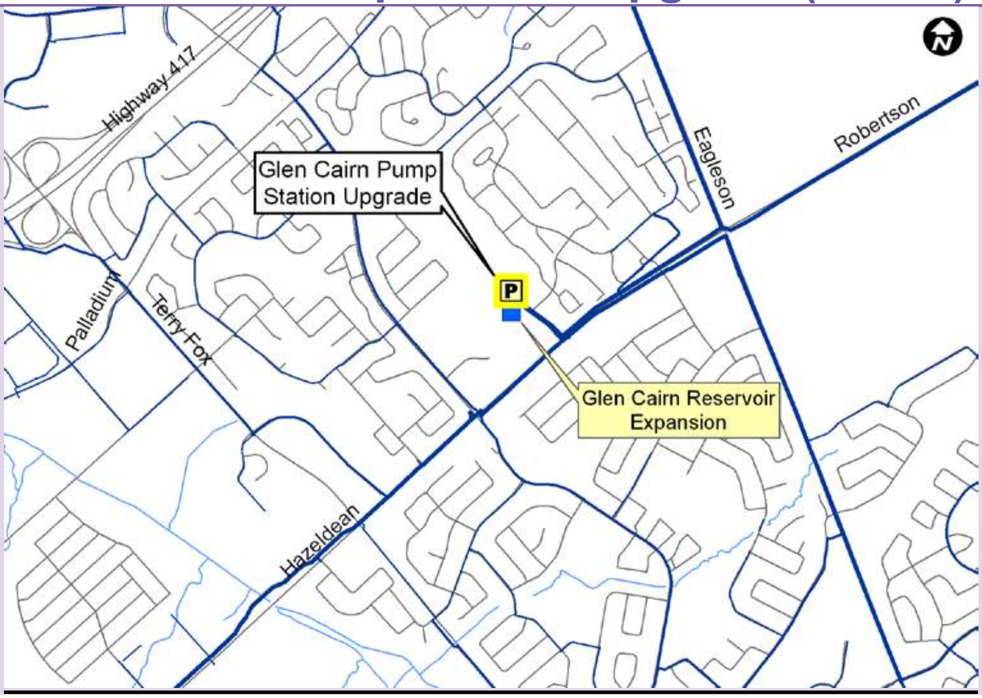
Timing
2019-2024: Increase storage at GCPS

Action Item Funding
Construction Cost Estimate = $6.2M
Capital Cost Estimate* = $13.1M (90**%** Development Charges, 10% Rate)
**including construction cost, engineering, city internal costs and contingency allowance. Funding split subject to review as part of 2014 Development Charges by-law.*

EA Requirements and Consultation
Class EA Schedule 'B' project - Notices, consultation and filing of Environmental Project File for public review required.

Follow Up Actions
The Official Plan projections and actual development pressures will determine the exact timing for implementation. Monitor development needs to ensure infrastructure is constructed in a manner that is coincident with development.

Glen Cairn Pump Station Upgrade (GCPS)



Scope and Justification

Increase pumping capacity at the GCPS to meet 2031 peak demand to Zone 3W to supplement the Campeau Drive Pump Station. An expansion of the facility is assumed.

Timing

2019-2024: Upgrade PS

Action Item Funding

Construction Cost Estimate = $1.5M
Capital Cost Estimate* = $3.1M (90% Development Charges, 10% Rate)
**including construction cost, engineering, city internal costs and contingency allowance. Funding split subject to review as part of 2014 Development Charges by-law.*

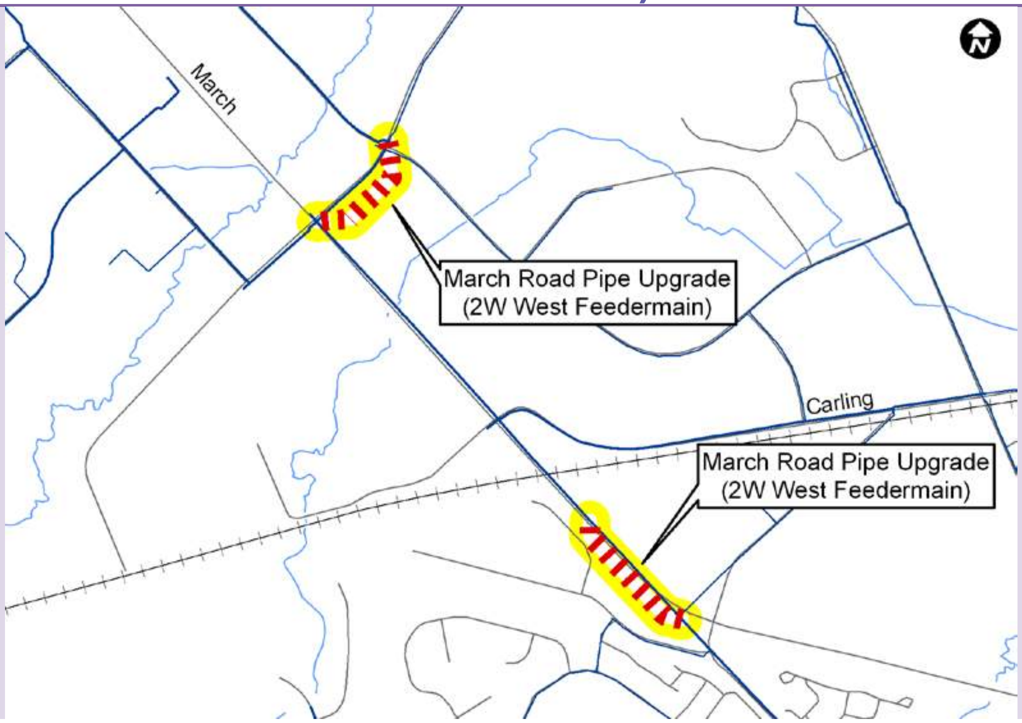
EA Requirements and Consultation

Class EA Schedule 'B' project - Notices, consultation and filing of Environmental Project File for public review required.

Follow Up Actions

The Official Plan projections and actual development pressures will determine the exact timing for implementation. Monitor development needs to ensure infrastructure is constructed in a manner that is coincident with development. Consider Coordination of works with 2019 mechanical renewal.

March Road Pipe Upgrade (Zone 2W West Feedermain)



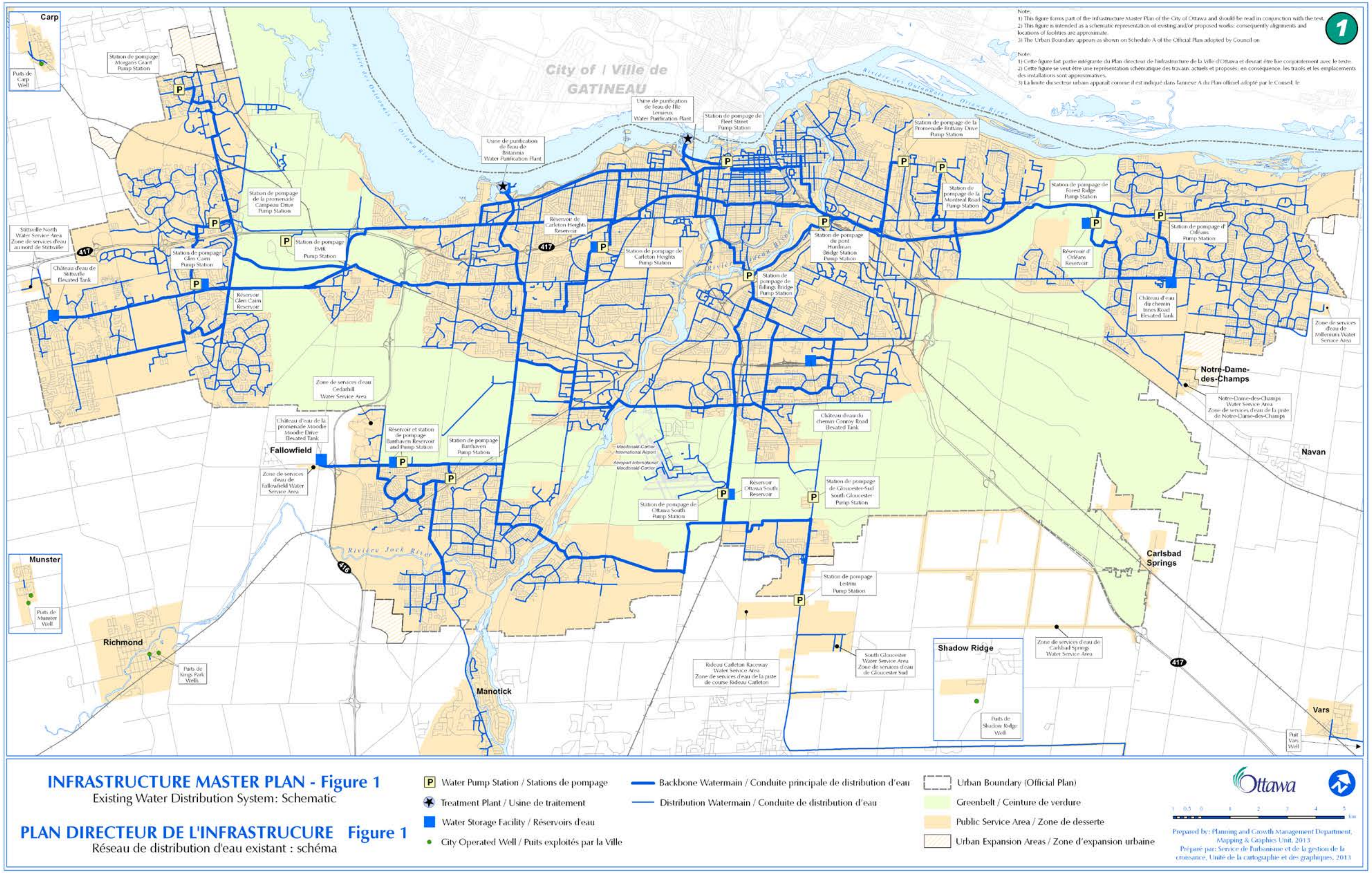
Scope and Justification
Upgrade existing watermain segments in the North Kanata area, on March Road and Solandt Road.

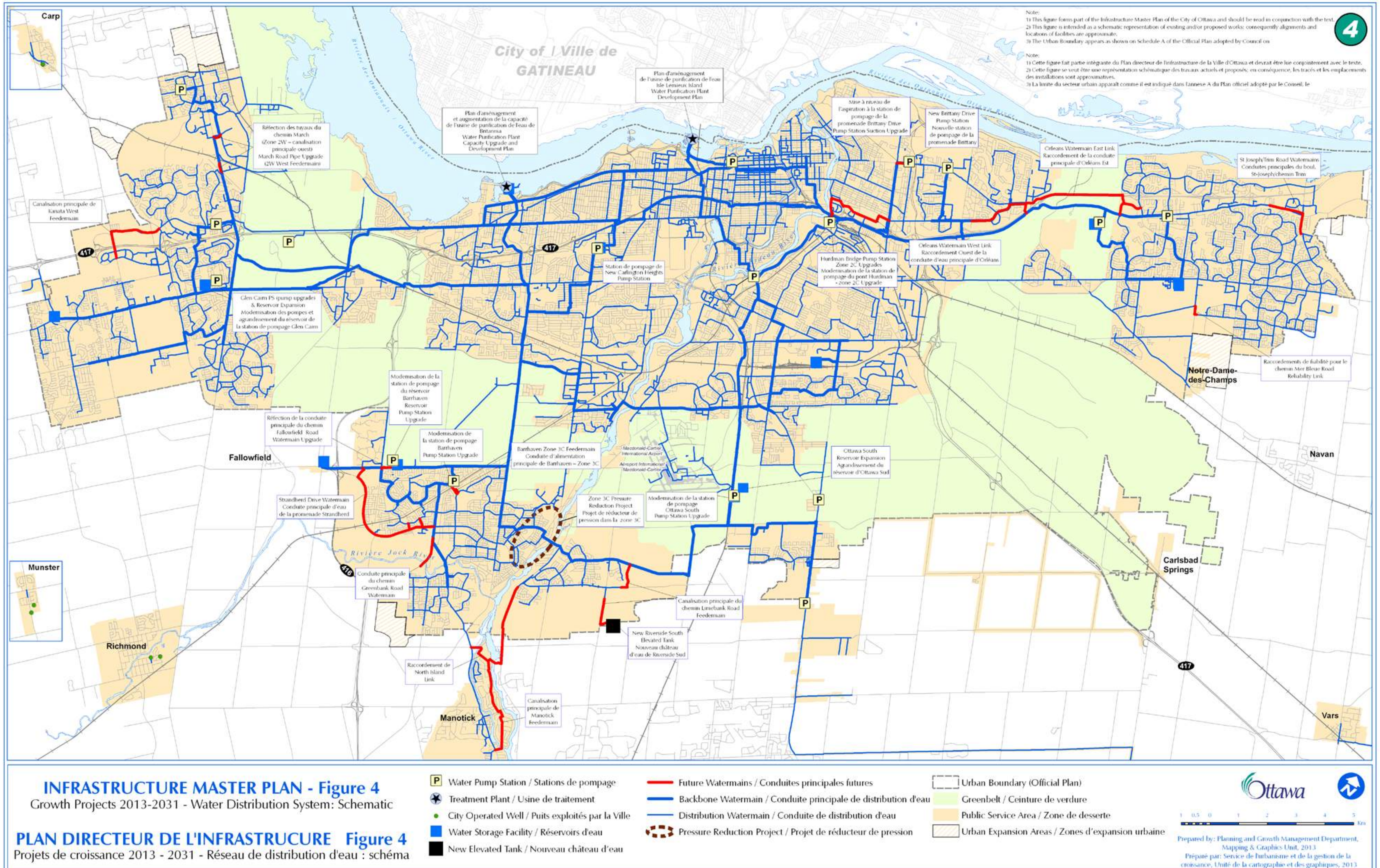
Timing:
2019 – 2024: Construct feedermain

Action Item Funding
Construction Cost Estimate = $1.2M
Capital Cost Estimate* = $2.2M (90% Development Charges, 10% Rate)
**including construction cost, engineering, city internal costs and contingency allowance. Funding split subject to review as part of 2014 Development Charges by-law.*

EA Requirements and Consultation
The 610 mm watermain upgrades are Schedule ‘A’ projects – No consultation required prior to implementation.

Follow Up Actions
Project timing to be confirmed based on actual increases in demand due to growth.


City of / Ville de GATINEAU
Carp
Munster
Richmond
Fallowfield
Manotick
Notre-Dame-des-Champs
Navan
Carlsbad Springs
Shadow Ridge
Vars
INFRASTRUCTURE MASTER PLAN - Figure 1
Existing Water Distribution System: Schematic
PLAN DIRECTEUR DE L'INFRASTRUCURE Figure 1
Réseau de distribution d'eau existant : schéma
Water Pump Station / Stations de pompage
Treatment Plant / Usine de traitement
Water Storage Facility / Réservoirs d'eau
City Operated Well / Puits exploités par la Ville
Backbone Watermain / Conduite principale de distribution d'eau
Distribution Watermain / Conduite de distribution d'eau
Urban Boundary (Official Plan)
Greenbelt / Ceinture de verdure
Public Service Area / Zone de desserte
Urban Expansion Areas / Zone d'expansion urbaine
Ottawa


Note:
1) This figure forms part of the Infrastructure Master Plan of the City of Ottawa and should be read in conjunction with the text.
2) This figure is intended as a schematic representation of existing and/or proposed works; consequently alignments and locations of facilities are approximate.
3) The Urban Boundary appears as shown on Schedule A of the Official Plan adopted by Council on
Note:
1) Cette figure fait partie intégrante du Plan directeur de l'infrastructure de la Ville d'Ottawa et devrait être lue conjointement avec le texte.
2) Cette figure se veut être une représentation schématique des travaux actuels et proposés; en conséquence, les tracés et les emplacements des installations sont approximatives.
3) La limite du secteur urbain apparaît comme il est indiqué dans l'annexe A du Plan officiel adopté par le Conseil, le
4
City of / Ville de GATINEAU
Carp
Munster
Richmond
Fallowfield
Manotick
Notre-Dame-des-Champs
Navan
Carlsbad Springs
Vars
INFRASTRUCTURE MASTER PLAN - Figure 4
Growth Projects 2013-2031 - Water Distribution System: Schematic
PLAN DIRECTEUR DE L'INFRASTRUCURE Figure 4
Projets de croissance 2013 - 2031 - Réseau de distribution d'eau : schéma
Water Pump Station / Stations de pompage
Treatment Plant / Usine de traitement
City Operated Well / Puits exploités par la Ville
Water Storage Facility / Réservoirs d'eau
New Elevated Tank / Nouveau château d'eau
Future Watermains / Conduites principales futures
Backbone Watermain / Conduite principale de distribution d'eau
Distribution Watermain / Conduite de distribution d'eau
Pressure Reduction Project / Projet de réducteur de pression
Urban Boundary (Official Plan)
Greenbelt / Ceinture de verdure
Public Service Area / Zone de desserte
Urban Expansion Areas / Zones d'expansion urbaine
Ottawa
Prepared by: Planning and Growth Management Department, Mapping & Graphics Unit, 2013
Préparé par: Service de l'urbanisme et de la gestion de la croissance, Unité de la cartographie et des graphiques, 2013

Kanata North Urban Expansion Potable Water Assessment

Final Report

Prepared for:
Novatech Engineering Consultants

Prepared by:
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March 28, 2016

Sign-off Sheet

This document entitled Kanata North Urban Expansion Potable Water Assessment was prepared by Stantec Consulting Ltd. for the account of Novatech Engineering Consultants. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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(signature)

Kevin Alemany M.A.Sc., P.Eng.

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Abbreviations

PRV	Pressure Reducing Valve
Dia.	Diameter
w/m	Watermain
HGL	Hydraulic Gradeline
KNUE	Kanata North Urban Expansion
AVDY	Average Day Demand
MXDY	Maximum Day Demand
PKHR	Peak Hour Demand
EPS	Extended Period Simulation
SS	Steady State
FF	Fire Flow
FUS	Fire Underwriters Survey

1.0 Background

1.1 PROPOSED DEVELOPMENT AREA

The proposed development site is located in Kanata, northwest of Old Carp Road and Maxwell Bridge Road, on the northwest and southeast side of March Road. It is the proposed location for a housing development that is projected to have a total of 3340 units and an estimated population of 9230 persons. **Figure 1-1** outlines the proposed development site boundary in red.

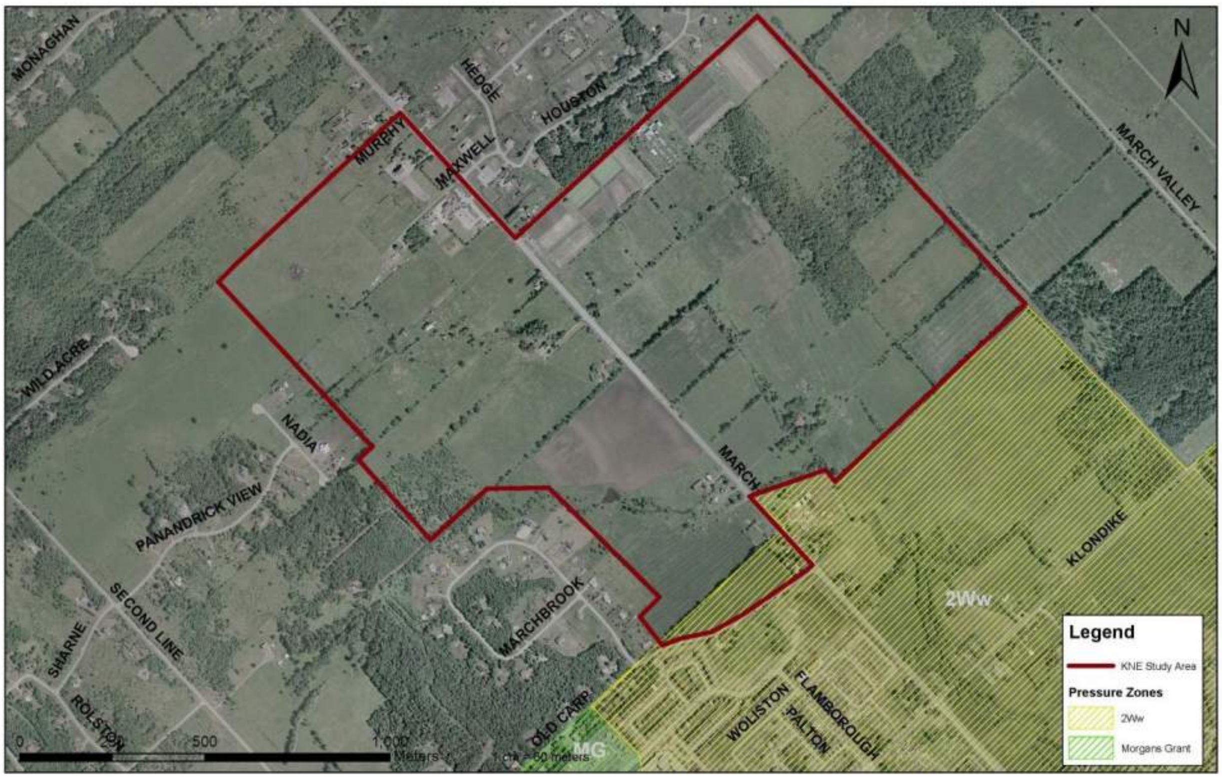


Figure 1-1: Proposed Development Site Location

The lands will include a mixture of low density, medium density and high density residential units including a mix of commercial and institutional lands. A development concept plan for the area is provided in **Appendix A.**

The southwest boundary of the site is adjacent to an existing residential development which has potable water serviced by the City of Ottawa. These lands are serviced by "Pressure Zone 2W". Given that it is on the most western boundary of Zone 2W, this particular area is also referred to as Zone 2Ww herein to distinguish its general location.

The northwest and northeast limits of the proposed development site border residential estate lots and farmland lots which are currently serviced by individual/private wells. The southeast boundary of the development site is bordered by an existing railway corridor, which is contiguous to farmland also currently serviced by well infrastructure.

1.2 GROUND ELEVATIONS

Ground elevations on the proposed development site vary between 69 and 94 metres. The portion of the site located on the west side of March Road decreases gradually in elevation from 94 metres on the western limits to about 80 metres along March Road. The portion of the site located east of March Road consists of 2 plateaus separated by a ridge. The western Plateau adjacent to March Road has an elevation of 80 metres, and the eastern plateau has an elevation of 69 metres. **Figure 1-2** illustrates the ground elevations assigned to nodes in the hydraulic model.

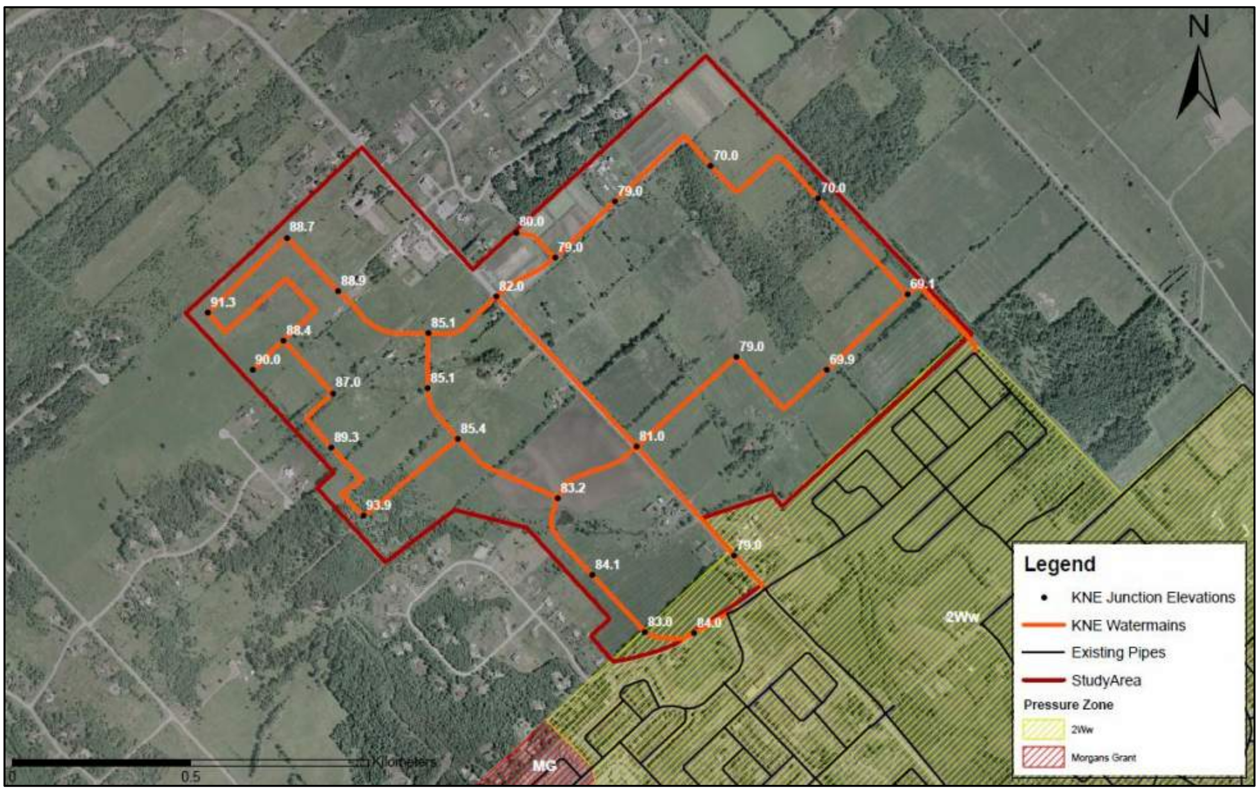


Figure 1-2: Development Site Elevations

1.3 EXISTING PRESSURE ZONES

The proposed site is situated near two existing water distribution pressure zones. Both of these pressure zones were analyzed to determine their compatibility with the potential site infrastructure.

Pressure zone 2Ww is located adjacent to the southeastern boundary of the proposed development site. This adjacency allows potential connection at several locations. Zone 2Ww has ground elevations similar to that of the proposed site, with values ranging between 68 and 99 metres. The overall hydraulic grade line in Zone 2Ww typically varies between 125 and 131 metres. The resulting pressures in Zone 2Ww typically range between 40 and 90 psi.

The Morgan's Grant Pressure Zone (Zone MG) is located approximately 250 metres southwest of the proposed development area. Connection to this pressure zone, given the existing structures and property ownership in the area, may require the creation of a minimum of 350 metres of additional pipeline – this does not account for the requirements to get a second redundant feed to the area. With ground elevations ranging between 91 and 107 metres, Zone MG is elevated compared to the upstream Zone 2W. To meet pressure servicing requirements at these elevations the Morgan's Grant Pumping Station was constructed. This pumping station allows the watermain infrastructure to maintain pressures between 58 and 82 psi. The overall hydraulic grade line in Zone MG varies from approximately 138 to 151 m.

1.4 EXISTING WATERMAIN NETWORK

Zone 2Ww is fed from a large dia. transmission w/m in Zone 2W along Timm Road and Robertson Road. Ultimately, this area is fed by pumps located at the Britannia Water Purification Plant and the Carlington Heights Pumping Station. The Glen Cairn Reservoir located to the south of Zone 2Ww provides balancing and emergency storage to Zone 2W/2Ww.

The existing Zone 2Ww pipe network consists primarily of a 1067mm dia. feedermain along Eagleson that drops down to 914mm, 610mm and 406mm before reaching the boundary of the KNUE lands (see **Figure 1-3**). Two sections of the 610mm dia. w/m along March Road step down in diameter from a 610mm to 406mm and back up to 610mm. These sections are discussed later in this assessment as they are deemed to create significant headloss relative to their lengths under high demands.

A secondary larger dia. w/m loops to the eastern boundary of Zone 2Ww with pipes ranging in size from 305 to 406mm dia. There is a small section of the secondary feed that drops down to 203mm on Penfield Drive.

The entire Zone 2Ww area north of Campeau Drive is fed by a single 914mm dia. watermain along Teron Road. There is an interzonal 203mm dia. w/m connection to Zone 3W in the western boundary of Zone 2Ww along Beaverbrook. Although the interzonal valve along Beaverbrook could be opened, this pipe has minimal capacity to provide to Zone 2Ww. The City has indicted that are two redundant feeds to the 2Ww area, however both include sections of private watermain which cannot be relied upon by the City for back-up supply purposes. These segments are shown in white in **Figure 1-3** below. The Critical Infrastructure Identification Study for Zone 2W recommended that ownership of some of these 406mm and 305mm sections of private watermain be transferred to the City to ensure adequate back-up supply in the event of a major failure condition. It is understood that this recommendation has yet to be implemented but it is the City's intent to pursue it.

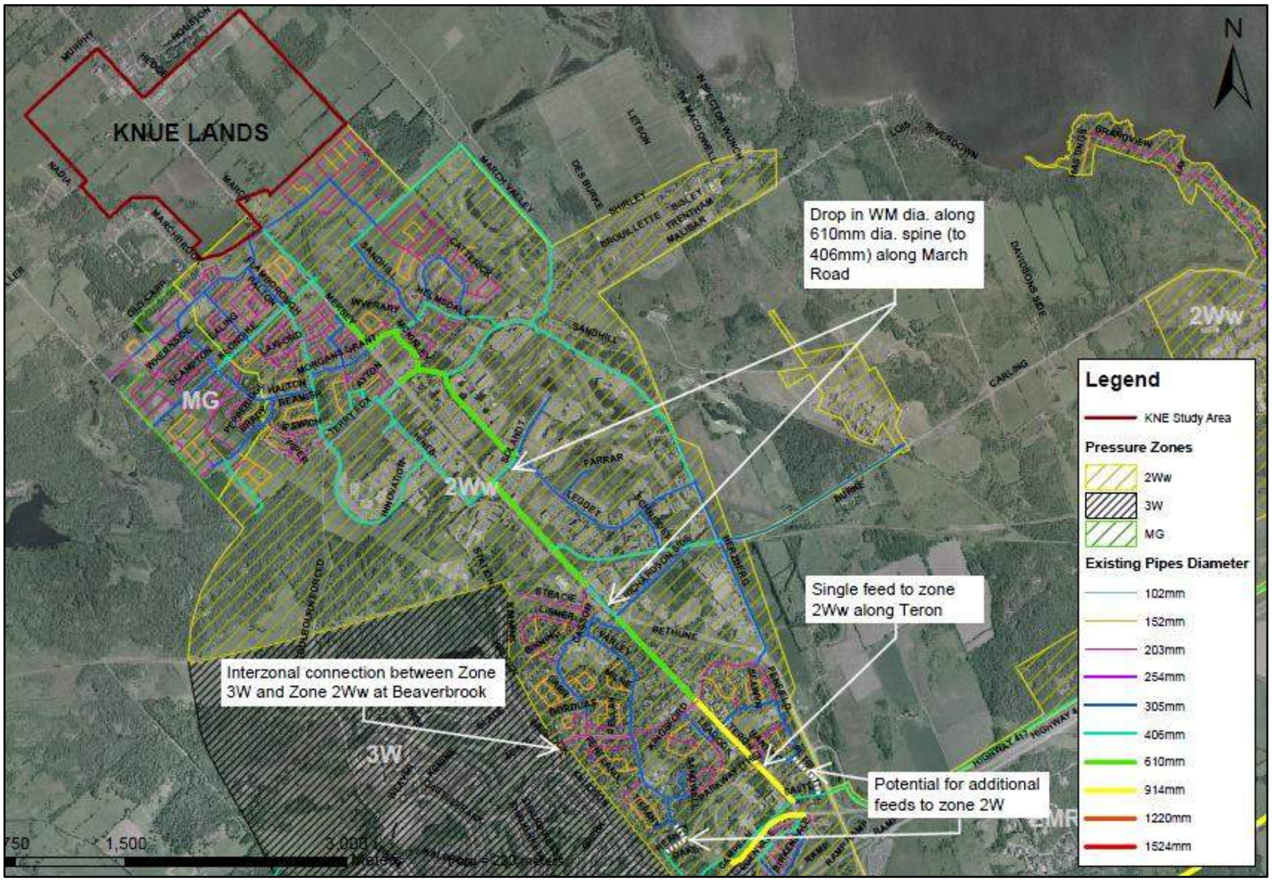


Figure 1-3: Existing Zone 2Ww Pipe Network (diameter shown in mm)

2.0 Approach

The following sections provide an analysis of the system pressures based on anticipated hydraulic gradelines to determine the appropriate servicing pressure zone, the system demands associated with the development area being assessed, and the modifications to the hydraulic model used in the assessment.

2.1 ALLOWABLE PRESSURES

An analysis of the existing pressure zone boundaries was performed to determine the appropriate servicing pressure zone for the KNUE lands. The proposed site has a total elevation change of 25m which is equivalent to a change in pressure of 36 psi. The desired pressure range for a given structure, as per the City of Ottawa Design Guidelines (Newell, W.R., 2010), is between 50 and 70 psi, with an absolute range between 40 and 80 psi. If pressures within the service area exceed 80 psi then, per the Ontario Plumbing Code (Government of Ontario, 2012), pressure controls are required, such as pressure reducing valves, to restrict high pressures to a maximum of 80 psi.

Considering the ground elevations of the proposed development, the proximity to existing watermains of each potential servicing pressure zone and the existing HGLs of the pressure zones, direct connections to the Zone 2Ww are the preferred alternative to the Zone MG. The Morgan's Grant pressure zone would produce tolerable pressures for a very small portion of the proposed site, but would produce excessively high pressures in the majority of the site. Pressure reducing valves would be required to mitigate the high pressures (as per the Ontario Plumbing Code) for most of the site. Servicing from Zone 2Ww allows for the higher elevation areas within the site to be inside tolerable servicing limits, while maintaining a more suitable HGL in the areas of lower elevations.

The North Eastern portion of the proposed site, located past the existing ridge, reaches elevations as low as 69 metres. This portion of the site will require pressure reduction measures to alleviate the high pressure in the region, regardless of the elected pressure zone. Connection of this area to Zone 2Ww will result in pressures up to 88 psi based on a maximum Zone 2Ww HGL of 130.9m. As per the Ontario Pluming Code, pressure reduction measures (i.e. individual household PRVs) will be required to mitigate high pressures in the system.

2.2 ANTICIPATED WATER DEMAND

The projected population for the KNUE lands is approximately 9230. Accordingly, zone/system level basic unit demands and outdoor water projections were applied to determine average day, maximum day and peak demands. **Table 2-1** summarizes the projected demands. These demands were distributed across all the new nodes added to the hydraulic model to simulate the pipe network in the KNUE lands. The total average day maximum day and peak hour demand (determined from the model) for the KNUE lands are 39.0L/s, 52.0L/s and 89.3L/s.

It is noted that each individual subdivision within the expansion area must be designed in accordance with the design parameters in the City's Water Design Guidelines (Newell, W.R., 2010), which has demands that are significantly higher than the system level parameters.

Table 2-1 - Projected Potable Water Demands for KNUE Lands

Land Use	Area (ha)	Quantity of Housing Units	Population	Avg Daily Flow (L/cap) [Res] (L/ha) [Comm & Inst]	Average Daily Demand (L/s)						Outdoor Water Demand		
					SFH	MLT	APT	COM_OGB	INS_OGB	Total AVDY	OWD_OGB	Max Daily Demand	PKHR from Model:
Institutional	15.6	-	-	50000					9.0	9.0			
Commercial	15.3	-	-	50000				8.9		8.9			
Firehall	0.8	-	-	50000					0.5	0.5			
Subtotal:	*31.7*	*0.0*	*0.0*					*8.9*	*9.5*	*18.3*			
Low density (SF)	64.7	1073	3637	180	7.6					7.6	13.0		
Med density (Street Town)		1067	2881	198		6.6				6.6			
Med Density (Multi-Unit Town)	16.8	600	1620	198		3.7				3.7			
High density (Apt)		600	1080	219			2.7			2.7			
Subtotal:		*3340*	*9218*		*7.6*	*10.3*	*2.7*	*0.0*	*0.0*	*20.6*	*13.0*		
Total:	***31.7***	***3340***	***9218***		***7.6***	***10.3***	***2.7***	***8.9***	***9.5***	***39.0***	***13.0***	***52.0***	***89.3***

PKHR Factor
1.7

2.3 WATERMAIN INFRASTRUCTURE DESIGN ALTERNATIVES

Given the layout of the existing Zone 2Ww large dia. w/m, the recommended alignment for a larger diameter feedermain to and through the KNUE lands, is along March Road. This alignment preserves the continuity of the larger diameter network and serves as the main feed to the proposed growth area.

To provide redundancy and added capacity to the KNUE lands, a secondary 305mm dia. w/m looping to the existing Zone 2Ww pipe network was considered. Two alternative alignments were considered, the first, an extension off an existing 305mm dia. w/m on Old Carp Road/Halton to the west of March Road, and the second, to an existing looped 203mm diameter network along Celtic Ridge to the east of March Road as depicted in **Figure 2-1**.

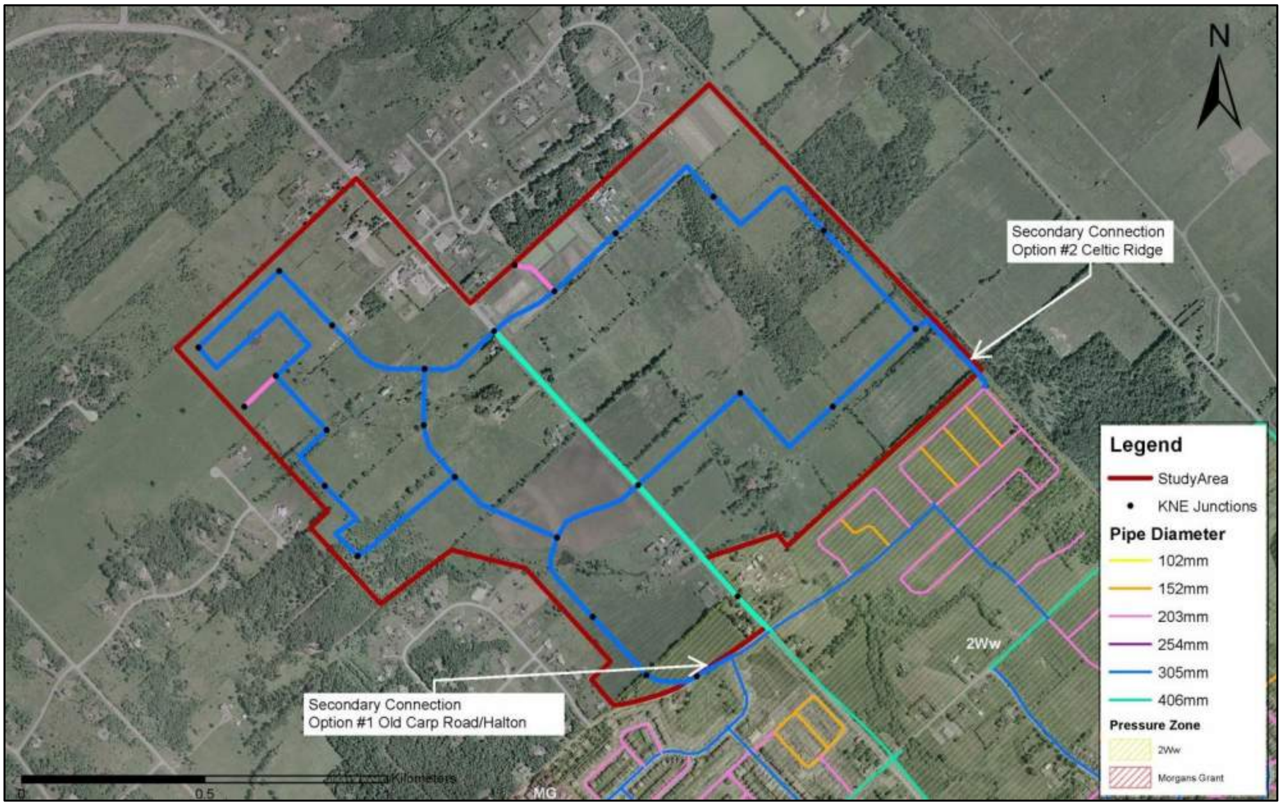


Figure 2-1: Proposed KNUE Pipe Diameters (mm) & Access Points to Existing Infrastructure

3.0 Hydraulic Modeling

3.1 HYDRAULIC MODEL DEVELOPMENT

With the permission of the City of Ottawa, the City's 2013 Water Master Plan all pipe computer model was used to assess the proposed growth scenarios. The hydraulic modeling software used is H2OMap water by Innovyze.

A watermain network in the KNUE lands was created using the proposed road network plans. Nodes were input into the model to provide a good distribution of demands and a good representation of ground elevation conditions. **Figure 3-1** and **Figure 3-2** show the locations and the IDs of the future nodes and watermains entered into the model respectively.

Using the base 2012 summer and winter scenarios, new child scenarios were developed with future KNUE nodes and pipes included in the model. An additional set of scenarios was created to model the future upgrades to the existing Zone 2Ww network, in particular, the two sections of 406mm dia. w/m along the 610mm dia. feedermain on March Road.

Ground elevations were assigned to nodes according to the location of the node with respect to the topography.

Residential, Institutional and Commercial demands were distributed according to the Kanata North Community Design Plan (Novatech, 2016). The Kanata North Community Design Plan (Novatech, 2016) was used in conjunction with the Kanata North Onsite Sanitary Drainage Area Plan (Novatech, 2016) to distribute residential and outdoor water demands according to the projected population and housing type present in each area.

Pipe diameters were assigned with diameters ranging from 305mm to 406mm to provide a strong network of watermains along primary routes. Hazen Williams carrying capacity "C" factors were applied based on City of Ottawa Design Water Guidelines (Newell, W.R., 2010)(110 for 203mm and 120 for 305/406mm).

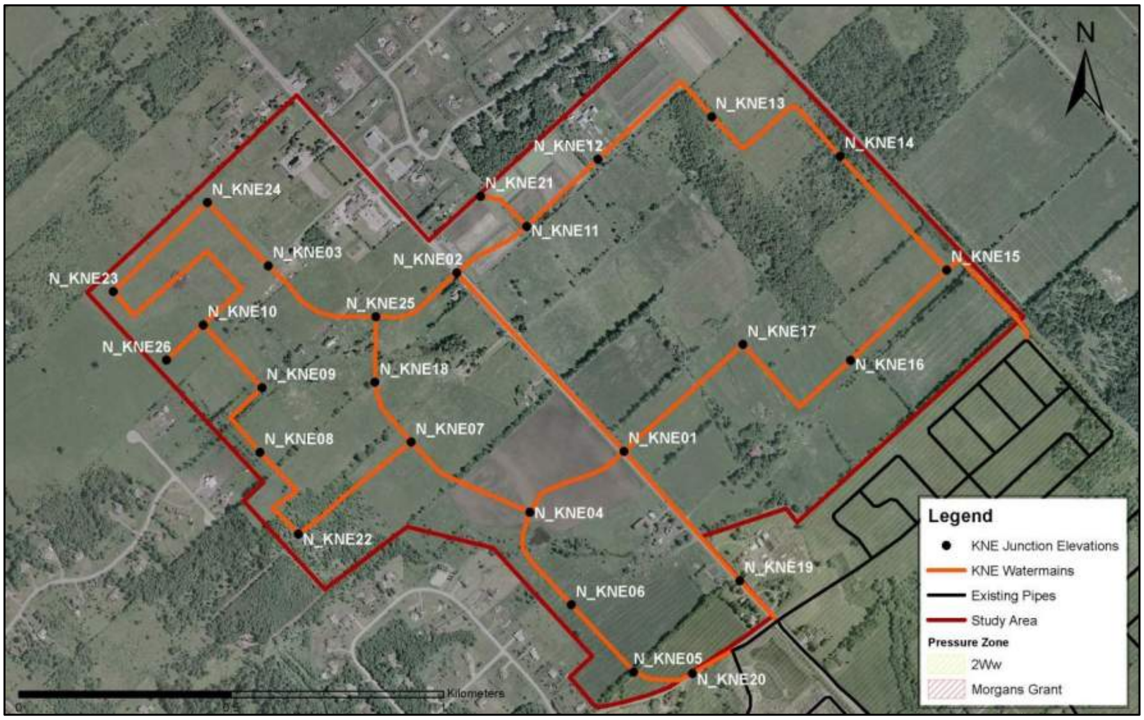


Figure 3-1: KNUE Lands Model Node ID's

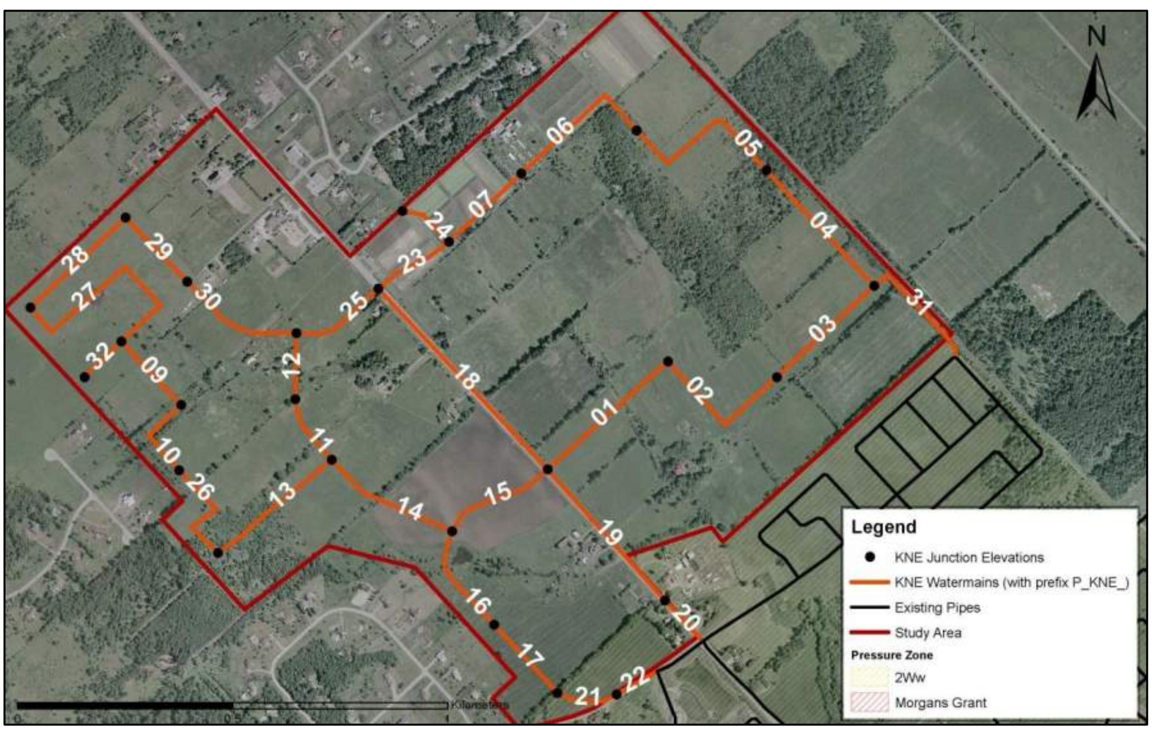


Figure 3-2: KNUE Lands Model Pipe ID's

Figure 3-3 provides the node allocation of each area of development to the watermain network. Areas shown without colour shading do not have allocated demands.

Figure 3-3: Area Demand Allocation

The demand applied from each of these areas on the respective node is summarized in **Table 3-1** below. This table summarizes residential, commercial, institutional and outdoor water demands.

Table 3-1: Node Average Day Demand Allocations

Node Allocation	Average Day Demand (L/s)				Total
	Residential	Commercial	Institutional	Outdoor	
N_KNE01	0.00	5.11	0.00	0.00	5.11
N_KNE02	0.00	0.00	0.00	0.00	0.00
N_KNE03	1.42	1.82	0.00	0.00	3.24
N_KNE04	1.15	0.39	0.00	0.00	1.54
N_KNE05	0.00	0.00	0.00	0.00	0.00
N_KNE06	2.53	0.00	1.18	0.53	4.25
N_KNE07	0.55	0.13	2.31	0.00	3.00
N_KNE08	0.00	0.00	0.00	0.00	0.00
N_KNE09	0.93	0.00	0.00	0.00	0.93
N_KNE10	0.00	0.00	0.00	4.07	4.07
N_KNE11	1.33	0.00	0.00	0.00	1.33
N_KNE12	0.74	0.00	1.67	0.00	2.41
N_KNE13	2.38	0.00	0.00	4.54	6.92
N_KNE14	0.81	0.00	1.33	0.00	2.14
N_KNE15	1.41	0.00	0.00	3.87	5.28
N_KNE16	1.80	0.00	0.00	0.00	1.80
N_KNE17	1.83	0.00	0.00	0.00	1.83
N_KNE18	0.00	0.00	0.00	0.00	0.00
N_KNE19	0.00	1.19	0.00	0.00	1.19
N_KNE20	0.32	0.00	0.00	0.00	0.32
N_KNE21	0.48	0.00	0.00	0.00	0.48
N_KNE22	0.95	0.00	0.00	0.00	0.95
N_KNE23	1.15	0.00	0.00	0.00	1.15
N_KNE24	0.53	0.00	2.50	0.00	3.03
N_KNE25	0.00	0.20	0.48	0.00	0.68
N_KNE26	0.62	0.00	0.00	0.00	0.62
TOTAL:	20.9	8.9	9.5	13.0	52.3

3.2 RESULTS

3.2.1 Average Daily Demands

The winter model scenario was tested to observe the pressures in the KNUE lands under the 2012 average daily demand conditions. No outdoor water demand was applied in this scenario. **Figure 3-4** provides the results of each node within the KNUE lands. The Hydraulic Gradeline under average day demands varies between 127m and 130m, as a result, **nodes with ground elevations lower than 74m can anticipate maximum pressures to exceed 80 psi**. The Ontario Building Code requires services with pressures greater than 80 psi to have pressure reduction measures such as pressure reduction valves installed along the service lines. The same results are observed for both secondary looping scenarios (i.e. option 1 through Old Carp Road and option 2 through Celtic Ridge).

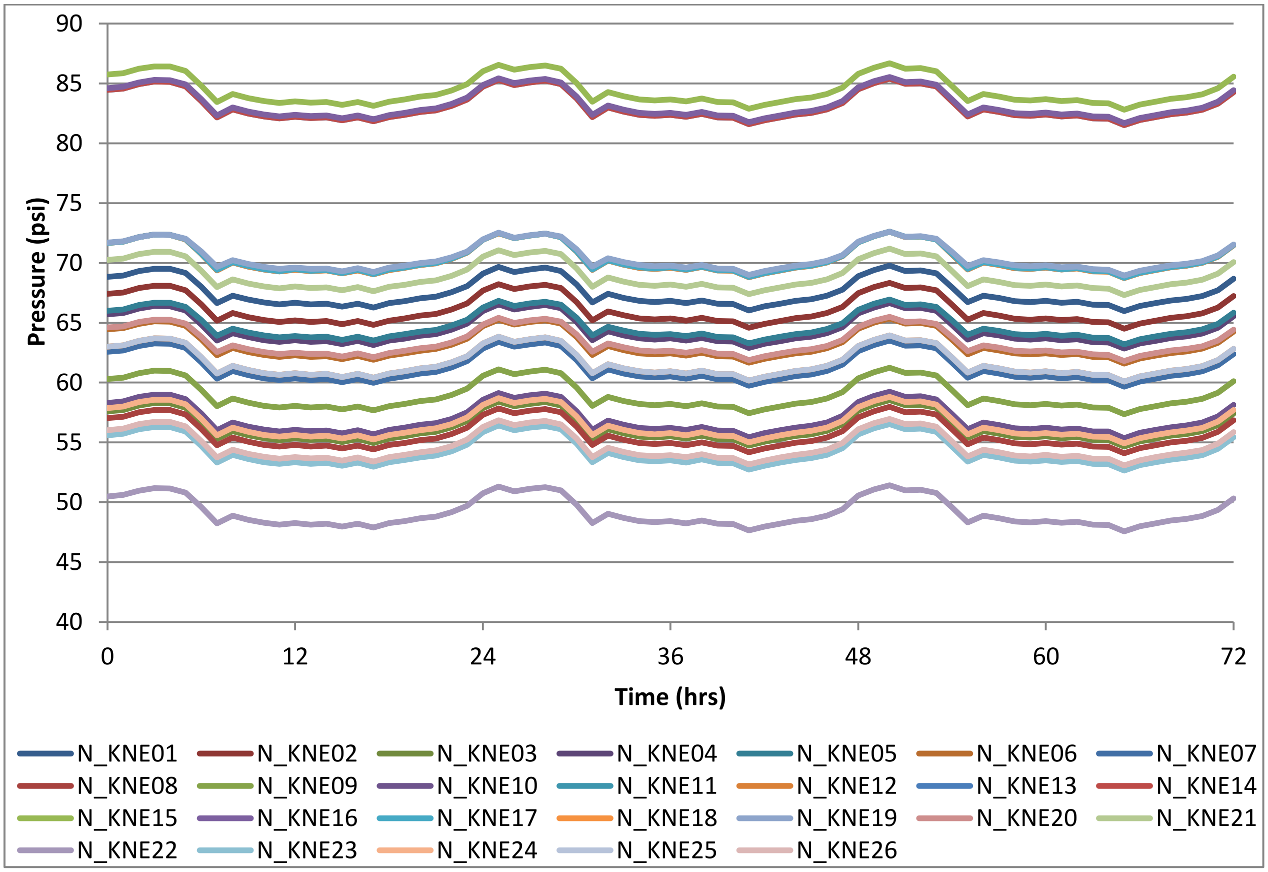


Figure 3-4: Pressures under Existing (2012) Plus KNUE Build-out AVDY Demands

3.2.2 Peak Hour Demands

The summer model scenario was tested to observe the pressures in the KNUE lands under the 2012 maximum daily demand & peak hour conditions. **Figure 3-5** shows the resulting minimum pressures in Zone 2Ww prior to the KNUE lands being added to the network. Minimum pressures in Zone 2Ww drop down close to 40 psi at the suction side to the Morgan's Grant Pump Station.

Figure 3-6 shows the resulting minimum pressures throughout zone 2Ww and the KNUE lands when the KNUE buildout demand is added to the network. As shown, there is a slight impact on the pressures in the existing Zone 2Ww due to additional headloss through the existing Zone 2Ww pipe network. Under peak demands, pressures drop by up to 4 psi, resulting in some "borderline" minimum pressure areas in the existing Zone 2Ww area falling below the 40 psi threshold. **Figure 3-7** further illustrates how the node pressures in the KNUE lands are impacted under peak demand conditions. Under this scenario, the HGL drops to approximately 121m in the KNUE lands resulting in elevations greater than 93m experiencing pressures less than the design guideline minimum requirement of 40 psi.

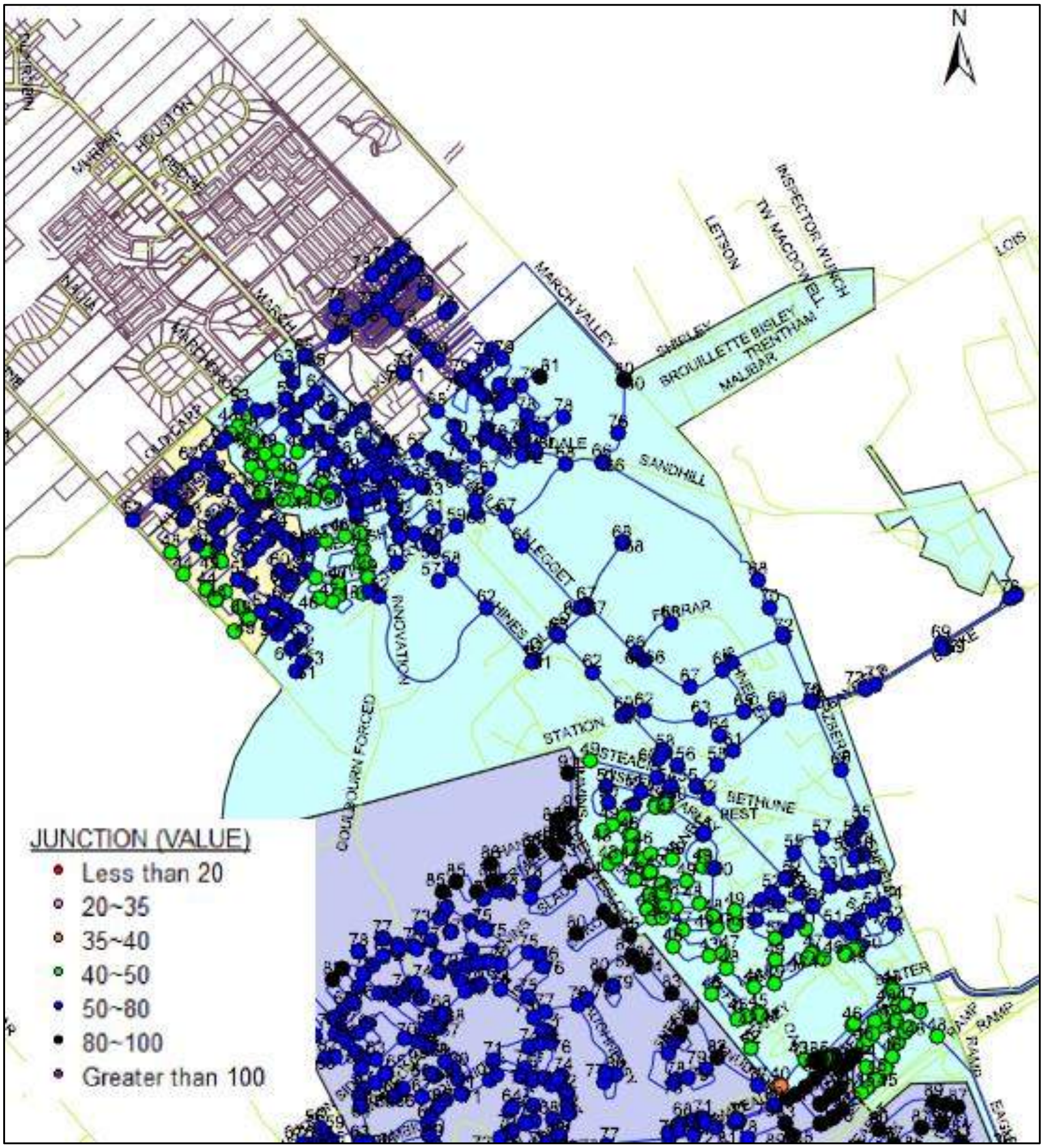


Figure 3-5: Zone 2Ww Minimum Pressures under Existing Network & Existing 2012 PKHR Demands (no KNUE)

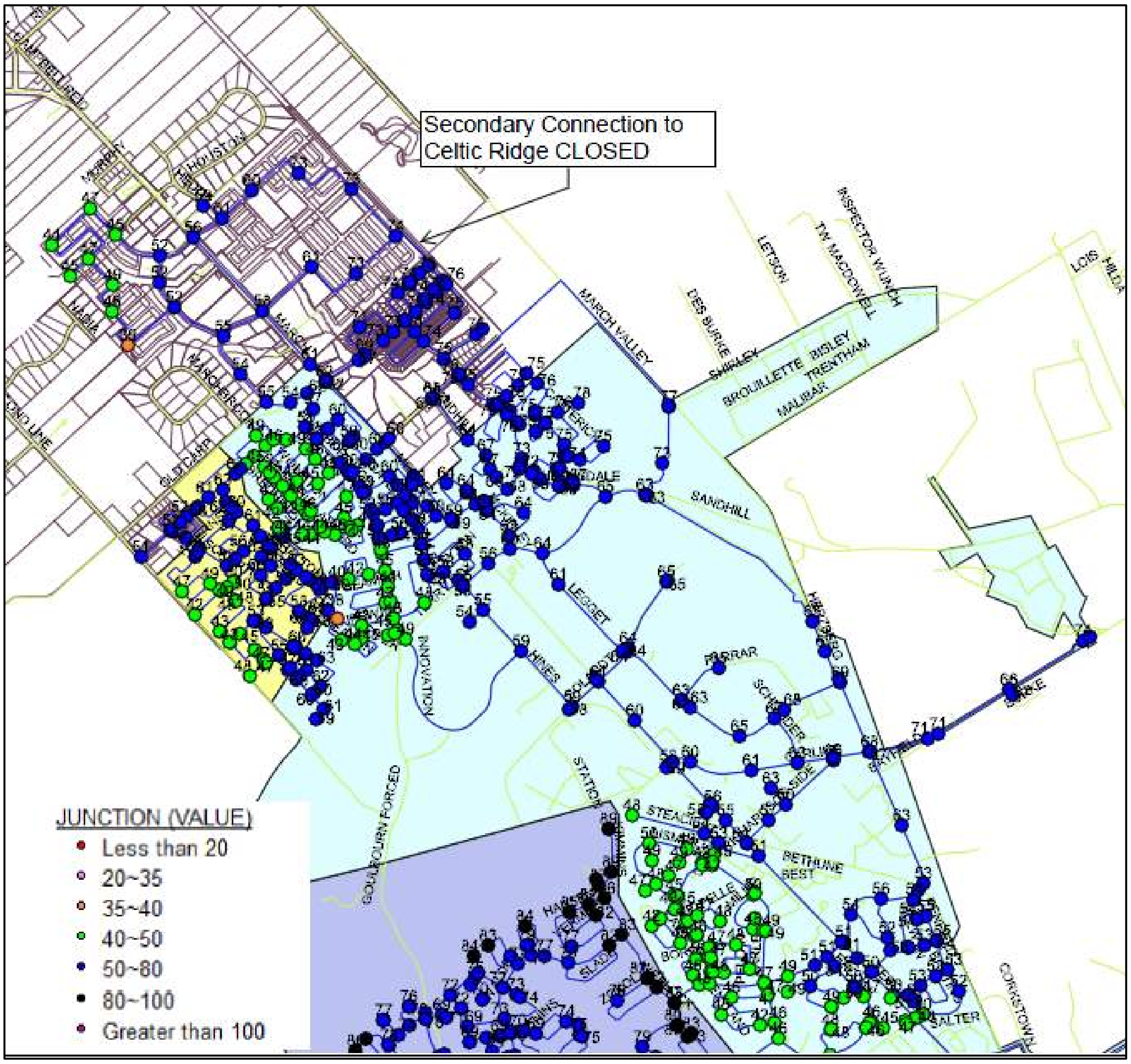


Figure 3-6: Zone 2Ww Minimum Pressures with Existing Network & Existing + KNUE 2012 PKHR Demands

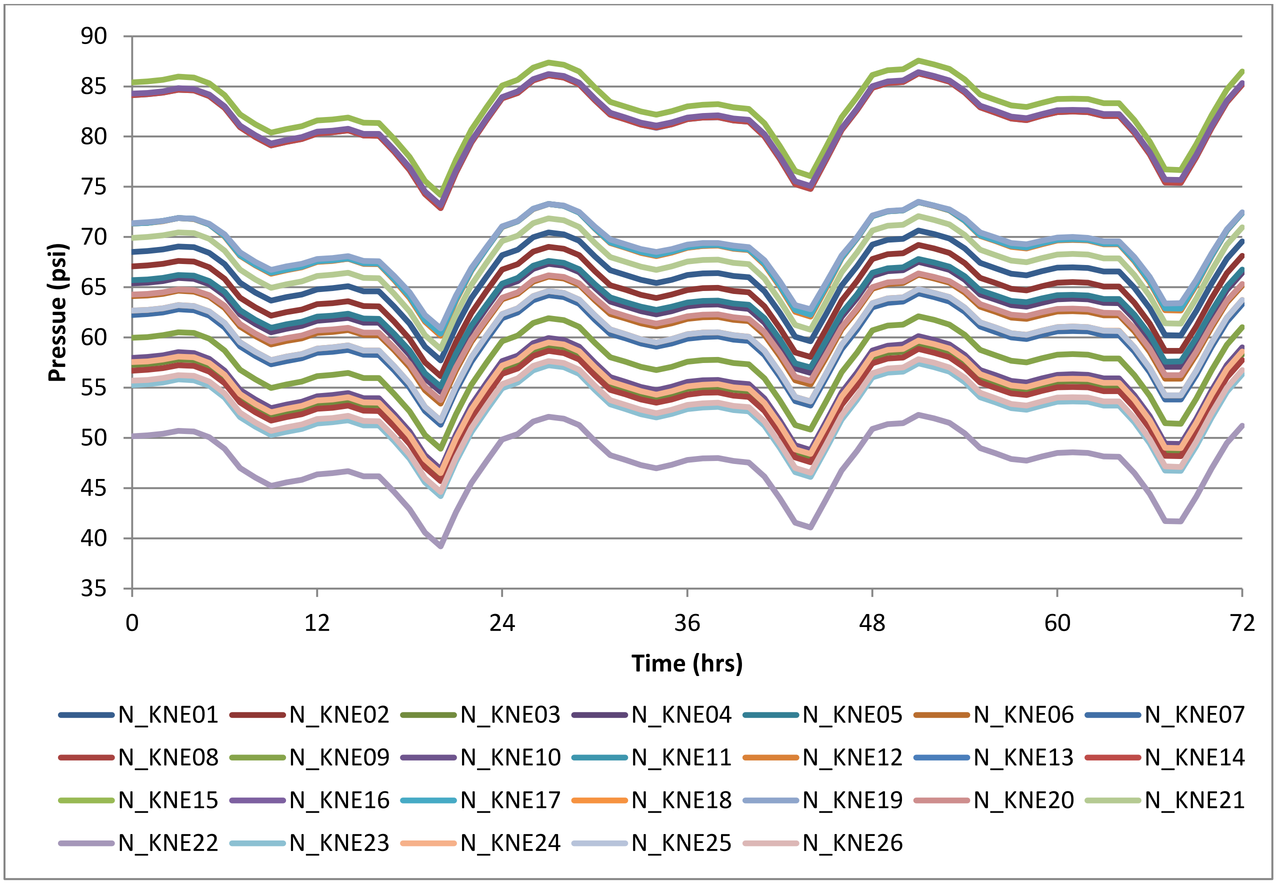


Figure 3-7: Pressures under Existing Network & Existing + KNUE 2012 PKHR EPS Demands

To improve minimum pressures, upgrades to two lengths of 406mm dia. w/m along the March Road alignment were made in the model (sections were upsized to 610mm dia.) **Figure 3-8** shows the resulting improvements to the minimum pressures in Zone 2Ww and the KNUE lands. These improvements decrease the headloss under peak demands and increase the minimum HGL in the KNUE lands to 122m. Under this scenario, nodes in the KNUE lands with ground elevations greater than 94m would experience pressures less than 40 psi. **Figure 3-9** further illustrates how the node pressures in the KNUE lands are impacted under peak demand conditions. Development exceeding 93m in elevation will therefore need to be phased such the replacement of the 406mm watermain on March and Solandt Road is occurs first. Elevations exceeding 93m are only seen at node N_KNE22 in the model.

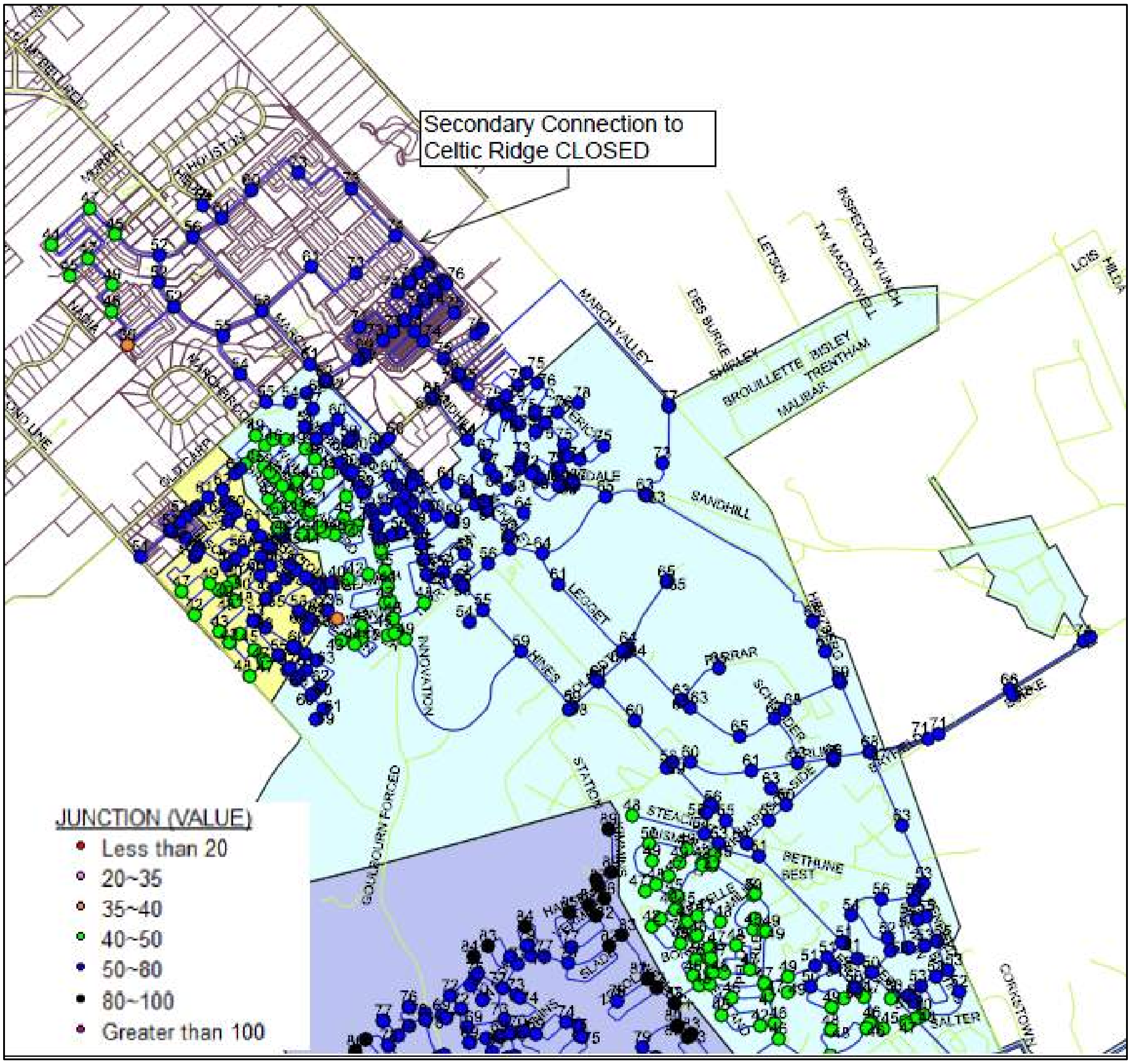


Figure 3-8: Minimum Pressures (psi) with Upgraded 2Ww Network & Existing + KNUE PKHR Demands

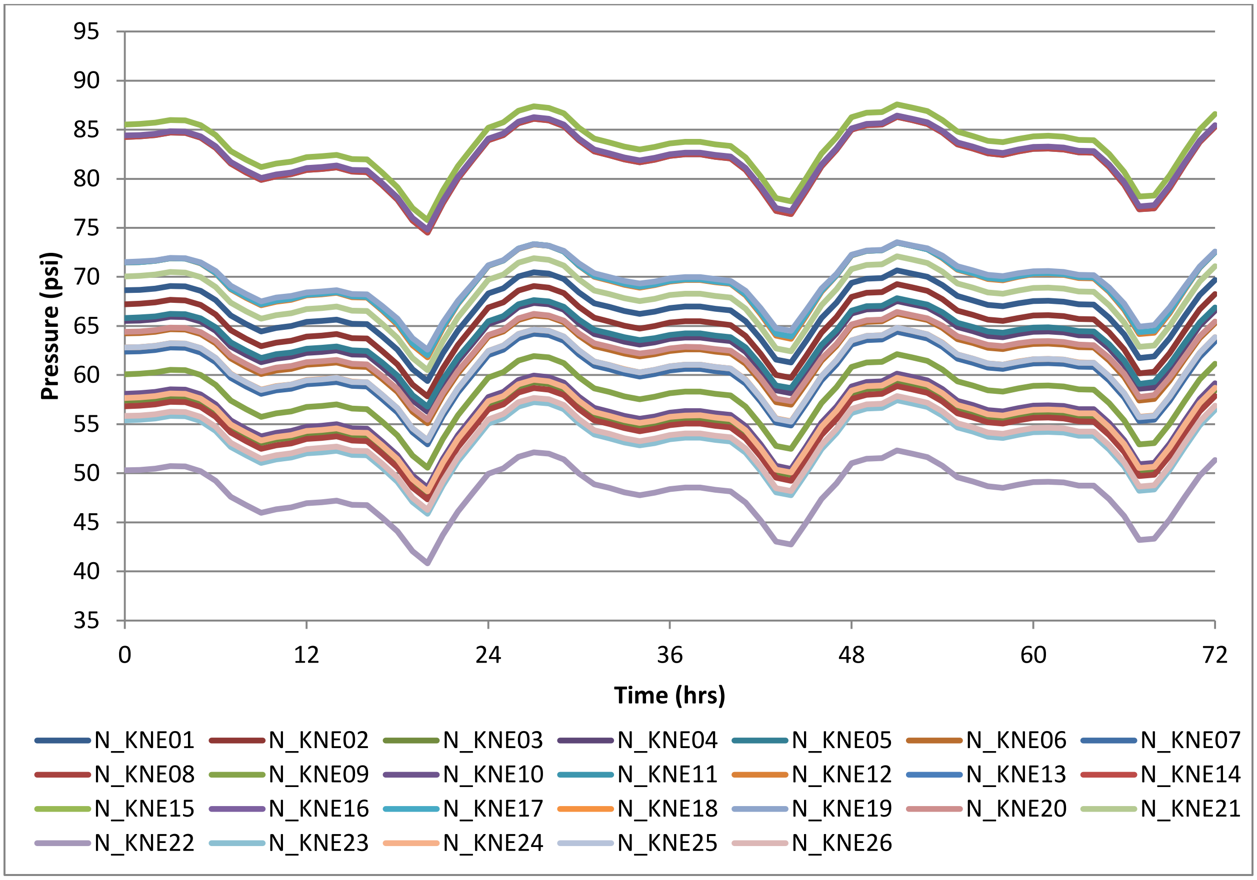


Figure 3-9: Pressures with upgraded 2Ww Network & Existing + KNUE 2012 MXDY EPS Demands

3.2.3 Max Day + Fire Flow Demands

A fire flow assessment was carried out on the proposed KNUE pipe network under MXDY steady state (SS) demand conditions and existing Zone 2Ww pipe conditions.

Table 3-2 provides the results of the fire flow analysis. Two scenarios were considered, existing Zone 2Ww piping with the main 406mm dia. w/m feed along March Road into the KNUE land and the secondary 305mm dia. w/m feed either from Old Carp Road (Option 1) or Celtic Ridge (Option 2).

The Old Carp Road (Option 1) scenario provides fire flow capacities greater than 117 L/s (7,020 L/min) at all nodes. The Celtic Ridge (Option 2) scenario is able to provide fire flow capacities greater than 115 L/s (6,900 L/min) at all nodes. A fire flow 167L/s (10,000L/min) is considered to be a strong flow capable of meeting typical residential construction requirements. Both layouts provide protection above the 167L/s (10,000L/min) at all nodes with the exception nodes N_KNE26 and N_KNE21, which are located at the ends of dead ends. The fireflow at these dead ends would be improved with additional looping with watermains outside the trunk system. This should be accounted for in the implementation strategy for this area. Further information on implementation strategies is provided in **section 3.3** of this report.

Fire flow requirements will still need to be assessed at a subdivision level to determine the Fire Underwriter Survey (FUS) fire flow requirements and any special provisions that may be required in the building designs. Fire flow assessments specific to the development of individual subdivisions within the study area will be carried out as part of each subdivision approval process. Infrastructure will have to be designed accordingly to ensure design guidelines are met and that building designs satisfy the available fire flow requirements as outlined in the Fire Underwriters Survey (FUS).

Table 3-2 - Projected Fire Flows in KNUE Lands Under 2012 MXDY SS Demands

	Available Flow at Hydrant (L/s)	
ID	**Feed from Old Carp Road**	**Feed from Celtic Ridge**
N_KNE01	418	413
N_KNE02	360	357
N_KNE03	222	215
N_KNE04	367	314
N_KNE05	366	215
N_KNE06	353	245
N_KNE07	310	290
N_KNE08	216	208
N_KNE09	220	213
N_KNE10	206	199
N_KNE11	323	335
N_KNE12	294	316
N_KNE13	335	372
N_KNE14	323	380
N_KNE15	335	428
N_KNE16	347	400
N_KNE17	328	354
N_KNE18	301	288
N_KNE19	497	501
N_KNE20	374	318
N_KNE21	131	132
N_KNE22	206	196
N_KNE23	193	188
N_KNE24	213	206
N_KNE25	311	300
N_KNE26	117	115
MIN	117	115
AVG	295	288

3.2.4 Failure Scenarios

The failure scenario analysis was completed to simulate average day demands with a pipe failure along the 406mm dia. w/m March Road feed into the KNUE lands. The winter demand scenario was tested. The two secondary servicing options were assessed. **Table 3-3** shows that under a failure scenario of the large dia. feed into the KNUE lands, the system will continue to provide the typical average day demands and a reduced fire flow as compared to the maximum day + fire flow scenario. The secondary service connection, referred to as Option 1 (Old Carp Road), provides on average 22% greater fire flow capacity than the Celtic Ridge connection.

Table 3-3 - Projected Fire Flows in KNUE Lands Under 2012 BSDY Demands with Pipe Failures

	Available Flow at Hydrant (L/s)		
ID	**BSDY + Fire + 406 BRK March Feed from Old Carp Road**	**BSDY + Fire + 406 BRK March Feed from Celtic Ridge**	**% Difference**
N_KNE01	176	135	-23%
N_KNE02	165	125	-24%
N_KNE03	131	100	-23%
N_KNE04	176	120	-32%
N_KNE05	266	109	-59%
N_KNE06	215	114	-47%
N_KNE07	158	115	-27%
N_KNE08	127	95	-25%
N_KNE09	133	102	-23%
N_KNE10	125	96	-23%
N_KNE11	167	136	-18%
N_KNE12	162	139	-14%
N_KNE13	185	166	-10%
N_KNE14	184	172	-6%
N_KNE15	186	184	-1%
N_KNE16	188	170	-10%
N_KNE17	166	140	-16%
N_KNE18	152	113	-26%
N_KNE19	172	133	-23%
N_KNE20	306	358	17%
N_KNE21	149	94	-37%
N_KNE22	115	84	-27%
N_KNE23	119	92	-23%
N_KNE24	129	100	-23%
N_KNE25	154	114	-26%
N_KNE26	115	76	-34%
MIN	115	76	-34%
AVG	166	130	-22%

Figure 3-10 shows the results of a failure of the 406mm feed along March Road into the KNUE lands under winter demands conditions. As shown, pressures remain above 40 psi under this condition.

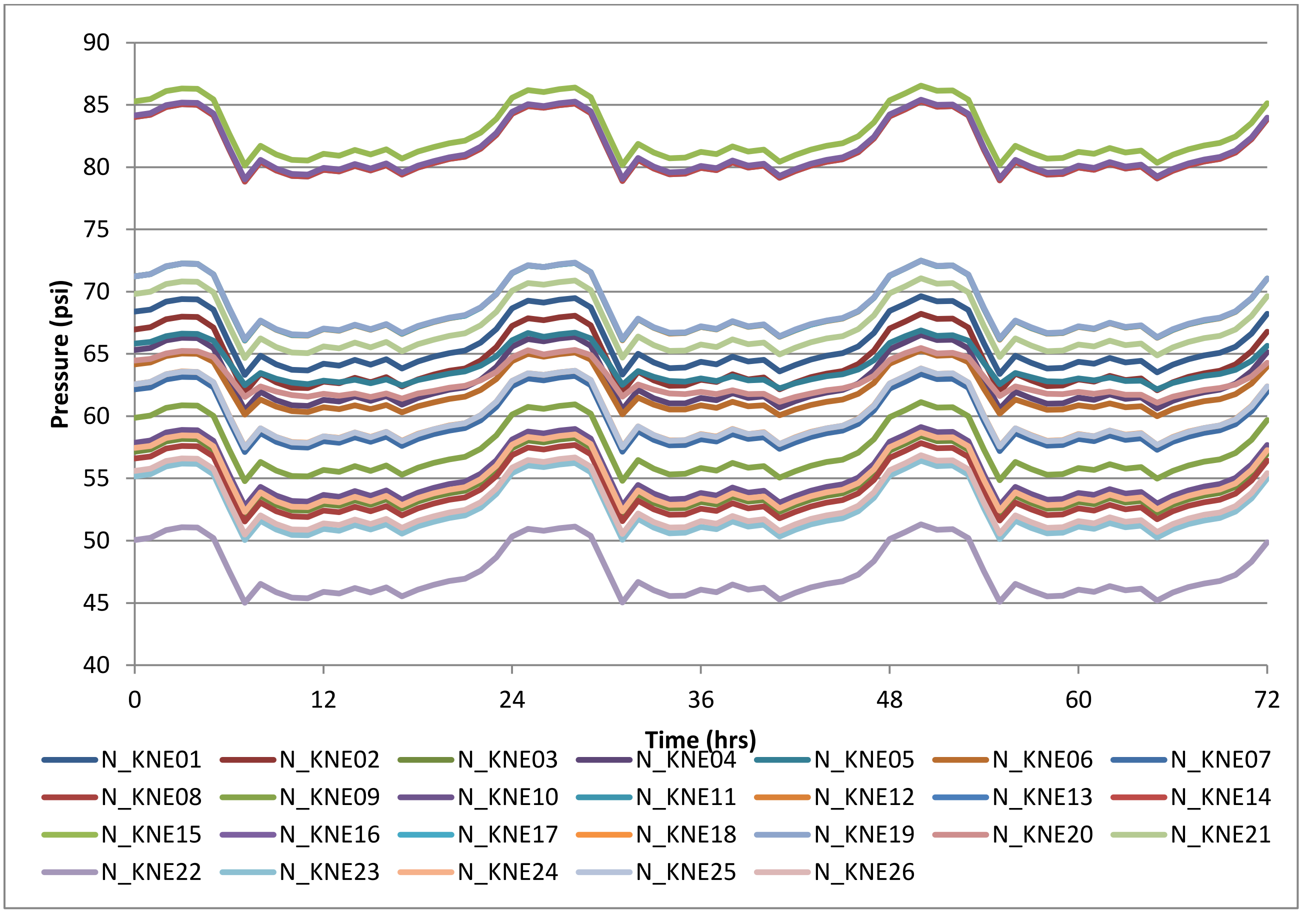


Figure 3-10: KNUE Pressures under Existing 2Ww Pipe Network & Existing + KNUE 2012 BSDY Demands with a pipe failure along the KNUE March Road feed.

3.2.5 2031 Demands

The winter model scenario was tested to observe the pressures in the KNUE lands and zone 2Ww under the 2031 average daily demand conditions. No outdoor water demand was applied in this scenario. **Figure 3-11** shows the resulting maximum pressures throughout zone 2Ww and the KNUE lands when the KNUE build-out demand is added to the network. It should be noted that all 2031 scenarios are represent the assumed replacement of the 406mm watermain along Solandt Road and March Road to 610mm.

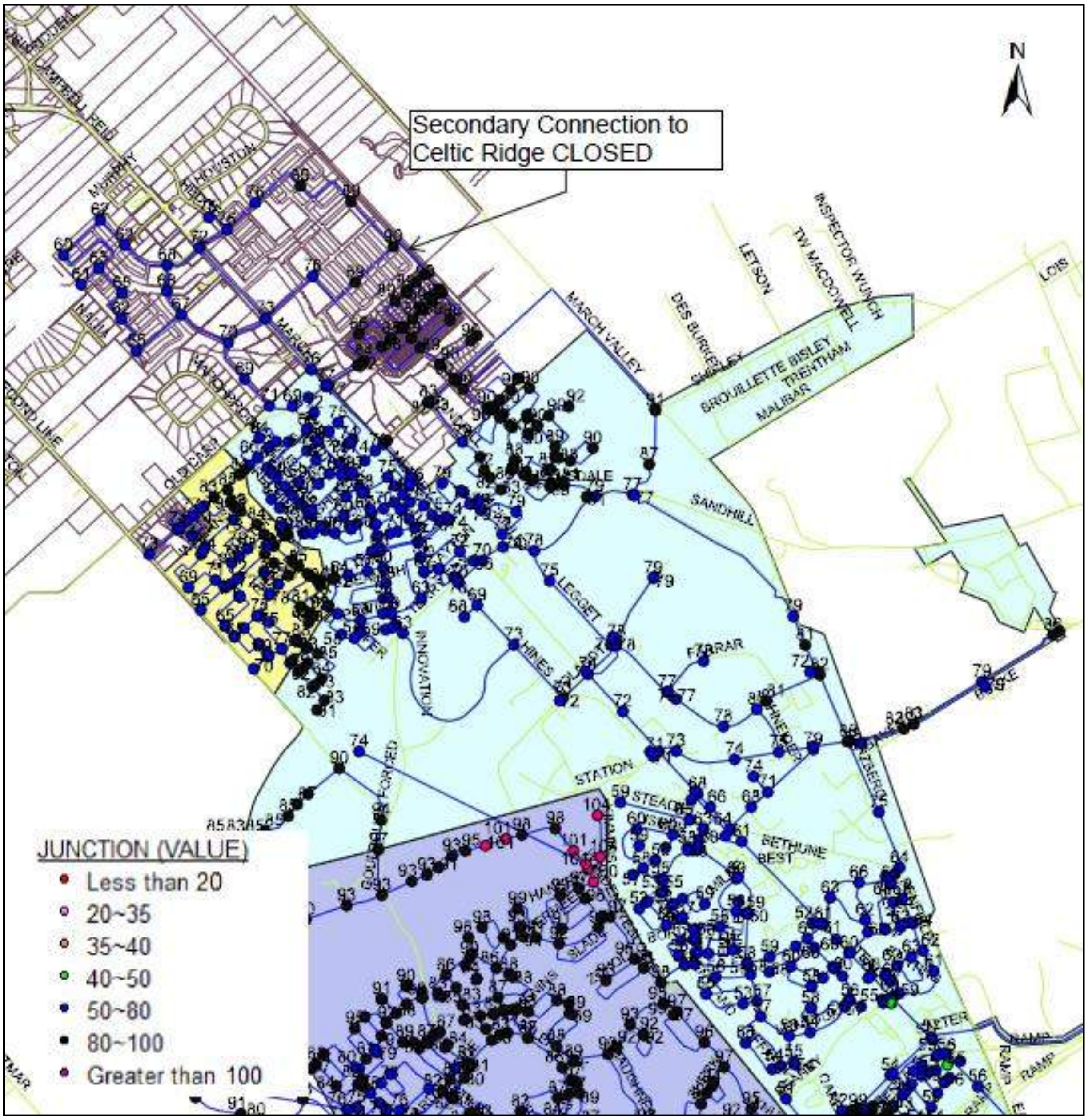


Figure 3-11: Resulting Maximum Pressures Under 2031 Average Day Demands

The summer model scenario was tested to observe the pressures in the KNUE lands and the 2Ww under the 2031 maximum daily demand & peak hour conditions. **Figure 3-12** shows the resulting minimum pressures throughout zone 2Ww and the KNUE lands when the KNUE build-out demand is added to the network. There was no significant change in the KNUE lands servicing.

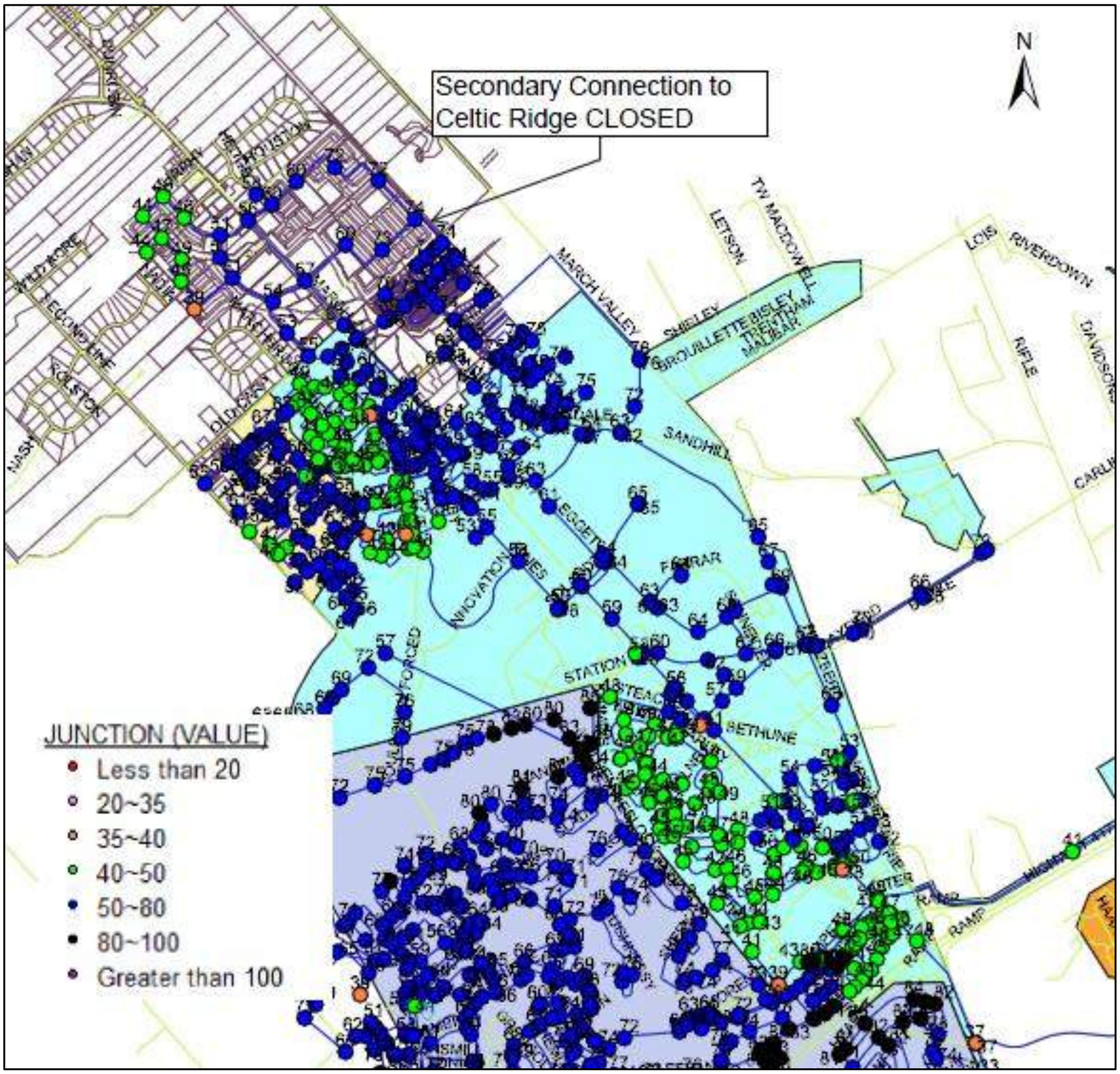


Figure 3-12: Resulting Minimum Pressures Under 2031 Peak Hour Demands

3.3 WATERMAIN INFRASTRUCTURE PHASING

The City of Ottawa Water Design Guidelines (Section 4.3.1) (Newell, W.R., 2010) state that two watermain connections are required to service a development area where the total water demand exceeds 50m^3/d. A secondary w/m connection to the March Road w/m, either along Old Carp Road or Celtic Ridge is required to achieve this guideline objective.

As an interim condition, fireflow and peak hour demand scenarios were modeled in a scenario where the entire development area was serviced by the single 406mm feed on March Road. The minimum pressure in the peak hour scenario was not reduced and fireflow was reduced below the 167 L/s minimum only at dead end locations. Under this interim single feed condition, the development area could be serviced; however the overall reliability would be reduced until the secondary feed is constructed.

Where dead ends must be used, a minimum pipe size of 150mm is required and water age analyses for flushing requirements must be completed. A dead end can service a maximum of 49 homes permanently and 75 homes on a temporarily basis of 2 years. Watermain implementation phasing, determined on site by site basis, will need to follow all requirements presented in the City of Ottawa Water Design Guidelines (Newell, W.R., 2010).

Two dead ends have been incorporated into the model to show potential connection points of the trunk watermain to surrounding areas that may be developed in the future. These dead-end watermains are highlighted in **Figure 3-13** below. The nodes at the end of these dead ends provide a worse-case scenario analysis for fireflow. It should be noted that these dead ends will need to follow the above mentioned requirements per the City of Ottawa Water Design Guidelines (Newell, W.R., 2010). Additional watermain may need to be implemented when these trunk mains develop to ensure the dead ends meet required standards. A proposed strategy for implementation is provided in **Figure 3-13** below. Development with elevations exceeding 93m cannot occur until the upgrade of the 406mm watermains on Solandt Road and March Road to 610mm watermains has occurred.

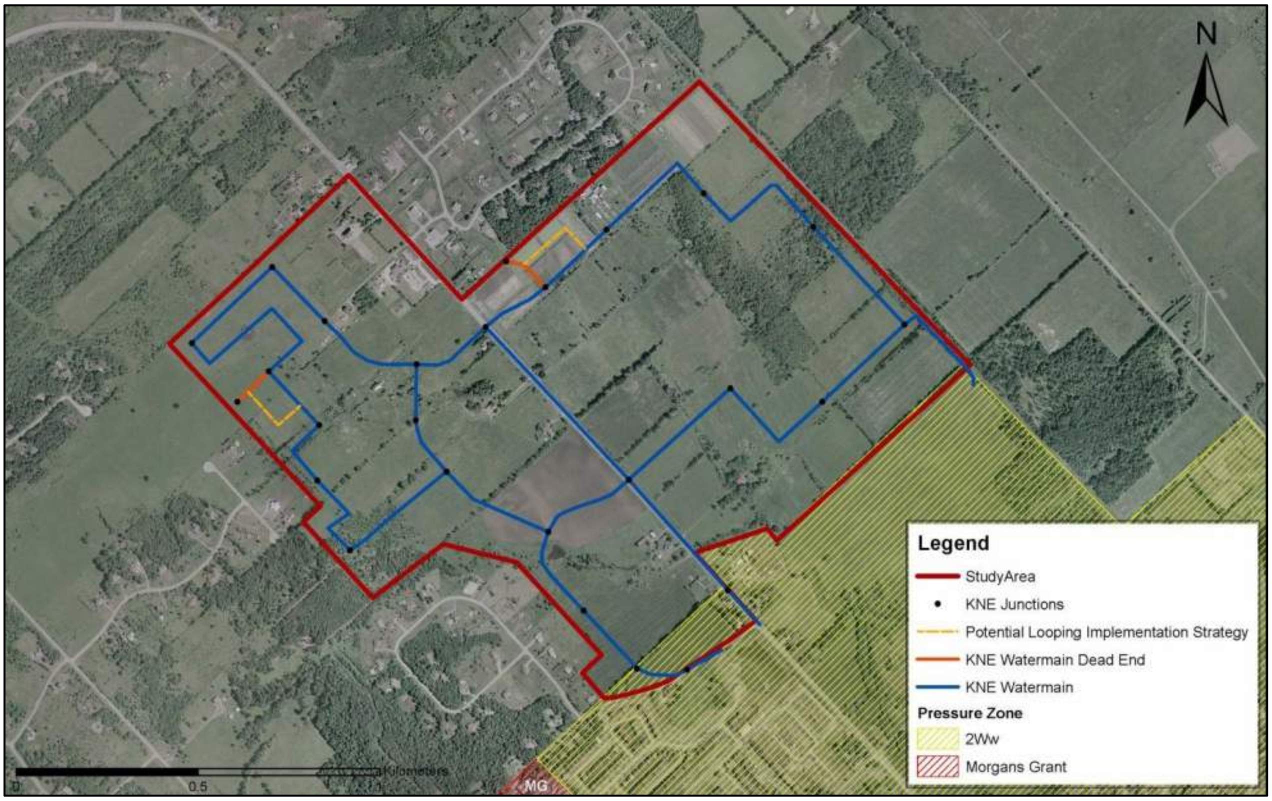


Figure 3-13: Dead End Implementation Strategy

4.0 Recommendations

Stantec Consulting LTD. (Stantec) has completed a hydraulic assessment of the potable water servicing alternatives for Kanata North Urban Expansion (KNUE) area on behalf of Novatech Engineering Consultants LTD. The purpose of this study is to provide a review of the existing conditions and watermain infrastructure in the area of the proposed development as well as offer an analysis of the potential servicing alternative opportunities and constraints.

Based on the findings of the analysis, the proposed pipe network shown in **Figure 2-1** of this report provides sufficient internal capacity to meet the pressure and flow requirements within the KNUE lands. There are two alternative secondary 305mm dia. w/m connections proposed (Old Carp Road and Celtic Ridge). Under typical demand conditions and pipe network conditions, both options provide similar results. The secondary connection to Old Carp Road provides better fire flow capacity under a pipe failure scenario, and thus is the preferred scenario. A diagram of this alternative is provided in **Figure 4-1** below:

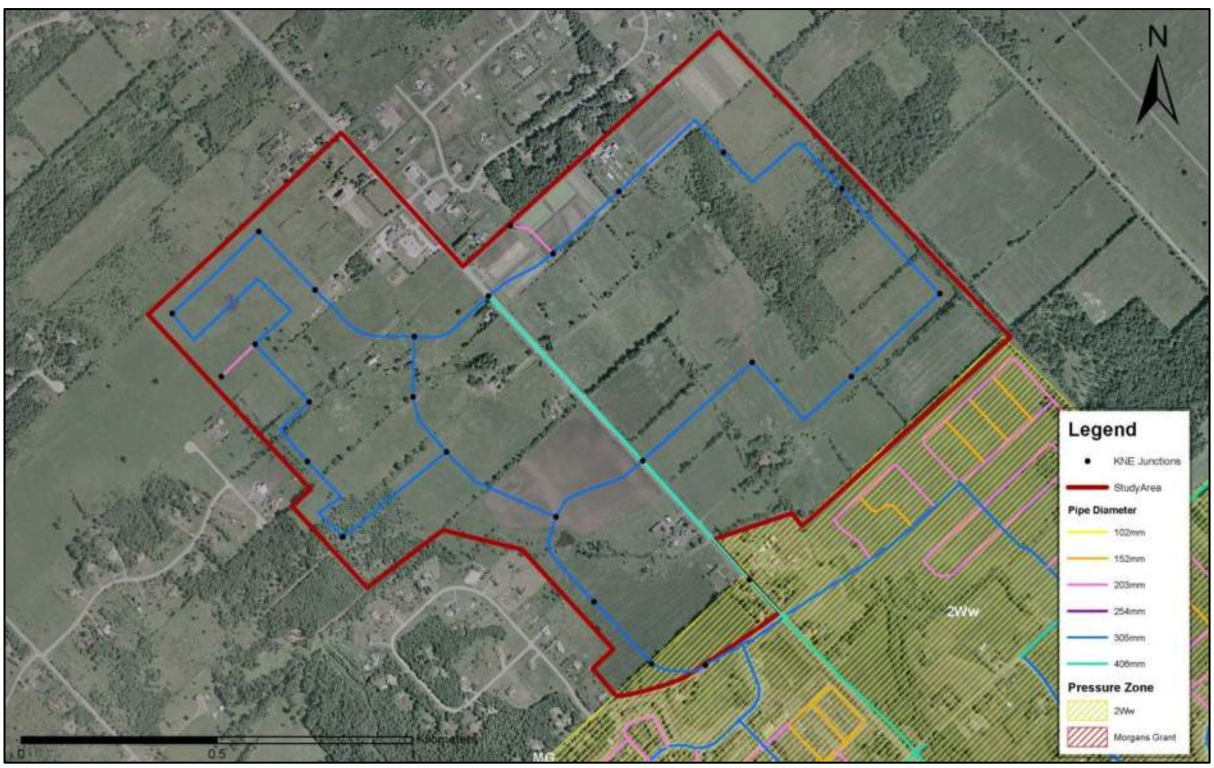


Figure 4-1: Preferred Watermain Layout

It should be noted that the dead end watermains shown above are to provide potential connection points of the trunk watermain to future development. These dead ends may require more watermain looping in actual development than shown in the layout above such that no permanent dead end permanently services greater than 49 homes as per section 4.3.1 of the City of Ottawa Water Design Guidelines (Newell, W.R., 2010).

The proposed KNUE area is recommended to be serviced entirely by the Zone 2Ww due to its topography and location. However, to keep minimum pressures above 40 psi and maximum pressures below 80 psi the following is recommended:

- Ensure site grading does not exceed 93m to maintain minimum pressures above 40 psi.
- Ensure services installed on lands with elevations less than 74m are equipped with pressure reduction valves to meet building code requirements (i.e. keeping maximum pressure below 80 psi).
- Upgrade the two sections of 406mm dia. w/m that break up the 610mm dia. watermain (a total length of approximately 550m) along March Road as described in this report to reduce headloss under build-out demands. This will allow site grading to be increased up to 94m in elevation, while still providing the minimum 40psi of pressure. It is recommended that these upgrades be carried prior to any lands greater than 93m being developed.

From a fire flow perspective, under normal conditions both secondary 305mm dia. connections to the KNUE lands (Old Carp Road and Celtic Ridge) provide adequate flows for typical fire flow requirements. Fire flow requirements will still need to be evaluated at the subdivision planning level to establish FUS requirements.

From a redundancy perspective, under a major pipe failure, the Old Carp Road alignment provides better capacity than the Celtic Ridge connection but both scenarios provide reduced fire flow compared to the maximum day plus fire flow scenario with no break.

In critical areas, where performance is expected to be close to design limits, additional losses through the local system could result in substandard service. Adjustments to future plans of subdivision or site plans in the study area may be needed in these areas. Adjustments could include one or more of the following:

- ROW adjustments to allow for improved watermain looping;
- reduce maximum elevation of serviced land; and/or
- adjust development characteristics to reduce fire flow requirements.

Lastly, through this assessment, there is a section of 914mm diameter watermain along Teron Drive that provides a “singe feed” to the entire Zone 2Ww area north of Campeau Drive. This single feed connection is noted for the City to consider for improved reliability from a zone servicing perspective. The City has indicated that it is the City’s intent to acquire existing private watermain connections at the south end of the 2Ww service area to improve back-up supply to the zone.

5.0 Works Cited

Ministry of the Environment. (2008). *Design Guideline for Drinking Water Systems* . Government of Ontario.

Newell, W.R. (2010). *Ottawa Design Guidelines - Water Distribution*. Ottawa: City of Ottawa.

Novatech. (2016). *Kanata North Community Design Plan* . Ottawa: Novatech.

Novatech. (2016). *Kanata North Onsite Sanitary Drainage Area Plan*. Ottawa: Novatech.

Appendix A Development Concept Plan

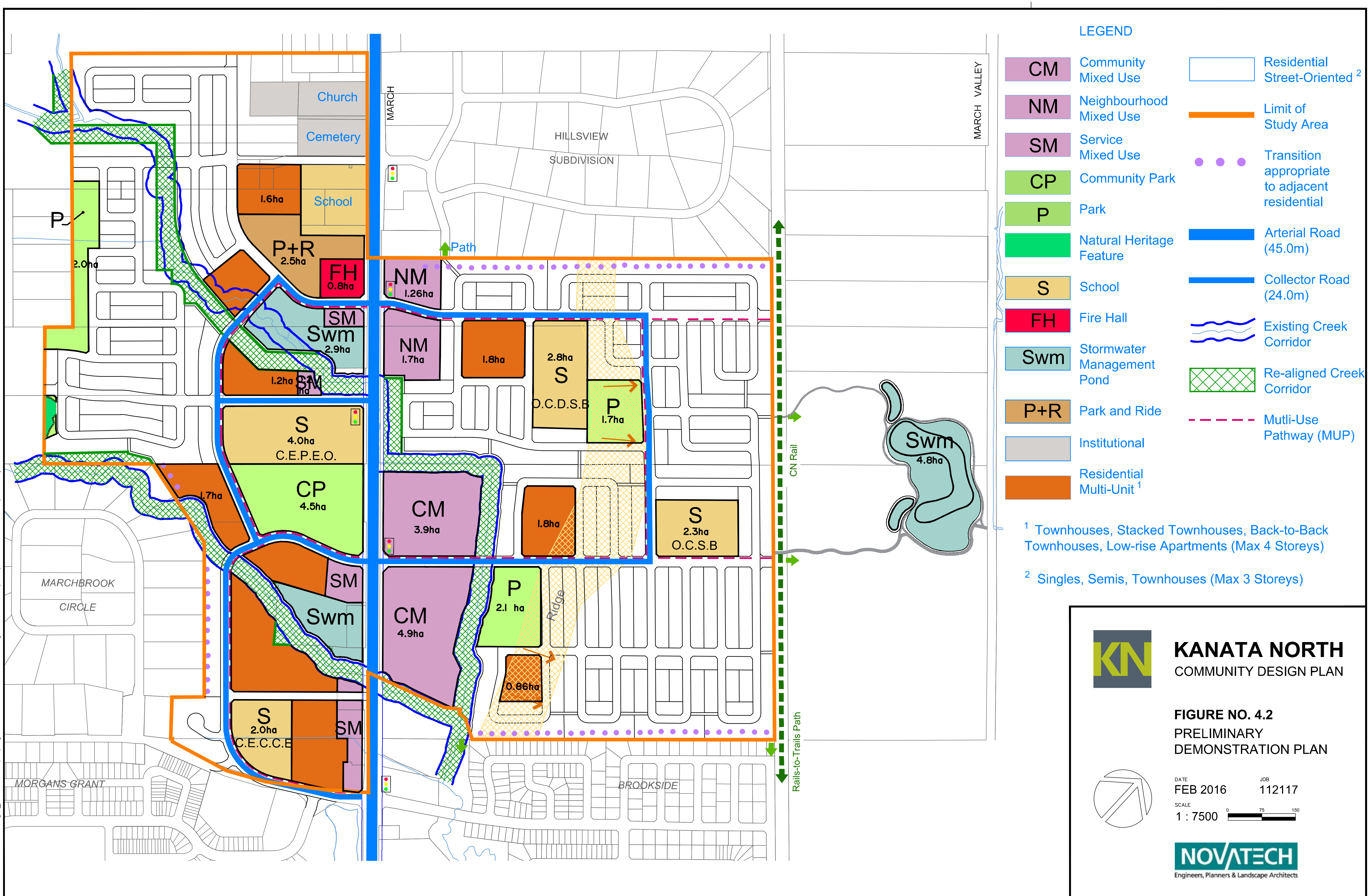


FIGURE NO. 4.2
PRELIMINARY DEMONSTRATION PLAN

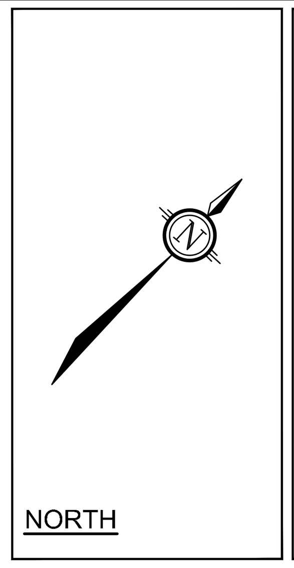
M:\2012\112117\CAD\Design_EMP\MEMO (CS)\Figure 9.1 Demonstration Plan.dwg, DEMO PLAN (MSS), Feb 23, 2016 - 2:00pm, lseely

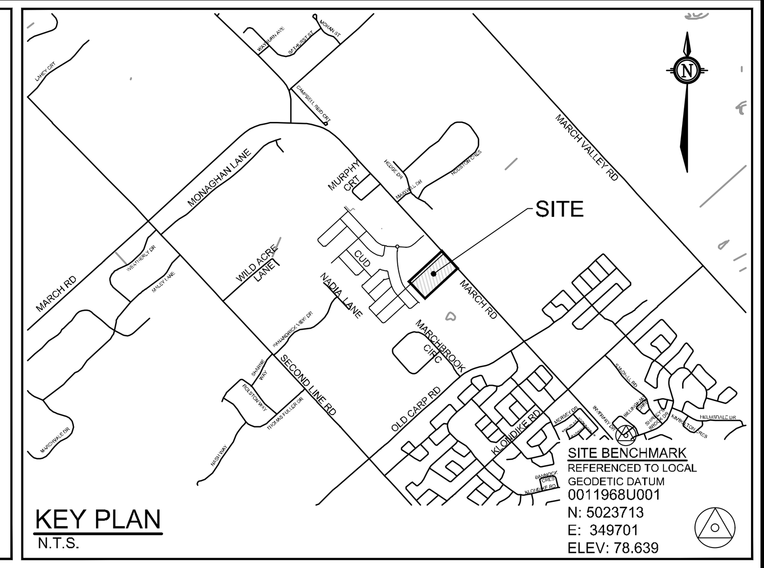
APPENDIX E
DRAWINGS

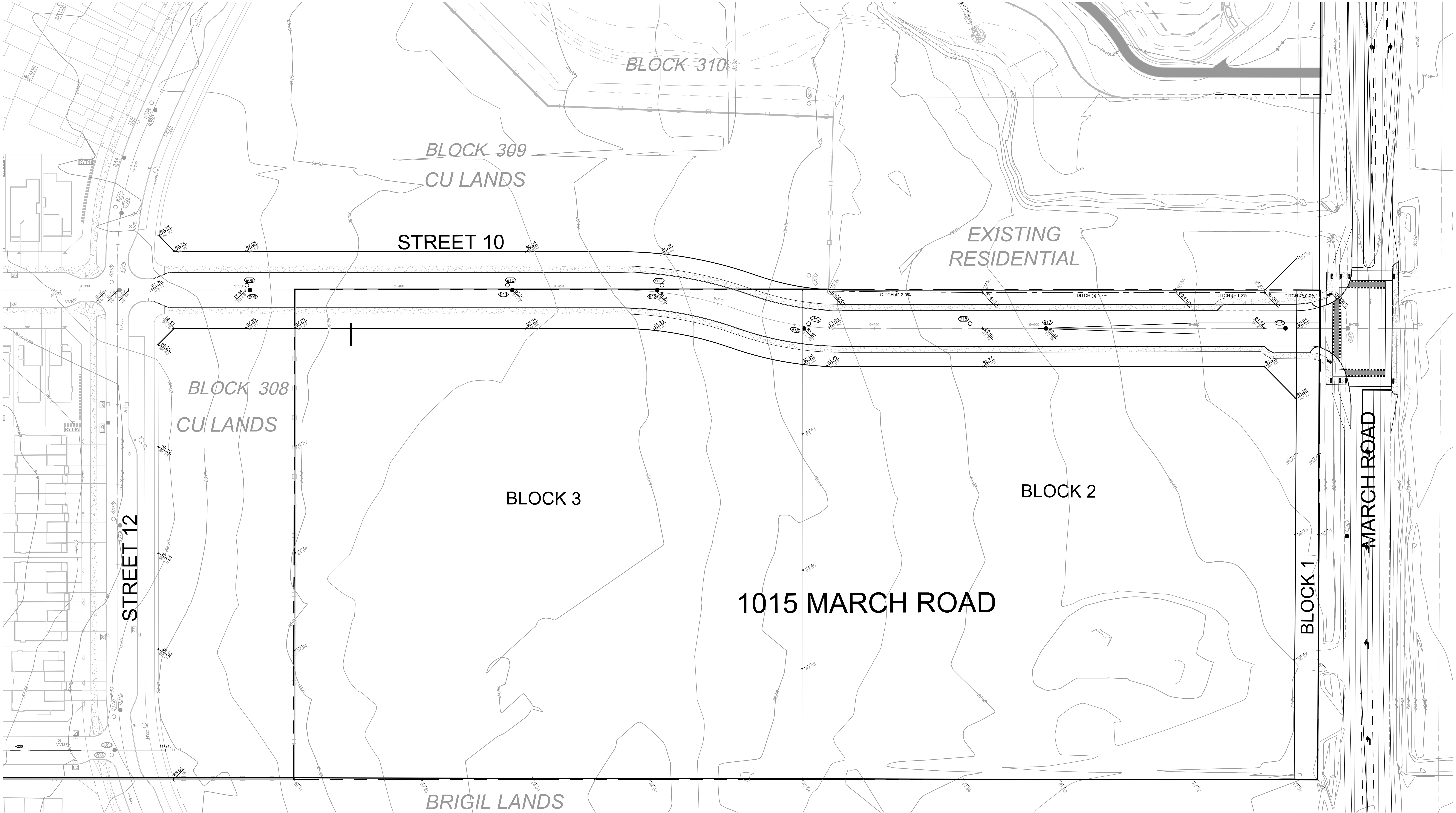
- Drawing List
  - 121247-GR Grading Plan

LEGEND

- PROPERTY BOUNDARY
- 127.55 / 127.45 — PROPOSED ELEVATION / EXISTING ELEVATION
- 127.55 / 127.45 — PROPOSED CUD ELEVATION / EXISTING ELEVATION
- 127.45 — EXISTING ELEVATION







REFER TO ____________ FOR ADDITIONAL NOTES

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	FEB 1/22	DDB

SCALE 1:500

1:500
0 5 10 15 20

DESIGN	BM
CHECKED	DDB
DRAWN	RBG
CHECKED	BM
APPROVED	DDB

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
Feb. 1 2022
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
1015 MARCH ROAD

DRAWING NAME
GRADING PLAN

PROJECT No. 121247-00
REV REV # 1
DRAWING No. 121247-GR

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