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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.

39 Years

Engineering excellence. Planning progress. Liveable landscapes.

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
Revised: August 10, 2022
Revised: November 25, 2022

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

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Engineers, Planners & Landscape Architects

November 25, 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 revised 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

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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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.

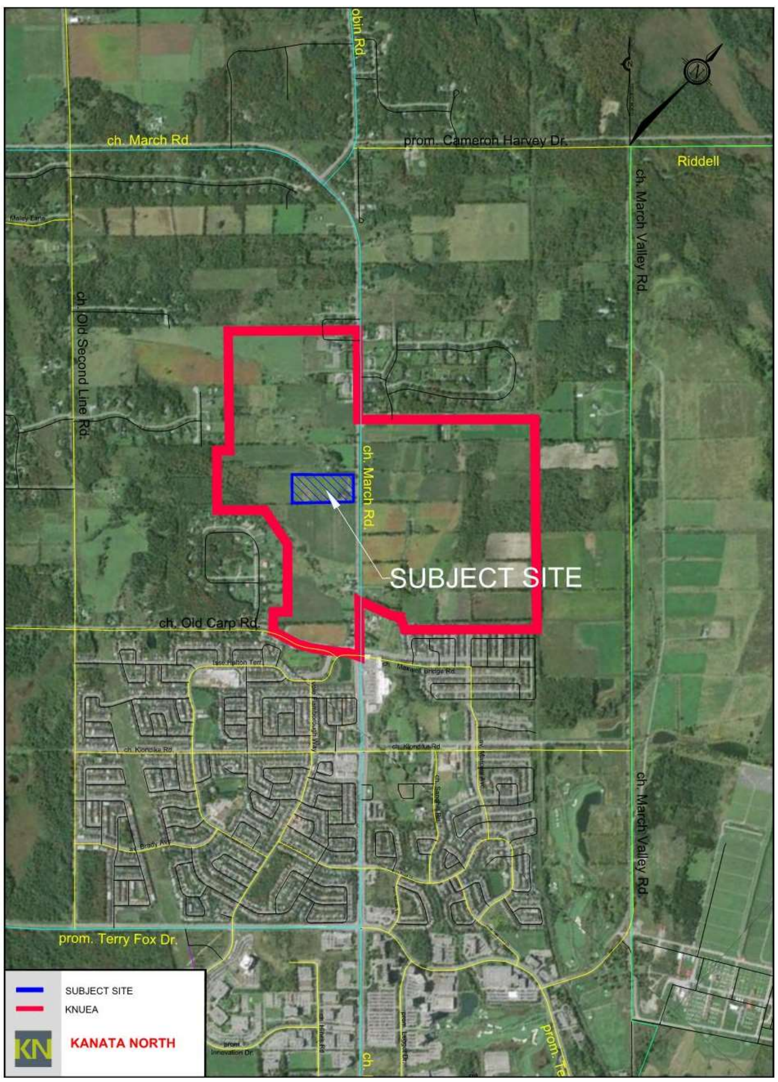
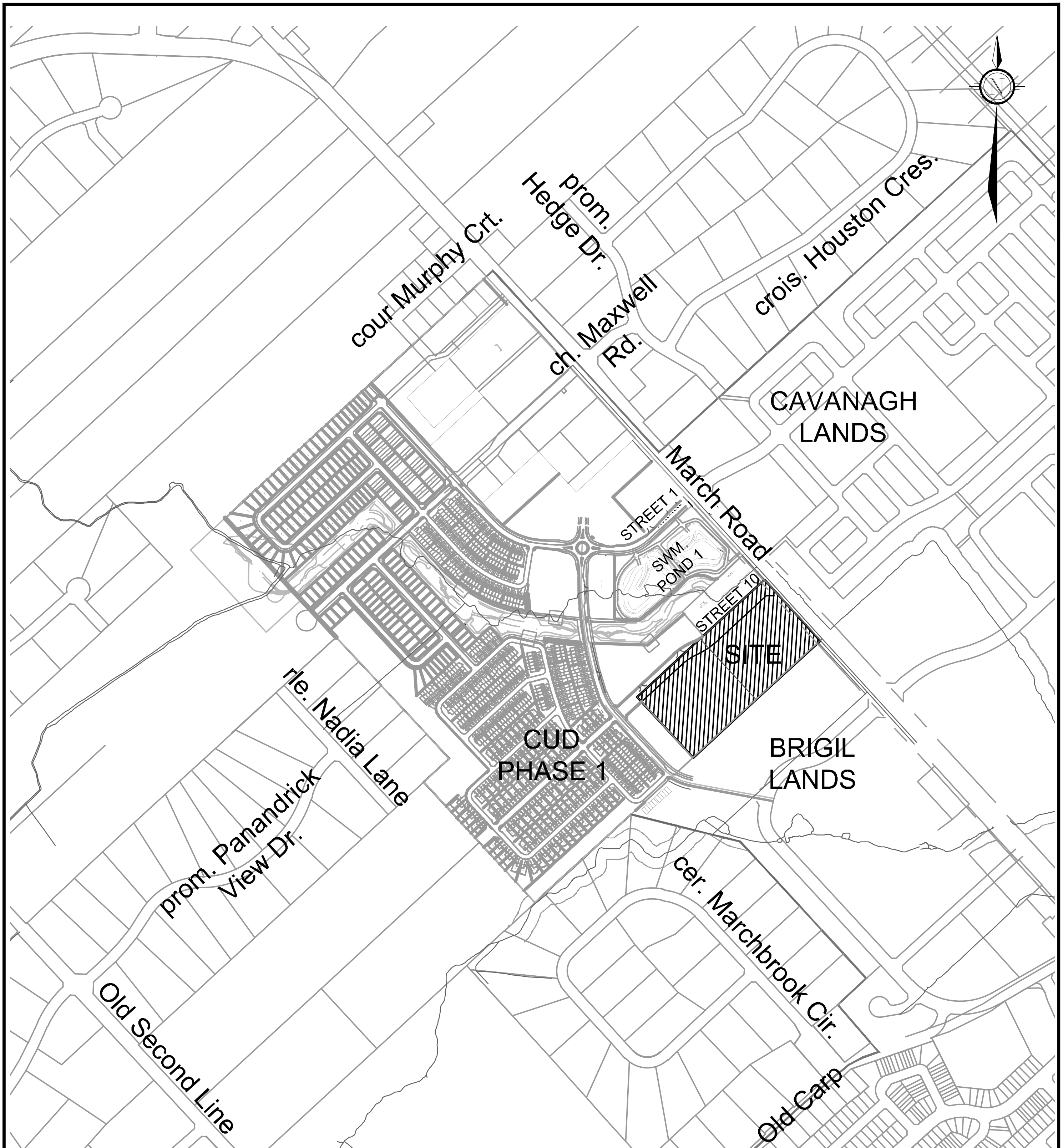


Figure 1 – Kanata North Urban Expansion Area (KNUEA) Context and Site Location



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1015 MARCH ROAD

KEY PLAN

SCALE 1 : 10000 (0 100 200 300 400)

DATE	JOB	FIGURE
NOV 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.

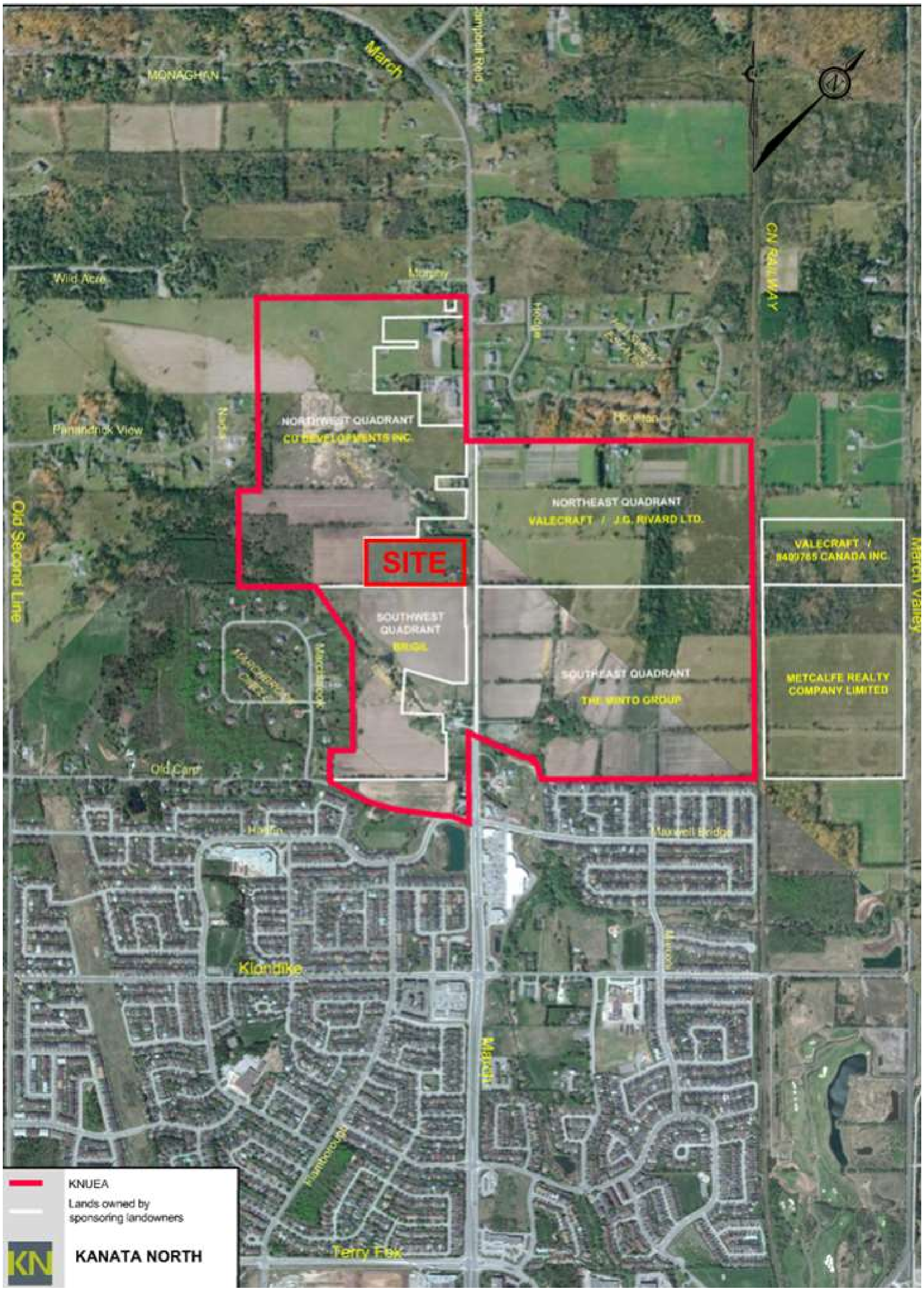


Figure 3 - KNUEA Boundaries and Properties of Sponsoring Landowners

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 (Copperwood Estate) 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

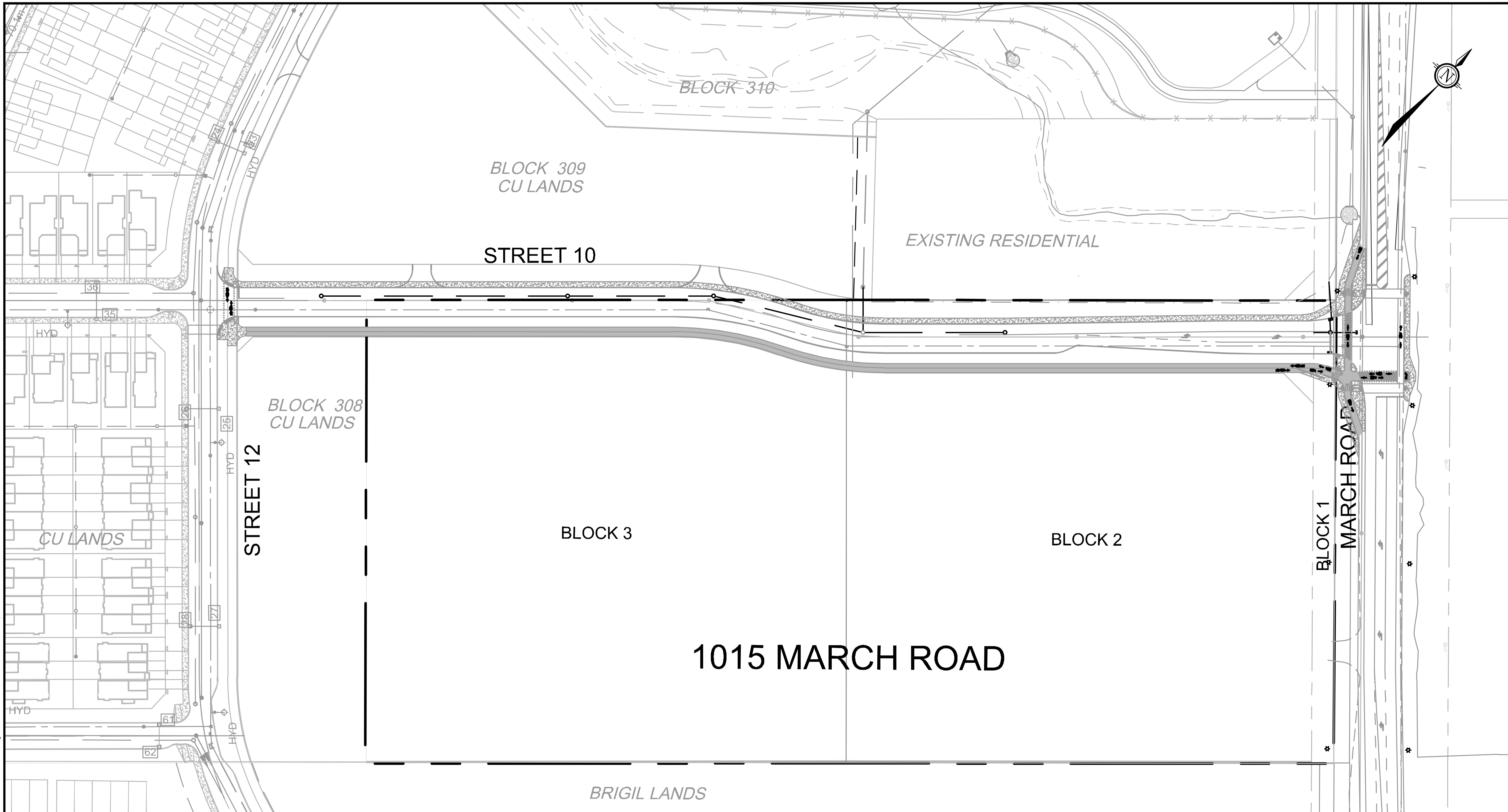
Under the new *Official Plan,* the Subject Site is now designated as a *Corridor – Mainstreet* measured 220 meters from the centreline of March Road with the remaining portion designated as *Neighbourhood*. The Subject Site is located within the *Suburban (West) Transect* of *Schedule B5* of the City 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, Report: PG5014-1 Revision 1 dated June 28, 2022, prepared by Paterson Group.*
- *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 November, 2022, prepared by Novatech.*



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1015 MARCH ROAD

CONCEPT PLAN

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

SHT11X17.DWG - 279mmX432mm

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 Copperwood Estate 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
NOV 2022	121247	FIGURE 5

SHT8X11.DWG - 216mmx279mm

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 in 2019 and nine (9) boreholes were advanced in 2022. 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.
- A permissible grade raise restriction of 2.5m is recommended for this site.

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, November 2022) 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.

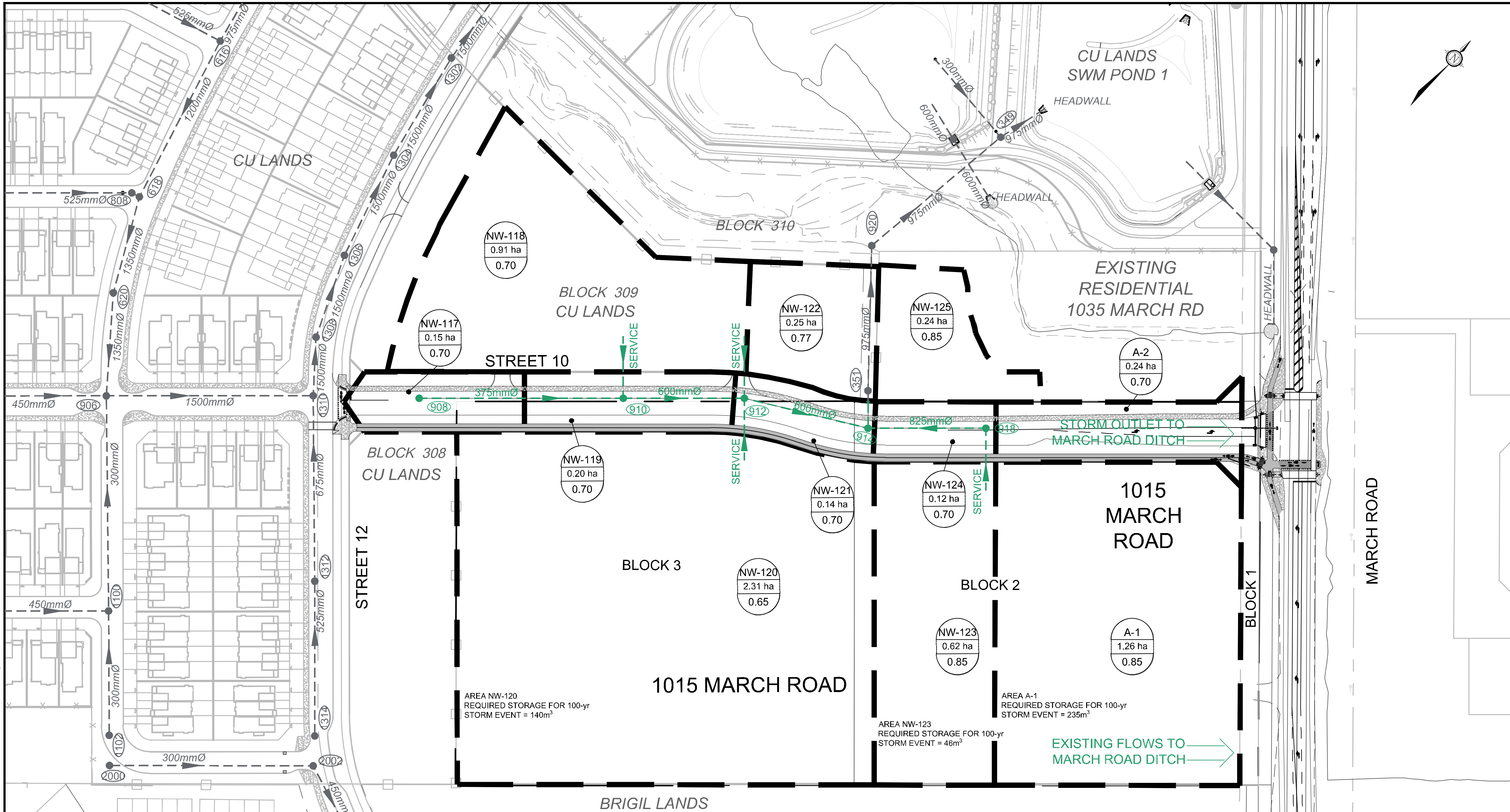
3.1 Lands Adjacent Street 10

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 309 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 within the upper west half of Street 10 to prevent excess overland flow along the west half of the roadway from spilling downstream to March Road. The remainder of Street 10 (lower east half) 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**.

Future School Site (Block 3)

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



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 (INTERIM)

SCALE 1 : 1000

DATE NOV 2022 | JOB 121247 | FIGURE 6

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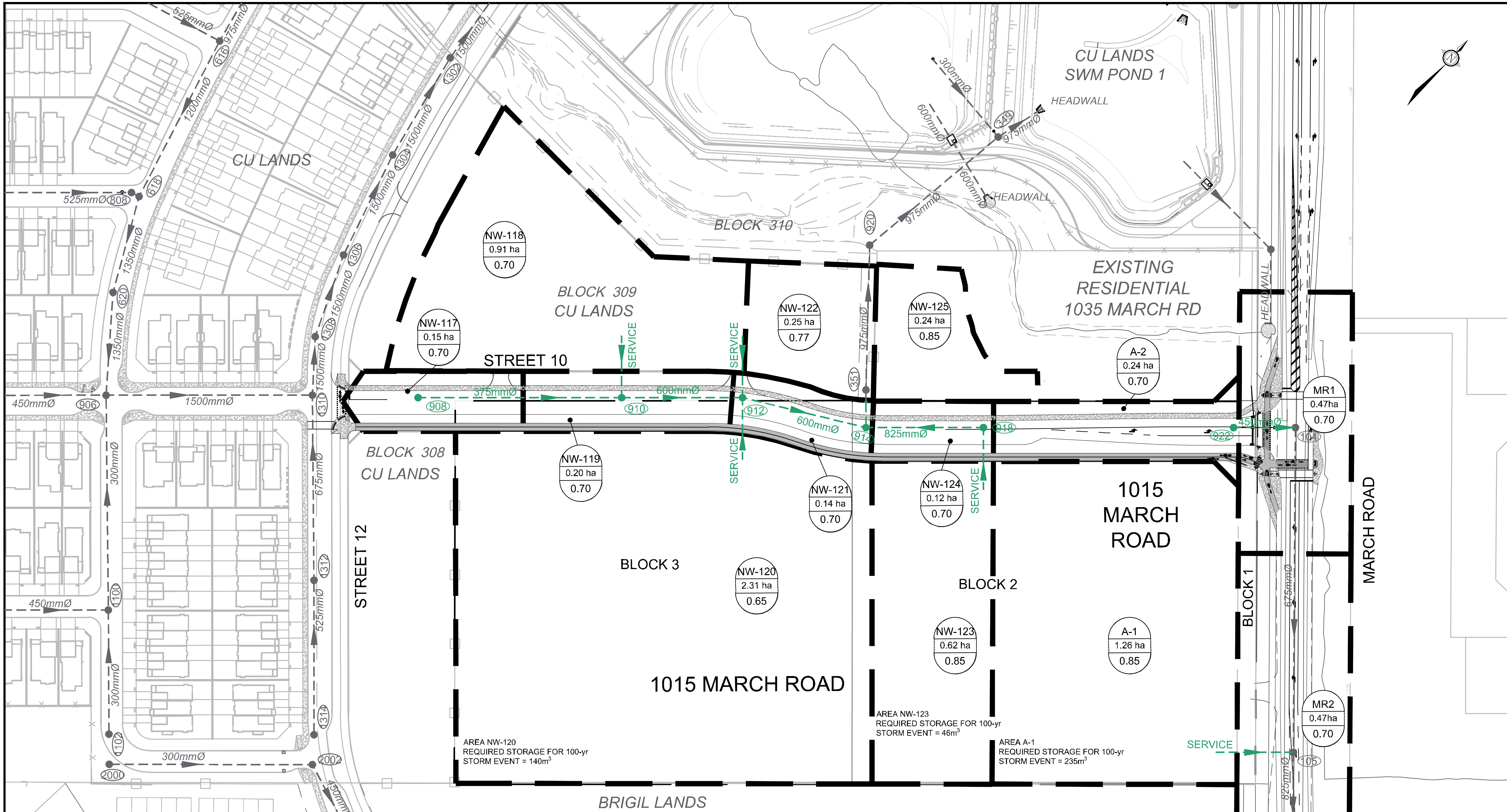

LEGEND

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 1 : 1000

DATE NOV 2022 | JOB 121247 | FIGURE 7

SHT11X17.DWG - 279mmX432mm

hydraulic grade line (HGL) elevations are dictated by the water levels in the lower SWM Pond 1, as shown below:

Estimated 100-year HGL	*3-hour Chicago*	*24-hour SCS*
Lower Pond (overflow weir = 81.87m)	81.64m	**81.87m**
MH914 (Street 10 – before diversion)	81.64m	**81.87m**
MH918 (Street 10 – eastern MH)	81.64m	**81.87m**

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. Ultimate storm servicing will be provided by storm sewers that will outlet to Pond 3. Pond 3 is the outlet for the east half of the subject site and is part of the 936 March Road 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 the west half of 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 on the upper west half of Street 10 will reduce the storm flows to March Road right-of-way as per CU Lands design.

Twin inlet storm catchbasins and sewers will be provided in the lower half of Street 10 but will not be connected to a piped storm sewer outlet until the future storm sewer is constructed in March Road. A 250mm pipe will be installed in the north set of catchbasins that will outlet to the existing ditch along March Road and provide the temporary outlet until March Road is urbanized. Quantity and quality control will be provided by a small plunge pool at the outlet of the 250mm pipe and the existing March Road ditch. A figure illustrating the proposed catchbasin system is provided in **Appendix B**. Once March Road is urbanized, the storm sewer stub from STMMH922 will be extended and connected to the new storm sewer within 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 design will be required as part of a separate site plan application for Block 2. A conceptual cross-section illustrating possible building finish floor elevations, on-site sewers, on-site dry pond, existing March Road ditch and future March Road storm sewers is provided in **Appendix B.**

Refer to **Figure 6** – Storm Sewer Layout (Interim) for more details.

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

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

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 (0.10 ha)	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 (West Half) (Outlet to SWM Pond 1)	Post-development conditions (0.62 ha)	0.85 (proposed – KNMSS)	• Proposed storm sewer (sized for 5-yr storm event on-site) and directed to minor system Street 10 (West Half) and conveyed to SWM Pond 1 in CU Lands.	• 100-year storm event controlled and stored on-site (within parking areas and underground) and released to minor system Street 10 (West Half) and conveyed to SWM Pond 1 in CU Lands.	• Emergency overland flows will be directed to March Road.
Block 2 (East Half) (Outlet to March Road)	Post-development conditions (1.26 ha)	0.85 (proposed – KNMSS)	• Interim: Proposed on-site storm sewer (sized for 5-yr storm event), may be directed to on-site dry pond and outlet to March Road ditch. The dry pond would be removed when March Road storm sewer is installed. • Ultimate: Proposed on-site storm sewer (sized for 5-yr storm event) directed to March Road storm sewer ultimately outletting to Pond 3.	• Interim: 100-year storm event controlled and stored on-site (within parking areas, dry pond and underground) and released to March Road ditch. • Ultimate: 100-year storm event controlled and stored on-site (within parking areas and underground) and released to storm sewer in March Road ultimately outletting to Pond 3.	• Emergency overland flows will be directed to March Road.
Block 3	Post-development conditions (2.31 ha)	0.65 (proposed – KNMSS)	• Proposed on-site storm sewer (sized for 5-yr storm event) directed to Street 10 (West Half) storm sewer via. on-site sewers.	• 100-year storm event controlled and stored on-site (within parking areas and underground) and released to minor system in Street 10 (West Half).	• Emergency overland flows will be directed to March Road.
Street 10 (West Half) (Outlet to SWM Pond 1)	Post-development conditions (0.61 ha)	0.70 (proposed – KNMSS)	• Proposed storm sewer (sized for 100-yr storm event) to be directed to SWM Pond 1 in CU Lands.	• 100-year storm event captured and conveyed in the storm sewer system to SWM Pond 1 in CU Lands.	• Emergency overland flows will be directed to March Road.
Street 10 (East Half) (Outlet to March Road)	Post-development conditions (0.24 ha)	0.70 (proposed – KNMSS)	• Interim: Proposed storm sewer (sized for 5-yr storm event) to capture storm events with catchbasins and directed to existing March Road ditch. An ICD will be installed to control flows. • Ultimate: Storm sewer sized to service east half of Street 10 (sized for 5-yr storm event) will be connected to March Road storm sewer system. An ICD will be installed to control flows.	• Interim: 100-year storm event controlled and released to March Road ditch. • Ultimate: 100-year storm event controlled and released to storm sewer in March Road ultimately outletting to Pond 3.	• Emergency overland flows will be directed to March Road.
Lands Not Owned by the Applicant					
1035 March Road	Remain per ex. conditions (0.24 ha)	0.85 (existing - KNMSS)	NA	Flows overland to: 1) March Road (urbanized); or 2) March Road westside ditch.	• Same as Major System.
Future Development Sites					
Block 308 (CU Lands)	Post-development conditions (0.19 ha)	0.65 (proposed – KNMSS)	• Proposed on-site storm sewer (sized for 5-yr event) directed to Street 12 storm sewer.	• 100-year storm event controlled and stored (underground) and released to minor system.	• Emergency overland flows will be directed to Street 12.
Block 309 (CU Lands)	Post-development conditions (1.16 ha)	0.70 (proposed – KNMSS)	• Proposed on-site storm sewer (sized for 5-yr event) directed to Street 10 (West Half) storm sewer.	• 100-year storm event 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 storm event) plus March Road (10-year storm event).	• Major overland flow conveyed and ultimately outletting to 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.

3.6 Low-Impact Development Techniques

As part of the adjacent CU Lands development detail design process, the City indicated that Low-Impact Development (LID) Techniques were not required and as this development has similar connections with CU Lands, no LID's are proposed for 1015 March Road.

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 (Copperwood Estate) 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 east half of 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 8** – 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

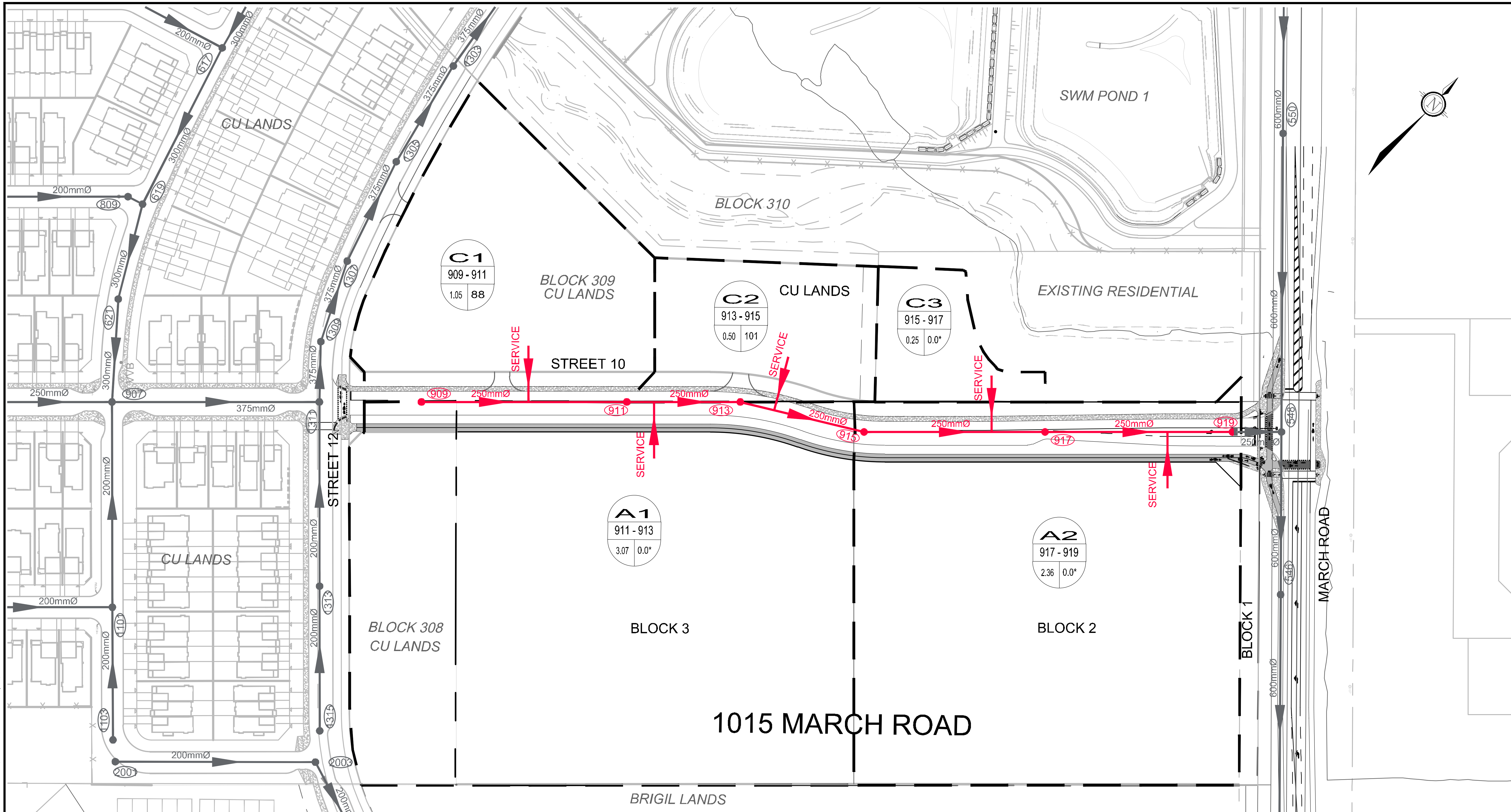
Design Criteria

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

NOVATECH
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1015 MARCH ROAD

PROPOSED SANITARY LAYOUT

SCALE 1 : 1500

DATE NOV 2022 | JOB 121247 | FIGURE FIGURE 8

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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
- Multi Unit Flats = 2.1 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

Sanitary Flows

The peak sanitary flows for the 1015 March Road development is 6.39 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	189	1.55	2.16	0.51	2.67
Institutional/Commercial/Mixed Use		5.68	1.84	1.88	3.72
Park		-	-	-	-
Total Flow	**189**	**7.23**	**4.00**	**2.39**	**6.39**

(1) Peaking Factor for residential and institutional/commercial areas as per Section 5.2.1

As demonstrated in the CU Lands Detailed Serviceability report, the sanitary sewer design sheet for Street 10 calculated a sanitary flow of 6.39 L/s to outlet to the March Road trunk sewer. The sanitary flows generated from the 1015 March Road development and Street 10 have been coordinated to match the flow derived in the Detailed CU Development Serviceability Report. Sanitary design sheets from the KNUEA Community Design Plan estimated a peak sanitary flow of 14.7 L/s to release from the 1015 March Road Development. A decrease in peak flow of roughly 57% from the KNUEA Community Design Plan to the proposed peak flow is largely due to a decrease in residential and non-residential design parameters. Refer to **Appendix C** for Street 10 design sheets and sanitary drainage area plans from the CU Detailed Serviceability Report and the KNUEA Community Design Plan**.**

The proposed sanitary sewer alignment and drainage areas are shown on **Figure 8** - 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 of Ottawa 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.

A 300mm 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 300mm 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 9** – 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.

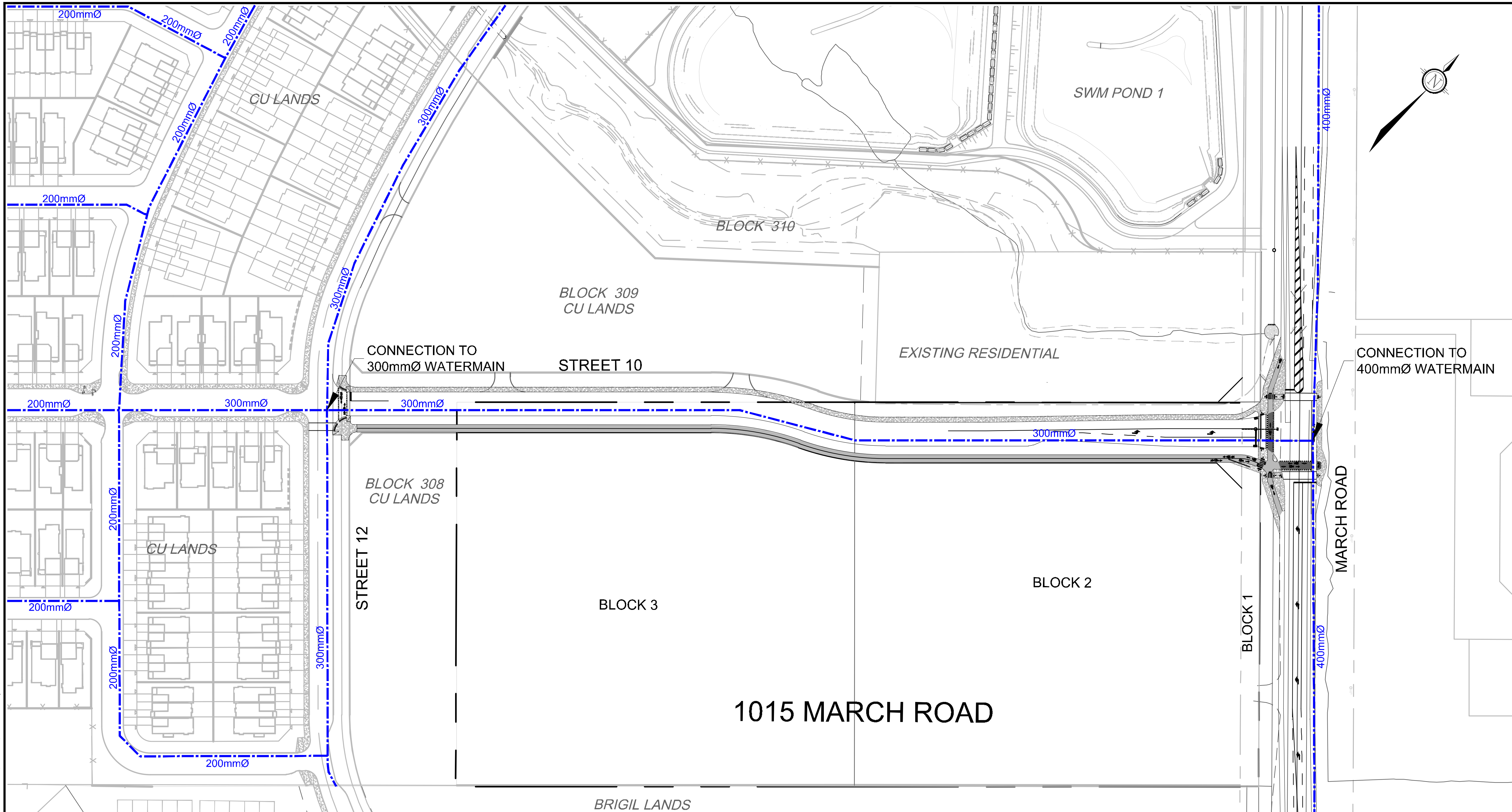
Boundary Conditions for the 1015 March Rd development have been taken from the CU development watermain design. Scenario 1 from the CU development serviceability report utilizes a single connection to the 400mm existing watermain on March Rd as a boundary condition. Refer to **Appendix D** for boundary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

NOVATECH

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Ottawa, Ontario, Canada K2M 1P6

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Website www.novatech-eng.com

1015 MARCH ROAD

PROPOSED
WATERMAIN LAYOUT

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

DATE NOV 2022 | JOB 121247 | FIGURE FIGURE 9

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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

Fire Flow Analysis

To analyze the proposed watermain under fire flow conditions, an iterative process has been utilized to determine a maximum allowable fire flow 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 fire flow 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)	2.16	9.48	689.5/100 (Max)	492.4/71.4 (Max)	6.3
Maximum Daily Demand (c/w Fire Flow) Node N48	3.66 (300.0)	22.01	137.9/20.0 (Min)	155.7/22.6 (Min)	N/A
Maximum Daily Demand (c/w Fire Flow) Node N50	3.66 (300.0)	22.01	137.9/20.0 (Min)	170.3/24.7 (Min)	N/A
Peak Hour	7.01	47.40	275.8/40.0 (Min)	345.5/50.1 (Min)	N/A

The table above indicates that the proposed watermain can service the proposed 1015 March Road development under all operating conditions using a series of 300mm pipes. Using an iterative method of fire flow analysis, the boundary condition with the greatest fire flow (300 L/s) provided adequate results within Blocks 2 and 3. The method of fire flow analysis is 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

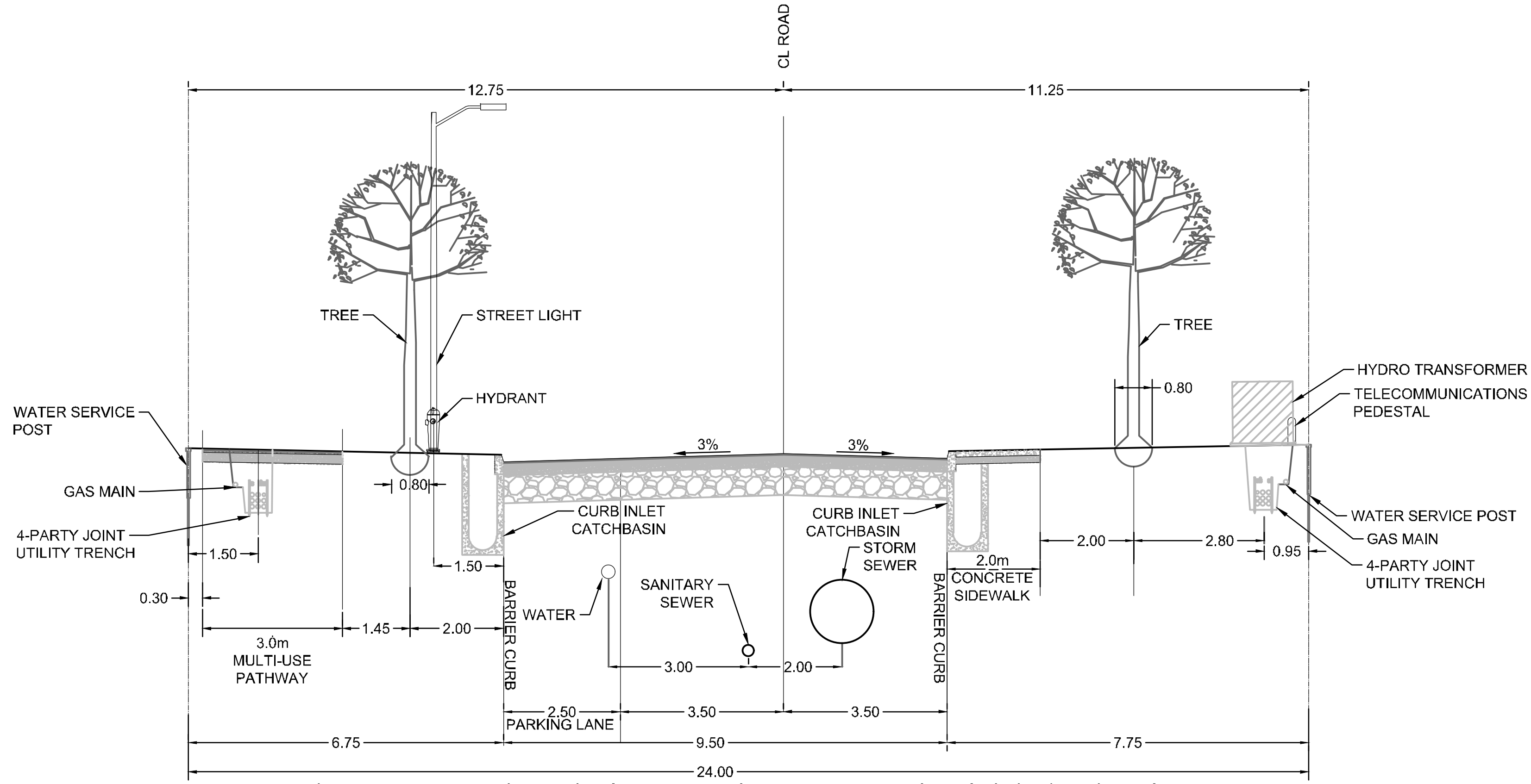
The proposed development will consist of a collector roadway with a 24.0m right of way (ROW). The proposed cross section will conform to the City of Ottawa Standards in force at the time of site plan pre-consultation. Refer to **Figure 10** – Street 10 (West) – Typical 24.0m Cross Section which applies to the ROW adjacent Block 309 of CU development lands. The proposed grading from the CU development 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). There is a swale with 3H:1V sloping proposed on the northeast side of Street 10 adjacent to 1035 March Road. The swale and sloping will allow the Street 10 ROW to match to the existing property. Refer to **Figure 11** – Street 10 (East) – Typical 24.0m Cross Section. The proposed grading on the south side of Blocks 2 and 3 will utilize a combination of retaining walls and/or maximum 3H:1V terracing to match to the current elevations of the Brigil Lands. The proposed grading along the Street 10 ROW and the perimeter of the site are shown on the Preliminary Grading Plan (Drawing **121247-GR**). Cross sections of the conceptual grading within Block 2 are included in **Appendix B**.

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



STREET 10 (WEST) - TYPICAL 24.0m CROSS SECTION
FROM SALINGER ST. (STREET 12) TO MARCH ROAD
ADJACENT BLOCK 309 CU LANDS

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

1015 MARCH ROAD

STREET 10 (WEST) - TYPICAL 24.0m CROSS SECTION

SCALE 1 : 150 (0 2 4 6)

DATE NOV 2022 | JOB 121247 | FIGURE FIGURE 10

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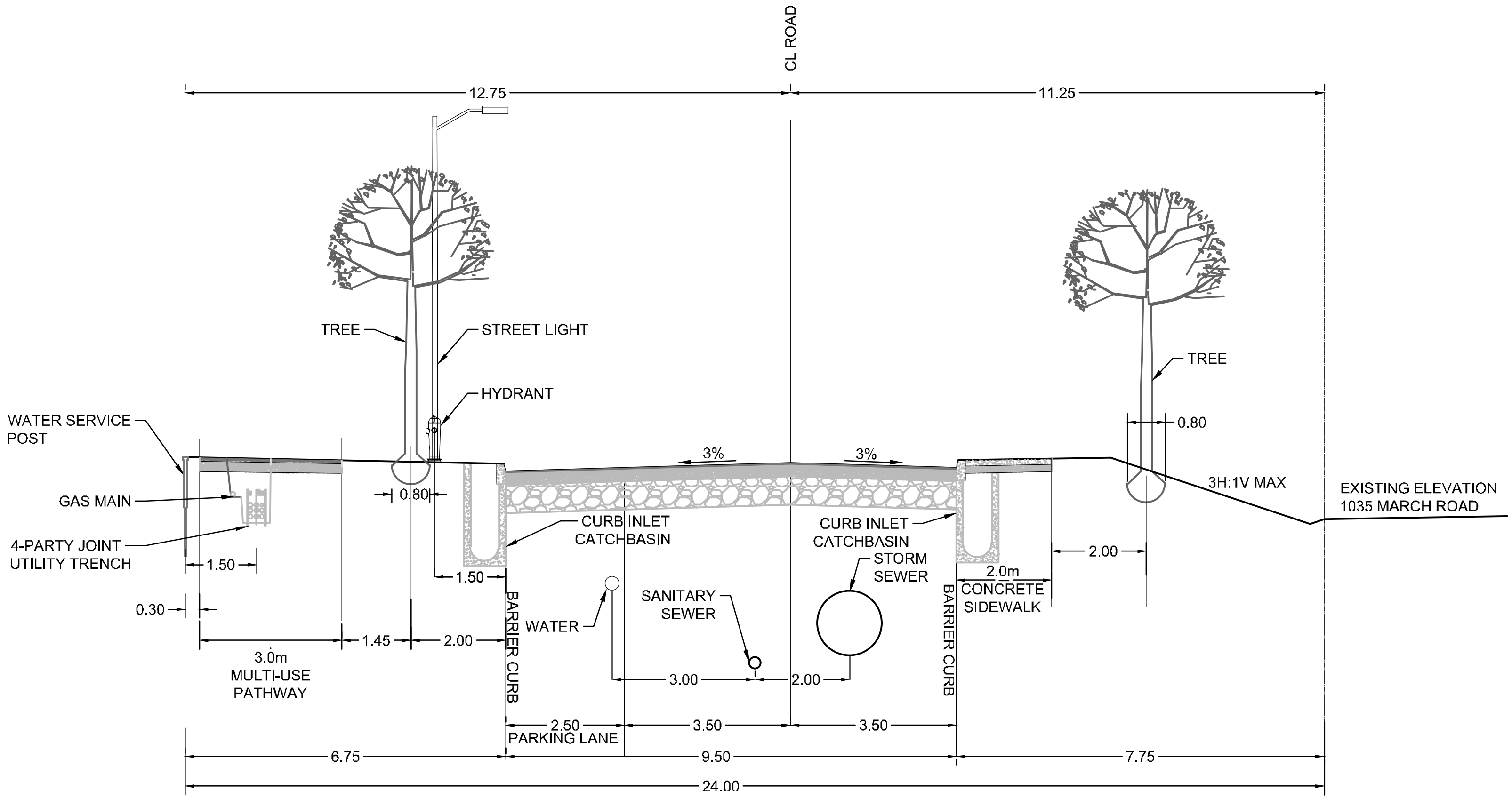

STREET 10 (EAST) - TYPICAL 24.0m CROSS SECTION FROM SALINGER ST. (STREET 12) TO MARCH ROAD ADJACENT 1035 MARCH ROAD

NOVATECH
Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
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Website www.novatech-eng.com

1015 MARCH ROAD

STREET 10 (EAST) - TYPICAL 24.0m CROSS SECTION

SCALE 1 : 150 (0 2 4 6)

DATE NOV 2022 | JOB 121247 | FIGURE FIGURE 11

SHT8X11.DWG - 216mmx279mm

M:\2021\121247\CAD\Design\Figures\CSK121247-XS-FIGS.dwg, FIGURE 2, Nov 10, 2022 - 2:45pm, bmcewen

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.
- 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:

<u>General</u>

- 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 936 March Road (Minto Lands) for the ultimate condition when March 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.

<u>Storm Drainage</u>

- 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. Twin inlet storm catchbasins and sewers will be provided in the lower half of Street 10 but will not be connected to a piped storm sewer outlet until the future storm sewer is constructed in March Road. A 250mm pipe will be installed in the north set of catchbasins that will outlet to the existing ditch along March Road and provide the temporary outlet until March Road is urbanized. Quantity and quality control will be provided by a small plunge pool at the outlet of the 250mm pipe and the existing March Road ditch. 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. 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 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.
- Low impact development features will not be implemented as per previous consultation with the City of Ottawa.

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 6.39 L/s.
- The sanitary flows from the Subject Site have decreased 57.0% compared to the estimated sanitary flows for the same area in the CU Lands detailed design. This is mainly due to changes in the residential and non-residential design parameters. 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 Celtic Ridge Crescent 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 300mm 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 300mm 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 following discussions with the City of Ottawa. 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:

LICENSED PROFESSIONAL ENGINEER
Drew Blair
D. D. BLAIR
100122737
NOV. 25 2022
PROVINCE OF ONTARIO

Drew Blair, P. Eng.
Senior Project Manager

APPENDIX A
Correspondence

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

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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Drew Blair

From: Steve Zorgel
Sent: Monday, November 7, 2022 11:12 AM
To: Drew Blair
Subject: FW: Copperwood Streetscape - CUP Submission

FYI.

Steve Zorgel, P.Eng., Project Manager | Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x298 | Fax: 613.254.5867
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From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Friday, November 4, 2022 2:43 PM
To: Steve Zorgel <s.zorgel@novatech-eng.com>
Cc: Greg Winters <G.Winters@novatech-eng.com>; Marc St.Pierre <m.stpierre@novatech-eng.com>; Jessica Palacios <j.palacios@novatech-eng.com>; Stern, Lisa <lisa.stern@ottawa.ca>
Subject: RE: Copperwood Streetscape - CUP Submission

Hi Steve,

See below summary from the City Forester, your proposed changes to the XSs have been accepted.

"The adjustments shown in the attached cross sections are acceptable for this design. 3.45/3.5m boulevards are a significant improvement from the previous proposal and cannot be improved any further. More space would be desired but I understand are not achievable in this case. Please update the CUP with the changes proposed.

Similarly for Street 7. 1.3m from tree to curb is well below our setback requirement, but given the asymmetrical cross section design to allow for tree planting on the sidewalk side, it is limiting available space on the opposing side. In future applications, utilities will be under the sidewalk and eliminate the need for an asymmetrical design so that preferred setbacks can be provided on both sides. Removing the trees from the non-sidewalk side will greatly impact the tree count and given this is only occurring on 1 of the cross sections, we can permit its use."

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

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

From: Steve Zorgel <s.zorgel@novatech-eng.com>
Sent: October 06, 2022 10:03 AM
To: Candow, Julie <julie.candow@ottawa.ca>

Cc: Greg Winters <g.winters@novatech-eng.com>; Marc St.Pierre <m.stpierre@novatech-eng.com>; Jessica Palacios <j.palacios@novatech-eng.com>; Stern, Lisa <lisa.stern@ottawa.ca>
Subject: RE: Copperwood Streetscape - CUP Submission

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Hi Julie,

Please find attached our proposed cross sections for Buckbean Street (Street 1) and Salinger Street (Street 12) to accommodate the comments below. I've also attached the latest CUP for reference, which also shows the previous XSs. A summary of the changes are as follows:

- The MUP for Salinger Street (Street 12) and Buckbean Street (Street 1, Northwest of RAB) can be moved to be 0.3m from the property line. There are no JUTs along this section, only 3-phase power under the MUP. This provides 3.45m for the tree.
- The MUP along Buckbean Street (northeast of RAB) can be shifted 1.0m towards the property line so the edge of the MUP is in line with JUT. This provides 3.5m for the tree.
- Rotterdam Street (Street 9) cannot accommodate trees on the right side between stations 10+250 to 10+325* only where a JUT and sidewalk are present. The remainder of the street can accommodate trees on right side. This has little impact on tree count (-4 trees).
- Whitlow Grass Street (Street 7) – Either side of the street cannot be shifted at all, any shift will not provide proper clearances to sidewalks and JUTs. Eliminating a tree on either side of this street will have significant impacts to tree counts.

If the City is satisfied with the proposed XSs for Salinger and Buckbean Street, we will implement the change to our drawings including the CUP.

Please review and let us know your thoughts.

Steve Zorgel, P.Eng., Project Coordinator | Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x298 | Fax: 613.254.5867
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From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Friday, September 9, 2022 8:51 AM
To: Steve Zorgel <s.zorgel@novatech-eng.com>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>; Greg Winters <G.Winters@novatech-eng.com>; Jessica Palacios <j.palacios@novatech-eng.com>; Stern, Lisa <lisa.stern@ottawa.ca>
Subject: RE: Copperwood Streetscape - CUP Submission

Hi Steve,

The City had an internal meeting yesterday regarding the proposed changes to the cross sections as you identified below. The City accepts the adjustment of the roadway cross section for Buckbean Street and Salinger Street that would have the concrete sidewalk adjacent to the curb.

That said, Forestry is not okay with a 2.5m boulevard between the roadway and the MUP, more specifically, a 1.5m offset from the tree to the curb is not acceptable. I have copy and pasted below Forestry's comments that were included with the City's latest comment response letter:

Forestry's minimum for blvd widths is 4.0m to allow sufficient soil volumes and setbacks to allow for long term development of the tree. This width requirement is wider than the individual setback requirements due to double sided impacts at lifecycle replacements of sidewalks and roads. Minimum setbacks from tree to curb is 2.0m. Setbacks from tree to sidewalk/mup is 1.5m. I can provide a bit of flexibility on the blvd widths, down to 3.5m, and tree to sidewalk, down to 1.0m. However any less on both, the tree is unlikely to survive for an expected lifecycle. Hopefully that helps for adjusting to the comments below.

32. 24.0 m ROW

Street 1 – BLVD width and tree to curb setback are insufficient. Can both the MUP and sidewalks be pushed closer to the JUT?
Street 12 & 1 – Same comments, sidewalk can be shifted, MUP cannot, any opportunity to increase blvd width on MUP side? JUT under sidewalk?
Street 12 & 1 @ Hydro Manhole locations – Same comments.
Street 4 & 10 – GREAT DESIGN, excellent setbacks and soil volumes. Any chance we can use this on Streets 1/12?

33. 18.0 m ROW

Street 9 – Left side is great, but no trees on right side. This will impact the tree count requirements.
Street 11 – great design, no concerns.
Street 7 – Left side, tree to curb setback is below minimum at 1.3m Can the JUT and Tree be switched in this side of the design? Without Hydrants is this possible? Right side is acceptable.
Local Rd. – Great.

Please ensure the next iteration of the Landscape Plan includes fencing and tree counts/species so we can complete a full review.

Thanks,

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

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

From: Steve Zorgel <s.zorgel@novatech-eng.com>
Sent: August 23, 2022 3:23 PM
To: Candow, Julie <julie.candow@ottawa.ca>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>; Greg Winters <g.winters@novatech-eng.com>; Jessica Palacios <j.palacios@novatech-eng.com>
Subject: Copperwood Streetscape - CUP Submission

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Hi Julie,

We wanted to circulate the streetscape plans and utility plans to you for any comments you may have at this time. The CUP has been circulated 3 times to utilities / SL and ROW management with the later circulations showing the tree locations. The Streetscape plan has not been circulated yet and contains the details of the species, etc.

Please find a link to the following Streetscape Plans and Composite Utility Plans for the Copperwood Estate subdivision for City review:

- Landscape Plan, Phase 1A, 116132-L1, dated August 18, 2022;
- Landscape Plan, Phase 1B, 116132-L2, dated August 18, 2022;
- Landscape Plan, Phase 1A, 116132-L3, dated August 18, 2022;
- Landscape Plan, Phase 1B, 116132-L4, dated August 18, 2022;
- Composite Utility Plan, Phase 1, 116132-U1 to U6, dated August 23, 2022;

Copperwood - Streetscape, CUP and XS

We are also proposing to adjust the roadway cross section for Buckbean Street and Salinger Street that would have the concrete sidewalk adjacent to the curb. The MUP on the opposite side would remain in the same location. This will be beneficial for grading in front of residential units and will help alleviate forestry comments and concerns. I have included the following:

- Proposed XSs for Buckbean and Salinger Street;
  - Figure 10 – Proposed XS for Bosch Street that is fronting future school property (similar design)
- 116132-GP4-SW-Markup – Showing the proposed sidewalk alignment along Buckbean Street that fronts the Park and Ride / Fire Hall.

We will update the engineering drawings / CUP with the cross sections if the City is satisfied.

Please let us know if you have any questions or concerns.

Steve Zorgel, **P.Eng.**, Project Coordinator | Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x298 | Fax: 613.254.5867
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APPENDIX B
Storm Drainage and Stormwater Management Calculations

1015 March Road

Project No.: 121247

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
Aug. 10 2022
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects

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

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	922	104			0.00	0.000	0.000	10.00						49	0.457	450	Conc	0.15	30.0	115.1	0.70	0.71	42%
			0.24	0.70	0.17	0.467	0.467	10.00		104.19			49										
					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	10.71						155	0.686	675	Conc	0.15	99.0	339.4	0.92	1.80	46%
					0.00	0.000	0.467	10.71		100.57			47										
			0.47	0.70	0.33	0.915	0.915	10.71			117.88		108										
					0.00	0.000	0.000	10.71															
								12.51															
AREA 1	Block 2	105			0.00	0.000	0.000	10.00						310	0.610	600	Conc	0.30	30.0	350.6	1.20	0.42	88%
			1.26	0.85	1.07	2.977	2.977	10.00		104.19			310										
					0.00	0.000	0.000	10.00															
					0.00	0.000	0.000	10.00															
								10.42															
March Road North MR2	105	106			0.00	0.000	0.000	12.51						517	0.838	825	Conc	0.15	95.0	579.7	1.05	1.51	89%
					0.00	0.000	3.444	12.51		92.58			319										
			0.47	0.70	0.33	0.915	1.829	12.51			108.46		198										
					0.00	0.000	0.000	12.51															
March Road North MR3	106	107			0.00	0.000	0.000	14.02						578	0.914	900	Conc	0.15	95.0	731.1	1.11	1.42	79%
					0.00	0.000	3.444	14.02		86.88			299										
			0.47	0.70	0.33	0.915	2.744	14.02			101.76		279										
					0.00	0.000	0.000	14.02															
								15.44															
March Road South	101	102			0.00	0.000	0.000	10.00						107	0.457	450	Conc	0.35	99.0	175.8	1.07	1.54	61%
					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	11.54						198	0.610	600	Conc	0.20	99.0	286.3	0.98	1.68	69%
					0.00	0.000	0.000	11.54															
			0.45	0.70	0.32	0.876	1.751	11.54			113.32		198										
					0.00	0.000	0.000	11.54															
March Road South	103	107			0.00	0.000	0.000	13.22						280	0.686	675	Conc	0.20	103.0	391.9	1.06	1.62	72%
					0.00	0.000	0.000	13.22															
			0.47	0.70	0.33	0.915	2.666	13.22			105.17		280										
					0.00	0.000	0.000	13.22															
								14.84															
Invention Boulevard Outlet	107	Minto Lands			0.00	0.000	0.000	15.44						804	0.914	900	Conc	0.25	47.4	943.8	1.44	0.55	85%
					0.00	0.000	3.444	15.44		82.17			283										
					0.00	0.000	5.410	15.44			96.22		521										
					0.00	0.000	0.000	15.44															

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
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						190	0.381	375	PVC	1.74	81.5	241.1	2.11	0.64	79%
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.000	15.00															
			0.15	0.70	0.11	0.292	0.292	15.00				145.31	42										
NW-118					0.00	0.000	0.000	15.00															
			0.91	0.70	0.64	1.771	1.771	15.00		83.56			148										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.292	15.00				145.31	42										
NW-119	910	912			0.00	0.000	0.000	15.64						581	0.610	600	Conc	1.84	48.3	868.4	2.98	0.27	67%
					0.00	0.000	1.771	15.64		81.54			144										
					0.00	0.000	0.000	15.64															
			0.20	0.70	0.14	0.389	0.681	15.64				141.80	97										
NW-120					0.00	0.000	0.000	15.64															
			2.31	0.65	1.50	4.174	5.945	15.64		81.54			485										
					0.00	0.000	0.000	15.64															
					0.00	0.000	0.681	15.64				141.80	97										
NW-122	912	914			0.00	0.000	0.000	15.91						619	0.610	600	Conc	1.71	47.4	837.1	2.87	0.28	74%
			0.25	0.77	0.19	0.535	6.480	15.91		80.72			523										
					0.00	0.000	0.000	15.91															
					0.00	0.000	0.681	15.91				140.37	96										
								16.19															
NW-121	918	914			0.00	0.000	0.000	15.00						243	0.838	825	Conc	0.12	75.7	518.5	0.94	1.34	47%
					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															
			0.62	0.85	0.53	1.465	1.465	15.00		83.56			122										
					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	1.465	15.00		83.56			122										
					0.00	0.000	0.000	15.00															
			0.12	0.70	0.08	0.234	0.506	15.00				145.31	74										
NW-125					0.00	0.000	0.000	15.00															
			0.24	0.85	0.20	0.567	2.032	15.00		83.56			170										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.506	15.00				145.31	74										
								16.34															

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	16.34						840	0.991	975	Conc	0.25	15.1	1,168.4	1.52	0.17	72%
					0.00	0.000	8.512	16.34		79.46			676										
					0.00	0.000	0.000	16.34															
					0.00	0.000	1.187	16.34				138.18	164										
	351	920			0.00	0.000	0.000	16.51						835	0.991	975	Conc	0.24	53.8	1,144.8	1.49	0.60	73%
					0.00	0.000	8.512	16.51		78.98			672										
					0.00	0.000	0.000	16.51															
					0.00	0.000	1.187	16.51				137.35	163										
	920	349			0.00	0.000	0.000	17.11						818	0.991	975	Conc	0.23	73.6	1,120.7	1.45	0.84	73%
					0.00	0.000	8.512	17.11		77.30			658										
					0.00	0.000	0.000	17.11															
					0.00	0.000	1.187	17.11				134.43	160										
	349	INLET 3 SWM Pond 1			0.00	0.000	0.000	17.96						794	0.991	975	Conc	0.27	18.8	1,214.3	1.58	0.20	65%
					0.00	0.000	8.512	17.96		75.08			639										
					0.00	0.000	0.000	17.96															
					0.00	0.000	1.187	17.96				130.57	155										
								18.15															

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	
Review Date:	June 15, 2022	
Review Date:	August 5, 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 FLOW TO SWM VIA FUTURE PHASE STREET 10	STREET 10	914			0.00	0.000	0.000	15.00						243									
					0.00	0.000	2.032	15.00		83.56			170										
					0.00	0.000	0.000	15.00															
					0.00	0.000	0.506	15.00				145.31	74										
								16.34															
	914	920			0.00	0.000	0.000	16.34						840	0.991	975	Conc	0.25	15.1	1,168.4	1.52	0.17	72%
					0.00	0.000	8.512	16.34		79.46			676										
					0.00	0.000	0.000	16.34															
					0.00	0.000	1.187	16.34				138.18	164										
	920	351			0.00	0.000	0.000	16.51						835	0.991	975	Conc	0.24	53.8	1,144.8	1.49	0.60	73%
					0.00	0.000	8.512	16.51		78.98			672										
					0.00	0.000	0.000	16.51															
					0.00	0.000	1.187	16.51				137.35	163										
	351	349			0.00	0.000	0.000	17.11						818	0.991	975	Conc	0.23	73.6	1,120.7	1.45	0.84	73%
					0.00	0.000	8.512	17.11		77.30			658										
					0.00	0.000	0.000	17.11															
					0.00	0.000	1.187	17.11				134.43	160										
	349	INLET 3			0.00	0.000	0.000	17.96						794	0.991	975	Conc	0.27	18.8	1,214.3	1.58	0.20	65%
					0.00	0.000	8.512	17.96		75.08			639										
					0.00	0.000	0.000	17.96															
					0.00	0.000	1.187	17.96				130.57	155										
								18.15															
NADIA LANE			26.22	0.35	9.18	25.512	25.512	132.00				30.53	779	779	0.914	900	Conc	0.35	259.6	1,116.8	1.70	2.54	70%

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:	August 8, 2022
Design By:	Steve Zorgel
Client:	CU Developments Inc.
Dwg. Reference:	116132-STM
Checked By:	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)

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
8.	REVISED AS PER CITY OF OTTAWA COMMENTS	-	SAZ
7.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ
6.	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP
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

DESIGN SAZ
CHECKED DDB
DRAWN RBG
CHECKED SAZ
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER S.A.N. ZORGEL 100191487 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 REV # 8
DRAWING No. 116132-STM

D07-16-18-0023

#17801

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Ottawa

Manning 0.013

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

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
GISBORNE PLACE																																	
			0.03	0.59	0.05	0.05			0.00	0.00			0.00	0.00			0.00	0.00															
			0.36	0.50	0.50	0.55			0.00	0.00			0.00	0.00			0.00	0.00															
			0.29	0.76	0.61	1.16			0.00	0.00			0.00	0.00			0.00	0.00															
	146	147	0.29	0.78	0.63	1.79			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	138	450	450	CONC	0.45	116.0	191.26	1.20	1.61	0.72
	147	148			0.00	1.79			0.00	0.00			0.00	0.00			0.00	0.00	11.61	71.14	96.40	112.97	165.09	127	450	450	CONC	0.40	11.5	180.32	1.13	0.17	0.71
			0.07	0.76	0.15	1.94			0.00	0.00			0.00	0.00			0.00	0.00															
	148	149	0.09	0.67	0.17	2.11			0.00	0.00			0.00	0.00			0.00	0.00	11.78	70.60	95.66	112.09	163.80	149	450	450	CONC	0.95	45.0	277.89	1.75	0.43	0.54
To ELSIE MACGILL WALK, Pipe 149 - 150						2.11				0.00				0.00				0.00	12.21														
ELSIE MACGILL WALK																																	
Contribution From STREET 3-5, Pipe 310 - 141						2.03				0.00				0.00				0.00	11.20														
			0.08	0.59	0.13	2.16			0.00	0.00			0.00	0.00			0.00	0.00															
			0.10	0.50	0.14	2.30			0.00	0.00			0.00	0.00			0.00	0.00															
			0.15	0.50	0.21	2.51			0.00	0.00			0.00	0.00			0.00	0.00															
	141	142	0.36	0.74	0.74	3.25			0.00	0.00			0.00	0.00			0.00	0.00	11.20	72.49	98.26	115.16	168.30	236	450	450	CONC	1.90	120.0	392.99	2.47	0.81	0.60
			0.12	0.76	0.25	3.51			0.00	0.00			0.00	0.00			0.00	0.00															
			0.16	0.59	0.26	3.77			0.00	0.00			0.00	0.00			0.00	0.00															
			0.25	0.50	0.35	4.11			0.00	0.00			0.00	0.00			0.00	0.00															
			0.30	0.74	0.62	4.73			0.00	0.00			0.00	0.00			0.00	0.00															
	142	143	0.33	0.50	0.46	5.19			0.00	0.00			0.00	0.00			0.00	0.00	12.01	69.87	94.66	110.92	162.07	363	600	600	CONC	0.55	118.0	455.36	1.61	1.22	0.80
	143	144			0.00	5.19			0.00	0.00			0.00	0.00			0.00	0.00	13.23	66.29	89.75	105.14	153.59	344	750	750	CONC	0.20	13.5	497.87	1.13	0.20	0.69
			0.27	0.78	0.59	5.78			0.00	0.00			0.00	0.00			0.00	0.00															
	144	145	0.33	0.76	0.70	6.47			0.00	0.00			0.00	0.00			0.00	0.00	13.43	65.74	89.00	104.26	152.30	426	750	750	CONC	0.25	67.0	556.64	1.26	0.89	0.76
	145	149			0.00	6.47			0.00	0.00			0.00	0.00			0.00	0.00	14.32	63.43	85.84	100.53	146.83	411	825	825	CONC	0.15	65.0	555.94	1.04	1.04	0.74
Contribution From GISBORNE PLACE, Pipe 148 - 149						2.11				0.00				0.00				0.00	12.21														
	149	150	0.28	0.76	0.59	9.17			0.00	0.00			0.00	0.00			0.00	0.00	15.36	60.94	82.42	96.52	140.94	559	900	900	CONC	0.20	69.5	809.60	1.27	0.91	0.69
To INVENTION BOULEVARD, Pipe 150 - HW 1						9.17				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	0.70	0.49	0.72			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	55	300	300	PVC	0.65	59.5	77.96	1.10	0.90	0.71
			0.20	0.59	0.33	1.04			0.00	0.00			0.00	0.00			0.00	0.00															
	133	1330	0.51	0.73	1.03	2.08			0.00	0.00			0.00	0.00			0.00	0.00	10.90	73.52	99.67	116.82	170.74	153	525	525	CONC	0.35	110.5	254.43	1.18	1.57	0.60
	1330	134			0.00	2.08			0.00	0.00			0.00	0.00			0.00	0.00	12.47	68.48	92.75	108.67	158.77	142	525	525	CONC	0.25	9.5	215.03	0.99	0.16	0.66
To JENNIE TROUT TERRACE, Pipe 134 - 139						2.08				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
			0.29	0.40	0.32	0.32			0.00	0.00			0.00	0.00			0.00	0.00															
	135	136	0.38	0.74	0.78	1.10			0.00	0.00			0.00	0.00			0.00	0.00	10.28	75.75	102.75	120.44	176.06	84	450	450	CONC	0.35	59.0	168.67	1.06	0.93	0.50
	136	137	0.09	0.40	0.10	1.20			0.00	0.00			0.00	0.00			0.00	0.00	11.21	72.47	98.23	115.12	168.24	87	450	450	CONC	0.25	12.5	142.55	0.90	0.23	0.61
	137	138	0.07	0.74	0.14	1.35			0.00	0.00			0.00	0.00			0.00	0.00	11.44	71.69	97.17	113.87	166.40	97	450	450	CONC	0.25	85.0	142.55	0.90	1.58	0.68
			0.47	0.59	0.77	2.12			0.00	0.00			0.00	0.00			0.00	0.00															
	138	139	0.59	0.74	1.21	3.33			0.00	0.00			0.00	0.00			0.00	0.00	13.02	66.88	90.56	106.09	154.99	223	675	675	CONC	0.15	95.5	325.56	0.91	1.75	0.68
To ELSIE MACGILL WALK, Pipe 139 - 140						3.33				0.00				0.00				0.00	14.77														
STREET 2-9																																	
			0.27	0.69	0.52	0.52																											
	231	232	0.24	0.59	0.39	0.91			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	70	375	375	PVC	0.65	49.0	141.36	1.28	0.64	0.50
			0.27	0.72	0.54	1.45			0.00	0.00			0.00	0.00			0.00	0.00															
			0.25	0.59	0.41	1.86			0.00	0.00			0.00	0.00			0.00	0.00															
	232	233	0.32	0.67	0.60	2.46			0.00	0.00			0.00	0.00			0.00	0.00	10.64	74.44	100.94	118.31	172.93	183	600	600	CONC	0.45	116.5	411.89	1.46	1.33	0.44
To STREET 2-5, Pipe 233 - 131						2.46				0.00				0.00				0.00	11.97														
PARKETTE BLOCK																																	
	STM CTRL MH 2	121			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 121 - 123						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

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2022-08-24
PROVINCE OF ONTARIO

Designed:	PROJECT:		
CPB	Minto - Kanata North		
Checked:	LOCATION:		
SLM	City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 1 OF 6

982_STM.xlsx

J0D# 17-982

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)	FLOW (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	450	450	PVC	0.65	95.5	229.86	1.45	1.10	0.31
	127	128			0.00	0.92			0.00	0.00			0.00	0.00			0.00	0.00	11.10	72.82	98.71	115.69	169.08	67	450	450	PVC	0.30	10.0	156.16	0.98	0.17	0.43
To JENNIE TROUT TERRACE, Pipe 128 - 129						0.92				0.00				0.00				0.00	11.27														
Contribution From GALARNEAU WAY, Pipe 125 - 126						1.02				0.00				0.00				0.00	11.35														
	126	128			0.00	1.02			0.00	0.00			0.00	0.00			0.00	0.00	11.35	71.98	97.56	114.33	167.09	73	525	525	CONC	0.65	4.5	346.73	1.60	0.05	0.21
To JENNIE TROUT TERRACE, Pipe 128 - 129						1.02				0.00				0.00				0.00	11.40														
BLOCK 160																																	
	2221	222	0.38	0.40	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	300	300	PVC	0.40	37.0	61.16	0.87	0.71	0.53
To STREET 2-5, Pipe 222 - 223						0.42				0.00				0.00				0.00	10.71														
STREET 2-5																																	
Contribution From BLOCK 160, Pipe 2221 - 222						0.42				0.00				0.00				0.00	10.71														
			0.32	0.59	0.52	0.95			0.00	0.00			0.00	0.00			0.00	0.00															
	223	224	0.56	0.76	1.18	2.13			0.00	0.00			0.00	0.00			0.00	0.00	10.71	74.17	100.57	117.88	172.30	158	675	675	CONC	0.25	116.0	420.29	1.17	1.65	0.38
To JENNIE TROUT TERRACE, Pipe 224 - 128						2.13				0.00				0.00				0.00	12.36														
			0.05	0.43	0.06	0.06			0.00	0.00			0.00	0.00			0.00	0.00															
			0.23	0.40	0.26	0.32			0.00	0.00			0.00	0.00			0.00	0.00															
	227	228	0.37	0.72	0.74	1.06			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	81	450	450	CONC	0.20	68.5	127.50	0.80	1.42	0.64
	228	229	0.38	0.76	0.80	1.86			0.00	0.00			0.00	0.00			0.00	0.00	11.42	71.74	97.23	113.94	166.51	133	525	525	CONC	0.20	114.0	192.33	0.89	2.14	0.69
	229	230	0.28	0.40	0.31	2.17			0.00	0.00			0.00	0.00			0.00	0.00	13.56	65.38	88.51	103.68	151.44	142	525	525	CONC	0.25	9.5	215.03	0.99	0.16	0.66
	230	233	0.35	0.76	0.74	2.91			0.00	0.00			0.00	0.00			0.00	0.00	13.72	64.96	87.93	102.99	150.44	189	675	675	CONC	0.40	62.0	531.63	1.49	0.70	0.36
Contribution From STREET 2-9, Pipe 232 - 233						2.46				0.00				0.00				0.00	11.97														
			0.21	0.76	0.44	5.81			0.00	0.00			0.00	0.00			0.00	0.00															
	233	131	0.24	0.78	0.52	6.33			0.00	0.00			0.00	0.00			0.00	0.00	14.42	63.18	85.49	100.12	146.23	400	750	750	CONC	0.35	116.0	658.62	1.49	1.30	0.61
To JENNIE TROUT TERRACE, Pipe 131 - 134						6.33				0.00				0.00				0.00	15.71														
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	0.72	1.20	1.20			0.00	0.00			0.00	0.00			0.00	0.00	10.16	76.21	103.37	121.18	177.14	92	375	375	PVC	2.00	120.0	247.95	2.25	0.89	0.37
To STREET 2-1, Pipe 212 - 216						1.20				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	0.50	0.10	0.10			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	7	300	300	PVC	2.00	34.0	136.76	1.93	0.29	0.05
	203	204			0.00	0.10			0.00	0.00			0.00	0.00			0.00	0.00	10.29	75.70	102.67	120.35	175.92	7	300	300	PVC	1.65	17.5	124.21	1.76	0.17	0.06
	204	205	0.31	0.66	0.57	0.67			0.00	0.00			0.00	0.00			0.00	0.00	10.46	75.09	101.83	119.36	174.47	50	375	375	PVC	0.30	37.5	96.03	0.87	0.72	0.52
	205	206			0.00	0.67			0.00	0.00			0.00	0.00			0.00	0.00	11.18	72.56	98.36	115.27	168.47	48	375	375	PVC	0.30	15.5	96.03	0.87	0.30	0.50
			0.15	0.59	0.25	0.91			0.00	0.00			0.00	0.00			0.00	0.00															
	206	207	0.29	0.74	0.60	1.51			0.00	0.00			0.00	0.00			0.00	0.00	11.47	71.57	97.00	113.67	166.11	108	375	375	PVC	3.40	88.0	323.29	2.93	0.50	0.33
			0.28	0.74	0.58	2.08			0.00	0.00			0.00	0.00			0.00	0.00															
	207	208	0.32	0.40	0.36	2.44			0.00	0.00			0.00	0.00			0.00	0.00	11.98	69.97	94.80	111.08	162.31	171	600	600	CONC	0.20	85.0	274.59	0.97	1.46	0.62

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
2022-08-24
PROVINCE OF ONTARIO

Designed:	PROJECT:		
CPB	Minto - Kanata North		
Checked:	LOCATION:		
SLM	City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 2 OF 6

JDDA 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	From Node	To Node	2 YEAR AREA (Ha)	2 YEAR R	2 YEAR Indiv. 2.78 AC	2 YEAR Accum. 2.78 AC	5 YEAR AREA (Ha)	5 YEAR R	5 YEAR Indiv. 2.78 AC	5 YEAR Accum. 2.78 AC	10 YEAR AREA (Ha)	10 YEAR R	10 YEAR Indiv. 2.78 AC	10 YEAR Accum. 2.78 AC	100 YEAR AREA (Ha)	100 YEAR R	100 YEAR Indiv. 2.78 AC	100 YEAR 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
	208	209			0.00	2.44			0.00	0.00			0.00	0.00			0.00	0.00	13.43	65.73	88.98	104.23	152.26	160	600	600	CONC	0.20	12.5	274.59	0.97	0.21	0.58
			0.32	0.59	0.52	2.97			0.00	0.00			0.00	0.00			0.00	0.00															
	209	212	0.38	0.72	0.76	3.73			0.00	0.00			0.00	0.00			0.00	0.00	13.65	65.15	88.19	103.30	150.90	243	675	675	CONC	0.20	65.0	375.92	1.05	1.03	0.65
Contribution From STREET 2-3, Pipe 211 - 212						1.20				0.00				0.00				0.00	11.05														
			0.21	0.67	0.39	5.32			0.00	0.00			0.00	0.00			0.00	0.00															
	212	216	0.35	0.59	0.57	5.89			0.00	0.00			0.00	0.00			0.00	0.00	14.68	62.53	84.60	99.08	144.70	368	750	750	CONC	0.20	69.5	497.87	1.13	1.03	0.74
	216	221			0.00	6.74			0.00	0.92			0.00	0.00			0.00	0.00	15.71	60.15	81.34	95.24	139.06	480	825	825	CONC	0.25	47.0	717.72	1.34	0.58	0.67
To JENNIE TROUT TERRACE, Pipe 221 - 224						6.74				0.92				0.00				0.00	16.29														
JENNIE TROUT TERRACE																																	
					0.00	0.00	2.63	0.40	2.92	2.92			0.00	0.00			0.00	0.00	13.00	66.93	90.63	106.17	155.11	265									
	STM CTRL MH 3	221	0.10	0.75	0.21	0.21			0.00	2.92			0.00	0.00			0.00	0.00	13.00	66.93	90.63	106.17	155.11	279	525	525	CONC	0.95	15.5	419.17	1.94	0.13	0.67
Contribution From STREET 2-1, Pipe 216 - 221						6.74				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	7.60			0.00	3.85			0.00	0.00			0.00	0.00															
	221	224	0.21	0.69	0.40	8.00			0.00	3.85			0.00	0.00			0.00	0.00	16.29	58.88	79.60	93.20	136.07	777	900	900	CONC	0.35	69.5	1070.99	1.68	0.69	0.73
Contribution From STREET 2-5, Pipe 223 - 224						2.13				0.00				0.00				0.00	12.36														
			0.22	0.67	0.41	10.54			0.00	3.85			0.00	0.00			0.00	0.00															
			0.27	0.59	0.44	10.98			0.00	3.85			0.00	0.00			0.00	0.00															
	224	128	0.33	0.59	0.54	11.53			0.00	3.85			0.00	0.00			0.00	0.00	16.98	57.46	77.66	90.92	132.73	961	975	975	CONC	0.35	72.5	1325.82	1.78	0.68	0.72
Contribution From STREET 2-6, Pipe 126 - 128						1.02				0.00				0.00				0.00	11.40														
Contribution From STREET 2-6, Pipe 127 - 128						0.92				0.00				0.00				0.00	11.27														
	128	129	0.06	0.60	0.10	13.56			0.00	3.85			0.00	0.00			0.00	0.00	17.66	56.13	75.84	88.78	129.59	1053	975	975	CONC	0.45	39.5	1503.34	2.01	0.33	0.70
	129	131	0.75	0.76	1.58	15.15			0.00	3.85			0.00	0.00			0.00	0.00	17.99	55.51	75.00	87.79	128.14	1129	1050	1050	CONC	0.35	85.0	1615.52	1.87	0.76	0.70
Contribution From STREET 2-5, Pipe 233 - 131						6.33				0.00				0.00				0.00	15.71														
			0.02	0.59	0.03	21.51			0.00	3.85			0.00	0.00			0.00	0.00															
			0.13	0.59	0.21	21.72			0.00	3.85			0.00	0.00			0.00	0.00															
	131	134	0.21	0.69	0.40	22.13			0.00	3.85			0.00	0.00			0.00	0.00	18.75	54.14	73.13	85.59	124.91	1479	1200	1200	CONC	0.30	73.5	2135.42	1.89	0.65	0.69
Contribution From SILICON WAY, Pipe 122-134						0.40				0.00				0.00				0.00	11.06														
Contribution From GOSLING CRESCENT, Pipe 133 - 134						2.08				0.00				0.00				0.00	12.63														
	134	139	0.15	0.50	0.21	24.81			0.00	3.85			0.00	0.00			0.00	0.00	19.40	53.03	71.61	83.80	122.29	1591	1535 x 975 HOR. Elliptical		CONC	0.30	74.5	2135.42	1.888128	0.66	0.75
To ELSIE MACGILL WALK, Pipe 139 - 140						24.81				3.85				0.00				0.00	20.05						Equivalent to 1200 Circular Pipe								
ELSIE MACGILL WALK																																	
Contribution From JENNIE TROUT TERRACE, Pipe 134 - 139						24.81				3.85				0.00				0.00	20.05														
Contribution From GOSLING CRESCENT, Pipe 138 - 139						3.33				0.00				0.00				0.00	14.77														
			0.31	0.59	0.51	28.65			0.00	3.85			0.00	0.00			0.00	0.00															
	139	140	0.35	0.64	0.62	29.28			0.00	3.85			0.00	0.00			0.00	0.00	20.05	51.95	70.14	82.07	119.75	1791	1650	1650	CONC	0.10	69.0	2882.24	1.35	0.85	0.62
	140	150	0.20	0.74	0.41	29.69			0.00	3.85			0.00	0.00			0.00	0.00	20.91	50.62	68.32	79.95	116.63	1766	1650	1650	CONC	0.10	71.5	2882.24	1.35	0.88	0.61
To INVENTION BOULEVARD, Pipe 150 - HW 1						29.69				3.85				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	0.68	0.40	1.71			0.00	0.00			0.00	0.00			0.00	0.00	12.11	69.55	94.23	110.41	161.33	119	450	450	CONC	0.35	67.5	168.67	1.06	1.06	0.71
			0.24	0.59	0.39	2.11			0.00	0.00			0.00	0.00			0.00	0.00															
Contribution From PARKETTE BLOCK, Pipe STM CTRL MH 2 - 121						0.00				0.53				0.00				0.00	10.19														
	121	123	0.39	0.76	0.82	2.93			0.00	0.53			0.00	0.00			0.00	0.00	13.67	65.11	88.13	103.23	150.79	238	600	600	CONC	0.35	120.0	363.25	1.28	1.56	0.65
To SILICON WAY, Pipe 123 - 124						2.93				0.53				0.00				0.00	15.22														
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	0.68	0.40	0.40			0.00	0.00			0.00	0.00			0.00	0.00	10.74	74.07	100.44	117.72	172.06	29	300	300	PVC	0.35	15.5	57.21	0.81	0.32	0.51
To JENNIE TROUT TERRACE, Pipe 134-139						0.40				0.00				0.00				0.00	11.06														
Contribution From OSLER STREET, Pipe 121 - 123						2.93				0.53				0.00				0.00	15.22														
			0.30	0.59	0.49	3.42			0.00	0.53			0.00	0.00			0.00	0.00															
	123	124	0.27	0.70	0.53	3.95			0.00	0.53			0.00	0.00			0.00	0.00	15.22	61.25	82.84	97.01	141.66	286	600	600	CONC	0.50	76.0	434.17	1.54	0.82	0.66
To INVENTION BOULEVARD, Pipe 124 - 150						3.95				0.53				0.00				0.00	16.05														

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
2022-08-24
PROVINCE OF ONTARIO

JOB # 17-982

Designed: CPB	PROJECT: Minto - Kanata North		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 3 OF 6

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

Ottawa

Manning 0.013

Location	From Node	To Node	2 YEAR AREA (Ha)	2 YEAR R	2 YEAR Indiv. 2.78 AC	2 YEAR Accum. 2.78 AC	5 YEAR AREA (Ha)	5 YEAR R	5 YEAR Indiv. 2.78 AC	5 YEAR Accum. 2.78 AC	10 YEAR AREA (Ha)	10 YEAR R	10 YEAR Indiv. 2.78 AC	10 YEAR Accum. 2.78 AC	100 YEAR AREA (Ha)	100 YEAR R	100 YEAR Indiv. 2.78 AC	100 YEAR 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	0.61	0.44	0.72			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	55	300	300	PVC	1.35	37.5	112.36	1.59	0.39	0.49
To INVENTION BOULEVARD, Pipe 119 - 120						0.72				0.00				0.00				0.00	10.39														
	125	126	0.15	0.71	0.30	1.02			0.00	0.00			0.00	0.00			0.00	0.00	10.87	73.61	99.80	116.97	170.96	75	450	450	CONC	0.65	41.5	229.86	1.45	0.48	0.33
To STREET 2-6, Pipe 126 - 128						1.02				0.00				0.00				0.00	11.35														
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	0.50	0.13	0.13			0.00	0.00			0.00	0.00			0.00	0.00															
			0.36	0.74	0.74	0.87			0.00	0.00			0.00	0.00			0.00	0.00															
	312	314	0.52	0.50	0.72	1.59			0.00	0.00			0.00	0.00			0.00	0.00	11.17	72.60	98.42	115.34	168.56	115	450	450	PVC	0.80	72.5	255.01	1.60	0.75	0.45
To STREET 3-4, Pipe 314 - 315						1.59				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	0.50	0.32	0.53			0.00	0.00			0.00	0.00			0.00	0.00															
			0.32	0.50	0.44	0.98			0.00	0.00			0.00	0.00			0.00	0.00															
	310	141	0.50	0.76	1.06	2.03			0.00	0.00			0.00	0.00			0.00	0.00	10.58	74.64	101.21	118.63	173.40	152	450	450	CONC	1.30	75.5	325.07	2.04	0.62	0.47
To ELSIE MACGILL WALK, Pipe 141 - 142						2.03				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	0.69	0.29	0.50			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	38	300	300	PVC	3.95	34.0	192.19	2.72	0.21	0.20
Contribution From STREET 3-5, Pipe 312 - 314						1.59				0.00				0.00				0.00	11.92														
	314	315	0.24	0.76	0.51	2.59			0.00	0.00			0.00	0.00			0.00	0.00	11.92	70.15	95.04	111.37	162.73	182	450	450	PVC	2.00	118.0	403.20	2.54	0.78	0.45
	315	118	0.27	0.76	0.57	3.17			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.80	91.83	107.58	157.18	215	525	525	CONC	0.70	31.5	359.82	1.66	0.32	0.60
To LEONE FARRELL ROAD, Pipe 118 - 119						3.17				0.00				0.00				0.00	13.01														
STREET 3-6																																	
	316	117	0.58	0.75	1.21	1.21			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	93	450	450	CONC	3.00	112.5	493.82	3.10	0.60	0.19
To LEONE FARRELL ROAD, Pipe 117 - 118						1.21				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						1.21				0.00				0.00				0.00	10.60														
					0.00	1.77	0.24	0.76	0.51	0.65			0.00	0.00			0.00	0.00															
	117	118	0.35	0.59	0.57	2.34			0.00	0.65			0.00	0.00			0.00	0.00	10.60	74.56	101.11	118.51	173.22	241	525	525	CONC	0.80	72.5	384.66	1.78	0.68	0.63
Contribution From STREET 3-4, Pipe 315 - 118						3.17				0.00				0.00				0.00	13.01														
					0.00	5.51	0.29	0.76	0.61	1.27			0.00	0.00			0.00	0.00															
	118	119	0.19	0.59	0.31	5.82			0.00	1.27			0.00	0.00			0.00	0.00	13.01	66.90	90.59	106.12	155.04	504	675	675	CONC	0.60	68.5	651.12	1.82	0.63	0.77
To INVENTION BOULEVARD, Pipe 119 - 120						5.82				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	0.50	0.17	0.29			0.00	0.00			0.00	0.00			0.00	0.00															
	301	302	0.20	0.50	0.28	0.57			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	44	300	300	PVC	0.90	57.5	91.74	1.30	0.74	0.48
	302	303	0.11	0.74	0.23	0.79			0.00	0.00			0.00	0.00			0.00	0.00	10.74	74.08	100.45	117.73	172.08	59	300	300	PVC	0.75	11.5	83.75	1.18	0.16	0.70
	303	304	0.20	0.74	0.41	1.21			0.00	0.00			0.00	0.00			0.00	0.00	10.90	73.51	99.67	116.81	170.73	89	375	375	PVC	0.90	69.0	166.33	1.51	0.76	0.53

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
2022-08-24
PROVINCE OF ONTARIO

Designed: CPB	PROJECT: Minto - Kanata North		
Checked: SLM	LOCATION: City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 4 OF 6

JOD# 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)																	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)	FLOW (min)	Q/Q full
	304	308	0.12	0.74	0.25	1.45			0.00	0.00			0.00	0.00			0.00	0.00	11.66	70.96	96.16	112.68	164.66	103	375	375	PVC	1.40	62.5	207.45	1.88	0.55	0.50
	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	0.72	0.76	2.11			0.00	0.00			0.00	0.00			0.00	0.00	11.78	70.58	95.64	112.07	163.77	149	450	450	CONC	1.10	68.5	299.02	1.88	0.61	0.50
	308	114	0.21	0.74	0.43	3.99			0.00	0.00			0.00	0.00			0.00	0.00	12.39	68.71	93.07	109.05	159.33	274	450	450	CONC	1.75	69.0	377.16	2.37	0.48	0.73
To INVENTION BOULEVARD, Pipe 114 - 115						3.99				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	1.50	0.83	3.46	3.46			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	361	675	675	CONC	0.15	99.0	325.56	0.91	1.81	1.11
	105	106			0.00	0.00			0.00	3.46			0.00	0.00			0.00	0.00	11.81	70.48	95.50	111.90	163.52	331	675	675	CONC	0.15	99.0	325.56	0.91	1.81	1.02
	106	107			0.00	0.00			0.00	3.46			0.00	0.00			0.00	0.00	13.63	65.21	88.27	103.40	151.03	306	675	675	CONC	0.15	95.0	325.56	0.91	1.74	0.94
To INVENTION BOULEVARD, Pipe 107 - 108						0.00				3.46				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				3.46				0.00				0.00	15.37														
					0.00	0.00			0.00	3.46	2.89	0.70	5.62	5.62			0.00	0.00	14.00														
	107	1081			0.00	0.00			0.00	3.46			0.00	5.62			0.00	0.00	16.03	59.44	80.37	94.11	137.40	807	900	900	CONC	0.25	26.0	905.16	1.42	0.30	0.89
	1081	108			0.00	0.00			0.00	3.46			0.00	5.62			0.00	0.00	16.03	59.44	80.37	94.11	137.40	807	900	900	CONC	0.25	50.0	905.16	1.42	0.59	0.89
	108	109			0.00	0.00	0.14	0.80	0.31	3.77			0.00	5.62			0.00	0.00	16.33	58.79	79.48	93.06	135.86	823	900	900	CONC	0.25	56.5	905.16	1.42	0.66	0.91
	109	110			0.00	0.00	0.17	0.80	0.38	4.15			0.00	5.62			0.00	0.00	17.00	57.43	77.62	90.87	132.65	833	900	900	CONC	0.25	57.5	905.16	1.42	0.67	0.92
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	26.62			0.00	5.62			0.00	0.00	17.67	56.11	75.82	88.76	129.55	2518	1200	1200	CONC	0.60	58.5	3019.94	2.67	0.37	0.83
	111	112			0.00	0.00	0.17	0.80	0.38	27.00			0.00	5.62			0.00	0.00	18.03	55.42	74.88	87.65	127.93	2515	1200	1200	CONC	0.60	51.5	3019.94	2.67	0.32	0.83
					0.00	0.00	0.31	0.74	0.64	27.64			0.00	5.62			0.00	0.00															
	112	113	0.33	0.50	0.46	0.46			0.00	27.64			0.00	5.62			0.00	0.00	18.36	54.84	74.08	86.71	126.55	2560	1200	1200	CONC	0.75	79.0	3376.40	2.99	0.44	0.76
	113	114			0.00	0.46	0.15	0.74	0.31	27.95			0.00	5.62			0.00	0.00	18.80	54.05	73.01	85.45	124.70	2546	1200	1200	CONC	0.75	29.5	3376.40	2.99	0.16	0.75
Contribution From STREET 3-3, Pipe 308 - 114						3.99				0.00				0.00				0.00	12.87														
					0.00	4.45	0.11	0.74	0.23	28.17			0.00	5.62			0.00	0.00															
	114	1140			0.00	4.45	0.11	0.76	0.23	28.41			0.00	5.62			0.00	0.00	18.96	53.76	72.62	84.99	124.03	2780	1200	1200	CONC	0.75	63.0	3376.40	2.99	0.35	0.82
	1140	115			0.00	4.45			0.00	28.41			0.00	5.62			0.00	0.00	19.31	53.16	71.80	84.03	122.61	2749	1200	1200	CONC	0.75	50.0	3376.40	2.99	0.28	0.81
					0.00	4.45	0.20	0.74	0.41	28.82			0.00	5.62			0.00	0.00															
					0.00	4.45	0.21	0.76	0.44	29.26			0.00	5.62			0.00	0.00															
			0.35	0.59	0.57	5.03			0.00	29.26			0.00	5.62			0.00	0.00															
	115	119	0.37	0.59	0.61	5.63			0.00	29.26			0.00	5.62			0.00	0.00	19.59	52.70	71.16	83.28	121.51	2847	1350	1350	CONC	0.50	101.0	3774.11	2.64	0.64	0.75
Contribution From GALARNEAU WAY, Pipe 1119 - 119						0.72				0.00				0.00				0.00	10.39														
Contribution From LEONE FARRELL ROAD, Pipe 118 - 119						5.82				1.27				0.00				0.00	13.64														
			0.18	0.59	0.30	12.47			0.00	30.53			0.00	5.62			0.00	0.00															
	119	120			0.00	12.47	0.28	0.76	0.59	31.12			0.00	5.62			0.00	0.00	20.23	51.66	69.75	81.62	119.09	3274	1500	1500	CONC	0.30	90.5	3871.78	2.19	0.69	0.85
	120	1200			0.00	12.47	0.19	0.76	0.40	31.52			0.00	5.62			0.00	0.00	20.92	50.60	68.30	79.91	116.58	3233	1500	1500	CONC	0.30	69.5	3871.78	2.19	0.53	0.84

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
2022-08-24
PROVINCE OF ONTARIO

Designed: CPB	PROJECT: Minto - Kanata North			
Checked: SLM	LOCATION: City of Ottawa			
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 5 OF 6	

JOD # 17-982

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Ottawa

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

Manning 0.013

Location	From Node	To Node	2 YEAR AREA (Ha)	2 YEAR R	2 YEAR Indiv. 2.78 AC	2 YEAR Accum. 2.78 AC	5 YEAR AREA (Ha)	5 YEAR R	5 YEAR Indiv. 2.78 AC	5 YEAR Accum. 2.78 AC	10 YEAR AREA (Ha)	10 YEAR R	10 YEAR Indiv. 2.78 AC	10 YEAR Accum. 2.78 AC	100 YEAR AREA (Ha)	100 YEAR R	100 YEAR Indiv. 2.78 AC	100 YEAR 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
Contribution From SCHOOL BLOCK, Pipe STM CTRL MH 1 - 1200						0.00				4.54				0.00				0.00	12.12														
	1200	124			0.00	12.47			0.00	36.06			0.00	5.62			0.00	0.00	21.45	49.81	67.23	78.66	114.74	3487	1500	1500	CONC	0.35	18.5	4182.00	2.37	0.13	0.83
Contribution From SILICON WAY, Pipe 123 - 124						3.95				0.53				0.00				0.00	16.05														
			0.02	0.59	0.03	16.45			0.00	36.59			0.00	5.62			0.00	0.00															
	124	150			0.00	16.45	0.27	0.66	0.50	37.09			0.00	5.62			0.00	0.00	21.58	49.62	66.97	78.35	114.30	3740	1920 x 1220 HOR. Elliptical		CONC	0.35	72.5	4182.00	2.366527	0.51	0.89
Contribution From ELSIE MACGILL WALK, Pipe 140 - 150						29.69				3.85				0.00				0.00	21.79						Equivalent to 1500 Circular Pipe								
Contribution From ELSIE MACGILL WALK, Pipe 149 - 150						9.17				0.00				0.00				0.00	16.27														
	150	HW 1			0.00	55.31	0.09	0.24	0.06	40.99			0.00	5.62			0.00	0.00	22.09	48.90	65.98	77.19	112.59	5843	2550	2550	CONC	0.10	69.5	9201.96	1.80	0.64	0.63
To POND INLET (SOUTH, Pipe HW 2 - HW 3						55.31				40.99				5.62				0.00	22.73														
POND INLET (SOUTH)																																	
Contribution From INVENTION BOULEVARD, Pipe 150 - HW 1						55.31				40.99				5.62				0.00	22.73														
	HW 2	1580	0.99	0.32	0.88	56.19			0.00	40.99			0.00	5.62			0.00	0.00	22.73	48.02	64.77	75.78	110.52	5779	3000	3000	CONC	0.10	17.5	14193.73	2.01	0.15	0.41
	1580	HW 3			0.00	56.19			0.00	40.99			0.00	5.62			0.00	0.00	22.88	47.82	64.51	75.47	110.07	5756	1800x900 Box Pipe		CONC	0.30	5.0	1799.59	1.14	0.07	3.20
To POND Outlet, Pipe OUTLET STRUCT. - HW 7						56.19				40.99				5.62				0.00	22.88														
POND INLET (SOUTH BYPASS)																																	
Contribution From POND INLET (SOUTH)					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00					3956									
	1580	501			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	3956	2100	2100	CONC	0.10	24.0	5483.08	1.58	0.25	0.72
	501	HW 10				0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.25	75.85	102.88	120.59	176.28	3956	2100	2100	CONC	0.10	104.0	5483.08	1.58	1.09	0.72
To POND Outlet, Pipe OUTLET STRUCT. - HW 7						0.00				0.00				0.00				0.00	11.35														
Fut. Subdivision																																	
	201(B.O.)	182(B.O.)			36.63	36.63			39.78	39.78			2.22	2.22			0.00	0.00	23.16	47.45	64.00	74.87	109.19	4451	2100	2100	CONC	0.30	42.9	9496.97	2.74	0.26	0.47
	182(B.O.)	182A(B.O.)				36.63			0.00	39.78			0.00	2.22			0.00	0.00	23.42	47.11	63.54	74.33	108.39	4419	2100	2100	CONC	0.30	16.0	9496.97	2.74	0.10	0.47
	182A(B.O.)	HW(B.O.)			0.00	36.63			0.00	39.78			0.00	2.22			0.00	0.00	23.52	46.98	63.37	74.13	108.10	4407	2100	2100	CONC	0.30	28.3	9496.97	2.74	0.17	0.46
To POND INLET (NORTH), Pipe HW 5 - 4030						36.63				39.78				2.22				0.00	23.69														
POND INLET (NORTH)																																	
Contribution From Fut. Subdivision, Pipe 182A (B.O.) - HW (B.O.)						36.63				39.78				2.22				0.00	23.69														
			0.86	0.25	0.60	37.23			0.00	39.78			0.00	2.22			0.00	0.00															
	HW 5	4030			0.00	37.23			0.00	39.78			0.00	2.22			0.00	0.00	23.69	46.76	63.07	73.78	107.59	4414	2100	2100	CONC	0.30	55.5	9496.97	2.74	0.34	0.46
	4030	HW 6			0.00	37.23			0.00	39.78			0.00	2.22			0.00	0.00	24.03	46.34	62.49	73.10	106.60	4374	1050	1050	CONC	0.30	15.0	1495.68	1.73	0.14	2.92
To POND Outlet, Pipe OUTLET STRUCT. - HW 7						37.23				39.78				2.22				0.00	24.17														
POND INLET (NORTH BYPASS)																																	
Contribution From POND INLET (NORTH)					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00					2879									
	4030	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	2879	1650	1650	CONC	0.15	23.5	3530.01	1.65	0.24	0.82
	502	HW 11				0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.24	75.91	102.96	120.68	176.42	2879	1650	1650	CONC	0.15	63.5	3530.01	1.65	0.64	0.82
To POND Outlet, Pipe OUTLET STRUCT. - HW 7						0.00				0.00				0.00				0.00	10.47														
POND OUTLET																																	
					0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00					359									
	OUTLET STRUCT.	HW7			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	1200	1200	CONC	0.35	20.0	2306.52	2.04	0.16	0.16

Definitions:
Q = 2.78 AIR, where
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A = Areas in hectares (ha)
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Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed:	PROJECT:		
CPB	Minto - Kanata North		
Checked:	LOCATION:		
SLM	City of Ottawa		
Dwg. Reference: 76-80	File Ref: 17-982	Date: 24 Aug 2022	Sheet No. SHEET 6 OF 6

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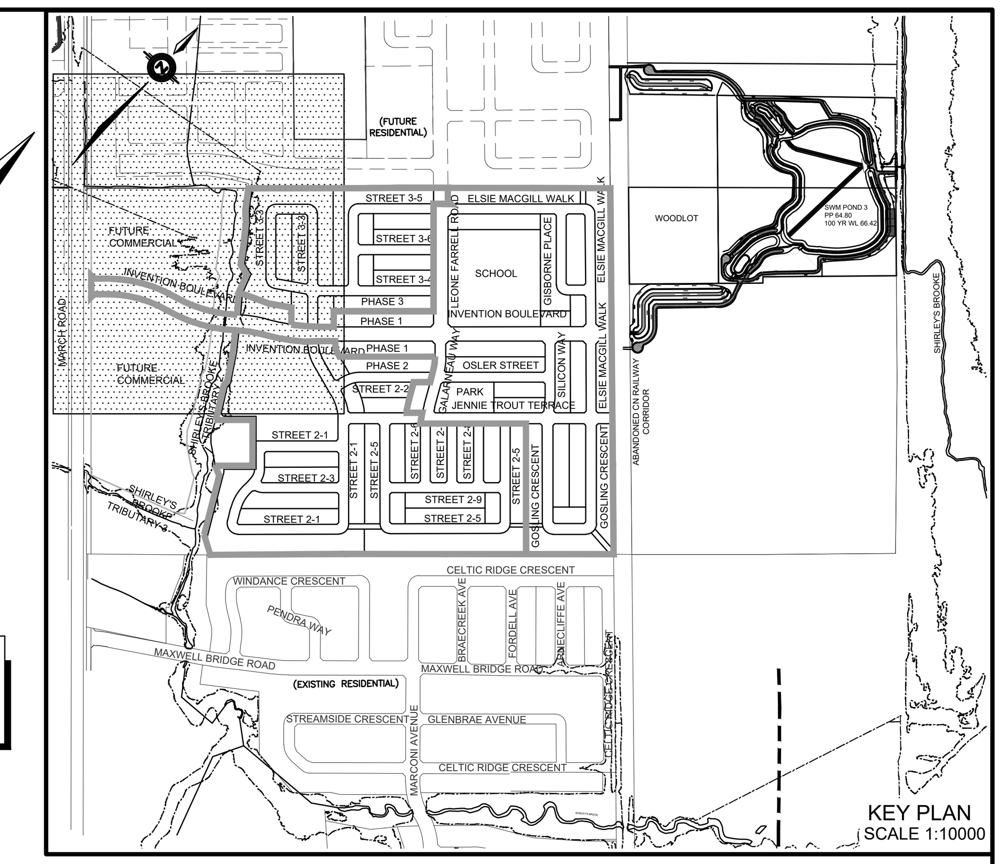
2022-08-24
PROVINCE OF ONTARIO

JODA 17-982

982_STM.xlsx

NOTE:
REFER TO DRAWING No. 84a FOR PHASE 3 INTERIM DRAINAGE PLAN.



LEGEND

- STORM DRAINAGE BOUNDARY
- EXTERNAL STORM DRAINAGE BOUNDARY
- STORM DRAINAGE BOUNDARY (OTHER PHASES)
- STORM FREQUENCY — 2Yr
- UPSTREAM MH TO DOWNSTREAM MH — 43 - 44
- AREA IN HECTARES — 0.37
- RUNOFF COEFFICIENT — 0.51
- EXTERNAL STORM FREQUENCY — 2 YR
- EXTERNAL UPSTREAM MH TO DOWNSTREAM MH — 303 - 305
- EXTERNAL AREA IN HECTARES — 7.86
- EXTERNAL RUNOFF COEFFICIENT — 0.75
- STREET CATCHBASIN & LEAD
- STREET CATCHBASIN WITH CLOSED LID & LEAD
- MAINTENANCE HOLE — MH202
- CURB INLET CATCHBASIN & LEAD
- CATCHBASIN/ MAINTENANCE HOLE — CBMH201
- INTERCONNECTED CATCH BASIN & LEADS
- CAP
- OVERLAND FLOW DIRECTION
- EXTERNAL OVERLAND FLOW DIRECTION
- EMERGENCY OVERLAND FLOW DIRECTION

No.	BY	DATE	DESCRIPTION
9	S.L.M.	22-09-22	POND RE-SUBMISSION
8	S.L.M.	22-08-24	4TH SUBMISSION
7	B.N.C.	22-08-03	POND RE-SUBMISSION
6	S.L.M.	22-05-31	POND RE-SUBMISSION
5	S.L.M.	22-05-24	3RD 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, RECEIVED APRIL 11, 2022 & 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

MINTO BROOKLINE
PHASE 1 & 2

DSEL
120 Iber Road Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2022-09-22
PROVINCE OF ONTARIO

Ottawa CITY OF OTTAWA

STORM DRAINAGE PLAN

© DSEL

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. 1:1000 (0 10 20 30 40)		SHEET No. 80

CITY PLAN No. 18694

CITY FILE No. D07-16-18-0032

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

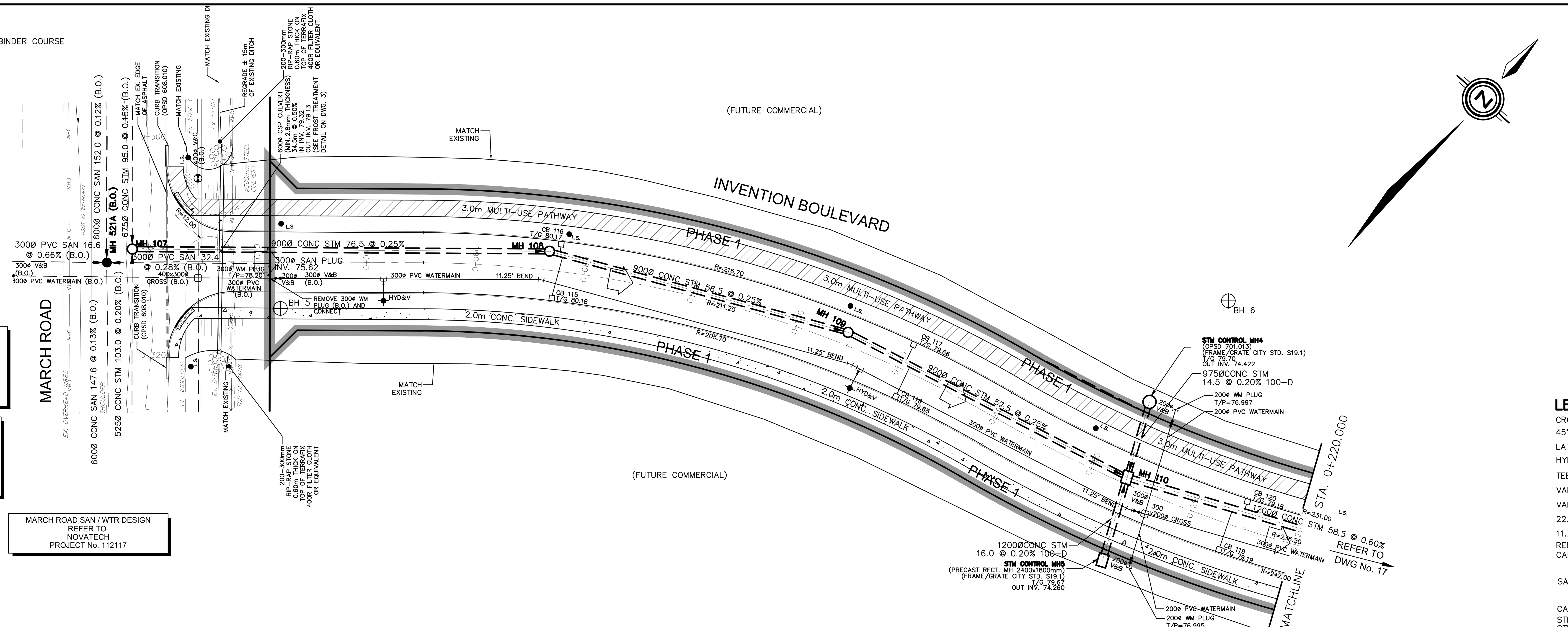
NOTE:
ALL WATERMAIN CONNECTIONS AND DECOMMISSIONING OF EXISTING WATERMAINS TO BE COMPLETED BY CITY FORCES. TRENCH BACKFILL/REINSTATEMENT TO BE COMPLETED BY THE CONTRACTOR TO THE SATISFACTION OF THE CITY OF OTTAWA.

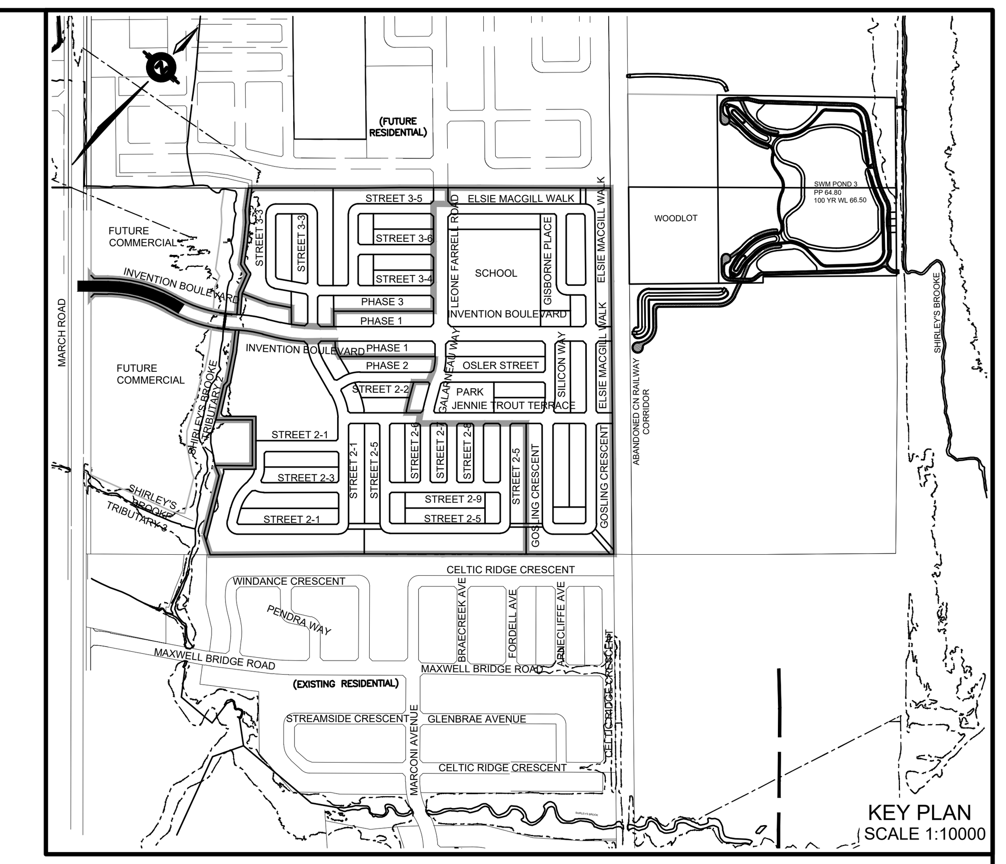
NOTE: RE: TEST PIT/BOREHOLE EXCAVATIONS
ANY DISTURBED MATERIAL ENCOUNTERED BELOW THE SUBGRADE LEVEL WITHIN A BUILDING FOOTPRINT TO BE SUB-EXCAVATED AND BACKFILLED WITH COMPACTED ENGINEERED FILL AS PER GEOTECHNICAL ENGINEERS RECOMMENDATION.

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.

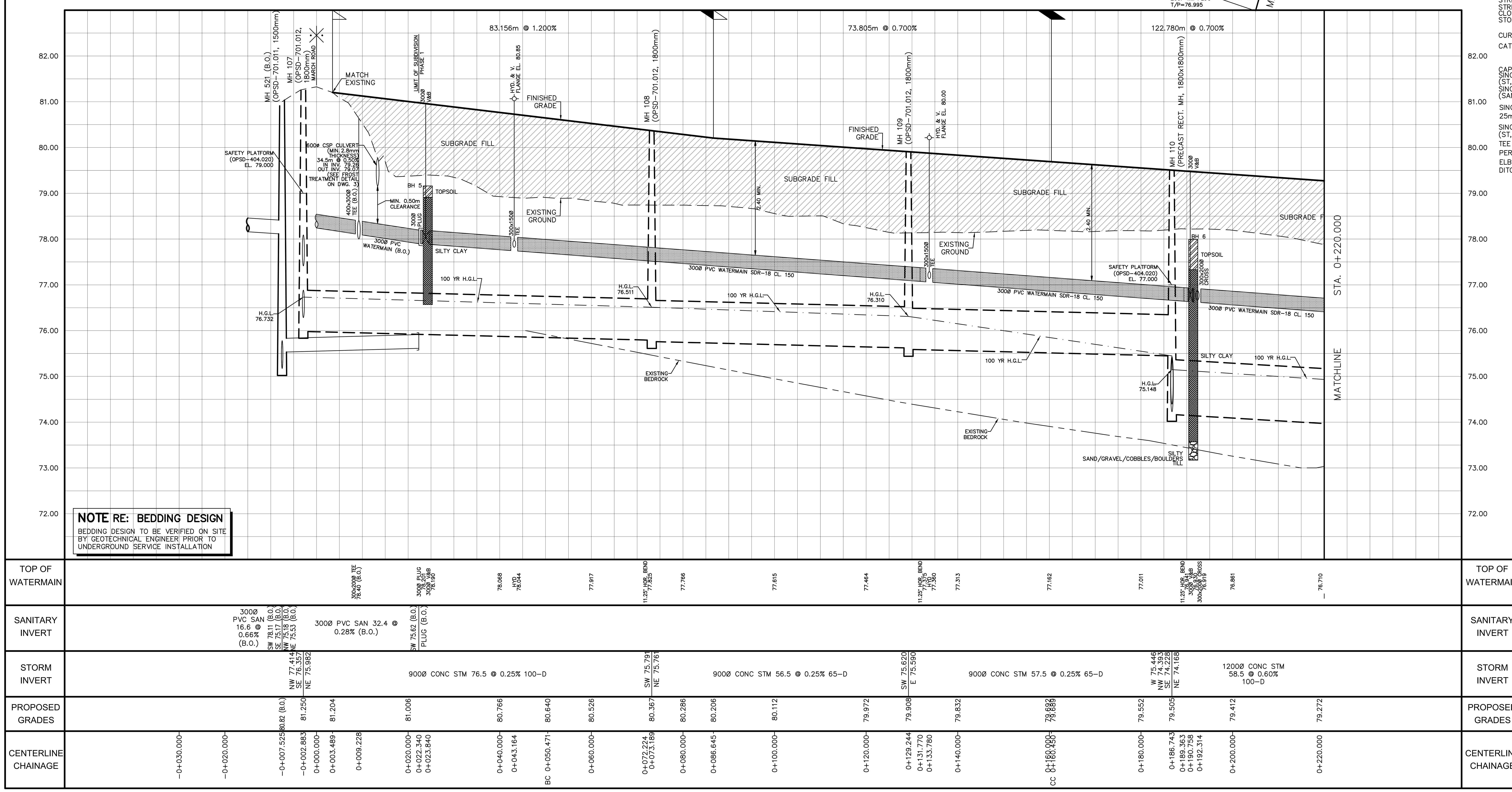
MARCH ROAD SAN / WTR DESIGN
REFER TO
NOVATECH
PROJECT No. 112117





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)



NOTE RE: BEDDING DESIGN
BEDDING DESIGN TO BE VERIFIED ON SITE BY GEOTECHNICAL ENGINEER PRIOR TO UNDERGROUND SERVICE INSTALLATION

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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OTTAWA ELEVATION= 95.23 METRES.

MINTO GROUP

KANATA NORTH
PHASE 1 & 2

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LICENSED PROFESSIONAL ENGINEER
S. L. MERRICK
100186523
2021. 12-23
PROVINCE OF ONTARIO
JOB # 17-982

CITY OF OTTAWA

PLAN AND PROFILE OF
INVENTION BOULEVARD
(STA. 0+000.000 TO STA. 0+220.000)

© DSEL

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: VERT. 1:50 HORZ. 1:500				SHEET No. 16

CITY PLAN No. XXXXXX
CITY FILE No. D07-XX-XX-XXXX

Drew Blair

From: Matt Wingate <MWingate@dsel.ca>
Sent: Thursday, November 17, 2022 2:49 PM
To: Drew Blair
Cc: Braden Kaminski
Subject: RE: March Valley Road - Minto Development
Attachments: 80 STORM DRAINAGE PLAN.pdf; E1a_982_STM.pdf

Hi Drew,

I've attached a copy of the current storm drainage drawing + storm sewer design sheets that illustrate the capture from the 1.5 Ha block into the Minto Brookline storm sewer and pond.
There should be no changes from the documents shared in August.
Let us know if you need anything more.

regards

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
cell: (613) 858-4975
e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: November 17, 2022 1:15 PM
To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Matt,

We are resubmitting our updated servicing and SWM report for 1015 March Road and ask if you have a newer or updated report from the one you provided back in August? We haven't changed any of the storm items that we discussed back in August. Just minor updates to other sections of the report.

If you have made revisions, can you please send us your latest Servicing and SWM report and drawings or at least your design sheets and storm drainage plans so that we can illustrate to the City that we have coordinated our downstream outlet with you?

Thanks,

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Matt Wingate <MWingate@dsel.ca>
Sent: Tuesday, August 9, 2022 2:57 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Cc: Braden Kaminski <BKaminski@dsel.ca>
Subject: RE: March Valley Road - Minto Development

Hi Drew,

We're in the process of updating our reporting/design for final submission/approval. The updates should be ready to share next week.
In the meantime, I've upload our 3rd submission servicing & SWM reporting for Minto's Brookline Phase 1/2 subdivision to the Sharepoint link below, for reference in your reporting.
Our updated reporting/design will incorporate the agreed capture from the 1.5 Ha block west of march Rd, per our correspondence below.

https://davidschaeffereng-my.sharepoint.com/:f:/g/personal/mwingate_dsel_ca/EqaVPH99Q7xOqZWwrKnCVQYBzoOpdMKfVspZ5uPO5-g98g?e=bt11Bm

regards

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
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e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: August 9, 2022 10:33 AM

To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Matt,

We are resubmitting our servicing and SWM report for 1015 March Road and ask if you can send us your latest Servicing and SWM report and drawings or at least your design sheets and storm drainage plans so that we can illustrate to the City that we have coordinated our downstream outlet with you?

Thanks,

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Drew Blair
Sent: Monday, May 30, 2022 4:08 PM
To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

Hi Matt,

Thanks for accommodating our revised areas/flows and updating your model.

We will control the commercial block to the 5-year capture with 100-year onsite storage. The 100-year release rate from the commercial block will be controlled up to a maximum release of 310 L/s as outlined below.

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Matt Wingate <MWingate@dsel.ca>
Sent: Monday, May 30, 2022 12:35 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

Hi Drew,

We've updated and resubmitted the Minto Brookline design. In the process, we updated drainage details for the proposed 1.26 Ha commercial block + 0.24 ha Street 10 area west of March Rd. We were able to incorporate 5-year capture from these areas (310 + 49 = 359 L/s) into the storm sewer without any impacts to HGL and USF freeboards throughout the Brookline subdivision. Adding 100-year capture from Street 10 only (310 + 105 = 415 L/s) resulted in a requirement to raise several USFs by a few inches, but we can accommodate these adjustments within our design. 100-

yr capture from the 1.26 Ha commercial block cannot be accommodated without significant pipe upsizing and changes to grading design in Brookline .

Hopefully you can accommodate the 415 L/s total sewer capture for the 1.5 Ha area (commercial block + Street 10). 5-yr capture with 100-year onsite storage for the commercial block is consistent with the restrictions applied to commercial blocks within the Brookline subdivision.

Let me know if you would like to discuss.

Regards

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
cell: (613) 858-4975
e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: May 20, 2022 8:20 AM
To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

That’s great! Lucky timing for us.

Thanks for this.

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867

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From: Matt Wingate <MWingate@dsel.ca>
Sent: Thursday, May 19, 2022 9:15 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

Hi Drew,
Your email caught us at the final stages of a modeling update, before resubmitting to the City for approval.

We've incorporated the increased runoff from lands west of March Rd into our storm sewer and pond design, per your email below. It appears that we can accommodate the request. We'll be better positioned to share formal updated documents next week.

Regards

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
cell: (613) 858-4975
e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: May 17, 2022 1:26 PM
To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Matt,

As an update, we have submitted our draft plan of subdivision application for 1015 March Road back in February and received comments from the City. One of the themes of the City comments is that we must coordinate our designs with those of the downstream players including your design for Minto lands and specifically our drainage areas to your Pond 3.

We have reviewed the drainage area for 1015 March Road that was used in the recently approved Shirley's Brook Subwatershed SWMHYMO model (Area 203d in the attached figure). The details within the model are as follows:

Area ID = 203d
Area = 1.26 ha
% Impervious = 70%
5-yr Peak Runoff = 267 L/s
100-yr Peak Runoff = 547 L/s

In our current design, the client has increased the size of the commercial area and a greater portion of Street 10 will be directed to the current March Road ditch/future storm sewers and the downstream Minto sewers and the outlet to Pond 3. Currently, we have 1.26 ha of commercial block (Area A1) and 0.24 ha of Street 10 (Area A2) directed to March Road; an increase of 0.24 ha from the SWMHYMO model assumed area. As per the Kanata North Master Servicing Study, any commercial areas are to utilize a C value of 0.85 and collector roadways C value is 0.70. We have updated these drainage areas and C values and are shown on the attached Figure 7 and storm sewer design sheet.

The calculations for our revised drainage areas are as follows:

Area= A1 – 1.26 ha
% Impervious = 92.8%
5-yr Peak Runoff – **Rational Method = 310 L/s**
100-yr Peak Runoff = 605 L/s

Area= A2 – 0.24 ha
% Impervious = 71%
5-yr Peak Runoff – **Rational Method = 49 L/s**
100-yr Peak Runoff = 105 L/s

Are you able to accommodate these changes into your detail design for the Minto lands? Do you foresee any issues with these updates? It appears there is still capacity in the sewers downstream on Innovation Drive and is only a minor overall increase to the drainage area for Pond 3.

I'm available to discuss anytime. Please let me know.

Thanks,

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
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From: Matt Wingate <MWingate@dsel.ca>
Sent: Tuesday, January 11, 2022 11:45 AM
To: Drew Blair <D.Blair@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

Hi Drew,
I'm pretty flexible this afternoon.
Feel free to give me a call on my cell.

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
cell: (613) 858-4975
e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: January 11, 2022 11:10 AM
To: Matt Wingate <MWingate@dsel.ca>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Matt,

Thanks for this info.

Could I give you a call to discuss? What's the best number and time to reach you?

Thanks,

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
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From: Matt Wingate <MWingate@dsel.ca>
Sent: Thursday, January 6, 2022 3:06 PM
To: Drew Blair <D.Blair@novatech-eng.com>
Cc: Steve Zorgel <s.zorgel@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

Hi Drew,

We updated and resubmitted our engineering package for Minto's subdivision before the holidays. I've attached a copy of the Rev 3 – Dec 23/21 storm drainage plans and plan/profile drawing that illustrate drainage entering into Minto's storm sewer from future March Road and lands to the west. The design remains unchanged from the Rev 2 – Aug 18/21 version of the storm drainage plan in your email.

A copy of the accompanying storm sewer design sheets is also attached. You'll note that we have included fictional future storm sewer runs along March Rd as a place holder in the sheets and drawings – to illustrate and account for the varying capture of 5-yr and 10-yr runoff from the western development lands and March Rd, respectively, into the Minto storm sewer at MH 107. The March Road storm sewers will need to be designed in the future by others.

The drainage boundaries for development west of March Rd are intended to match the property limits shown in the attached CU drainage plan received Nov 24/20.
Let me know if we misinterpreted or something has changed.

Regards

Matt Wingate, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext 522
direct: (613) 836-1522
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e-mail: mwingate@DSEL.ca

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From: Drew Blair <D.Blair@novatech-eng.com>
Sent: January 5, 2022 4:09 PM
To: Matt Wingate <MWingate@dsel.ca>
Cc: Steve Zorgel <s.zorgel@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Matt,

We're currently working on the draft plan of subdivision design for the lands west of March Road that are to be captured and conveyed down March Road and through Minto's Brookline subdivision to Pond 3. They are identified as 1.24Ha on the attached DSEL Storm Drainage Plan.

I was hoping to discuss the proposed storm pipe sizing on March Road including the area and design flows assumed outletting from the lands west of March Road. There appears to be some differences between the attached storm drainage plan, the 2020 Functional Design plan and the Kanata North MSS storm plan. Perhaps we could get a copy of your latest detailed engineering Servicing Report for the Brookline subdivision or at minimum the latest storm sewer design sheets that size the storm pipes on March Road. Could we also get the latest drawings for the proposed March Road storm sewer with inverts so that we can coordinate with our site?

Thanks for any help you can provide.

Drew

Drew Blair, P.Eng., Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 236 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Matt Wingate <MWingate@dsel.ca>
Sent: Tuesday, September 21, 2021 4:28 PM
To: Steve Zorgel <s.zorgel@novatech-eng.com>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: March Valley Road - Minto Development

Hi Steve,
I've attached a PDF copy of our storm drainage plans for Minto's Brookline subdivision and Pond 3.

KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

STORM SEWER DESIGN SHEET

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

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			AREA (a)			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-1
CONCEPUTAL DESIGN FOR EAST SWMF
FLOW RATES BASED ON RATIONAL METHOD

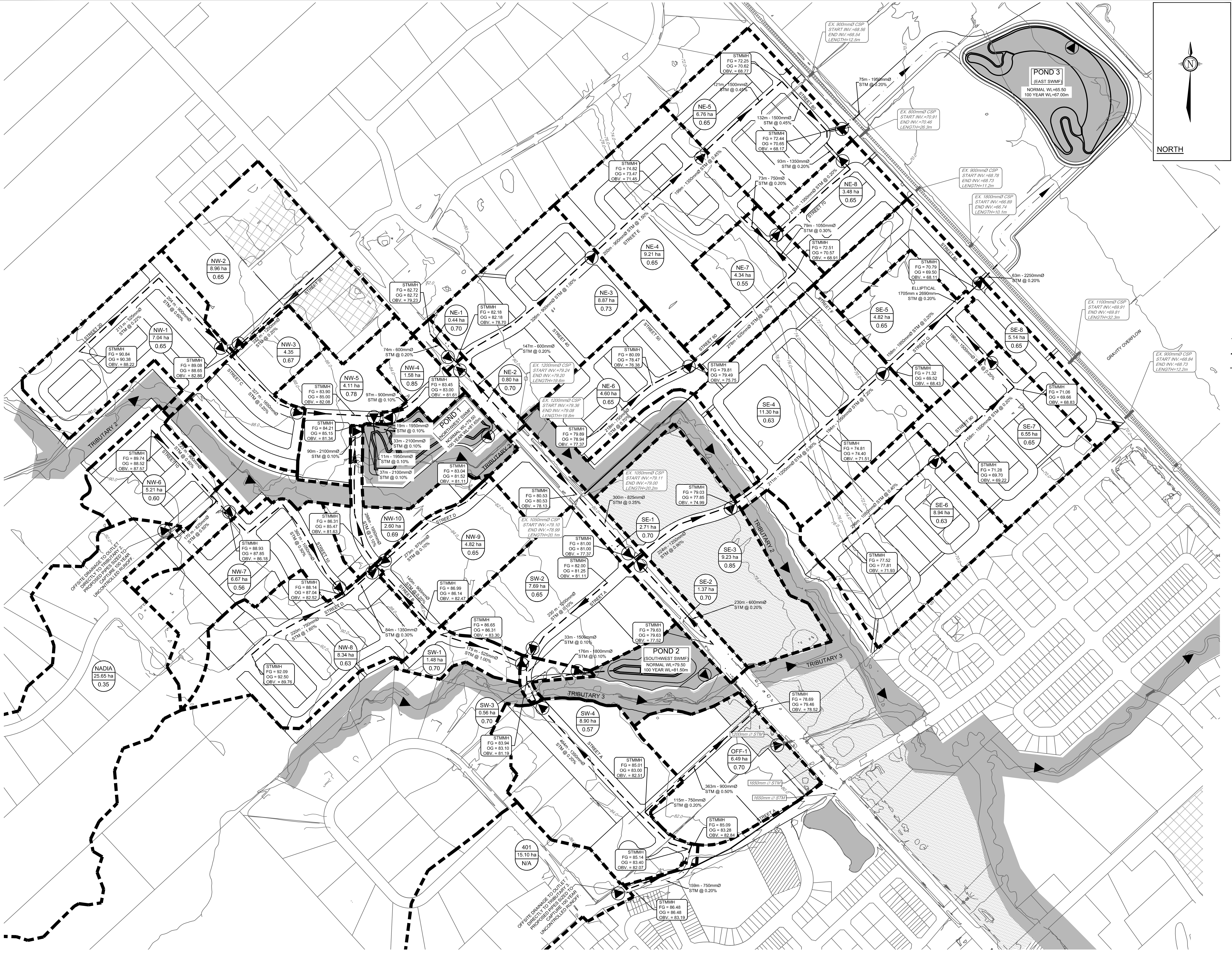
NOVATECH
Engineers, Planners & Landscape Architects

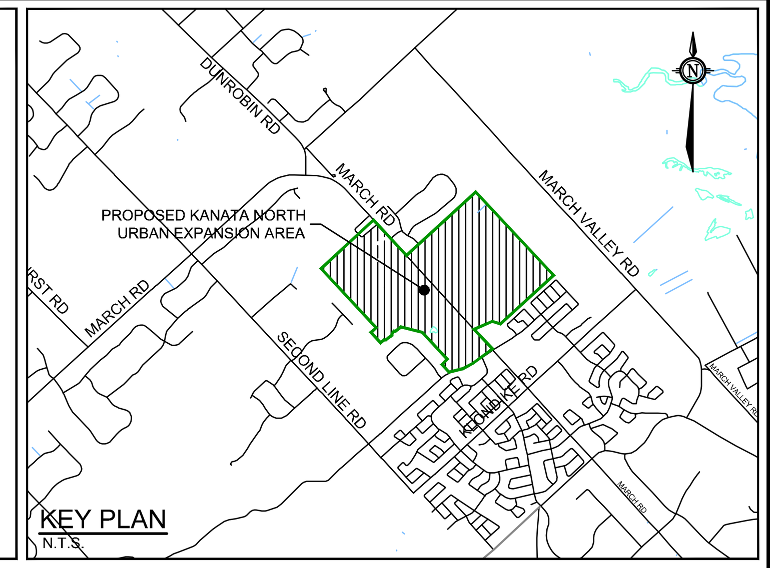
LOCATION			AREA (a)			FLOW					SEWER DATA								
Catchment ID	From Node	To Node	Area (ha)	C	AC (ha)	Indiv 2.78 AC	Accum 2.78 AC	Time of Conc.	Intensity (mm/hr)	Peak Flow (L/s)	Dia. (m) Actual	Dia. (mm)	Type	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow Time (min)	Ratio Q/Q full
SE-6	SE-6	SE-7	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	**Novate Engineering Consultants Ltd.**	
Date	May, 2016	
Design B	Alex McAuley	
Client	**Dwg. Re eren e**	**C e ed B**
Kanata North Land Owners	112117-STM1, 112117-STM2	CJR





LEGEND

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

M:\2012\112117\CAD\Design_MSS\112117- STM.dwg, STM1, May 20, 2016

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 (0 30 60 90 120)

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 REV # 3
DRAWING No. 112117-STM1

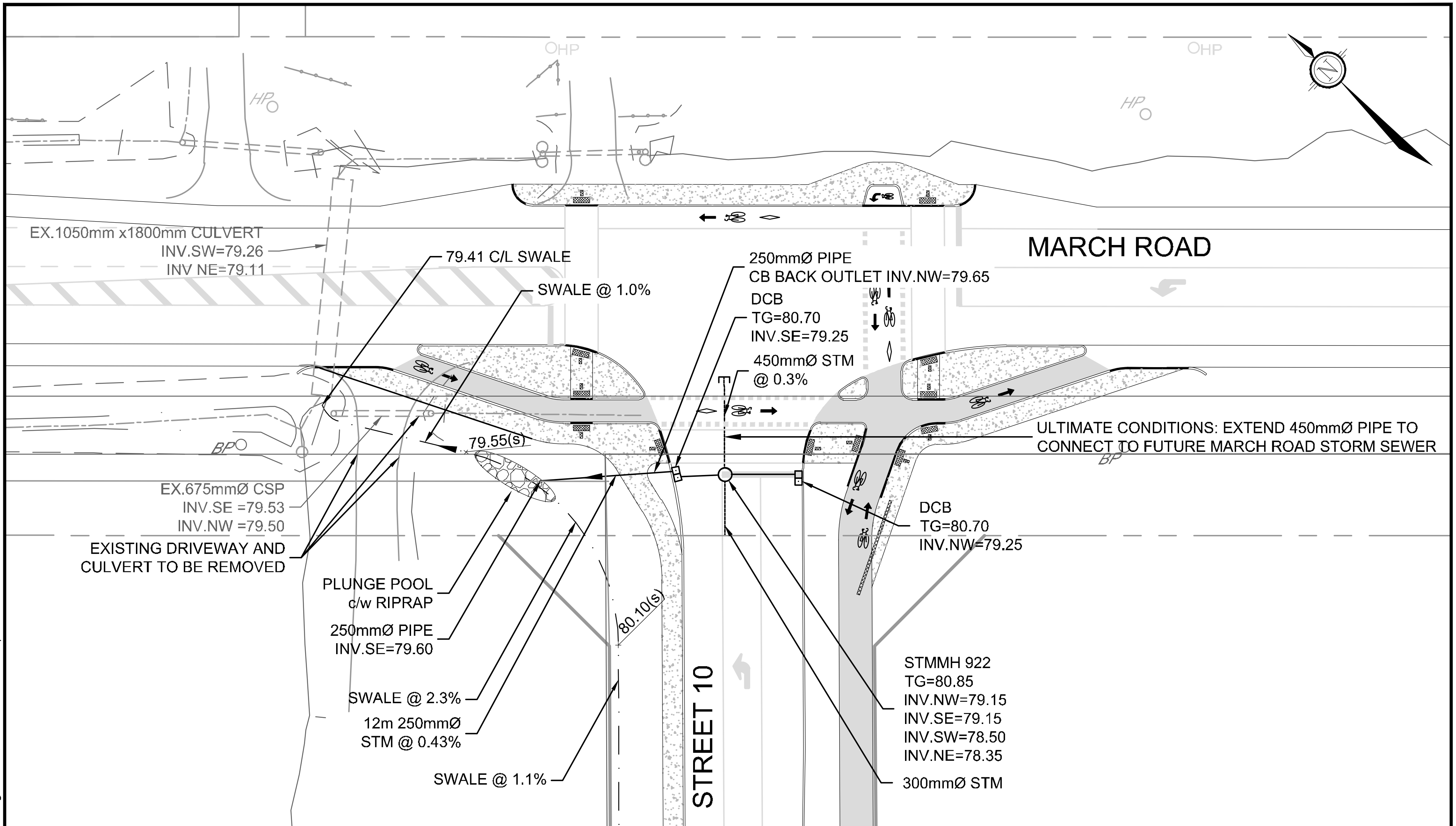
PLANB1.DWG - 1000mmx707mm

<u>Commercial / Institutional / Multi-Unit Residential Areas</u>

The major system analysis also assumes that on-site storage will be provided for commercial, institutional, and multi-unit residential areas for storms greater than the 5-year and up to the 100-year event, and that no major system flows will be generated for these areas. The overall site grading does provide major drainage outlets from these areas in the event that the available on-site storage is exceeded.

Ta le 5.4.3 Estimated Ma or S stem Pea Flows and Runo Volumes

Land Use	**'C'**	**Imperv**	**Minor S stem Inlet Rate (L/s/ a)**	**Ma or S stem Dis arge Rate (L/s/ a)**
Arterial Roads / Transitway	0.65	64%	185	101
Collector Roads	0.70	71%	145	125
Mixed Use / Commercial	0.85	93%	150	0
Schools/Church	0.65	64%	115	130
Parks	0.40	29%	70	12
Open Space	0.20	0%	50	26
Street Oriented Residential	0.65	64%	100	Varies, see Figure 5.4.3
Multi Unit Residential	0.70	71%	115	Varies, see Figure 5.4.3
Park and Ride	0.85	93%	185	0



M:\2021\121247\CAD\Design\Figures\121247-CP-GP.dwg, CP-GP, Nov 24, 2022 - 2:34pm, bmcewen

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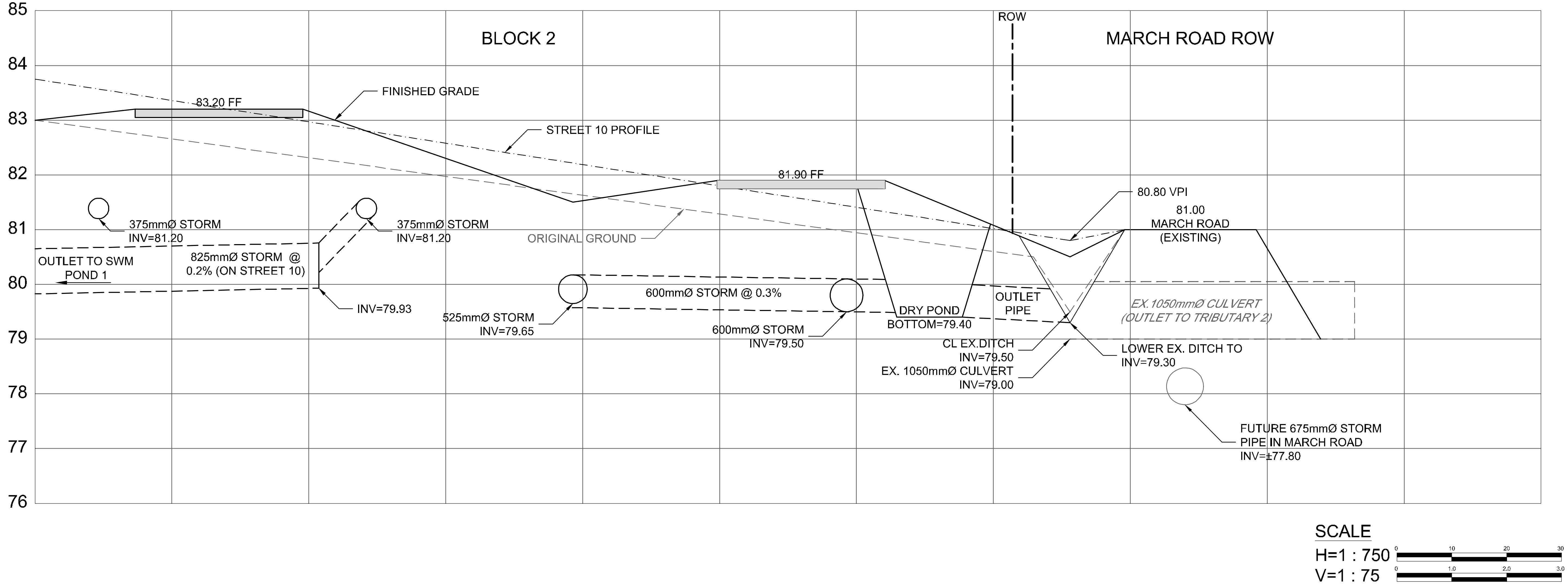
1015 MARCH ROAD

CONCEPTUAL SERVICING STREET 10 (INTERIM CONDITIONS)

SCALE 1 : 500 (0, 5m, 10m, 20m)

DATE	JOB	FIGURE
NOV 2022	121247	CP-GP

SHT8X11.DWG - 216mmx279mm



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

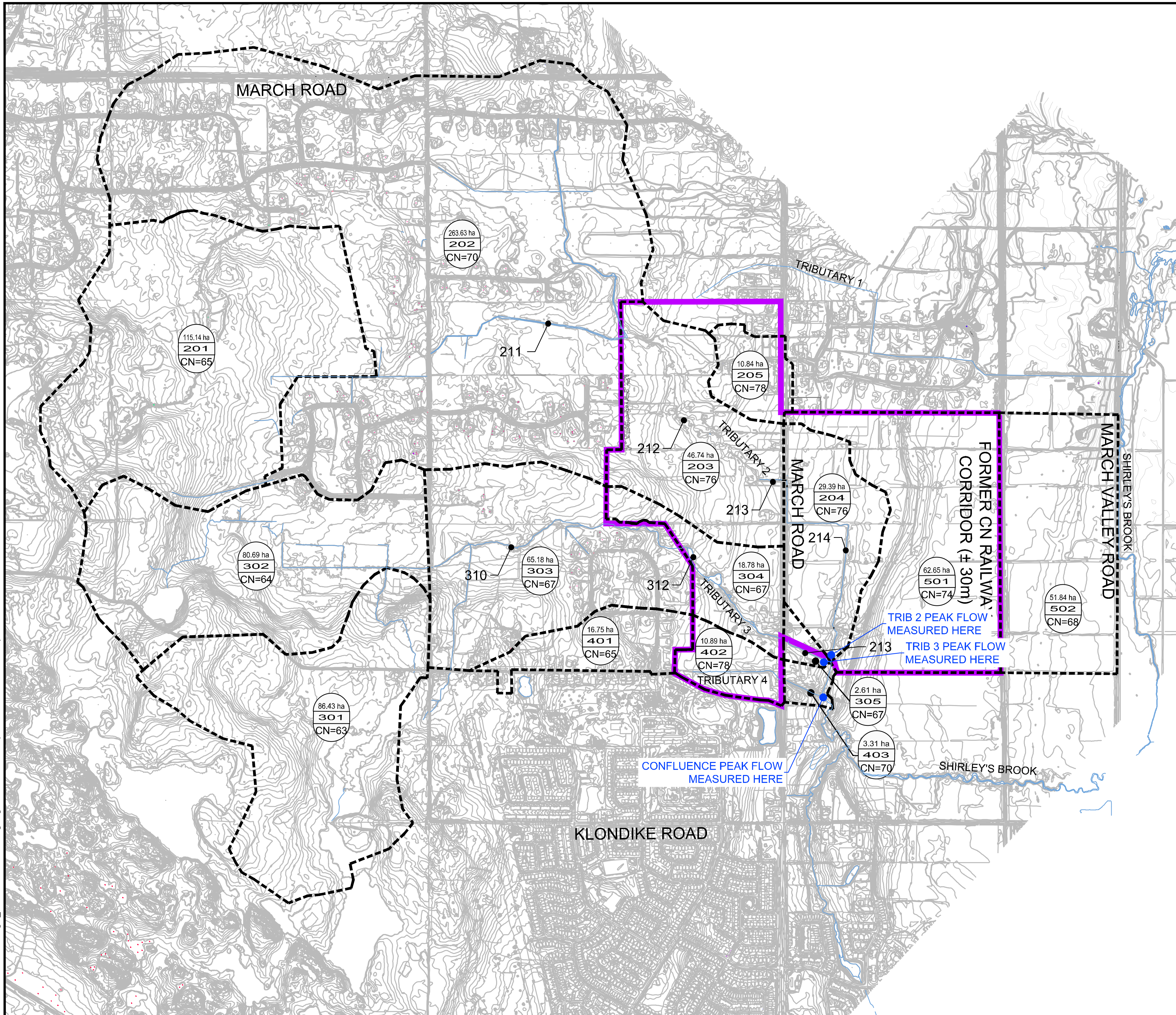
1015 MARCH ROAD

CONCEPTUAL STORM SERVICING FOR BLOCK 2

SCALE	AS NOTED	
DATE AUG 2022	JOB 121247	FIGURE FIG-CP-STM

M:\2021\121247\CAD\Design\Figures\121247-BLK2-PR.dwg, BLK2-PROF(11x17), Aug 04, 2022 - 11:53am, bmcewen

SHT11X17.DWG - 279mmX432mm



LEGEND

- KNUEA
- DRAINAGE CHANNEL
- SUBCATCHMENT DRAINAGE BOUNDARIES
- 29.39 ha — SUBCATCHMENT AREA (HA)
- 204 — DRAINAGE AREA ID
- CN=76 — SCS CURVE NUMBER

KANATA NORTH

COMMUNITY DESIGN PLAN

FIGURE NO. 3.15

PRE-DEVELOPMENT DRAINAGE AREAS

DATE JUN 2016

JOB 112117

SCALE NTS

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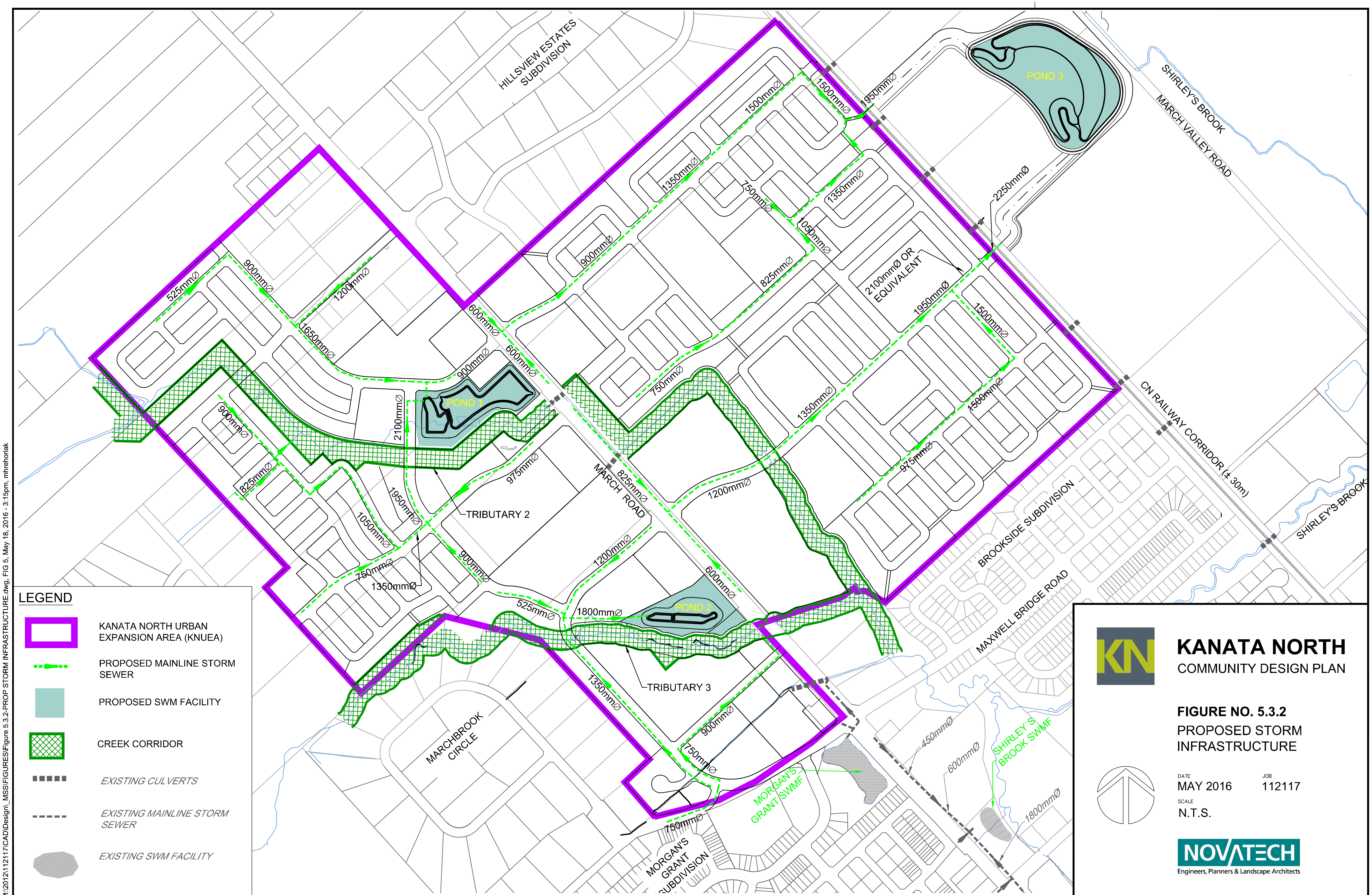
M:\2012\112117\CAD\Design_EMP\112117-SWM.dwg, Figure 3.15 PreDevelopment, Jun 23, 2016 - 5:07pm, kbanks


KANATA NORTH
COMMUNITY DESIGN PLAN
FIGURE NO. 5.3.2
PROPOSED STORM INFRASTRUCTURE
DATE MAY 2016
JOB 112117
SCALE N.T.S.
NOVATECH
Engineers, Planners & Landscape Architects
LEGEND
KANATA NORTH URBAN EXPANSION AREA (KNUEA)
PROPOSED MAINLINE STORM SEWER
PROPOSED SWM FACILITY
CREEK CORRIDOR
EXISTING CULVERTS
EXISTING MAINLINE STORM SEWER
EXISTING SWM FACILITY
HILLSVIEW ESTATES SUBDIVISION
POND 1
POND 2
POND 3
SHIRLEY'S BROOK
MARCH VALLEY ROAD
CN RAILWAY CORRIDOR (± 30m)
MARCH ROAD
TRIBUTARY 2
TRIBUTARY 3
BROOKSIDE SUBDIVISION
MAXWELL BRIDGE ROAD
MARCHBROOK CIRCLE
MORGAN'S GRANT SUBDIVISION
MORGAN'S GRANT SWMF
SHIRLEY'S BROOK SWMF
2100mmØ OR EQUIVALENT
1500mmØ
1950mmØ
1350mmØ
750mmØ
1050mmØ
900mmØ
825mmØ
2250mmØ
525mmØ
1200mmØ
1650mmØ
600mmØ
2100mmØ
975mmØ
1800mmØ
450mmØ
M:\2012\112117\CAD\Design_MSS\FIGURES\Figure 5.3.2-PROP STORM INFRASTRUCTURE.dwg, FIG 5, May 18, 2016 - 3:15pm, mhrehoriak

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
Fax: 905-948-0577
info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate o Annual Grit Colle tion

Engineer	**Novatech**	**Pro e t**	Copperwood Estate
Conta t	Vahid Mehdipour	**CDS Model**	30_25_6
Report Date	5-Jun-15	**OGS Lo ation**	

Area	5.22	ha
Imperviousness	69	%
Runo Coe i ient	0.70	

Assumptions

1. Annual Rainfall	944	mm	
2. Typical Grit Concentration	120	mg/l	
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	68%		

Runo Volume = Area x Rainfall Depth x Runoff Coefficient = 34,494 cu.m

Grit Colle ted = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 2,815 kg

Grit Volume = Mass / Apparent Density = 1,759 litres or 1.759 cu.m

T ere ore it an e e pe ted t at t is site will generate appro imatel 1.759 u.m o grit annuall .

Sump Capacity of CDS unit = 3.203 cu.m

T ere ore t e design sump apa it will a ommodate a leaning re uen o one time per 20 to 24 mont s.

CONTECH ENGINEERED SOLUTIONS

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SI E DISTRIBUTION

CDS TECHNOLOGIES

Pro e t Name	Copperwood Estate	**Engineer**	**Novate**
Lo ation	Kanata, ON	**Conta t**	Vahid Mehdipour
OGS	OGS	**Report Date**	8-Apr-22

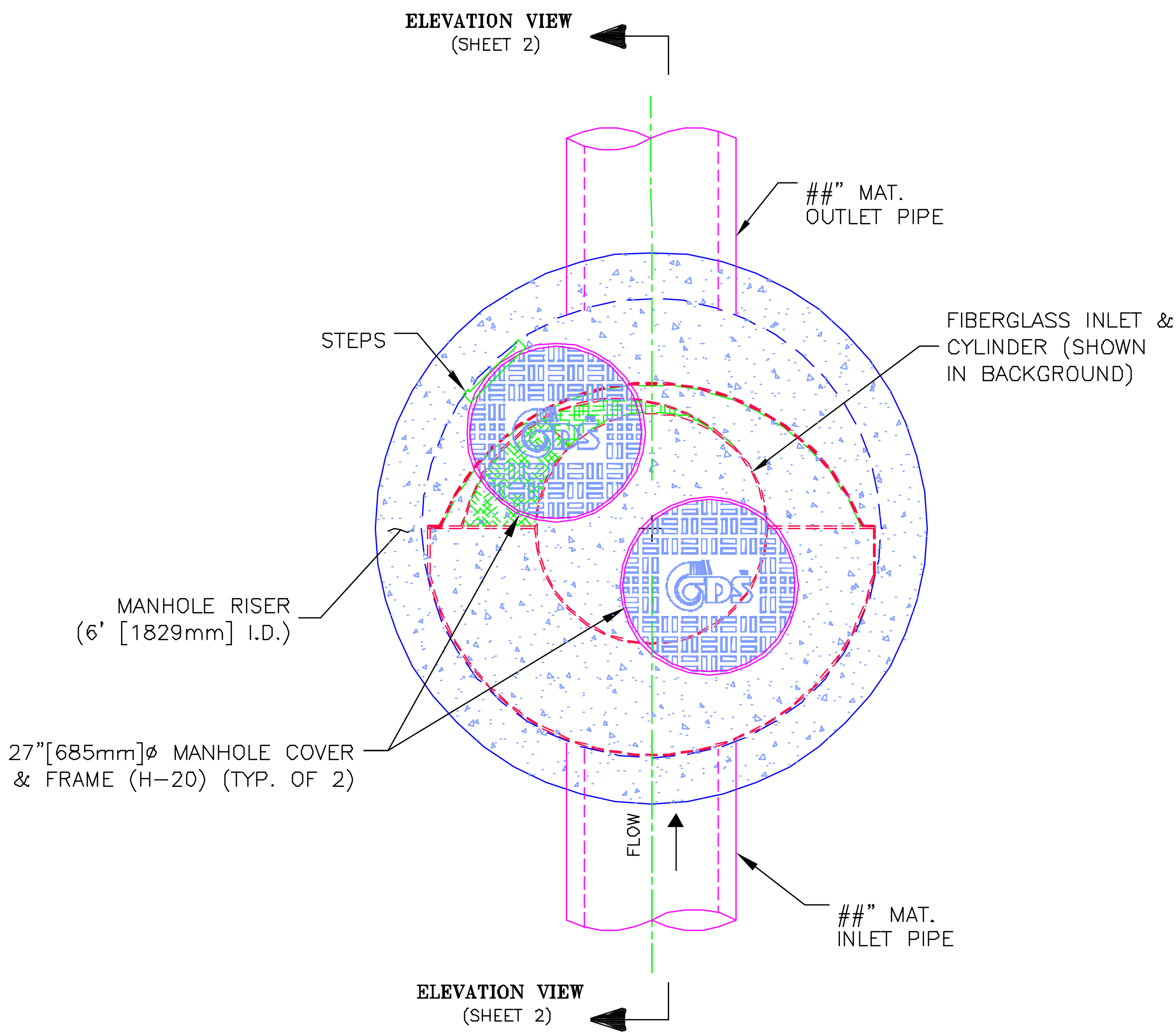
Area	5.22	ha	**Rain all Station**	215	
Weig ted C	0.70		**Parti le Si e Distri ution**	FINE	
CDS Model	3025		**CDS Treatment Capa it**	68	l/s

Rain all Intensit [1] (mm/ r)	**Per ent Rain all Volume[1]**	**Cumulative Rain all Volume**	**Total Flowrate (l/s)**	**Treated Flowrate (l/s)**	**Operating Rate ( )**	**Removal E i ien ( )**	**In remental Removal ( )**
0.5	9.2%	9.2%	5.1	5.1	7.5	96.7	8.9
1.0	10.6%	19.8%	10.1	10.1	14.9	94.6	10.0
1.5	9.9%	29.7%	15.2	15.2	22.4	92.4	9.2
2.0	8.4%	38.1%	20.3	20.3	29.8	90.3	7.6
2.5	7.7%	45.8%	25.4	25.4	37.3	88.2	6.8
3.0	5.9%	51.7%	30.4	30.4	44.8	86.0	5.1
3.5	4.4%	56.1%	35.5	35.5	52.2	83.9	3.7
4.0	4.7%	60.7%	40.6	40.6	59.7	81.7	3.8
4.5	3.3%	64.0%	45.6	45.6	67.2	79.6	2.6
5.0	3.0%	67.1%	50.7	50.7	74.6	77.5	2.3
6.0	5.4%	72.4%	60.9	60.9	89.5	73.2	3.9
7.0	4.4%	76.8%	71.0	68.0	100.0	67.2	2.9
8.0	3.5%	80.3%	81.1	68.0	100.0	58.8	2.1
9.0	2.8%	83.2%	91.3	68.0	100.0	52.3	1.5
10.0	2.2%	85.3%	101.4	68.0	100.0	47.0	1.0
15.0	7.0%	92.3%	152.2	68.0	100.0	31.4	2.2
20.0	4.5%	96.9%	202.9	68.0	100.0	23.5	1.1
25.0	1.4%	98.3%	253.6	68.0	100.0	18.8	0.3
30.0	0.7%	99.0%	304.3	68.0	100.0	15.7	0.1
35.0	0.5%	99.5%	355.0	68.0	100.0	13.4	0.1
40.0	0.5%	100.0%	405.7	68.0	100.0	11.8	0.1
45.0	0.0%	100.0%	456.5	68.0	100.0	10.5	0.0
50.0	0.0%	100.0%	507.2	68.0	100.0	9.4	0.0
							75.2

Removal Efficiency Adjustment[2] =	6.5%
Predi ted Net Annual Load Removal E i ien	**68.7**
Predi ted Annual Rain all Treated	**88.5**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS efficiency based on testing conducted at the University of Central Florida.
4 - CDS design and scaling based on original manufacturer model and product specifications.

PLAN VIEW



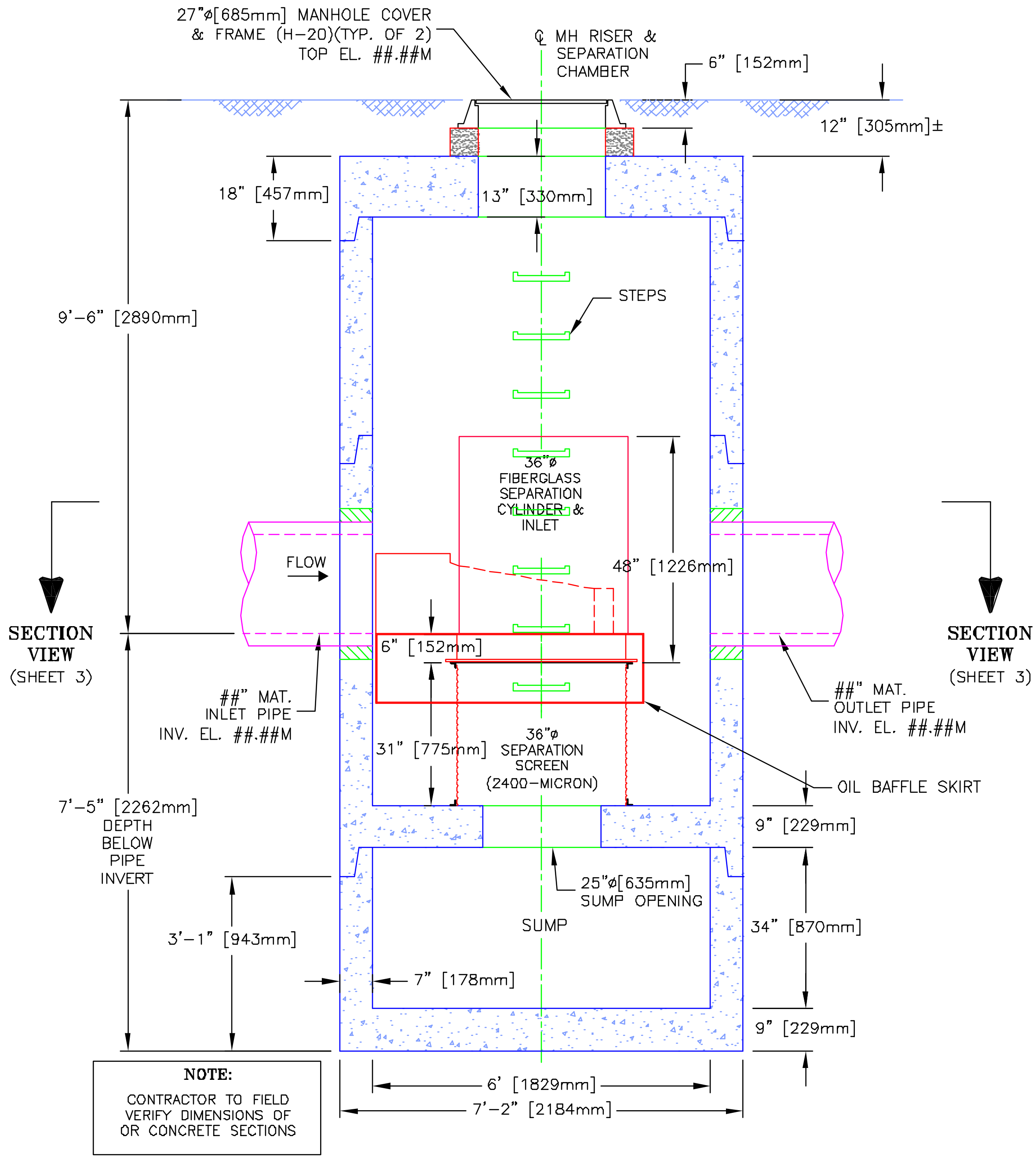
MODEL CDS30_25m, 68 L/S TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 2.5'
		DATE ##/##/##	SHEET
		DRAWN INITIALS	1
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

CDS TECHNOLOGIES™

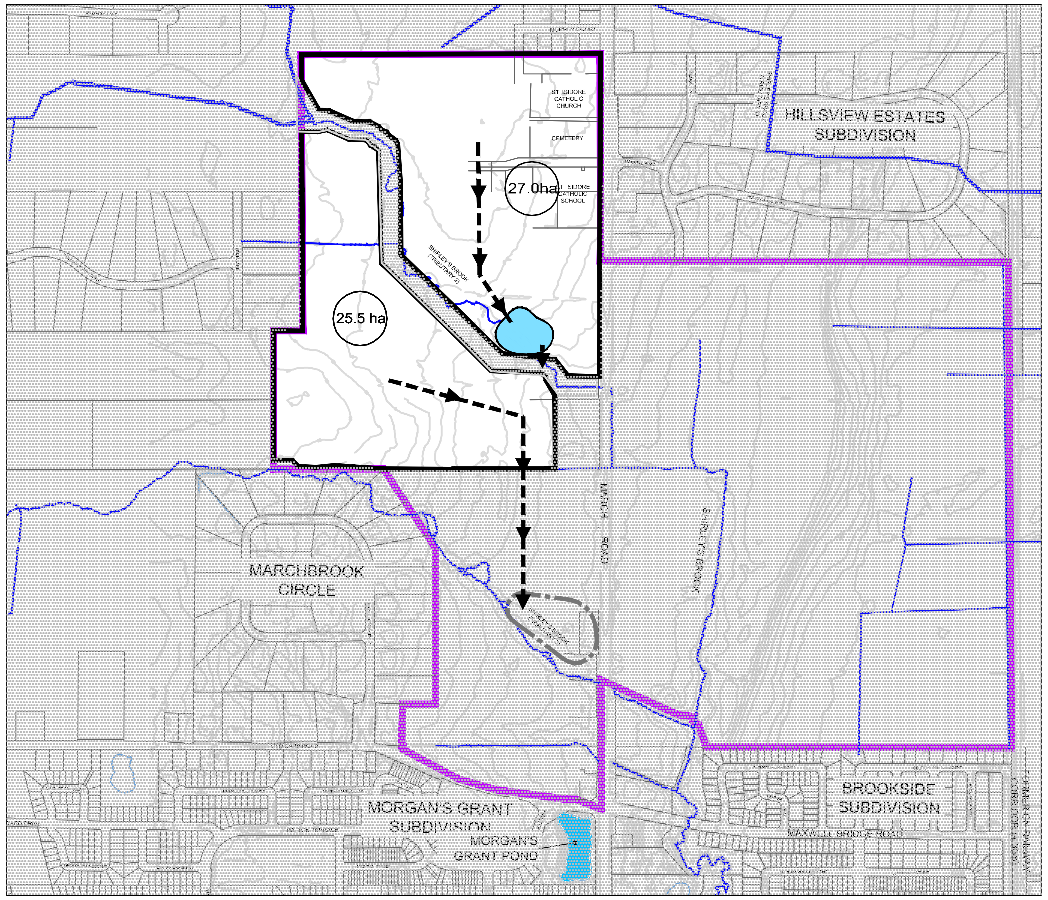
ELEVATION VIEW



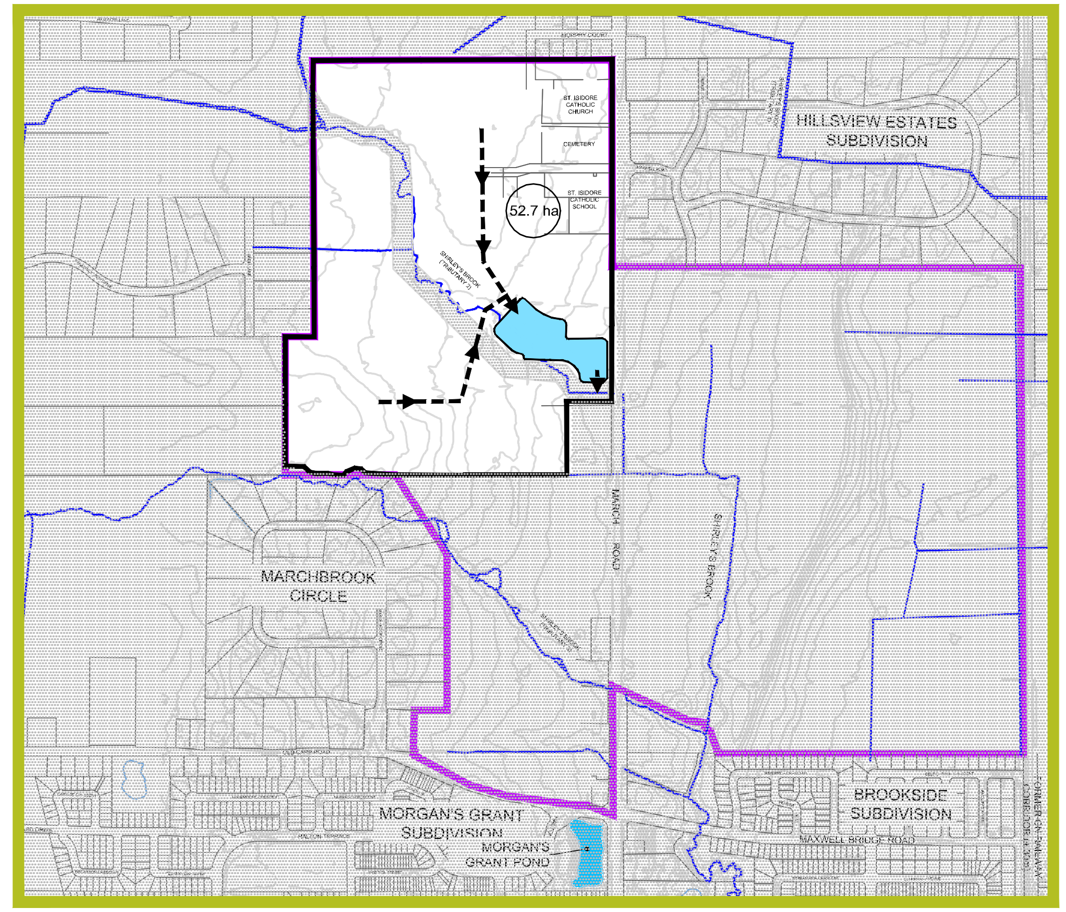
MODEL CDS30_25m, 68 L/S TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB#	CAN-##-###	SCALE 1" = 3'
		DATE	##/##/##	SHEET
		DRAWN	INITIALS	2
		APPROV.		

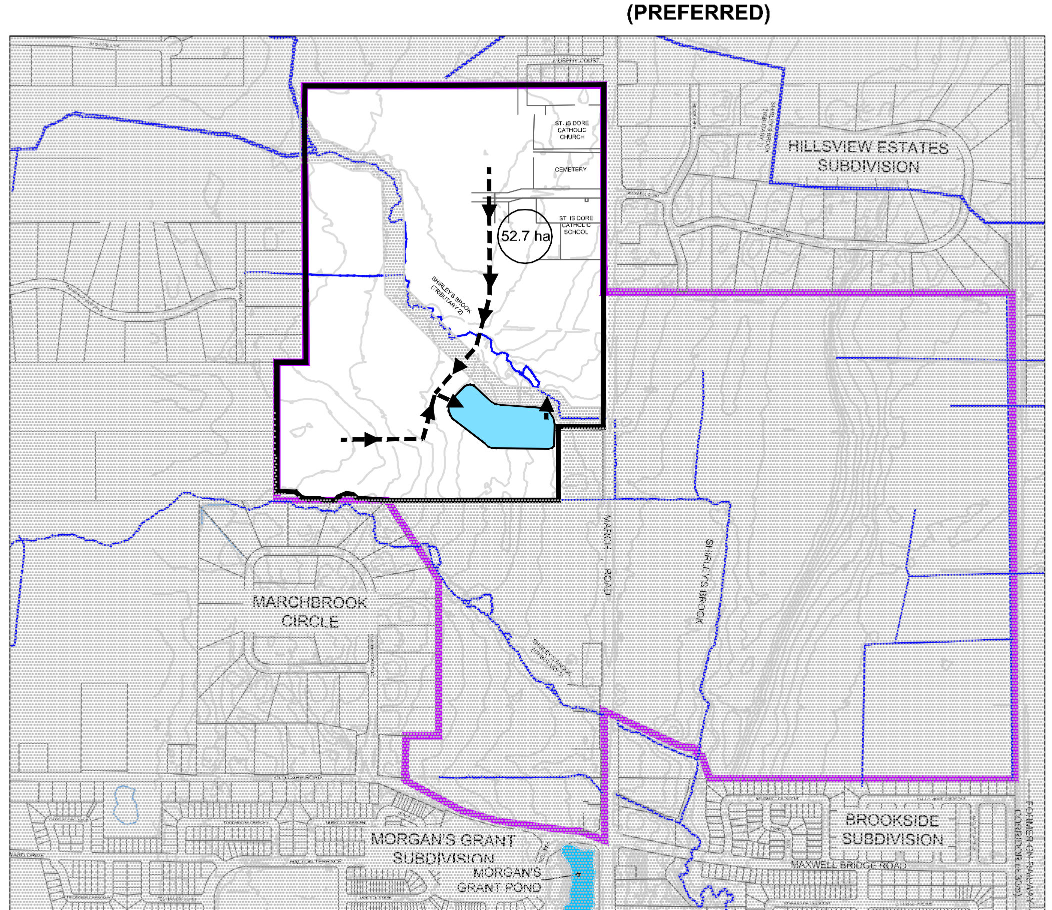
Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577



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
- 23.9 ha — AREA (HECTARES)
- STORM SEWER

KANATA NORTH
COMMUNITY DESIGN PLAN

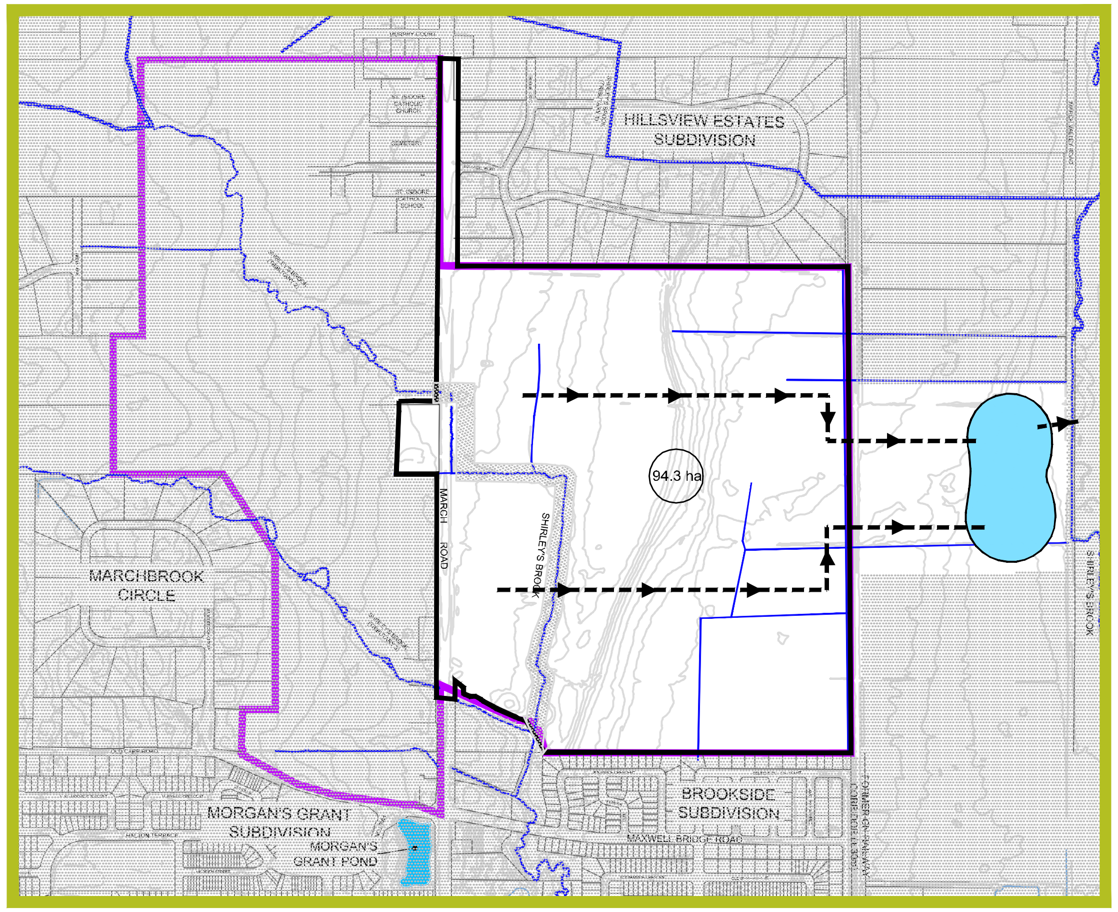
FIGURE NO. 6.1
SWMF ALTERNATIVES
NORTHWEST QUADRANT

DATE JUN 2016 | JOB 112117
SCALE NTS

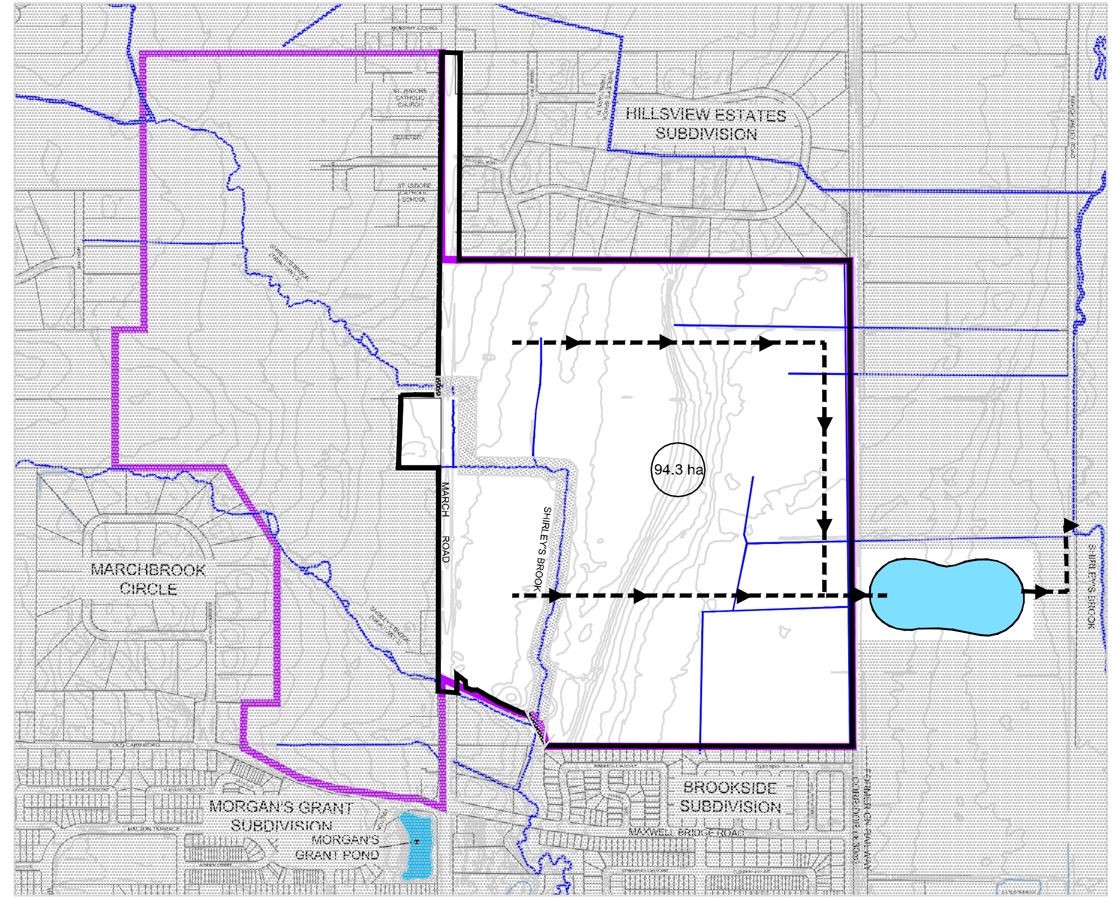
NOVATECH
Engineers, Planners & Landscape Architects

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

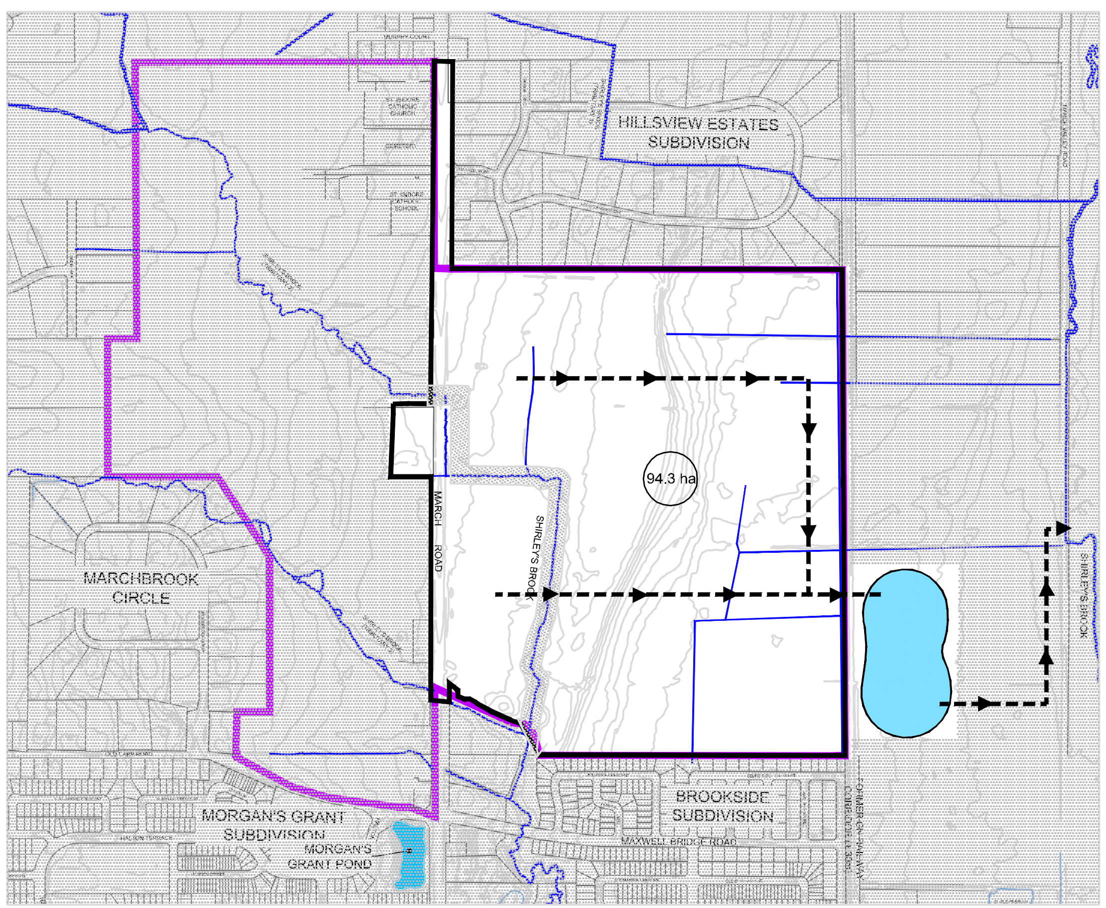
SHT11x17.DWG - 279mmx432mm



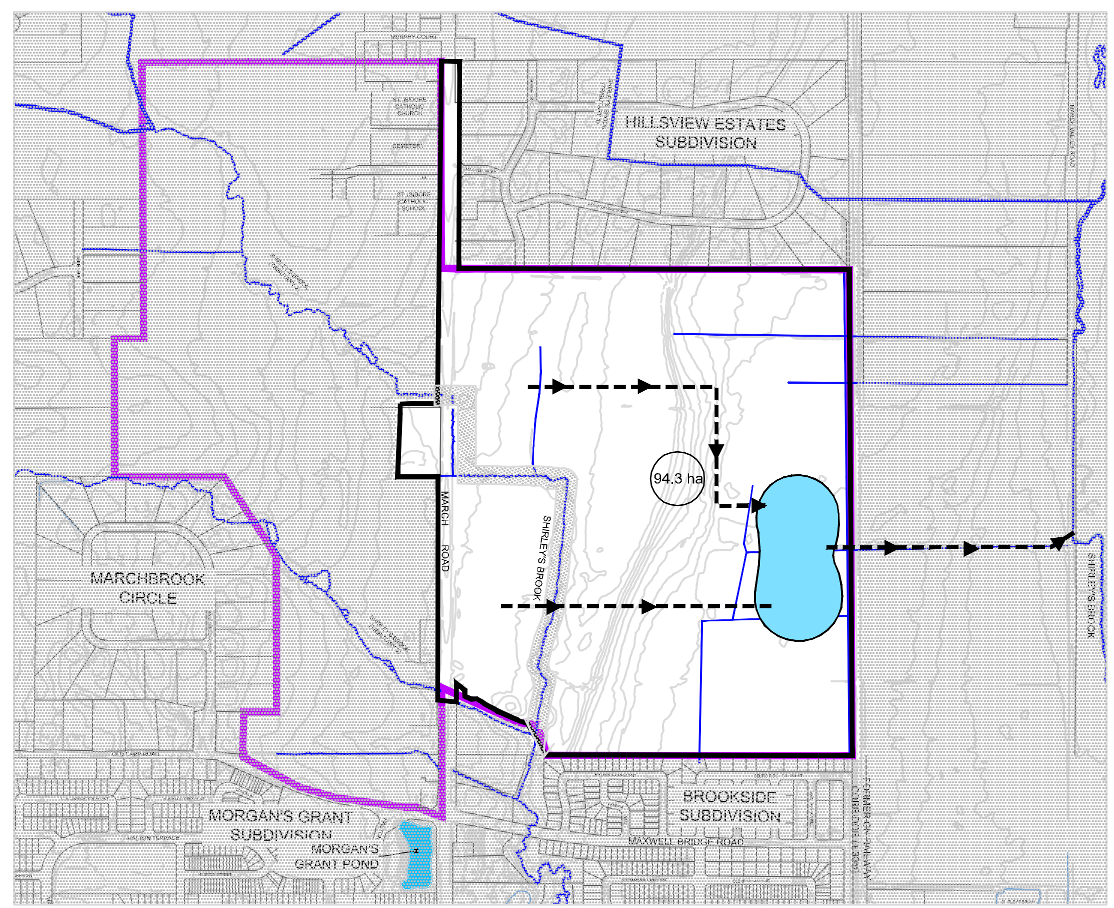
OPTION 1 - SWM FACILITY OUTSIDE URBAN BOUNDARY, INTEGRATED WITHIN WOODED AREA (PREFERRED)



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

LEGEND

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

KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 6.4
SWMF ALTERNATIVES - EAST OF MARCH

DATE JUN 2016
JOB 112117
SCALE NTS

NOVATECH
Engineers, Planners & Landscape Architects

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

1015 March Road
121247

Quality control in the swale

Criteria	Recommended	Swale to Trib2
Channel Slope	< 4.0% (MOE)	1.00%
Bottom Width	> 0.75m (MOE)	0
Side Slopes (H:V)	> 2.5:1 (MOE)	3:1
25mm Event (Water Quality)		
Peak Flow		9.1 L/s
Flow Depth	± 0.1 (FHWA)	0.09 m
Velocity	< 0.5m/s (MOE)	0.40 m/s

A1 - Storage Requirments

Required Storage for Chicago3hr-100year =	235 m3
Release Rate for Chicago3hr-100year =	323 L/s
Orifice Size =	0.375 m
5 Year Release Rate[1]=	335 L/s

1- 5yr release rate is 310 L/s from rational method (C=0.85) & 150L/s/ha *1.26 = 189L/s
SWMHYMO reulst is based on 70% Imp. = 267 L/s
This is calculated based on Chiacgo 3hr-5yr for developed condition.

Eastern Part of Street 10 (ST10-1015MarchRd)

Storm	Depth (m)	Velocity (m/s)	Depth×Velocity (m2/s)
Chicago 3hr-100yr	0.01	0.85	0.01
Chicago 3hr-100yr + 20%	0.02	0.94	0.01
			<0.6

ICD Name	Inlet Node	Area ID	PCSWMM Peak Flow Rate (L/s)
O-A2_1015MarchRd1/2	A2_1015MarchRd1	A2	41.3
Approching Flow Rate (L/s)	**Capture Rate (L/s)**	**Bypass Flow (L/s)**	**Ponding Depth (m)**
33.2	33.2	0.0	0

area, with an additional 0.35m of head on the orifice for the 100-year storm event. Therefore, the 100-year release rates are slightly higher than the 5-year peak flow due to the additional 0.35m of head. Runoff from storms that exceed the 100-year design event are assumed to flow overland to March Road. **Ta le 3.4** summarizes the required storage and 100-year inlet capture rate for the future development blocks. It should be noted that storage requirements can be different during the detailed design of the blocks.

Ta le 3.4 Summar o re uired storage and 100- ear inlet apture rate or uture development lo

Area ID	Drainage Area (a)	Runo Coe .	100- ear Inlet Capture Rate[3] (L/s)	Re uired 100- ear Storage[4] (m)
NW-110B	2.58	0.85	516	339
NW-118	0.91	0.70	218	50
NW-120	2.31	0.65	469	140
NW-122	0.25	0.77	69	20
NW-123	0.86	0.76	240	46
NW-125	0.25	0.85	69	24
NW-114	0.89	0.62	267	63
NW-112	2.58	0.85	722	165
NW-31	0.94	0.70	241	49
NW-108&NW-104B	3.02	0.35	528	137
NW-109	1.98	0.30	508	71
NW-90	0.60	0.65	132	29
NW-98	0.57	0.70	167	17
NW-111	0.79	0.30	230	21
FUT1204/NW-9	3.08	0.65	588	300
FUT306	2.82	0.65	600	236
FUTURE	4.21	0.59	888	272

Refer to detailed ICD sizing calculations, release rates and 100-year surface storage volumes provided in **Appendi B-3**. ICD calculations are based on the 3-hour Chicago storm distribution, which generates the highest peak flows and is the critical design event for the sizing of the storm sewers and ICDs for the future development areas. It should be noted that i.e., drainage area NW-110B, is affected by upstream HGL elevation and that is why required storage is high. In the detailed design stage for each of future development blocks, required storage will be determined, but considering the release rates and boundary condition will be essential.

3.7.1 PCSWMM Model Results

The results of the hydrologic and hydraulic analysis demonstrate that the overall stormwater management strategies for the Copperwood Estate subdivision will conform to the stormwater management criteria outlined in this report.

Overall Model Schematic

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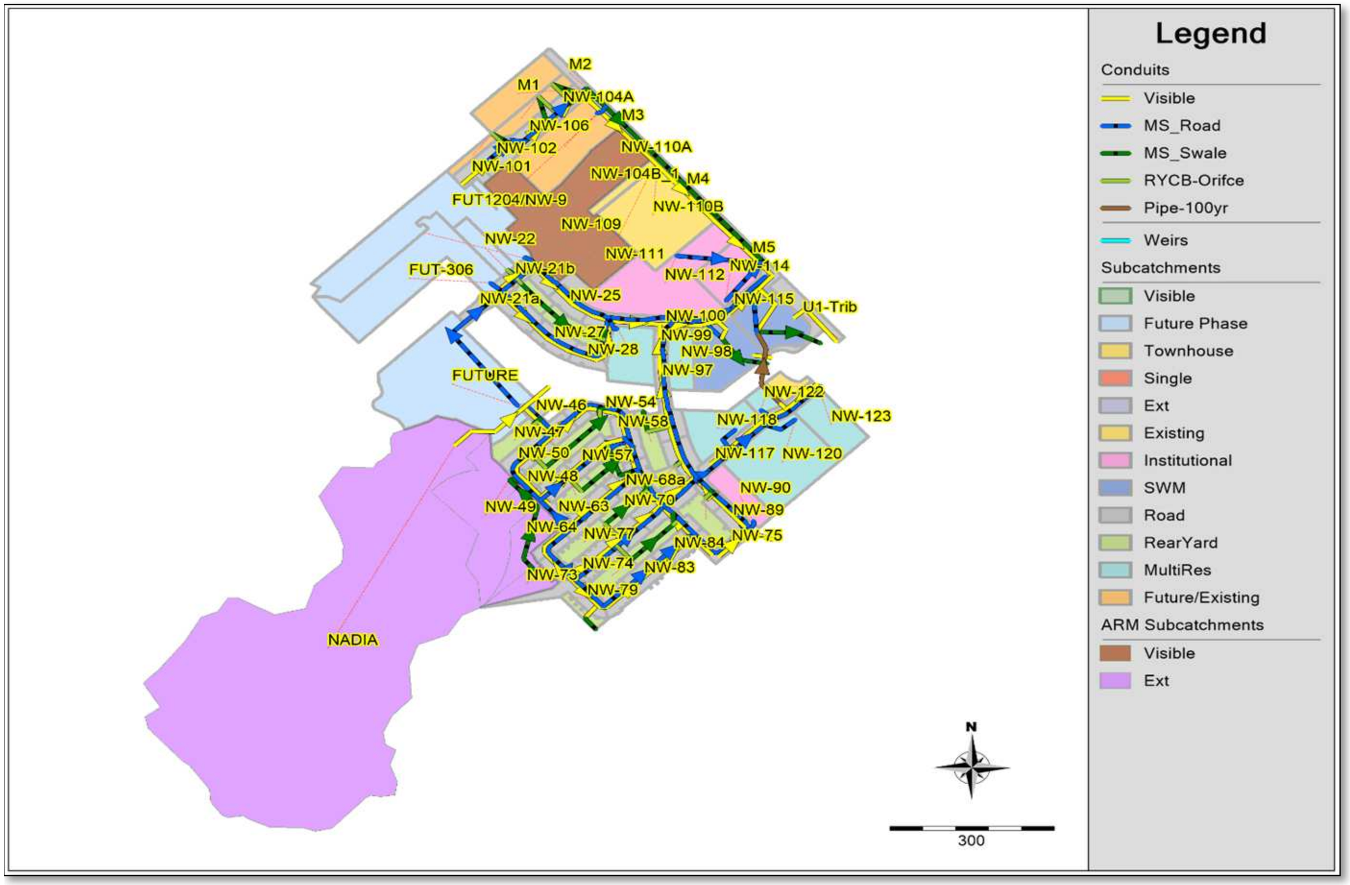
Subcatchments



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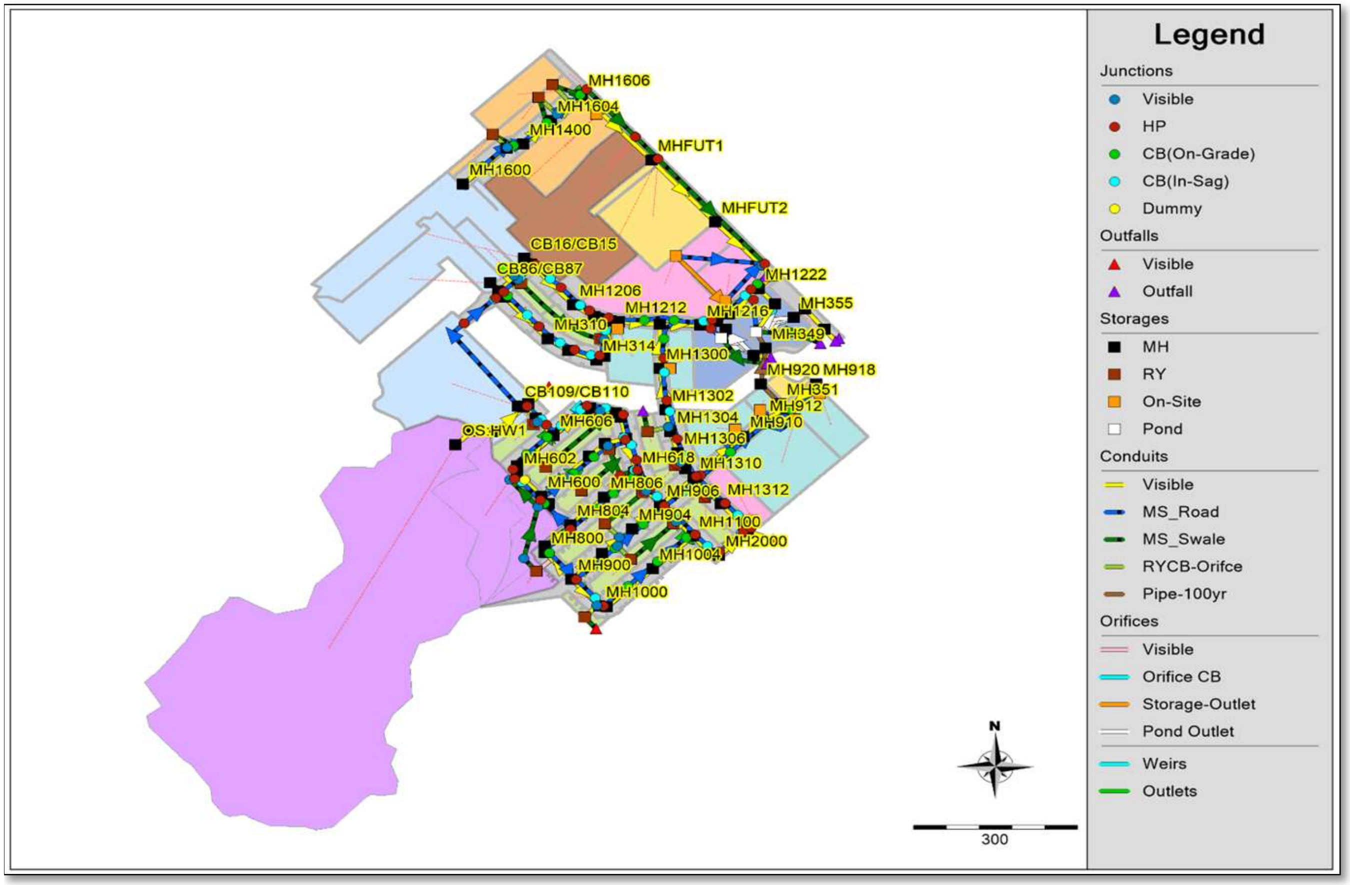
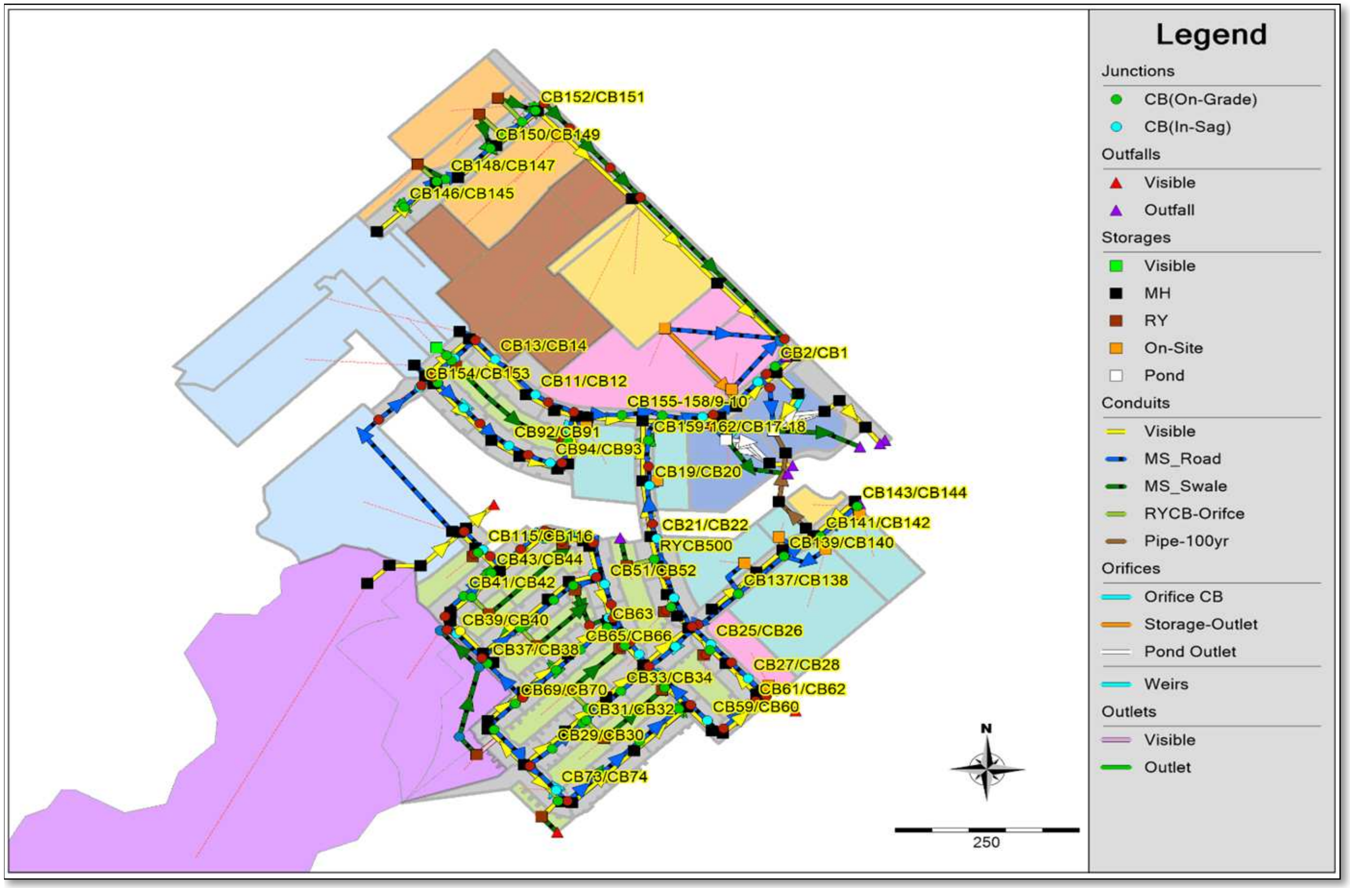
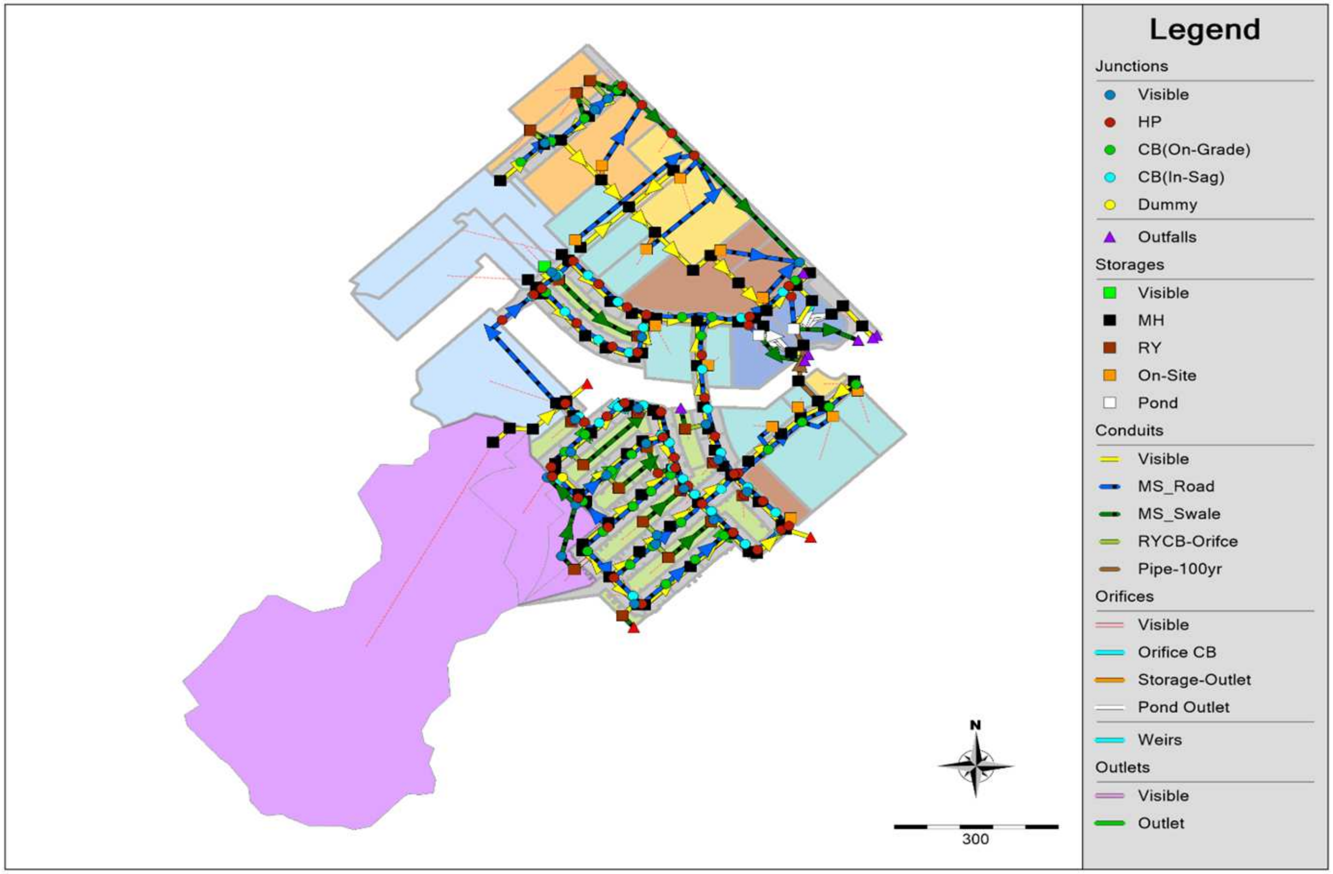
Maintenance Holes



Catchbasins



Overall Model Schematic



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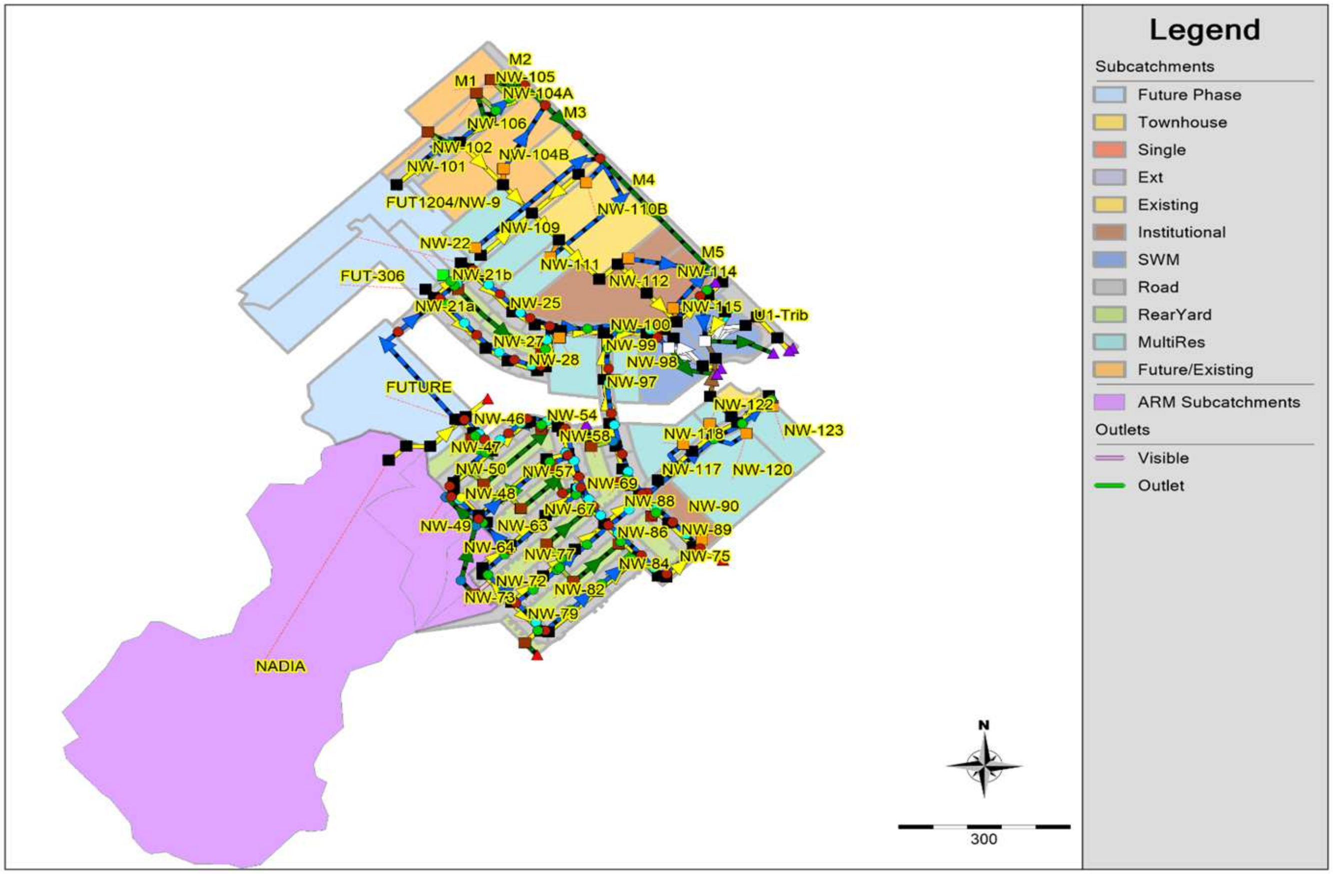
Subcatchments



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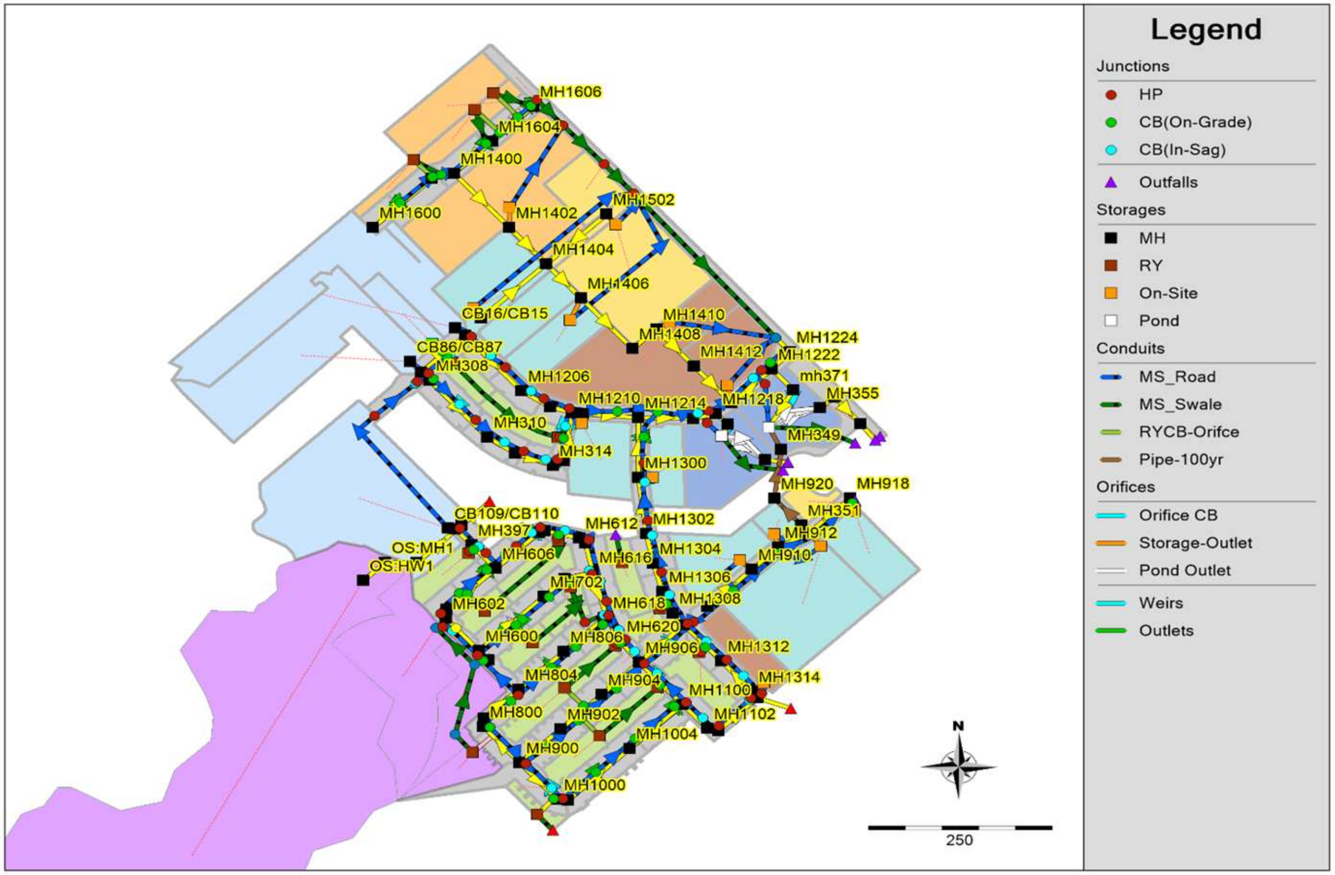
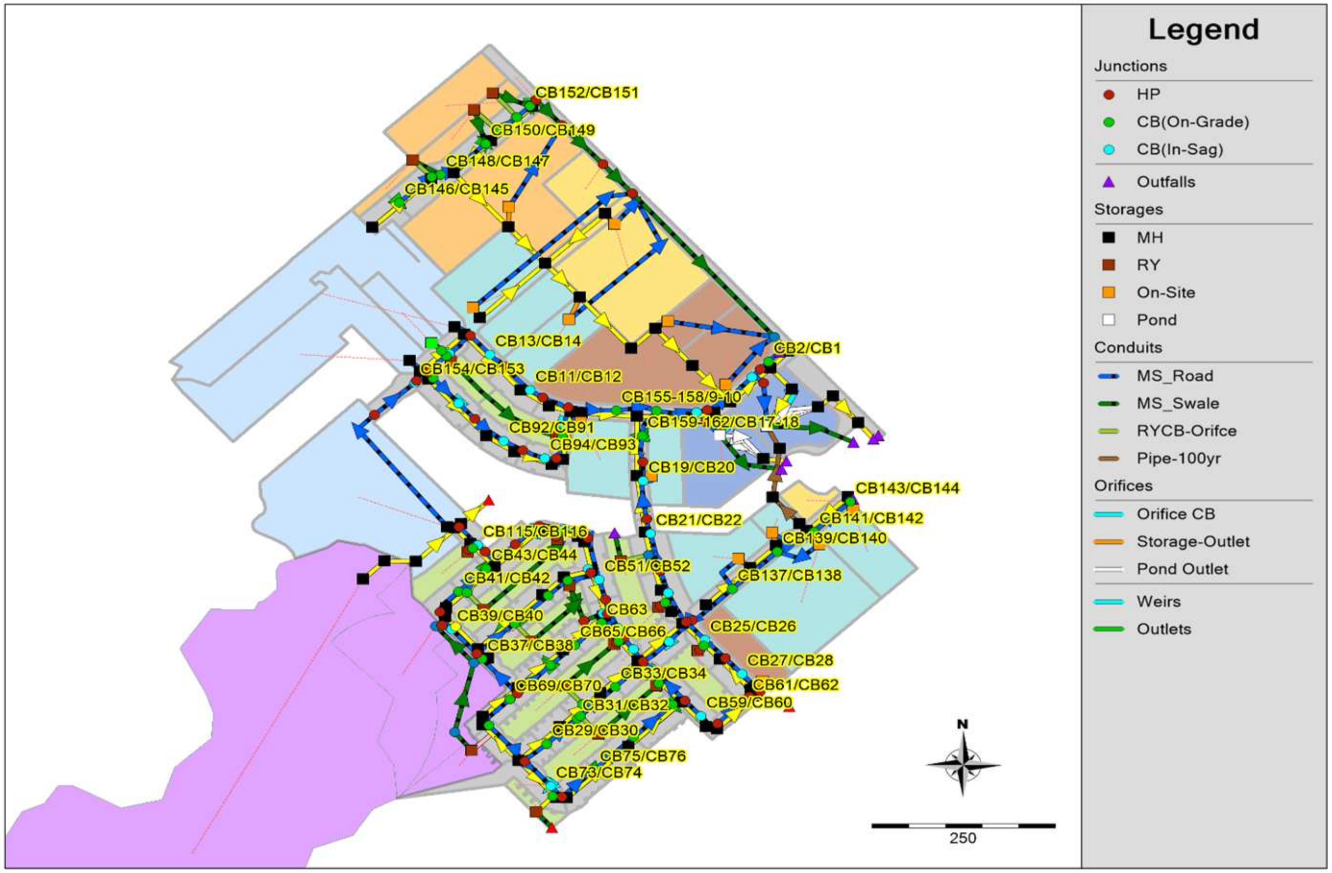
Maintenance Holes



Catchbasins



Subcatchment Parameters
Scenario 1

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
U1-Trib	0.57	50	115	1.5	43	0	0.50
SWM-2	1.08	108	100	1.0	80	90	0.76
SWM-1	1.31	131	100	1.0	80	90	0.76
NW-99	0.13	108	12	1.5	64	50	0.65
NW-98	0.57	48	120	1.5	71	50	0.70
NW-97	0.21	175	12	1.5	59	50	0.61
NW-96	0.41	250	16	3.5	59	90	0.61
NW-95	0.36	171	21	3.0	73	50	0.71
NW-94	0.14	88	16	3.5	56	90	0.59
NW-93	0.39	195	20	3.5	72	50	0.70
NW-92	0.41	241	17	3.0	60	90	0.62
NW-91	0.22	129	17	3.0	59	50	0.61
NW-90	0.60	43	140	1.5	64	50	0.65
NW-89	0.24	114	21	3.5	60	50	0.62
NW-88	0.33	165	20	4.0	78	50	0.75
NW-87	0.36	212	17	4.5	54	90	0.58
NW-86	0.32	160	20	4.0	63	50	0.64
NW-85	0.19	106	18	4.0	50	50	0.55
NW-84	0.33	183	18	5.0	75	50	0.73
NW-83	0.33	183	18	5.0	75	50	0.73
NW-82	0.32	200	16	4.5	55	90	0.59
NW-81	0.27	150	18	4.5	76	50	0.73
NW-80	0.16	100	16	1.5	62	90	0.63
NW-79	0.51	300	17	5.0	35	50	0.45
NW-78	0.36	171	21	5.0	77	50	0.74
NW-77	0.36	212	17	4.5	54	90	0.58
NW-76	0.29	138	21	5.0	78	50	0.75
NW-75	0.12	150	8	1.5	44	50	0.51
NW-74	0.16	76	21	4.5	81	50	0.77
NW-72	0.21	117	18	5.0	62	50	0.63
NW-71	0.21	105	20	4.5	67	50	0.67
NW-70	0.30	188	16	5.0	54	90	0.58
NW-69	0.19	95	20	4.0	73	50	0.71
NW-68b	0.15	107	14	5.0	68	50	0.68
NW-68a	0.10	56	18	5.5	72	50	0.70
NW-67	0.21	111	19	5.5	78	50	0.75
NW-66	0.27	159	17	4.0	56	90	0.59
NW-65	0.29	153	19	5.0	77	50	0.74
NW-63	0.14	140	10	1.5	54	50	0.58
NW-62	0.20	111	18	5.0	70	50	0.69
NW-61	0.40	200	20	4.5	77	50	0.74
NW-60	0.43	239	18	3.5	59	90	0.61

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
NW-59	0.28	165	17	4.0	56	90	0.59
NW-58	0.22	122	18	5.0	74	50	0.72
NW-57	0.22	129	17	4.5	82	50	0.77
NW-56	0.22	129	17	4.5	80	50	0.76
NW-55	0.31	182	17	4.5	75	50	0.73
NW-54	0.15	115	13	1.5	52	50	0.56
NW-53	0.16	94	17	4.5	79	50	0.75
NW-52	0.26	153	17	4.5	78.5	50	0.75
NW-51	0.25	147	17	3.5	60	90	0.62
NW-50	0.19	106	18	3.5	82	50	0.77
NW-48	0.17	170	10	1.5	55	50	0.59
NW-47	0.32	200	16	3.0	55	90	0.59
NW-46	0.16	80	20	1.5	60	50	0.62
NW-32	0.26	325	8	1.5	67	50	0.67
NW-31	0.94	85	110	1.5	71	50	0.70
NW-30	0.39	229	17	4.5	60	90	0.62
NW-29	0.27	150	18	3.5	59	50	0.61
NW-28	0.24	109	22	3.5	74	50	0.72
NW-27	0.36	164	22	3.0	81	50	0.77
NW-26b	0.38	173	22	4.5	79	50	0.75
NW-26a	0.03	38	8	1.5	64	50	0.65
NW-25	0.27	150	18	3.5	76	50	0.73
NW-24	0.23	128	18	4.0	75	50	0.73
NW-23	0.25	147	17	4.5	62	90	0.63
NW-22	0.44	99	44	1.5	64	25	0.65
NW-21b	0.24	218	11	1.5	59	50	0.61
NW-21a	0.21	140	15	1.5	60	50	0.62
NW-125	0.24	64	38	1.5	96	25	0.87
NW-124	0.12	75	16	1.5	71	50	0.70
NW-123	0.62	48	128	1.5	92.8	50	0.85
NW-122	0.25	49	51	1.5	81.4	50	0.77
NW-121	0.14	88	16	1.5	71	50	0.70
NW-120	2.31	165	140	1.5	64	50	0.65
NW-119	0.20	125	16	1.5	71	50	0.70
NW-118	0.91	65	140	1.5	71	50	0.70
NW-117	0.15	94	16	1.5	71	50	0.70
NW-116	0.04	33	12	1.5	73	50	0.71
NW-115	0.23	192	12	1.5	60	50	0.62
NW-114	0.89	86	103	1.5	60	50	0.62
NW-113	0.18	150	12	1.5	62	50	0.63
NW-112	2.58	96	270	1.5	93	50	0.85
NW-110B	2.57	170	151	1.5	64	50	0.65

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
NW-107	0.31	27	115	1.5	64	90	0.65
NW-106	0.28	175	16	1.5	64	25	0.65
NW-105	0.18	28	65	1.5	64	90	0.65
NW-104B	3.03	117	260	1.0	21	50	0.35
NW-104A	0.31	194	16	1.5	64	25	0.65
NW-103	0.17	15	114	1.5	64	90	0.65
NW-102	0.35	219	16	1.5	64	25	0.65
NW-101	0.20	125	16	1.5	64	25	0.65
NW-100	0.07	47	15	1.5	74	50	0.72
M5	0.34	425	8	1.5	64	0	0.65
M4	0.27	386	7	1.5	64	0	0.65
M3	0.24	343	7	1.5	64	0	0.65
M2	0.20	250	8	1.5	64	0	0.65
M1	0.98	55	177	1.5	50	50	0.55
FUTURE	4.21	947	44	1.5	56	25	0.59
FUT-306	2.82	635	44	1.5	64	25	0.65
FUT1204/NW-9	3.08	693	44	1.5	64	25	0.65

ARM Subcatchments

Name	Area (ha)	Flow Length (m)	Slope (%)	Imperv. (%)	SCS Curve Number	Runoff Coeff.
NADIA	26.22	820	2.0	21.4	69	0.35
NW-49	2.46	200	2.0	21.4	69	0.35
NW-64	0.98	120	3.0	21.4	77	0.35
NW-73	0.48	80	1.5	13.0	64	0.29
NW-109	1.98	120	1.0	7.0	79	0.30
NW-110A	0.65	106	1.0	0.0	77	0.20
NW-111	0.79	140	1.5	14.0	77	0.30

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Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
U1-Trib	0.57	50	115	1.5	53	0	0.57
SWM-2	1.08	108	100	1	80	90	0.76
SWM-1	1.31	131	100	1	80	90	0.76
NW-99	0.13	108	12	1.5	64	50	0.65
NW-98	0.57	48	120	1.5	71	50	0.70
NW-97	0.21	175	12	1.5	59	50	0.61
NW-96	0.41	250	16	3.5	59	90	0.61
NW-95	0.36	171	21	3	73	50	0.71
NW-94	0.14	88	16	3.5	56	90	0.59
NW-93	0.39	195	20	3.5	72	50	0.70
NW-92	0.41	241	17	3	60	90	0.62
NW-91	0.22	129	17	3	59	50	0.61
NW-90	0.60	43	140	1.5	64	50	0.65
NW-89	0.24	114	21	3.5	60	50	0.62
NW-88	0.33	165	20	4	78	50	0.75
NW-87	0.36	212	17	4.5	54	90	0.58
NW-86	0.32	160	20	4	63	50	0.64
NW-85	0.19	106	18	4	50	50	0.55
NW-84	0.33	183	18	5	75	50	0.73
NW-83	0.33	183	18	5	75	50	0.73
NW-82	0.32	200	16	4.5	55	90	0.59
NW-81	0.27	150	18	4.5	76	50	0.73
NW-80	0.16	100	16	1.5	62	90	0.63
NW-79	0.51	300	17	5	35	50	0.45
NW-78	0.36	171	21	5	77	50	0.74
NW-77	0.36	212	17	4.5	54	90	0.58
NW-76	0.29	138	21	5	78	50	0.75
NW-75	0.12	150	8	1.5	44	50	0.51
NW-74	0.16	76	21	4.5	81	50	0.77
NW-72	0.21	117	18	5	62	50	0.63
NW-71	0.21	105	20	4.5	67	50	0.67
NW-70	0.30	188	16	5	54	90	0.58
NW-69	0.19	95	20	4	73	50	0.71
NW-68b	0.15	107	14	5	68	50	0.68
NW-68a	0.10	56	18	5.5	72	50	0.70
NW-67	0.21	111	19	5.5	78	50	0.75
NW-66	0.27	159	17	4	56	90	0.59
NW-65	0.29	153	19	5	77	50	0.74
NW-63	0.14	140	10	1.5	54	50	0.58
NW-62	0.20	111	18	5	70	50	0.69
NW-61	0.40	200	20	4.5	77	50	0.74
NW-60	0.43	239	18	3.5	59	90	0.61

Subcatchment Parameters
Scenario 2

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
NW-59	0.28	165	17	4	56	90	0.59
NW-58	0.22	122	18	5	74	50	0.72
NW-57	0.22	129	17	4.5	82	50	0.77
NW-56	0.22	129	17	4.5	80	50	0.76
NW-55	0.31	182	17	4.5	75	50	0.73
NW-54	0.15	115	13	1.5	52	50	0.56
NW-53	0.16	94	17	4.5	79	50	0.75
NW-52	0.26	153	17	4.5	78.5	50	0.75
NW-51	0.25	147	17	3.5	60	90	0.62
NW-50	0.19	106	18	3.5	82	50	0.77
NW-48	0.17	170	10	1.5	55	50	0.59
NW-47	0.32	200	16	3	55	90	0.59
NW-46	0.16	80	20	1.5	60	50	0.62
NW-32	0.26	325	8	1.5	67	50	0.67
NW-31	0.94	85	110	1.5	71	50	0.70
NW-30	0.39	229	17	4.5	60	90	0.62
NW-29	0.27	150	18	3.5	59	50	0.61
NW-28	0.24	109	22	3.5	74	50	0.72
NW-27	0.36	164	22	3	81	50	0.77
NW-26b	0.38	173	22	4.5	79	50	0.75
NW-26a	0.03	38	8	1.5	64	50	0.65
NW-25	0.27	150	18	3.5	76	50	0.73
NW-24	0.23	128	18	4	75	50	0.73
NW-23	0.25	147	17	4.5	62	90	0.63
NW-22	0.44	99	44	1.5	64	25	0.65
NW-21b	0.24	218	11	1.5	59	50	0.61
NW-21a	0.21	140	15	1.5	60	50	0.62
NW-125	0.24	64	38	1.5	96	25	0.87
NW-124	0.12	75	16	1.5	71	50	0.70
NW-123	0.62	48	128	1.5	92.8	50	0.85
NW-122	0.25	49	51	1.5	81.4	50	0.77
NW-121	0.14	88	16	1.5	71	50	0.70
NW-120	2.31	165	140	1.5	64	50	0.65
NW-119	0.20	125	16	1.5	71	50	0.70
NW-118	0.91	65	140	1.5	71	50	0.70
NW-117	0.15	94	16	1.5	71	50	0.70
NW-116	0.04	33	12	1.5	73	50	0.71
NW-115	0.23	192	12	1.5	60	50	0.62
NW-114	0.89	86	103	1.5	93	50	0.85
NW-113	0.18	150	12	1.5	62	50	0.63
NW-112	2.58	96	270	1.5	93	50	0.85
NW-111	0.79	56	140	1.5	70	50	0.69
NW-110B	2.58	147	175	1.5	64	50	0.65

Subcatchment Parameters
Scenario 2

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Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
NW-110A	0.64	60	106	1.5	0	50	0.20
NW-109	1.98	139	142	1.5	67	50	0.67
NW-108	1.02	109	94	1.5	64	50	0.65
NW-107	0.31	27	115	1.5	64	90	0.65
NW-106	0.28	175	16	1.5	64	25	0.65
NW-105	0.18	28	65	1.5	64	90	0.65
NW-104B_2	0.65	58	112	1.5	64	50	0.65
NW-104B_1	1.33	67	200	1.5	64	50	0.65
NW-104A	0.31	194	16	1.5	64	25	0.65
NW-103	0.17	15	114	1.5	64	90	0.65
NW-102	0.35	219	16	1.5	64	25	0.65
NW-101	0.20	125	16	1.5	64	25	0.65
NW-100	0.07	47	15	1.5	74	50	0.72
M5	0.34	425	8	1.5	64	0	0.65
M4	0.27	386	7	1.5	64	0	0.65
M3	0.24	343	7	1.5	64	0	0.65
M2	0.20	250	8	1.5	64	0	0.65
M1	0.98	55	177	1.5	50	50	0.55
FUTURE	4.21	947	44	1.5	56	25	0.59
FUT-306	2.82	635	44	1.5	64	25	0.65
FUT1204/NW-9	3.08	693	44	1.5	64	25	0.65

ARM Subcatchments

Name	Area (ha)	Flow Length (m)	Slope (%)	Imperv (%)	SCS Curve Number	Runoff Coeff.
NADIA	26.22	820	2	21.4	69	0.35
NW-49	2.46	200	2	21.4	69	0.35
NW-64	0.98	120	3	21.4	77	0.35
NW-73	0.48	80	2	13	64	0.29

Scenario 2 - Equivalent Orifice Sizing & Required Storages

Name	Inlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	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] (m^3)
Orifices (Future Development Areas)										
O-SU110B	SU110B	NW-110B	2.58	0.35	0.485	466	465	892	516	376
O-SU118	SU118	NW-118	0.91	0.35	0.285	185	184	352	218	134
O-SU120	SU120	NW-120	2.31	0.35	0.424	429	419	824	469	355
O-SU122	SU122	NW-122	0.25	0.35	0.159	62	61	116	69	47
O-SU123	SU123	NW-123	0.86	0.35	0.300	160	159	293	230	63
O-SU125	SU125	NW-125	0.25	0.35	0.159	68	63	118	69	49
O-SU2	SU2	NW-114	0.89	0.35	0.318	236	235	426	267	159
O-SU3	SU3	NW-112	2.58	0.35	0.600	567	566	1092	722	370
O-SU31	SU31	NW-31	0.94	0.35	0.300	196	195	375	241	134
O-SU4	SU4	NW-104B_1	1.33	0.35	0.300	108	108	387	238	149
O-SU5	SU5	NW-109	1.98	0.35	0.450	382	381	731	508	223
O-SU90	SU90	NW-90	0.60	0.35	0.300	111	110	214	132	82
O-SU98	SU98	NW-98	0.57	0.35	0.224	118	117	225	167	58
O-SU9	SU9	NW-111	0.79	0.35	0.250	159	158	302	230	72
O-CB16/CB15	CB16/CB15	FUT1204/NW-9	3.08	0.35	0.485	627	549	1271	588	683
O-MH429-MH306	CB86/CB87	FUT306	2.82	0.35	0.485	574	544	1163	600	563
O-CB109/CB110	CB109/CB110	FUTURE	4.21	0.35	0.600	762	761	1607	888	719

[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] (m^3)
O-SU-104B	SU-104B	NW-104B	3.03	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.

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MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr12hr (m)	HGL Elevation 100yr12hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.17	89.68	90.42	1.27	1.25
MH1004	87.62	87.17	90.25	87.53	87.58	87.92	88.61	1.08	1.03
MH1100	85.76	85.08	88.49	85.96	86.15	86.26	86.72	0.76	0.57
MH1102	85.96	85.66	88.50	86.04	86.22	86.34	86.92	0.88	0.70
MH1204	86.47	85.57	88.79	86.42	86.72	86.77			
MH1206	85.73	84.83	88.19	85.75	85.95	86.05	86.41	0.66	0.46
MH1208	85.48	84.58	88.08	85.41	85.60	85.78	86.18	0.77	0.58
MH1210	84.98	84.08	87.60	85.22	85.38	85.52	86.18	0.96	0.80
MH1212	84.86	83.96	87.37	85.07	85.23	85.37			
MH1214	83.66	82.01	86.96	84.38	84.67	84.68			
MH1216	83.56	81.91	85.15	84.38	84.65	84.68			
MH1218	83.46	81.81	85.30	84.38	84.64	84.68			
MH1220	81.14	79.94	84.43	81.87	82.21	82.17			
MH1222	80.86	79.36	82.81	81.87	82.15	82.17			
MH1224	89.59	79.59	82.10	81.87	82.15	89.89			
MH1300	83.77	82.27	87.33	84.71	84.99	85.01	87.59	2.88	2.60
MH1302	83.87	82.37	87.53	84.93	85.18	85.23	86.12	1.19	0.94
MH1304	85.13	83.63	87.76	85.04	85.28	85.43	86.12	1.08	0.84
MH1306	85.18	83.68	87.68	85.14	85.38	85.48	86.22	1.08	0.84
MH1308	85.22	83.72	87.85	85.23	85.46	85.53	86.31	1.08	0.85
MH1310	85.29	83.79	88.05	85.30	85.52	85.60	86.31	1.01	0.79
MH1312	85.87	85.19	88.19	85.62	85.65	86.17	86.58	0.96	0.93
MH1314	86.05	85.52	88.15	85.87	85.87	86.35	86.66	0.79	0.79
MH1400	83.45	82.62	88.47	84.88	85.16	85.18			
MH1402	83.12	82.29	87.81	84.75	85.02	85.05			
MH1404	82.89	81.99	87.38	84.55	84.78	84.85			
MH1406	82.46	81.56	86.97	84.20	84.43	84.50			
MH1408	81.94	81.04	85.04	83.11	83.35	83.41			
MH1410	81.76	80.78	85.04	82.49	82.72	82.79			

MH1412	81.43	80.23	84.59	81.97	82.34	82.27			
MH1500	86.15	85.70	88.87	88.02	88.63	88.32			
MH1502	83.25	82.57	85.28	84.59	84.72	84.89			
MH1600	87.93	87.68	90.52	87.81	87.81	88.23			
MH1602	85.20	84.90	88.74	85.22	85.60	85.52			
MH1604	83.84	83.16	87.36	85.07	85.36	85.37			
MH1606	84.15	83.47	86.04	85.13	85.42	85.43			
MH2000	85.17	84.87	88.64	84.87	84.87	85.47			
MH2002	83.86	83.41	88.21	83.51	83.51	84.16			
MH306	86.85	86.10	89.17	87.05	87.38	87.35			
MH308	86.31	85.93	88.97	86.41	86.64	86.71	86.90	0.49	0.26
MH310	85.95	85.50	88.26	86.09	86.28	86.39	86.42	0.33	0.14
MH312	85.78	85.25	88.28	85.92	86.11	86.22	86.39	0.47	0.28
MH314	85.58	85.05	88.00	85.75	85.94	86.05	86.22	0.47	0.28
MH316	85.51	84.98	87.97	85.69	85.87	85.99	86.22	0.53	0.35
MH349	80.28	79.30	83.97	81.87	82.15	82.17			
MH351	80.61	79.63	83.04	81.87	82.15	82.17			
MH353	82.60	81.23	85.00	82.19	82.20	82.90			
mh371	0.00	79.27	83.30	81.87	82.15	82.17			
MH386	80.16	78.73	82.30	79.82	79.83	80.46			
MH397	86.99	86.24	89.51	87.69	88.00	87.99			
MH402	87.18	86.43	90.29	87.90	88.22	88.20			
MH600	88.05	87.00	90.11	87.31	87.31	88.35	88.37	1.06	1.06
MH600B	88.26	87.88	90.21	88.12	88.12	88.56	88.41	0.29	0.29
MH602	87.23	86.70	89.74	87.24	87.52	87.54	88.12	0.88	0.60
MH604	87.11	86.51	89.75	87.20	87.49	87.50	88.12	0.92	0.63
MH606	86.38	85.40	89.22	87.01	87.30	87.31	87.70	0.69	0.40
MH608	86.22	85.24	88.64	86.68	86.94	86.98	87.07	0.39	0.13
MH610	86.17	85.19	88.61	86.61	86.87	86.91	87.07	0.46	0.20
MH612	86.06	85.08	88.47	86.37	86.61	86.67	86.87	0.50	0.26
MH614	86.00	85.02	88.53	86.28	86.51	86.58	86.87	0.59	0.36
MH616	85.90	84.70	88.20	86.11	86.31	86.41	86.87	0.76	0.56
MH618	85.79	84.44	88.15	85.94	86.14	86.24	86.70	0.76	0.56
MH620	85.54	84.19	88.16	85.87	86.07	86.17	86.47	0.60	0.40
MH702	86.50	85.97	89.20	86.61	86.79	86.91	87.62	1.01	0.83
MH704	86.20	85.67	88.64	86.47	86.65	86.77	86.90	0.43	0.25

MH800	89.42	89.12	91.66	89.30	89.30	89.72	90.26	0.96	0.96
MH802	89.23	88.93	91.51	89.15	89.16	89.53	90.26	1.11	1.10
MH804	88.13	87.75	90.64	87.99	87.99	88.43	88.98	0.99	0.99
MH806	86.89	86.36	89.52	86.62	86.62	87.19	88.08	1.46	1.46
MH808	85.85	85.32	88.16	86.06	86.20	86.36	86.88	0.82	0.68
MH900	90.33	89.35	92.58	89.52	89.52	90.63	90.76	1.24	1.24
MH902	88.32	87.87	91.00	88.12	88.13	88.62	89.35	1.23	1.22
MH904	86.72	86.27	89.58	86.72	87.12	87.02	88.00	1.28	0.88
MH906	85.47	83.97	88.26	85.64	85.83	85.94	86.42	0.78	0.59
MH908	85.00	84.62	87.39	84.74	84.86	85.30			
MH910	83.57	82.97	85.99	83.20	83.26	83.87			
MH912	82.65	82.05	85.13	82.43	82.69	82.95			
MH914	80.65	79.67	83.85	81.87	82.15	82.17			
MH918	80.75	79.92	82.83	81.87	82.15	82.17			
MH920	80.45	79.47	82.60	81.87	82.15	82.17			
MH937	82.83	81.78	85.10	84.38	84.64	84.68			

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MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr3hr (m)	HGL Elevation 100yr3hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.16	89.68	90.42	1.27	1.26
MH1004	87.62	87.17	90.25	87.52	87.57	87.92	88.61	1.09	1.04
MH1100	85.76	85.08	88.49	85.93	86.10	86.23	86.72	0.79	0.62
MH1102	85.96	85.66	88.50	86.01	86.18	86.31	86.92	0.91	0.74
MH1204	86.47	85.57	88.79	86.39	86.67	86.77			
MH1206	85.73	84.83	88.19	85.74	85.88	86.04	86.41	0.67	0.53
MH1208	85.48	84.58	88.08	85.39	85.52	85.78	86.18	0.79	0.66
MH1210	84.98	84.08	87.60	85.20	85.29	85.50	86.18	0.98	0.89
MH1212	84.86	83.96	87.37	85.04	85.14	85.34			
MH1214	83.66	82.01	86.96	84.14	84.55	84.44			
MH1216	83.56	81.91	85.15	84.14	84.55	84.44			
MH1218	83.46	81.81	85.30	84.14	84.55	84.44			
MH1220	81.14	79.94	84.43	81.64	82.05	81.94			
MH1222	80.86	79.36	82.81	81.64	82.05	81.94			
MH1224	89.59	79.59	82.10	81.64	82.05	89.89			
MH1300	83.77	82.27	87.33	84.68	84.79	84.98	87.59	2.91	2.80
MH1302	83.87	82.37	87.53	84.91	85.01	85.21	86.12	1.21	1.11
MH1304	85.13	83.63	87.76	85.02	85.12	85.43	86.12	1.10	1.00
MH1306	85.18	83.68	87.68	85.12	85.23	85.48	86.22	1.10	0.99
MH1308	85.22	83.72	87.85	85.20	85.32	85.52	86.31	1.11	0.99
MH1310	85.29	83.79	88.05	85.27	85.39	85.59	86.31	1.04	0.92
MH1312	85.87	85.19	88.19	85.62	85.63	86.17	86.58	0.96	0.95
MH1314	86.05	85.52	88.15	85.87	85.87	86.35	86.66	0.79	0.79
MH1400	83.45	82.62	88.47	84.82	85.07	85.12			
MH1402	83.12	82.29	87.81	84.70	84.93	85.00			
MH1404	82.89	81.99	87.38	84.52	84.71	84.82			
MH1406	82.46	81.56	86.97	84.16	84.35	84.46			
MH1408	81.94	81.04	85.04	83.05	83.25	83.35			
MH1410	81.76	80.78	85.04	82.38	82.60	82.68			

MH1412	81.43	80.23	84.59	81.80	82.14	82.10			
MH1500	86.15	85.70	88.87	87.99	88.32	88.29			
MH1502	83.25	82.57	85.28	84.53	84.67	84.83			
MH1600	87.93	87.68	90.52	87.81	87.81	88.23			
MH1602	85.20	84.90	88.74	85.13	85.51	85.50			
MH1604	83.84	83.16	87.36	85.01	85.27	85.31			
MH1606	84.15	83.47	86.04	85.07	85.33	85.37			
MH2000	85.17	84.87	88.64	84.87	84.87	85.47			
MH2002	83.86	83.41	88.21	83.51	83.51	84.16			
MH306	86.85	86.10	89.17	87.03	87.34	87.33			
MH308	86.31	85.93	88.97	86.37	86.60	86.67	86.90	0.53	0.30
MH310	85.95	85.50	88.26	86.06	86.23	86.36	86.42	0.36	0.19
MH312	85.78	85.25	88.28	85.89	86.03	86.19	86.39	0.50	0.36
MH314	85.58	85.05	88.00	85.72	85.85	86.02	86.22	0.50	0.37
MH316	85.51	84.98	87.97	85.66	85.79	85.96	86.22	0.56	0.43
MH349	80.28	79.30	83.97	81.64	82.05	81.94			
MH351	80.61	79.63	83.04	81.64	82.05	81.94			
MH353	82.60	81.23	85.00	82.18	82.20	82.90			
mh371	0.00	79.27	83.30	81.64	82.05	81.94			
MH386	80.16	78.73	82.30	79.80	79.82	80.46			
MH397	86.99	86.24	89.51	87.63	87.90	87.93			
MH402	87.18	86.43	90.29	87.84	88.12	88.14			
MH600	88.05	87.00	90.11	87.31	87.31	88.35	88.37	1.06	1.06
MH600B	88.26	87.88	90.21	88.12	88.12	88.56	88.41	0.29	0.29
MH602	87.23	86.70	89.74	87.15	87.42	87.53	88.12	0.97	0.70
MH604	87.11	86.51	89.75	87.12	87.38	87.42	88.12	1.00	0.74
MH606	86.38	85.40	89.22	86.96	87.19	87.26	87.70	0.74	0.51
MH608	86.22	85.24	88.64	86.64	86.84	86.94	87.07	0.43	0.23
MH610	86.17	85.19	88.61	86.58	86.76	86.88	87.07	0.49	0.31
MH612	86.06	85.08	88.47	86.34	86.51	86.64	86.87	0.53	0.36
MH614	86.00	85.02	88.53	86.25	86.42	86.55	86.87	0.62	0.45
MH616	85.90	84.70	88.20	86.08	86.23	86.38	86.87	0.79	0.64
MH618	85.79	84.44	88.15	85.91	86.06	86.21	86.70	0.79	0.64
MH620	85.54	84.19	88.16	85.84	85.99	86.14	86.47	0.63	0.48
MH702	86.50	85.97	89.20	86.57	86.73	86.87	87.62	1.05	0.89
MH704	86.20	85.67	88.64	86.43	86.60	86.73	86.90	0.47	0.30

MH800	89.42	89.12	91.66	89.30	89.30	89.72	90.26	0.96	0.96
MH802	89.23	88.93	91.51	89.15	89.16	89.53	90.26	1.11	1.10
MH804	88.13	87.75	90.64	87.99	87.99	88.43	88.98	0.99	0.99
MH806	86.89	86.36	89.52	86.61	86.62	87.19	88.08	1.47	1.46
MH808	85.85	85.32	88.16	86.04	86.17	86.34	86.88	0.84	0.71
MH900	90.33	89.35	92.58	89.52	89.52	90.63	90.76	1.24	1.24
MH902	88.32	87.87	91.00	88.12	88.13	88.62	89.35	1.23	1.22
MH904	86.72	86.27	89.58	86.68	87.09	87.02	88.00	1.32	0.91
MH906	85.47	83.97	88.26	85.61	85.75	85.91	86.42	0.81	0.67
MH908	85.00	84.62	87.39	84.74	84.85	85.30			
MH910	83.57	82.97	85.99	83.20	83.26	83.87			
MH912	82.65	82.05	85.13	82.43	82.66	82.95			
MH914	80.65	79.67	83.85	81.64	82.05	81.94			
MH918	80.75	79.92	82.83	81.64	82.05	81.94			
MH920	80.45	79.47	82.60	81.64	82.05	81.94			
MH937	82.83	81.78	85.10	84.14	84.55	84.44			

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Manhole ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr12hr (m)	HGL Elevation 100yr12hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.14	89.15	89.68	90.42	1.28	1.27
MH1004	87.62	87.17	90.25	87.52	87.56	87.92	88.61	1.09	1.05
MH1100	85.76	85.08	88.49	85.97	86.15	86.27	86.72	0.75	0.57
MH1102	85.96	85.66	88.50	86.04	86.23	86.34	86.92	0.88	0.69
MH1204	86.47	85.57	88.79	86.49	86.76	86.79			
MH1206	85.73	84.83	88.19	85.75	85.97	86.05	86.41	0.66	0.44
MH1208	85.48	84.58	88.08	85.42	85.62	85.78	86.18	0.76	0.56
MH1210	84.98	84.08	87.60	85.23	85.40	85.53	86.18	0.95	0.78
MH1212	84.86	83.96	87.37	85.11	85.28	85.41			
MH1214	83.66	82.01	86.96	84.38	84.67	84.68			
MH1216	83.56	81.91	85.15	84.38	84.65	84.68			
MH1218	83.46	81.81	84.96	84.38	84.64	84.68			
MH1220	81.14	79.94	84.43	81.44	81.90	81.74			
MH1222	80.86	79.36	82.81	81.44	81.90	81.74			
MH1224	89.59	79.59	82.10	81.44	81.90	89.89			
MH1300	83.77	82.27	87.33	84.72	85.02	85.02	87.59	2.87	2.57
MH1302	83.87	82.37	87.53	84.95	85.21	85.25	86.12	1.17	0.91
MH1304	85.13	83.63	87.76	85.06	85.31	85.43	86.12	1.06	0.81
MH1306	85.18	83.68	87.68	85.16	85.40	85.48	86.22	1.06	0.82
MH1308	85.22	83.72	87.85	85.24	85.48	85.54	86.31	1.07	0.83
MH1310	85.29	83.79	88.05	85.31	85.54	85.61	86.31	1.00	0.77
MH1312	85.87	85.19	88.19	85.62	85.65	86.17	86.58	0.96	0.93
MH1314	86.05	85.52	88.15	85.87	85.87	86.35	86.66	0.79	0.79
MH1400	86.09	85.41	88.43	85.61	85.61	86.39			
MH1600	87.82	87.57	89.93	87.70	87.70	88.12			
MH1602	86.23	85.93	88.77	86.27	86.28	86.57			
MH1604	85.03	84.35	87.31	84.60	84.60	85.33			
MH1606	84.30	82.98	85.85	83.74	83.74	84.60			
MH2000	85.17	84.87	88.64	84.87	84.87	85.47			

MH2002	83.86	83.41	88.21	83.51	83.51	84.16			
MH306	86.85	86.10	89.17	87.16	87.42	87.46			
MH308	86.31	85.93	88.97	86.34	86.58	86.64	86.90	0.56	0.32
MH310	85.95	85.50	88.26	86.02	86.22	86.32	86.42	0.40	0.20
MH312	85.78	85.25	88.28	85.87	86.07	86.17	86.39	0.52	0.32
MH314	85.58	85.05	88.00	85.72	85.92	86.02	86.22	0.50	0.30
MH316	85.51	84.98	87.97	85.66	85.86	85.96	86.22	0.56	0.36
MH349	80.28	79.30	83.97	81.44	81.90	81.74			
MH351	80.61	79.63	83.04	81.44	81.90	81.74			
MH353	82.60	81.23	85.00	82.19	82.20	82.90			
mh371	81.17	79.27	83.30	81.44	81.90	81.74			
MH386	80.16	78.73	82.30	79.81	79.82	80.46			
MH397	86.99	86.24	89.51	87.71	88.02	88.01			
MH402	87.18	86.43	90.29	87.92	88.24	88.22			
MH600	88.05	87.00	90.11	87.31	87.31	88.35	88.37	1.06	1.06
MH600B	88.26	87.88	90.21	88.12	88.12	88.56	88.41	0.29	0.29
MH602	87.23	86.70	89.74	87.26	87.54	87.56	88.12	0.86	0.58
MH604	87.11	86.51	89.75	87.23	87.50	87.53	88.12	0.89	0.62
MH606	86.38	85.40	89.22	87.04	87.31	87.34	87.70	0.66	0.39
MH608	86.22	85.24	88.64	86.70	86.96	87.00	87.07	0.37	0.11
MH610	86.17	85.19	88.61	86.63	86.89	86.93	87.07	0.44	0.18
MH612	86.06	85.08	88.47	86.39	86.63	86.69	86.87	0.48	0.24
MH614	86.00	85.02	88.53	86.30	86.53	86.60	86.87	0.57	0.34
MH616	85.90	84.70	88.20	86.13	86.33	86.43	86.87	0.74	0.54
MH618	85.79	84.44	88.15	85.96	86.16	86.26	86.70	0.74	0.54
MH620	85.54	84.19	88.16	85.89	86.09	86.19	86.47	0.58	0.38
MH702	86.50	85.97	89.20	86.62	86.81	86.92	87.62	1.00	0.81
MH704	86.20	85.67	88.64	86.49	86.67	86.79	86.90	0.41	0.23
MH800	89.42	89.12	91.66	89.30	89.30	89.72	90.26	0.96	0.96
MH802	89.23	88.93	91.51	89.15	89.16	89.53	90.26	1.11	1.10
MH804	88.13	87.75	90.64	87.99	87.99	88.43	88.98	0.99	0.99
MH806	86.89	86.36	89.52	86.62	86.62	87.19	88.08	1.46	1.46
MH808	85.85	85.32	88.16	86.07	86.23	86.37	86.88	0.81	0.65
MH900	90.33	89.35	92.58	89.52	89.53	90.63	90.76	1.24	1.23
MH902	88.32	87.87	91.00	88.19	88.29	88.62	89.35	1.16	1.06
MH904	86.72	86.27	89.58	87.14	87.50	87.44	88.00	0.86	0.50

MH906	85.47	83.97	88.26	85.66	85.85	85.96	86.42	0.76	0.57
MH908	85.00	84.62	87.39	84.74	84.86	85.30			
MH910	83.57	82.97	85.99	83.20	83.26	83.87			
MH912	82.65	82.05	85.13	82.43	82.69	82.95			
MH914	80.65	79.67	83.85	81.44	81.90	81.74			
MH918	80.75	79.92	82.83	81.44	81.90	81.74			
MH920	80.45	79.47	82.60	81.44	81.90	81.74			
MH937	82.83	81.78	86.48	84.38	84.64	84.68			
MHFUT1	82.85	81.87	84.90	82.11	82.11	83.15			
MHFUT2	81.15	79.80	83.40	81.44	81.90	81.74			

116132 Kanata North - Northwest Quadrant
HGL Elevations - Scenario 1 (3hr Chicago)

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Manhole ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr3hr (m)	HGL Elevation 100yr3hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.14	89.15	89.68	90.42	1.28	1.27
MH1004	87.62	87.17	90.25	87.52	87.55	87.92	88.61	1.09	1.06
MH1100	85.76	85.08	88.49	85.93	86.10	86.23	86.72	0.79	0.62
MH1102	85.96	85.66	88.50	86.01	86.18	86.31	86.92	0.91	0.74
MH1204	86.47	85.57	88.79	86.42	86.71	86.77			
MH1206	85.73	84.83	88.19	85.75	85.90	86.05	86.41	0.66	0.51
MH1208	85.48	84.58	88.08	85.40	85.54	85.78	86.18	0.78	0.64
MH1210	84.98	84.08	87.60	85.21	85.31	85.51	86.18	0.97	0.87
MH1212	84.86	83.96	87.37	85.09	85.19	85.39			
MH1214	83.66	82.01	86.96	84.13	84.55	84.43			
MH1216	83.56	81.91	85.15	84.14	84.55	84.44			
MH1218	83.46	81.81	84.96	84.14	84.55	84.44			
MH1220	81.14	79.94	84.43	81.16	81.58	81.46			
MH1222	80.86	79.36	82.81	81.16	81.58	81.46			
MH1224	89.59	79.59	82.10	81.16	81.58	89.89			
MH1300	83.77	82.27	87.33	84.69	84.82	84.99	87.59	2.90	2.77
MH1302	83.87	82.37	87.53	84.92	85.03	85.22	86.12	1.20	1.09
MH1304	85.13	83.63	87.76	85.03	85.13	85.43	86.12	1.09	0.99
MH1306	85.18	83.68	87.68	85.13	85.24	85.48	86.22	1.09	0.98
MH1308	85.22	83.72	87.85	85.21	85.33	85.52	86.31	1.10	0.98
MH1310	85.29	83.79	88.05	85.28	85.40	85.59	86.31	1.03	0.91
MH1312	85.87	85.19	88.19	85.62	85.63	86.17	86.58	0.96	0.95
MH1314	86.05	85.52	88.15	85.87	85.87	86.35	86.66	0.79	0.79
MH1400	86.09	85.41	88.43	85.61	85.61	86.39			
MH1600	87.82	87.57	89.93	87.70	87.70	88.12			
MH1602	86.23	85.93	88.77	86.26	86.28	86.56			
MH1604	85.03	84.35	87.31	84.60	84.60	85.33			
MH1606	84.30	82.98	85.85	83.74	83.74	84.60			
MH2000	85.17	84.87	88.64	84.87	84.87	85.47			
MH2002	83.86	83.41	88.21	83.51	83.51	84.16			

MH306	86.85	86.10	89.17	87.06	87.39	87.36			
MH308	86.31	85.93	88.97	86.27	86.54	86.61	86.90	0.63	0.36
MH310	85.95	85.50	88.26	86.00	86.16	86.30	86.42	0.42	0.26
MH312	85.78	85.25	88.28	85.85	85.99	86.15	86.39	0.54	0.40
MH314	85.58	85.05	88.00	85.70	85.83	86.00	86.22	0.52	0.39
MH316	85.51	84.98	87.97	85.65	85.77	85.95	86.22	0.57	0.45
MH349	80.28	79.30	83.97	81.16	81.58	81.46			
MH351	80.61	79.63	83.04	81.16	81.58	81.46			
MH353	82.60	81.23	85.00	82.18	82.20	82.90			
mh371	81.17	79.27	83.30	81.16	81.58	81.47			
MH386	80.16	78.73	82.30	79.79	79.80	80.46			
MH397	86.99	86.24	89.51	87.65	87.92	87.95			
MH402	87.18	86.43	90.29	87.85	88.14	88.15			
MH600	88.05	87.00	90.11	87.31	87.31	88.35	88.37	1.06	1.06
MH600B	88.26	87.88	90.21	88.12	88.12	88.56	88.41	0.29	0.29
MH602	87.23	86.70	89.74	87.16	87.44	87.53	88.12	0.96	0.68
MH604	87.11	86.51	89.75	87.14	87.40	87.44	88.12	0.98	0.72
MH606	86.38	85.40	89.22	86.98	87.21	87.28	87.70	0.72	0.49
MH608	86.22	85.24	88.64	86.66	86.86	86.96	87.07	0.41	0.21
MH610	86.17	85.19	88.61	86.59	86.79	86.89	87.07	0.48	0.28
MH612	86.06	85.08	88.47	86.36	86.53	86.66	86.87	0.51	0.34
MH614	86.00	85.02	88.53	86.27	86.43	86.57	86.87	0.60	0.44
MH616	85.90	84.70	88.20	86.09	86.25	86.39	86.87	0.78	0.62
MH618	85.79	84.44	88.15	85.93	86.08	86.23	86.70	0.77	0.62
MH620	85.54	84.19	88.16	85.86	86.00	86.16	86.47	0.61	0.47
MH702	86.50	85.97	89.20	86.59	86.75	86.89	87.62	1.03	0.87
MH704	86.20	85.67	88.64	86.45	86.62	86.75	86.90	0.45	0.28
MH800	89.42	89.12	91.66	89.30	89.30	89.72	90.26	0.96	0.96
MH802	89.23	88.93	91.51	89.15	89.16	89.53	90.26	1.11	1.10
MH804	88.13	87.75	90.64	87.99	87.99	88.43	88.98	0.99	0.99
MH806	86.89	86.36	89.52	86.61	86.62	87.19	88.08	1.47	1.46
MH808	85.85	85.32	88.16	86.05	86.19	86.35	86.88	0.83	0.69
MH900	90.33	89.35	92.58	89.52	89.52	90.63	90.76	1.24	1.24
MH902	88.32	87.87	91.00	88.18	88.26	88.62	89.35	1.17	1.09
MH904	86.72	86.27	89.58	87.09	87.47	87.39	88.00	0.91	0.53
MH906	85.47	83.97	88.26	85.63	85.77	85.93	86.42	0.79	0.65
MH908	85.00	84.62	87.39	84.74	84.85	85.30			
MH910	83.57	82.97	85.99	83.20	83.26	83.87			

MH912	82.65	82.05	85.13	82.43	82.66	82.95			
MH914	80.65	79.67	83.85	81.16	81.58	81.46			
MH918	80.75	79.92	82.83	81.16	81.61	81.46			
MH920	80.45	79.47	82.60	81.16	81.58	81.46			
MH937	82.83	81.78	86.48	84.14	84.55	84.44			
MHFUT1	82.85	81.87	84.90	82.11	82.11	83.15			
MHFUT2	81.15	79.80	83.40	81.16	81.58	81.46			

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)	0.023	0.018
Target Particle Size (mm)	150	150
Settling Velocity (m/s)	0.0003	0.0003
Min. Required Forebay Settling Length (m)	**25**	**22**
Dispersion Lengths		
Desired Velocity in Forebay (m/s)	0.5	0.5
Inlet Flow Rate (2-year - 3-hour Chicago Storm) (m^3/s)	3.64	3.01
Depth of Forebay (m)	1.50	1.50
Min. Required Forebay Settling Length (m)	**39**	**32**
Provided Lengths		
Min. Required Forebay Length[1] (m)	**39**	**32**
Provided Forebay Length (m)	**40**	**35**

[1] *Minimum dispersion length governs forebay length.*

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)	30.28	22.58	**52.86**
Imperviousness (%)	65%	69%	**67%**
Required Water Quality Treatment Volumes			
Treatment Volume(1) (m^3/ha)	202	206	**203.7**
Required Permenent Pool Volume (m^3)	4,905	3,748	**8,654**
Required Extended Detention Volume(2) (m^3)	1,211	903	**2,114**
Provided Water Quality Treatment Volumes			
Provided Permenent Pool Volume (m^3)	6,556	4,748	**11,304**
Provided Extended Detention Volume(3) (m^3)	1,499	936	**2,435**

(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)
Stage-Area-Storage Table (Upper Pond)

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3)	
			Total	Active
Bottom of Pond	**80.50**	**3,094**	**0**	**-**
	81.00	3,854	1,737	-
	81.50	4,649	3,863	-
Bottom of Wetland Shelf	81.75	5,258	5,101	-
Top of Wetland Shelf	81.80	5,610	5,373	-
Normal Water Level	**82.00**	**6,221**	**6,556**	**0**
Extended Detention(1)	**82.20**	**8,767**	**8,055**	**1,499**
Top of Forebay Berm	82.30	6,712	8,829	**2,273**
	82.35	6,760	9,166	**2,610**
	82.50	6,905	10,190	**3,634**
	83.00	7,397	11,847	**5,291**
2-Year(2)	**83.02**	**7,417**	**13,616**	**7,060**
5-Year(2)	**83.40**	**7,802**	**16,439**	**9,883**
	83.50	7,903	17,224	**10,668**
	84.00	8,423	21,306	**14,750**
100-Year(2)	**84.38**	**8,745**	**24,612**	**18,056**
Stree Test	84.63	8,957	26,683	**20,127**
Top of Pond	**85.00**	**9,551**	30,312	**23,756**

[1] Extended detention volume (40 m^3/ha).

[2] Based on PCSWMM model results for a 12-hour SCS storm distribution.

116132(Kanata North - Northwest Quadrant)
Stage-Area-Storage Table (Lower Pond)

Scenario 1

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3) Total	Volume (m^3) Active
Bottom of Pond	**78.00**	**1,972**	**0**	**-**
	78.50	2,566	1,135	-
	79.00	3,207	2,578	-
Bottom of Wetland Shelf	79.25	3,538	3,421	-
Top of Wetland Shelf	79.30	3,755	3,603	-
Normal Water Level	**79.50**	**4,159**	**4,395**	**0**
Extended Detention(1)	**79.72**	**4,351**	**5,331**	**936**
Top of Forebay Berm	79.80	4,421	5,682	**1,287**
	79.85	4,537	5,906	**1,511**
	80.00	4,651	6,595	**2,200**
2-Year(2)	**80.15**	**4,768**	**7,282**	**2,887**
	80.50	5,041	8,999	**4,604**
5-Year(2)	**80.52**	**5,057**	**9,104**	**4,709**
	81.00	5,444	11,624	**7,229**
	81.50	5,858	14,450	**10,055**
100-Year(2)(3)	**81.44**	**5,807**	**14,124**	**9,729**
Stress Test	81.90	6,199	16,868	**12,473**
	82.00	6,284	17,492	**13,097**
Top of Pond	**82.30**	**6,580**	19,430	**15,035**

1 Extended detention volume (40 m^3/ha).
2 Based on PCSWMM model results for a 12-hour SCS storm distribution.
3 Boundary condition is considered.

Scenario 2

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3) Total	Volume (m^3) Active
Bottom of Pond	**78.00**	**1,972**	**0**	**-**
	78.50	2,566	1,135	-
	79.00	3,207	2,578	-
Bottom of Wetland Shelf	79.25	3,538	3,421	-
Top of Wetland Shelf	79.30	3,755	3,603	-
Normal Water Level	**79.50**	**4,159**	**4,395**	**0**
Extended Detention(1)	**79.72**	**4,351**	**5,331**	**936**
Top of Forebay Berm	79.80	4,421	5,682	**1,287**
	79.85	4,537	5,906	**1,511**
	80.00	4,651	6,595	**2,200**
	80.50	5,041	9,018	**4,623**
2-Year(2)	**80.56**	**5,089**	**9,314**	**4,919**
5-Year(2)	**80.92**	**5,378**	**11,223**	**6,828**
	81.00	5,444	11,656	**7,261**
	81.50	5,858	14,481	**10,086**
100-Year(2)(3)	**81.87**	**5,971**	**16,685**	**12,290**
	82.00	6,284	17,482	**13,087**
Stress Test	82.09	6,373	18,050	**13,655**
Top of Pond	**82.30**	**6,580**	**19,408**	**15,013**

1 Extended detention volume (40 m^3/ha).
2 Based on PCSWMM model results for a 12-hour SCS storm distribution.
3 Boundary condition is considered.

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)	0.0234	0.0183
Target Particle Size (mm)	150	150
Settling Velocity (m/s)	0.0003	0.0003
Min. Required Forebay Settling Length (m)	**25**	**22**
Dispersion Lengths		
Desired Velocity in Forebay (m/s)	0.5	0.5
Inlet Flow Rate (2-year - 3-hour Chicago Storm) (m^3/s)	3.64	3.01
Depth of Forebay (m)	1.50	1.50
Min. Required Forebay Settling Length (m)	**39**	**32**
Provided Lengths		
Min. Required Forebay Length[1] (m)	**39**	**32**
Provided Forebay Length (m)	**40**	**35**

[1] *Minimum dispersion length governs forebay length.*

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)	30.28	22.58	**52.86**
Imperviousness (%)	65%	69%	**67%**
Required Water Quality Treatment Volumes			
Treatment Volume[(1)] (m^3/ha)	202	206	**203.7**
Required Permenent Pool Volume (m^3)	4,905	3,748	**8,654**
Required Extended Detention Volume[(2)] (m^3)	1,211	903	**2,114**
Provided Water Quality Treatment Volumes			
Provided Permenent Pool Volume (m^3)	6,556	4,395	**10,951**
Provided Extended Detention Volume[(3)] (m^3)	1,499	936	**2,435**

(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)
Stage-Area-Storage Table (Lower Pond)

Scenario 1

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3)	
			Total	Active
Bottom of Pond	**78.00**	**1,972**	**0**	**-**
	78.50	2,566	1,135	-
	79.00	3,207	2,578	-
Bottom of Wetland Shelf	79.25	3,538	3,421	-
Top of Wetland Shelf	79.30	3,755	3,603	-
Normal Water Level	**79.50**	**4,159**	**4,395**	**0**
Extended Detention(1)	**79.72**	**4,351**	**5,331**	**936**
Top of Forebay Berm	79.80	4,421	5,682	**1,287**
	79.85	4,537	5,906	**1,511**
	80.00	4,651	6,595	**2,200**
2-Year(2)	**80.15**	**4,768**	**7,282**	**2,887**
	80.50	5,041	8,999	**4,604**
5-Year(2)	**80.52**	**5,057**	**8,104**	**3,709**
	81.00	5,444	10,624	**6,229**
100-Year(2)(3)	**81.44**	**5,808**	**14,154**	**9,759**
	81.50	5,858	14,504	**10,109**
Stress Test	81.90	6,199	16,868	
	82.00	6,284	17,492	**13,097**
Top of Pond	**82.30**	**6,580**	19,430	**15,035**

[1] Extended detention volume (40 m^3/ha).
[2] Based on PCSWMM model results for a 12-hour SCS storm distribution.
[3] Boundary condition is considered.

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3)	
			Total	Active
Bottom of Pond	**78.00**	**1,972**	**0**	**-**
	78.50	2,566	1,135	-
	79.00	3,207	2,578	-
Bottom of Wetland Shelf	79.25	3,538	3,421	-
Top of Wetland Shelf	79.30	3,755	3,603	-
Normal Water Level	**79.50**	**4,159**	**4,395**	**0**
Extended Detention(1)	**79.72**	**4,351**	**5,331**	**936**
Top of Forebay Berm	79.80	4,421	5,682	**1,287**
	79.85	4,537	5,906	**1,511**
	80.00	4,651	6,595	**2,200**
	80.50	5,041	9,018	**4,623**
2-Year(2)	**80.56**	**5,089**	**9,314**	**4,919**
5-Year(2)	**80.92**	**5,378**	**11,223**	**6,828**
	81.00	5,444	11,656	**7,261**
	81.50	5,858	14,481	**10,086**
100-Year(2)(3)	**81.87**	**6,181**	**16,685**	**12,290**
	82.00	6,284	17,482	**13,087**
Stress Test(3)	82.09	6,373	18,050	**13,655**
Top of Pond	**82.30**	**6,580**	**19,430**	**15,035**

[1] Extended detention volume (40 m^3/ha).
[2] Based on PCSWMM model results for a 12-hour SCS storm distribution.
[3] Boundary condition is considered.

116132 (Kanata North - Northwest Quadrant)
Stage-Area-Storage Table (Upper Pond)

Stage	Elevation (m)	Contour Area (m^2)	Volume (m^3) Total	Volume (m^3) Active
Bottom of Pond	**80.50**	**3,094**	**0**	**-**
	81.00	3,854	1,737	-
	81.50	4,649	3,863	-
Bottom of Wetland Shelf	81.75	5,258	5,101	-
Top of Wetland Shelf	81.80	5,610	5,373	-
Normal Water Level	**82.00**	**6,221**	**6,556**	**0**
Extended Detention(1)	**82.20**	**8,767**	**8,055**	**1,499**
Top of Forebay Berm	82.30	6,712	8,829	**2,273**
	82.35	6,760	9,166	**2,610**
	82.50	6,905	10,190	**3,634**
	83.00	7,397	11,847	**5,291**
2-Year(2)	**83.02**	**7,417**	**13,616**	**7,060**
5-Year(2)	**83.40**	**7,802**	**16,439**	**9,883**
	83.50	7,903	17,224	**10,668**
	84.00	8,423	21,306	**14,750**
100-Year(2)	**84.38**	**8,745**	**24,612**	**18,056**
Stress Test	84.63	8,957	26,902	**20,346**
Top of Pond	**85.00**	**9,551**	30,312	**23,756**

[1] Extended detention volume (40 m^3/ha).

[2] Based on PCSWMM model results for a 12-hour SCS storm distribution.

Drew Blair

From: Marc St.Pierre
Sent: Wednesday, May 18, 2022 8:13 AM
To: Drew Blair
Subject: FW: Copperwood (CUD) LIDs

FYI

Marc St. Pierre, Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 247 | Cell: 613.229.9714 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Tuesday, February 8, 2022 1:53 PM
To: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Copperwood (CUD) LIDs

Hi Marc,

To follow up on our conversation below, it is the City's current opinion that LIDs within the Copperwood Estate subdivision will not be required to be implemented.

Thanks,

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

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

From: Marc St.Pierre <m.stpierre@novatech-eng.com>
Sent: January 28, 2022 10:31 AM
To: Candow, Julie <julie.candow@ottawa.ca>
Subject: RE: Copperwood (CUD) LIDs

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Julie,

Thank you for the quick turnaround, we had a meeting with the CUD clients and considering that there is uncertainty on the City's part on how to best implement, operate and maintain LID's within a residential subdivision and the fact that they will not be recognized as a storm water management solution, the clients are of the opinion that LID's should not be implemented within the Copperwood (CUD) development at this time.

Let know when you want to meet.

Thanks

Marc St. Pierre, Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 247 | Cell: 613.229.9714 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Friday, January 28, 2022 9:47 AM
To: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Copperwood (CUD) LIDs

Hi Marc,

Just an update.

The decision on whether LIDs will be required within the CU development will ultimately be a decision made by Management. Court Curry in the new Manager in West on an interim basis. I need to set a meeting with Court and Gabrielle (our senior engineer who also has the background on this file and Kanata North).

Gabrielle is currently tied up with the Kanata Lakes golf course hearing and is unavailable until late next week.

Can this discussion /decision be postponed till late next week or do you need a decision sooner than that?

Thanks for understanding,

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

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

From: Marc St.Pierre <m.stpierre@novatech-eng.com>
Sent: January 26, 2022 3:26 PM
To: Candow, Julie <julie.candow@ottawa.ca>
Subject: RE: Copperwood (CUD) LIDs

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re time if the City; s position is that LID's are not to be implemented.

Thanks.

Marc St. Pierre, Senior Project Manager | Land Development Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 247 | Cell: 613.229.9714 | Fax: 613.254.5867
The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Wednesday, January 26, 2022 3:18 PM
To: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: RE: Copperwood (CUD) LIDs

I just reached out to my fellow PM's. They sent me an email that was circulated to City staff on November 16th, 2021 which included the following:

Asset Management Branch has noted a increasing trend in development applications that recommend some form of Low Impact Development (LID) measure, such as the (modified) Etobicoke System. Please note that AMB's position with respect to these measures are as follows:

- *AMB will not approve major changes to approved MSS's that involve elimination or downsizing of end-of-pipe facilities in favour of LIDs*
- *LIDs may be required in some areas based on an approved subwatershed-scale master study for the purposes of runoff volume control intended to recharge aquifers / provide watercourse baseflow and/or to mitigate in-stream erosion impacts*
- *AMB will consider application of LID on a pilot basis in other areas subject to approval by City operations staff. However, downsizing/elimination of planned end-of-pipe facilities in these cases will not be permitted.*
- *Roles of LID and end-of-pipe facility proposals that fall outside of the above parameters will only be considered in context of an updated Subwatershed Plan or Environmental Management Plan, in accordance with New Official Plan policies.*
- *Given the lack of local guidelines, standards, and performance data, monitoring of LID installations is required in all cases. AMB will confirm what information is to be used to guide the design of any LID infrastructure at the time of pre-consultation.*
- *The above positions will be reviewed once City Sewer Design Guidelines are updated to include LID and/or new provincial guidelines are implemented.*

If you have certain items you wish to discuss at Monday's meeting please let me know so I can discuss with AMB in advance if need be.

APPENDIX C
Sanitary Collection

SANITARY SEWER DESIGN SHEET
1015 March Road

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT # : 121247
DESIGNED BY : BM
CHECKED BY : DDB
DATE PREPARED : 13-Jan-22
DATE REVISED : 5-May-22
DATE REVISED : 5-Aug-22
DATE REVISED : 15-Nov-22

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
Nov. 15 2022
PROVINCE OF ONTARIO

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	Multi-Unit Flat	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	1.05					42	0.088	1.05	0.088	1.05	3.6	1.03		0.00		0.00		0.00	0.00	1.05	1.05	0.35	1.38	82.0	250	254.00	DR 35	1.94	86.4	1.71	1.6%	
Street 10	911	913	A1	3.07						0.000	0.00	0.088	1.05	3.6	1.03		0.00	3.07	3.07		0.00	0.99	3.07	4.12	1.36	3.39	45.3	250	254.00	DR 35	1.94	86.4	1.71	3.9%	
Street 10	913	915	C2	0.50					48	0.101	0.50	0.189	1.55	3.5	2.16		0.00		3.07		0.00	0.99	0.50	4.62	1.52	4.68	47.4	250	254.00	DR 35	1.71	81.1	1.60	5.8%	
Street 10	915	917	C3	0.25						0.000	0.00	0.189	1.55	3.5	2.16	0.25	0.25		3.07		0.00	1.08	0.25	4.87	1.61	4.84	75.7	250	254.00	DR 35	1.98	87.3	1.72	5.5%	
Street 10	917	919	A2	2.36						0.000	0.00	0.189	1.55	3.5	2.16	2.36	2.61		3.07		0.00	1.84	2.36	7.23	2.39	6.39	74.9	250	254.00	DR 35	2.15	91.0	1.80	7.0%	
Street 10	919	548		0.00						0.000	0.00	0.189	1.55	3.5	2.16		2.61		3.07		0.00	1.84	0.00	7.23	2.39	6.39	18.1	250	254.00	DR 35	1.20	68.0	1.34	9.4%	
Total Flows															**2.16**							**1.84**			**2.39**	**6.39**									

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 1035 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, 2.1 persons per multi-unit flats)
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- Phase 1

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-21
DATE REVISED : 4-May-22
DATE REVISED : 14-Nov-22

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	Multi-Unit Flats	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}	Actual Velocity
FUTURE BLOCK / EXISTING LANDS ACCOUNTED FOR INCLUDING BLOCK 315	FUT / EX	1407		0.00						0.000		0.280	5.69	3.5	3.15		0.00		4.34		0.00	1.41	0.00	10.03	3.31	7.86	69.2	200	203.20	DR 35	0.45	23.0	0.71	34.3%		
Easement - Park&Ride	1407	1409	B77	3.33			25	25		0.113	3.33	0.392	9.02	3.4	4.35		0.00		4.34		0.00	1.41	3.33	13.36	4.41	10.16	103.3	200	203.20	DR 35	0.44	22.7	0.70	44.8%		
Easement - Park&Ride	1409	1215		0.00						0.000		0.392	9.02	3.4	4.35		0.00		4.34		0.00	1.41	0.00	13.36	4.41	10.16	97.2	200	203.20	DR 35	0.44	22.7	0.70	44.8%		
Street 1	1215	1217	B68	0.13						0.000	0.13	2.452	38.60	3.0	23.94		0.00		4.34		2.22	1.50	0.13	45.16	14.90	40.34	69.9	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15
Street 1	1217	1219	B69	0.14						0.000	0.14	2.452	38.74	3.0	23.94		0.00		4.34		2.22	1.50	0.14	45.30	14.95	40.39	27.1	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15
Street 1	1219	1221								0.000	0.00	2.452	38.74	3.0	23.94		0.00		4.34		2.22	1.50	0.00	45.30	14.95	40.39	28.2	375	381.00	DR 35	0.76	159.5	1.40	25.3%	0.34	1.16
																																				0.00
Street 1	1221	1223	B78	1.10						0.000	0.27	2.452	39.01	3.0	23.94		0.00	0.83	5.17		2.22	1.77	1.10	46.40	15.31	41.02	99.1	375	381.00	DR 35	0.75	158.4	1.39	25.9%	0.34	1.15
Total Flows - Outlet 1															**23.94**							**1.77**		**46.40**	**15.31**	**41.02**										
Outlet 2 - Street 10 and March Road																																				
Street 10	909	911	A1	1.05					42	0.088	1.05	0.088	1.05	3.6	1.03		0.00		0.00		0.00	0.00	1.05	1.05	0.35	1.38	82.0	250	254.00	DR 35	1.94	86.4	1.71	1.6%		
Street 10	911	913	A2	3.57					48	0.101	0.50	0.189	1.55	3.5	2.16		0.00	3.07	3.07		0.00	0.99	3.57	4.62	1.52	4.68	45.3	250	254.00	DR 35	1.94	86.4	1.71	5.4%		
Street 10	913	915	A3	0.00						0.000	0.00	0.189	1.55	3.5	2.16		0.00		3.07		0.00	0.99	0.00	4.62	1.52	4.68	47.4	250	254.00	DR 35	1.71	81.1	1.60	5.8%		
Street 10	915	917	A4	0.25						0.000	0.00	0.189	1.55	3.5	2.16	0.25	0.25		3.07		0.00	1.08	0.25	4.87	1.61	4.84	75.7	250	254.00	DR 35	1.98	87.3	1.72	5.5%		
Street 10	917	919	A5	2.36						0.000	0.00	0.189	1.55	3.5	2.16	2.36	2.61		3.07		0.00	1.84	2.36	7.23	2.39	6.39	74.9	250	254.00	DR 35	2.15	91.0	1.80	7.0%		
Total Flows - Outlet 2															**2.16**							**1.84**			**2.39**	**6.39**										

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, 2.1 persons per multi-unit apartment, 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/Institutional/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
7.	REVISED AS PER CITY OF OTTAWA COMMENTS	-	SAZ
6.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ
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

1:1500 (0 15 30 45 60)

DESIGN TJM
CHECKED SAZ
DRAWN MTM
CHECKED SAZ
APPROVED MSP

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
S.A.N. ZORGEL
100191487
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 # 7
DRAWING No. 116132-SAN

D07-16-18-0023

PLANB1.DWG - 1000mmx707mm

#17801

LOCATION				RESIDENTIAL AREA AND POPULATION											ICI										INFILTRATION				FLOW	PIPE							
									Cumulative						IND		COMM		INST		Par		COMM / INST														
Drainage Area	From	To	Total Area	Dwellings		Density (Net ha)		Pop.	Residential			k	Peak	Peak	Area	Accu.	Area	Accu.	Area	Accu.	Area	Accu.	Peak	Peak	Total	Accu. Area		Infiltration	Total	Length	Dia	Dia	Slope	Velocity	Capacity	Ratio	Ratio
	Node	Node		SFH	SD/TH	Low[3]	High[4]		Area	Pop.		Factor	Factor	Flow		Area		Area		Area		Area	Factor	Flow	Area	New	Exist	Flow	Flow		Act	Nom		(Full)	(Full)	Q/Qfull	d/D
			(ha)	3.4	2.7	101	161		(ha)	New	Exist	New		(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)		(l/s)	(ha)	(ha)		(l/s)	(l/s)	(m)	(mm)	(mm)	(%)	(m/s)	(l/s)	(%)	
				pers/ea	pers/ea	pers/ha	per/ha																														
Mar Trun Sewer																																					
CUD	CUD	MH525	46.41					2445		**2445**		0.80	3.01	23.9					**5.17**	5.17	2.22	2.22	1.0	1.8	46.41	46.41		15.3	41.0								
Cavanagh (See note #11)	Cavanagh	MH525	17.46					863.0		**3308**		0.80	2.92	31.4			**3.54**	3.54	**2.92**	8.09		2.22	1.0	3.9	17.46	63.87		21.1	56.3	0.0	610	600	0.00	0.00	0.0		
MH524	MH525	MH524	0.44					0.0		**3308**		0.80	2.92	31.4				3.54		8.09		2.22	1.0	3.9	0.44	64.31		21.2	56.4	97.4	610	600	0.13	0.79	231.2	24%	0.34
CUD	MH524	MH523	7.52					167.0		**3475**		0.80	2.91	32.8			**1.02**	4.56	**3.77**	11.86		2.22	1.0	5.4	7.52	71.83		23.7	61.9	119.4	610	600	0.13	0.79	231.2	27%	0.34
MH522	MH523	MH522	0.66					0.0		**3475**		0.80	2.91	32.8				4.56		11.86		2.22	1.0	5.4	0.66	72.49		23.9	62.1	152.8	610	600	0.13	0.79	231.2	27%	0.34
Brigil / Minto Commercial (See note #12, 13)	MH522	MH521	18.18					1439.0		**4914**		0.80	2.80	44.6			**9.35**	13.91		11.86		2.22	1.0	8.4	18.18	90.67		29.9	83.0	152.0	610	600	0.12	0.76	222.1	37%	0.41
MH520	MH521	MH520	0.66					0.0		**4914**		0.80	2.80	44.6				13.91		11.86		2.22	1.0	8.4	0.66	91.33		30.1	83.2	147.6	610	600	0.13	0.79	231.2	36%	0.41
MH519	MH520	MH519	0.38					0.0		**4914**		0.80	2.80	44.6				13.91		11.86		2.22	1.0	8.4	0.38	91.71		30.3	83.3	147.0	610	600	0.14	0.82	239.9	35%	0.41
Brigil (See note #12)	MH519	MH518	11.08					2795.0		**7709**		0.80	2.65	66.3			**0.61**	14.52	**2.06**	13.92		2.22	1.0	9.3	11.08	102.79		33.9	109.5	80.6	610	600	0.17	0.90	264.4	41%	0.44
MH517	MH518	MH517	0.28					0.0		**7709**		0.80	2.65	66.3				14.52		13.92		2.22	1.0	9.3	0.28	103.07		34.0	109.6	137.2	610	600	0.17	0.90	264.4	41%	0.44
Brigil External Lands (See note #12)	MH517	MH515	2.09					214.0		**7923**		0.80	2.64	67.9				14.52		13.92		2.22	1.0	9.3	2.09	105.16		34.7	111.9	62.9	610	600	0.17	0.90	264.4	42%	0.44
MH514	MH515	MH514	0.61					0.0		**7923**		0.80	2.64	67.9				14.52		13.92		2.22	1.0	9.3	0.61	105.77		34.9	112.1	151.8	610	600	0.17	0.90	264.4	42%	0.44
MH513	MH514	MH513	0.53					0.0		**7923**		0.80	2.64	67.9				14.52		13.92		2.22	1.0	9.3	0.53	106.30		35.1	112.3	150.0	610	600	0.50	1.55	453.5	25%	0.34
MH512	MH513	MH512	0.53					0.0		**7923**		0.80	2.64	67.9				14.52		13.92		2.22	1.0	9.3	0.53	106.83		35.3	112.4	149.3	610	600	0.47	1.50	439.6	26%	0.34
MH511	MH512	MH511	0.32					0.0		**7923**		0.80	2.64	67.9				14.52		13.92		2.22	1.0	9.3	0.32	107.15		35.4	112.5	91.4	525	525	0.10	0.63	135.9	83%	0.67
MH510	MH511	MH510	2.18				1.76	283.4		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	2.18	109.33		36.1	115.4	119.4	610	600	0.10	0.69	202.8	57%	0.53
MH509	MH510	MH509	0.37					0.0		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	0.37	109.69		36.2	115.5	100.1	610	600	0.10	0.69	202.8	57%	0.53
MH508	MH509	MH508	0.45					0.0		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	0.45	110.15		36.3	115.6	117.8	610	600	0.10	0.69	202.8	57%	0.53
MH507	MH508	MH507	0.52					0.0		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	0.52	110.67		36.5	115.8	122.3	610	600	0.10	0.69	202.8	57%	0.53
MH506	MH507	MH506	0.49					0.0		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	0.49	111.16		36.7	116.0	84.3	610	600	0.11	0.73	212.7	55%	0.53
MH505	MH506	MH505	0.35					0.0		**8206**		0.80	2.63	70.0				14.52		13.92		2.22	1.0	9.3	0.35	111.51		36.8	116.1	124.9	610	600	0.10	0.69	202.8	57%	0.53
MH504 (Includes MG Sub & 750 March. See Notes #9, #10)	MH505	MH504	54.04	39	132			3677.0		**8206**	3677	0.74	2.39	83.8				14.52		13.92		2.22	1.0	9.3	54.04	111.51	54.04	55.7	148.8	16.7	610	600	0.12	0.76	222.1	67%	0.58
MH502	MH504	MH502	0.38					0.0		**8206**	3677	0.74	2.39	83.8				14.52		13.92		2.22	1.0	9.3	0.38	111.89	54.04	55.8	149.0	142.7	610	600	0.10	0.69	202.8	73%	0.61
MH501 (Includes Sandhill Road)	MH502	MH501	12.63	9	60		6.19	1189.2		**8206**	4866	0.73	2.33	88.4				14.52	**2.11**	16.03		2.22	1.0	10.0	12.63	112.03	66.53	60.3	158.6	55.2	610	600	0.10	0.69	202.8	78%	0.64
MH500	MH501	EX 107	0.02					0.0		**8206**	4866	0.73	2.33	88.4				14.52		16.03		2.22	1.0	10.0	0.02	112.05	66.53	60.3	158.6	9.5	610	600	0.21	1.01	293.9	54%	0.50
McKinley Drive/Shirley's Brook Drive	McKinley	EX 107	8.27		117			315.9			316	0.60	2.84	2.1			**2.73**	2.73		0.00			1.0	0.9	8.27	0.00	8.27	2.9	5.9								
BRPS (See notes #6, #7, #8)	BRPS	EX 107	187.37					10263.0		**4169**	6094	0.68	2.32	64.2	**35.08**	35.08	**6.76**	6.76	**5.47**	5.47	**4.96**	4.96	1.5	27.5	187.37	59.00	128.37	64.4	156.1								
Total Flows into East Mar Trun	**MH500**	**EMT**	**374.22**					**23651**		**12375**	**11276**	0.70	2.11	**139.9**		**35.08**		**24.01**		**21.50**				**38.35**	**374.2**	**171.05**	**203.17**	**127.6**	**305.8**		**762**	**750**	**0.10**	**0.80**	**367.1**	**83**	

DESIGN PARAMETERS

Average Daily Flow (Future)=	280	L/cap/day
Average Daily Flow (Existing)=	200	L/cap/day
Comm/Inst Flow (Future)=	28000	L/ha/day
Comm/Inst Flow (Existing)=	17000	L/ha/day
Industrial (Future)=	35000	L/ha/day
Industrial (Existing)=	10000	L/ha/day
Max Res Peak Factor	4	
ICI Peak Factor=	1.5	1 IF <20% As per Table 1- Techical Bulletin ISTD 2018-01

Industrial Peak Factor= per MOE graph		
Extraneous Flow (Future)=	0.33	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	
Harmon Correction Factor =	0.80	(Future)
Harmon Correction Factor =	0.60	(Existing) Hybrid Harmon Correction factor used based on prop/ex population ratio

Designed: Robert Gifford
Steve Zorgel

Checked: Marc St. Pierre

Dwg. Reference: 116132-SAN (Copperwood Estate
112117-SAN1 (KNMSS)
112117-SAN2 (KNMSS)
17-982-DWG3 (Minto)
160401687-SAN1 (Cavanagh)

PROJECT:
Copperwood Estate

CLIENT:
CU Developments Inc.

Date: December 23, 2021

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.Unit counts for the KNUEA have been updated to reflect current information from the Cavanagh, Minto, Brigil and CU Developments developments.
6. Population from Novatech #103106 Sanitary Sewer Design Sheet
7. 244 Th units = from Novatech #103106Sanitary Sewer Design Sheet, plus future 137 units North of Klondike and West of Maconi (5.67ha @ 65pers/ha)
8. Population from Novatech #103106 Sanitary Sewer Design Sheet
9. Information obtained from JLRichards #24566, Sanitary Design Sheet, July 2012
10. 83 units obtained from Co-op website (http://www.chaseo.ca/meber/blue-heron-co-op/)
11. Population and drainage areas obtained from Servicing and Stormwater Management Report, Valecraft homes, completed by Stantec, #160401328, June 4, 2020.
12. Population and drainage areas obtained from Brigil Kanata North Functional Site Servicing Stormwater Management Report, completed by Stantec, #160101347, August 21, 2020.
13. Population and drainage areas obtained from Functional Site Servicing Report, Minto Communities, completed by DESL, Project 17-982, April 2020.

LOCATION				RESIDENTIAL AREA AND POPULATION											ICI										INFILTRATION				FLOW	PIPE							
									Cumulative						IND		COMM		INST		Par																
Drainage Area	From	To	Total Area	Dwellings		Density (Net ha)		Pop.	Residential			k	Peak	Peak	Area	Accu.	Area	Accu.	Area	Accu.	Area	Accu.	Peak	Peak	Total	Accu. Area		Infiltration	Total	Length	Dia	Dia	Slope	Velocity	Capacity	Ratio	Ratio
	Node	Node		SFH	SD/TH	Low[3]	High[4]		Area	Pop.		Factor	Factor	Flow		Area		Area		Area		Area	Factor	Flow	Area	New	Exist	Flow	Flow		Act	Nom		(Full)	(Full)	Q/Qfull	d/D
			(ha)	3.4	2.7	101	161		(ha)	New	Exist	New		(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)		(l/s)	(ha)	(ha)		(l/s)	(l/s)	(m)	(mm)	(mm)	(%)	(m/s)	(l/s)	(%)	
				pers/ea	pers/ea	pers/ha	per/ha																														
Multivesco / Claridge West Lands	FUTURE	MH525	62.7					3757.0		**3757**		0.80	2.89	35.1											62.7	62.70		20.7	55.8								
Elk Farm	FUTURE	MH525	50.4					3026.0		**6783**		0.80	2.70	59.3											50.4	113.10		37.3	96.6								
Mar Trun Sewer																																					
CUD	CUD	MH525	46.41					2445		**6783**	2445	0.75	2.49	68.7					5.17	5.17	2.22	2.22	1.0	1.1	46.41	113.10	46.41	53.6	123.4								
Cavanagh	Cavanagh	MH525	17.46					863.0		**6783**	3308	0.73	2.43	72.1			3.54	3.54	2.92	8.09		2.22	1.0	2.4	17.46	113.10	63.87	59.7	134.2	0.0	610	600	0.00	0.00	0.0		
MH524	MH525	MH524	0.44					0.0		**6783**	3308	0.73	2.43	72.1				3.54		8.09		2.22	1.0	2.4	0.44	113.10	64.31	59.8	134.3	97.4	610	600	0.13	0.79	231.2	58%	0.53
CUD	MH524	MH523	7.52					167.0		**6783**	3475	0.73	2.42	72.8			1.02	4.56	3.77	11.86		2.22	1.0	3.3	7.52	113.10	71.83	62.5	138.5	119.4	610	600	0.13	0.79	231.2	60%	0.56
MH522	MH523	MH522	0.66					0.0		**6783**	3475	0.73	2.42	72.8				4.56		11.86		2.22	1.0	3.3	0.66	113.10	72.49	62.7	138.8	152.8	610	600	0.13	0.79	231.2	60%	0.56
Brigil / Minto Commercial	MH522	MH521	18.18					1439.0		**6783**	4914	0.72	2.35	78.4			9.35	13.91		11.86		2.22	1.0	5.2	18.18	113.10	90.67	69.1	152.6	152.0	610	600	0.12	0.76	222.1	69%	0.58
MH520	MH521	MH520	0.66					0.0		**6783**	4914	0.72	2.35	78.4				13.91		11.86		2.22	1.0	5.2	0.66	113.10	91.33	69.3	152.9	147.6	610	600	0.13	0.79	231.2	66%	0.58
MH519	MH520	MH519	0.38					0.0		**6783**	4914	0.72	2.35	78.4				13.91		11.86		2.22	1.0	5.2	0.38	113.10	91.71	69.4	153.0	147.0	610	600	0.14	0.82	239.9	64%	0.56
Brigil	MH519	MH518	11.08					2795.0		**6783**	7709	0.69	2.24	89.4			0.61	14.52	2.06	13.92		2.22	1.0	5.7	11.08	113.10	102.79	73.3	168.4	80.6	610	600	0.17	0.90	264.4	64%	0.56
MH517	MH518	MH517	0.28					0.0		**6783**	7709	0.69	2.24	89.4				14.52		13.92		2.22	1.0	5.7	0.28	113.10	103.07	73.4	168.5	137.2	610	600	0.17	0.90	264.4	64%	0.56
Brigil External Lands	MH517	MH515	2.09					214.0		**6783**	7923	0.69	2.24	90.2				14.52		13.92		2.22	1.0	5.7	2.09	113.10	105.16	74.1	170.0	62.9	610	600	0.17	0.90	264.4	64%	0.58
MH514	MH515	MH514	0.61					0.0		**6783**	7923	0.69	2.24	90.2				14.52		13.92		2.22	1.0	5.7	0.61	113.10	105.77	74.3	170.2	151.8	610	600	0.17	0.90	264.4	64%	0.58
MH513	MH514	MH513	0.53					0.0		**6783**	7923	0.69	2.24	90.2				14.52		13.92		2.22	1.0	5.7	0.53	113.10	106.30	74.5	170.4	150.0	610	600	0.50	1.55	453.5	38%	0.41
MH512	MH513	MH512	0.53					0.0		**6783**	7923	0.69	2.24	90.2				14.52		13.92		2.22	1.0	5.7	0.53	113.10	106.83	74.7	170.6	149.3	610	600	0.47	1.50	439.6	39%	0.41
MH511	MH512	MH511	0.32					0.0		**6783**	7923	0.69	2.24	90.2				14.52		13.92		2.22	1.0	5.7	0.32	113.10	107.15	74.8	170.7	91.4	525	525	0.10	0.63	135.9	126%	0.90
MH510	MH511	MH510	2.18				1.76	283.4		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	2.18	113.10	109.33	75.6	172.6	119.4	610	600	0.10	0.69	202.8	85%	0.70
MH509	MH510	MH509	0.37					0.0		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	0.37	113.10	109.69	75.7	172.7	100.1	610	600	0.10	0.69	202.8	85%	0.70
MH508	MH509	MH508	0.45					0.0		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	0.45	113.10	110.15	75.9	172.9	117.8	610	600	0.10	0.69	202.8	85%	0.70
MH507	MH508	MH507	0.52					0.0		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	0.52	113.10	110.67	76.1	173.1	122.3	610	600	0.10	0.69	202.8	85%	0.70
MH506	MH507	MH506	0.49					0.0		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	0.49	113.10	111.16	76.2	173.2	84.3	610	600	0.11	0.73	212.7	81%	0.67
MH505	MH506	MH505	0.35					0.0		**6783**	8206	0.69	2.23	91.3				14.52		13.92		2.22	1.0	5.7	0.35	113.10	111.51	76.4	173.3	124.9	610	600	0.10	0.69	202.8	85%	0.70
MH504 (Includes MG Sub & 750 March. See Notes #9, #10)	MH505	MH504	54.04	39	132			3677.0		**6783**	11883	0.67	2.13	105.5				14.52		13.92		2.22	1.0	5.7	54.04	113.10	165.55	95.3	206.5	16.7	610	600	0.12	0.76	222.1	93%	0.73
MH502	MH504	MH502	0.38					0.0		**6783**	11883	0.67	2.13	105.5				14.52		13.92		2.22	1.0	5.7	0.38	113.10	165.93	95.4	206.6	142.7	610	600	0.10	0.69	202.8	102%	0.79
MH501 (Includes Sandhill Road)	MH502	MH501	12.63	9	60		6.19	1189.2		**6783**	13073	0.67	2.11	110.0				14.52	2.11	16.03		2.22	1.0	6.1	12.63	113.10	178.56	99.8	216.0	55.2	610	600	0.10	0.69	202.8	107%	0.84
MH500	MH501	EX 107	0.02					0.0		**6783**	13073	0.67	2.11	110.0				14.52		16.03		2.22	1.0	6.1	0.02	113.10	178.58	99.8	216.0	9.5	610	600	0.21	1.01	293.9	73%	0.61
McKinley Drive/Shirley's Brook Drive	McKinley	EX 107	8.27		117			315.9			316	0.60	2.84	2.1			2.73	2.73		0.00			1.0	0.5	8.27	0.00	8.27	2.9	5.5								
BRPS (See notes #6, #7, #8)	BRPS	EX 107	187.37					10263.0		**4169**	6094	0.68	2.32	64.2	35.08	35.08	6.76	6.76	5.47	5.47	4.96	4.96	1.0	6.7	187.37	0.00	187.37	65.6	136.4								
Total Flows into East Mar Trun	**MH500**	**EMT**	**374.22**					**23651**		**10952**	**19482**	0.67	1.99	**160.3**		**35.08**		**24.01**		**21.50**				**13.32**	**374.2**	**113.10**	**374.22**	**168.3**	**341.9**		**762**	**750**	**0.10**	**0.80**	**367.1**	**93**	

DESIGN PARAMETERS

Average Daily Flow (Future)=	280 L/cap/day
Average Daily Flow (Existing)=	200 L/cap/day
Comm/Inst Flow (Future)=	28000 L/ha/day
Comm/Inst Flow (Existing)=	17000 L/ha/day
Industrial (Future)=	35000 L/ha/day
Industrial (Existing)=	10000 L/ha/day
Max Res Peak Factor	4
ICI Peak Factor=	1.5 1 IF <20% As per Table 1- Techical Bulletin ISTD 2018-01

Industrial Peak Factor= per MOE graph		
Extraneous Flow (Future)=	0.33 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	
Harmon Correction Factor =	0.80	
Harmon Correction Factor =	0.60 (Existing)	Hybrid Harmon Correction factor used based on prop/ex population ratio

Designed: Robert Gifford, Steve Zorgel

PROJECT: Copperwood Estate

Checked: Marc St. Pierre

CLIENT: CU Developments Inc.

Dwg. Reference: 116132-SAN (Copperwood Estate; 112117-SAN1 (KNMSS); 112117-SAN2 (KNMSS); 17-982-DWG3 (Minto); 160401687-SAN1 (Cavanagh)

Date: December 23, 2021

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
6. Population from Novatech #103106 Sanitary Sewer Design Sheet
7. 244 Th units = from Novatech #103106Sanitary Sewer Design Sheet, plus future 137 units North of Klondike and West of Maconi (5.67ha @ 65pers/ha)
8. Population from Novatech #103106 Sanitary Sewer Design Sheet
9. Information obtained from JLRichards #24566, Sanitary Design Sheet, July 2012
10. 83 units obtained from Co-op website (http://www.chaseo.ca/meber/blue-heron-co-op/)
11. Population and drainage areas obtained from Servicing and Stormwater Management Report, Valecraft homes, completed by Stantec, #160401328, June 4, 2020.
12. Population and drainage areas obtained from Brigil Kanata North Functional Site Servicing Stormwater Management Report, completed by Stantec, #160101347, August 21, 2020.
13. Population and drainage areas obtained from Functional Site Servicing Report, Minto Communities, completed by DESL, Project 17-982, April 2020.
14. The Elk Farm, Multivesco and Claridge West Lands are considered future works that will be built beyond the KNUEA buildout. All previously proposed flow (residential, commercial, institutional, industrial) from KNUEA are considered existing and operational flows. The only design (proposed) flows are from the Elk Farm, Multivesco and Claridge West Lands.
15. Unit count for Multivesco, Elk Farm and Claridge West lands based on 60 persons / gross hectare as per City of Ottawa sewer design guidelines
16. For drainage areas from Multivesco, Elk Farm and Claridge West Lands refer to CU Developments sanitary drainage plan, 116132-SAN

The proposed development will be serviced by a network of gravity sewers, designed in accordance with the wastewater design parameters from ISTB-2018-01 and the Sewer Design Guidelines, summarized in **Table 1**. These design parameters represent a flow reduction from the outdated wastewater design parameters used during the KNMSS design.

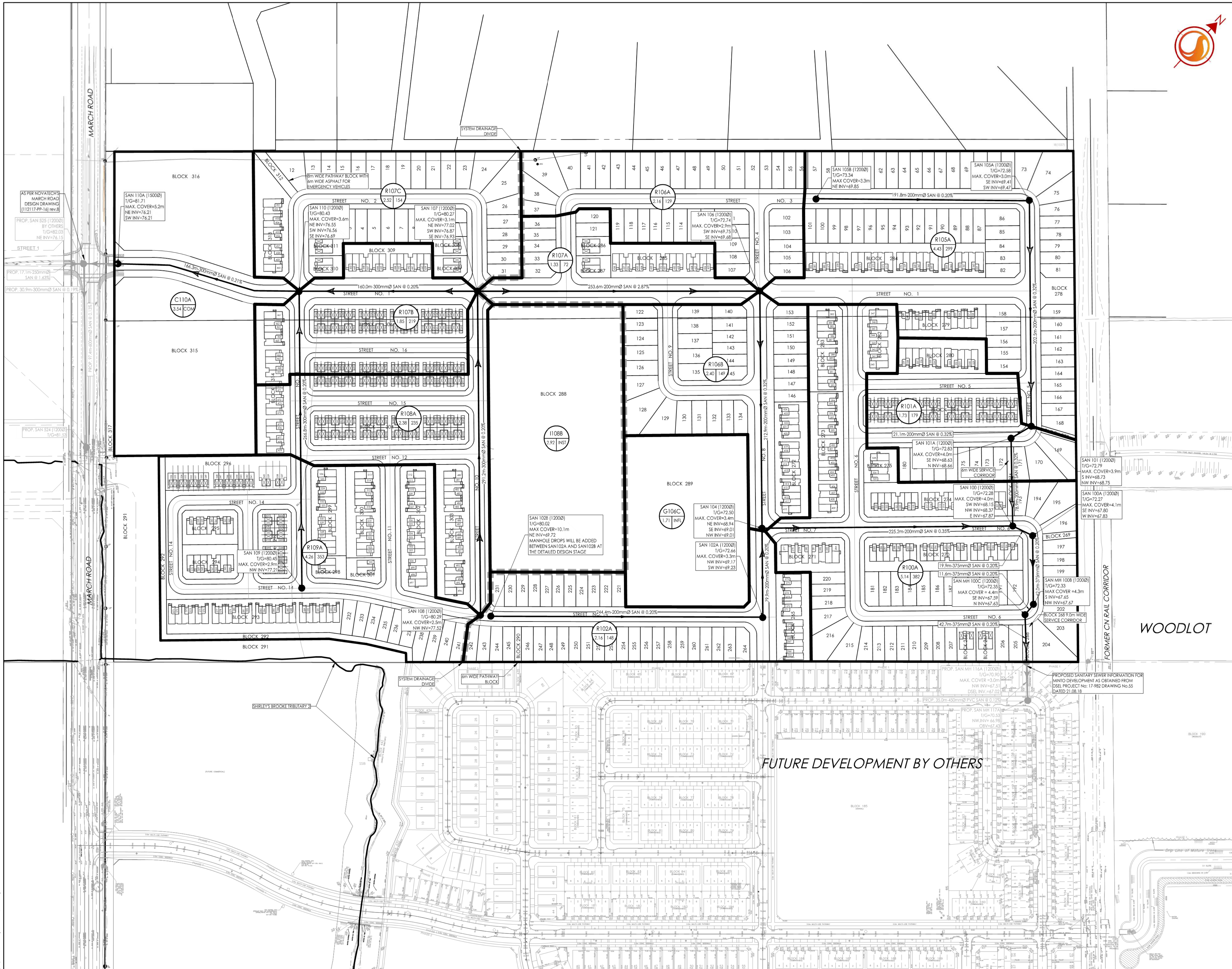
The conceptual sanitary sewer design sheet can be found in **Appendix B.1**. A breakdown of the estimated sewage peak flows that will be directed to each outlet is shown in **Table 2**.

Table 2: Estimated Wastewater Peak Flows

Outlet	Residential Population (persons)	Residential Peak Flow (L/s)	Institutional Area (ha)	Commercial Area (ha)	Commercial /Institutional Peak Flow (L/s)	Total Area (ha)	Extraneous Flow (L/s)	Total Peak Flow (L/s)
BRPS (via Minto Development)	1,270	13.1	N/A	N/A	N/A	21.05	6.9	20.1
March Road	863	9.2	2.92	3.54	3.1	17.46	5.8	18.1

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

It is anticipated that a sanitary HGL analysis will be completed for the proposed sanitary sewer system tributary to the BRPS at the detailed design stage, once design information on the sanitary overflow and KNUEA SWM Pond 3 have been finalized.



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Legend

PROPOSED TRUNK SANITARY SEWER
EXISTING/PROPOSED (BY OTHERS) TRUNK SANITARY SEWER
SANITARY DRAINAGE BOUNDARY
EXISTING/PROPOSED (BY OTHERS) SANITARY DRAINAGE BOUNDARY
AREA ID
POPULATION
SANITARY DRAINAGE AREA (ha)

Notes

2	REVISED PER NEW DRAFT PLAN	AJ	AMP	21.10.06
1	FOR REVIEW	AJ	AMP	21.09.28
Revision		By	Appd.	YY.MM.DD

File Name: 160401328	AJ	KS	DT	19.07.05
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
A.M. PAEREZ FERNANDEZ
100105130
2021-10-06
PROVINCE OF ONTARIO

Client/Project
CAVANAGH DEVELOPMENTS

CAVANAGH NORTHRIDGE
DRAFT PLAN OF SUBDIVISION
OTTAWA, ON

Title
FUNCTIONAL OVERALL
SANITARY SEWER SYSTEM

Project No. 160401687
Scale 1:1500

Drawing No. SAN-1
Sheet 2 of 5
Revision 2

ORIGINAL SHEET - ARCH D

- The KNMSS shows a second connection to the future 600mm diameter trunk sewer on March Road would be provided through the realigned Old Carp River Road to service the portion of the proposed site south of Tributary 3. However, based on the proposed development layout and development timing of the adjacent properties, it is proposed to service the southern portion of the site through a connection to the future March Road trunk sewer at the proposed local street. The proposed local street sanitary sewer has been sized to service the future school block (area I12, by others), as well as the future service mixed-use blocks fronting March Road (areas C11B and C11C, by others) to avoid deep service connections along the March Road trunk sewer. The remainder of external areas within KNMSS area W-12 which consist of a future mixed-use block (R-EXT1, by others) and a future low density residential area (R-EXT2, by others) will be serviced through a future sewer along the future Old Carp Road realignment connected to the trunk sewer March Road.

3.3 PROPOSED SERVICING

Drawing OSA-1 illustrates the conceptual main trunk sewer alignment and sanitary drainage areas. As per the KNMSS, the proposed development sanitary sewer system is split in two with two separate connections to the future 600 mm diameter March Road trunk sewer to avoid crossing Tributary 3. The March Road sanitary sewer design has been completed (see design drawings in **Appendix B.2**).

The proposed development will be serviced by a network of gravity sewers, designed in accordance with the wastewater design parameters from ISTB-2018-01 and the Sewer Design Guidelines, summarized in **Table 1**. The conceptual sanitary sewer design sheet can be found in **Appendix B.1**. A breakdown of the estimated sewage peak flows that will be directed to each outlet is shown in **Table 2**.

Table 2: Estimated Wastewater Peak Flows

Outlet	Residential Population (persons)	Residential Peak Flow (L/s)	Institutional Area (ha)	Commercial Area (ha)	Commercial /Institutional Peak Flow (L/s)	Total Area (ha)	Extraneous Flow (L/s)	Total Peak Flow (L/s)
Northern Outlet	1,439	14.7	N/A	N/A	N/A	8.18	2.7	**17.4**
Southern Outlet	2,795	26.9	2.05	0.61	1.3	10.46	3.5	**31.7**

1. As per KNMSS, 8.7L/s were assumed from the site to the northern outlet to March Road (Areas W-10 and W-11, 1.08ha commercial , 390 persons, 71.6 units/net ha, 50% at 2.7p/unit and 50% at 1.8p/unit).
2. As per KNMSS, 25.3L/s were assumed from the site to the southern outlet to March Road (Area W-12, 1350 persons, 71.6 units/net ha, 50% at 2.7p/unit and 50% at 1.8p/unit, 2.01ha institutional).
3. The park area was not included in the infiltration peak flow calculations in the KNMSS, but it has been included here.
4. Institutional area (Area I12) corresponds to a future school block (by others) which will be serviced through the proposed local street and southern outlet to March Road and as such, it has been included in the proposed sanitary sewer sizing.
5. Commercial Area (C11B and C11C) corresponds to future commercial blocks (by others) which have been included in the proposed sanitary sizing of the local street sewer.

As can be seen in the above table, the total estimated peak flow of 17.4 L/s to the northern March Road outlet exceeds the assumed KN MSS peak flow of 8.7 L/s (8.7 L/s exceedance). This is in part due to the higher density proposed for the service mixed-use block adjacent to March Road within area R6A which was assumed as commercial sewage in the KN MSS which generates significantly lower peak flows, and to the addition of the park area in the infiltration calculations for the propose site.

Similarly, the total estimated peak flow to the proposed southern March Road outlet is approximately 31.7 L/s which includes future commercial areas by others C11B and C11C that were part of a different drainage area in the KN MSS (MR-3) and have been included in the proposed sanitary sewer sizing to avoid future service connections to the deep trunk sewer on March Road. These future commercial areas generate approximately 0.3 L/s as per the KN MSS assumptions and as such, the peak flow contribution from these areas should be removed when comparing the proposed peak flow to the assumed KN MSS peak flows from area W-12 to the southern March Road outlet.

Two external areas to be developed by others (R-EXT1 and R-EXT2) were included in the KN MSS area W-12, so in order to compare the total proposed peak flows to the March Road southern outlet to the assumed KN MSS peak flow of 25.3 L/s, the peak flows from these areas which will be serviced through a future sanitary sewer connection to March Road along the Old Carp Road realignment need to be estimated. Area R-EXT1 is zoned Mixed-Use and has been assumed as multi-unit residential as per the KN MSS (71.6 units/net ha, 50% townhomes at 2.7p/unit and 50% apartments at 1.8p/unit). Area R-EXT-2 is zoned Residential-Street Oriented and has been assumed as low density as per the KN MSS (16.6 singles/net ha * 3.4pers/unit + 16.5 Towns/net ha * 2.7pers/unit). The total peak flow generated from these areas is approximately 2.9 L/s (see detailed calculations in the conceptual sanitary sewer design sheet included in **Appendix B.1**).

Based on the above peak flow breakdown, the proposed sanitary peak flows to the southern outlet (31.7 L/s) include commercial peak flows from external areas (0.3 L/s) which results in a proposed peak flow of 31.4 L/s within the KN MSS area W-12. An additional 2.9 L/s will be generated by the external areas R-EXT1 and R-EXT2 which are also within the KN MSS area W-12, for a total proposed peak flow of 34.3 L/s, which exceeds the KN MSS assumed peak flow from area W-12 of 25.3 L/s by 9.0 L/s.

Based on the sanitary design sheet provided in the KN MSS (see **Appendix B.2**), there is 18 L/s residual capacity in the downstream sanitary sewers. The total peak flow exceedance to the March Road trunk sewer from the KN MSS areas W-10, W-11 and W-12 is expected to be approximately 17.7 L/s based on the unit count and expected population density for the proposed Brigil Kanata North Development.

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Legend

- SA24A / 0.38 / 34 — SANITARY DRAINAGE AREA ID#; POPULATION; SANITARY DRAINAGE AREA ha.
- SANITARY DRAINAGE AREA
- PROPOSED SANITARY SEWER
- FUTURE SANITARY DRAINAGE AREA
- FUTURE SANITARY SEWER
- MVCA 100 YEAR FLOODPLAIN
- MVCA MEANDER BELT
- MVCA REGULATION LIMIT

Notes

		By	Appd.	YY.MM.DD
1	ISSUED FOR DRAFT PLAN APPROVAL	WAJ	AMP	20.08.18

Revision

File Name: 160401347-SA.dwg	WAJ	AMP	WAJ	20.06.11
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

LICENSED PROFESSIONAL ENGINEER
A.M. PAEREZ FERNANDEZ
100105130
2020-08-21
PROVINCE OF ONTARIO

Client/Project

3223701 CANADA INC.

BRIGIL - KANATA NORTH

OTTAWA, ON

Title

CONCEPTUAL OVERALL SANITARY DRAINAGE PLAN

Project No. 160401347

Scale 1:1250 (0, 12.5, 37.5, 62.5m)

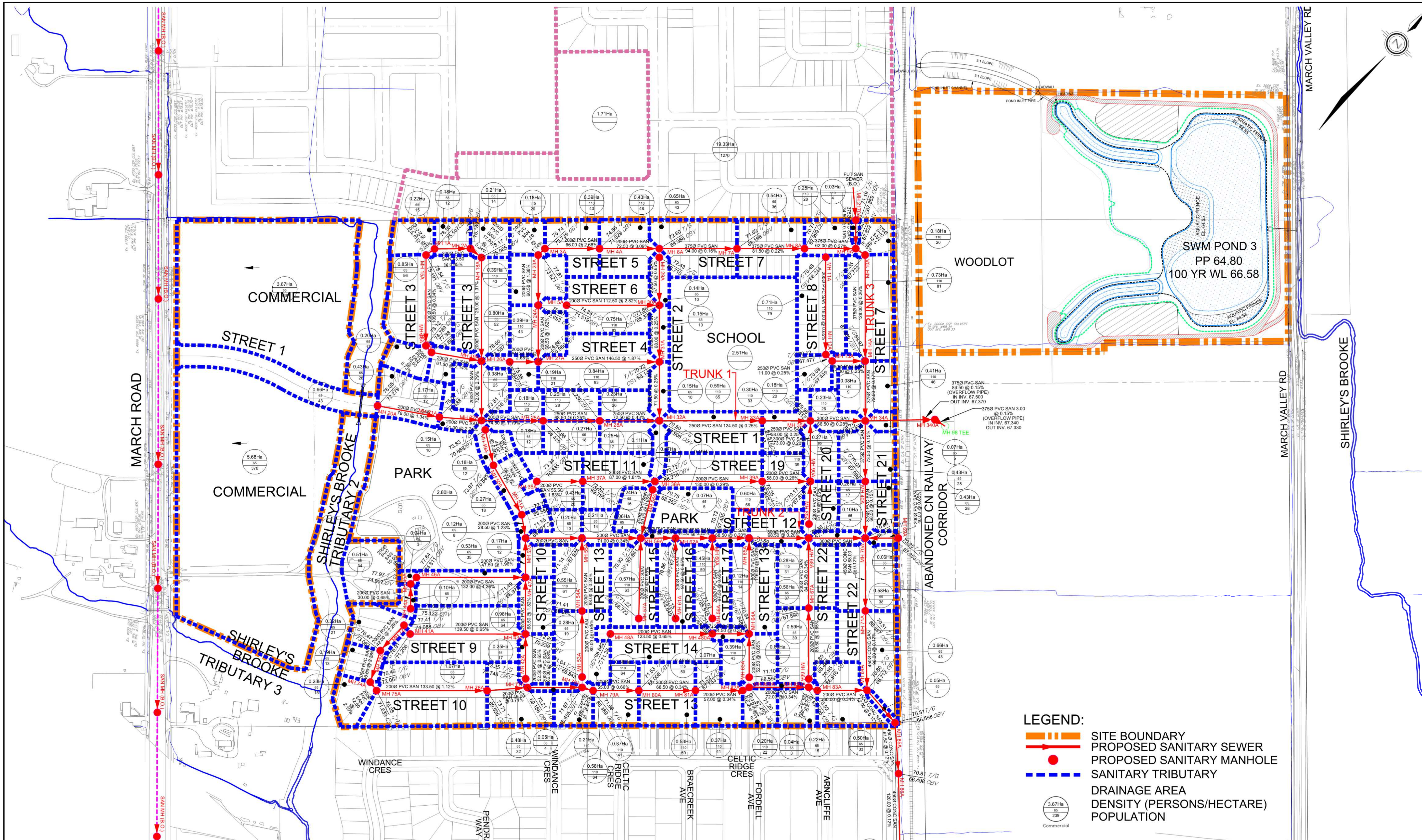
Drawing No. OSA-1

Sheet 4 of 6

Revision 1

W:\active\160401347 Brigil Kanata North\design\drawing\160401347-SA.dwg
2020/08/17 9:10 AM By: Johnson, Warren

ORIGINAL SHEET - ARCH D



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SANITARY SERVICING APPENDIX
MINTO KANATA NORTH

PROJECT No. :	17-982
SCALE:	1:2000
DATE:	April 2020
DRAWING No.	3

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Trunk 2																											
	69A	70A	0.06		0	0.06	0				0.00		0.00		0.00	0.00	0.06	0.06	0.02	0.02	40.0	200	0.65	26.44	0.00	0.84	0.12
To Trunk 3, Pipe 70A - 71A						0.06	0				0.00		0.00		0.00			0.06									
			3.42		223	3.42	223				0.00		0.00		0.00		3.42	3.42									
	52A	55A	0.20		13	3.62	236	3.5	2.67		0.00		0.00	2.76	2.76	0.30	2.96	6.38	2.11	5.08	68.5	200	0.34	19.12	0.27	0.61	0.51
			1.13		125	4.75	361				0.00		0.00		2.76		1.13	7.51									
	55A	59A	0.21		14	4.96	375	3.4	4.17		0.00		0.00		2.76	0.30	0.21	7.72	2.55	7.01	71.0	200	0.34	19.12	0.37	0.61	0.56
			0.57		63	5.53	438				0.00		0.00		2.76		0.57	8.29									
			0.24		16	5.77	454				0.00		0.00		2.76		0.24	8.53									
	59A	62A	0.06		4	5.83	458	3.4	5.04		0.00		0.00		2.76	0.30	0.06	8.59	2.83	8.17	42.0	250	0.25	29.73	0.27	0.61	0.51
			0.45		50	6.28	508				0.00		0.00		2.76		0.45	9.04									
	62A	60A	0.07		5	6.35	513	3.4	5.61		0.00		0.00		2.76	0.30	0.07	9.11	3.01	8.91	44.5	300	0.25	48.35	0.18	0.68	0.52
			0.45		50	6.80	563				0.00		0.00	0.49	3.25		0.94	10.05									
	60A	65A	0.12		14	6.92	577	3.4	6.27		0.00		0.00		3.25	0.35	0.12	10.17	3.36	9.98	68.5	300	0.20	43.25	0.23	0.61	0.50
			1.63		180	8.55	757				0.00		0.00		3.25		1.63	11.80									
	65A	68A	0.28		31	8.83	788	3.3	8.41		0.00		0.00		3.25	0.35	0.28	12.08	3.99	12.74	68.5	300	0.20	43.25	0.29	0.61	0.53
			1.15		75	9.98	863				0.00		0.00		3.25		1.15	13.23									
	68A	70A	0.10		7	10.08	870	3.3	9.22		0.00		0.00		3.25	0.35	0.10	13.33	4.40	13.97	68.5	300	0.20	43.25	0.32	0.61	0.55
To Trunk 3, Pipe 70A - 71A						10.08	870				0.00		0.00		3.25			13.33									
Trunk 1																											
			0.66		43	0.66	43				0.00		0.00		0.00		0.66	0.66									
	20A	21A	0.43		28	1.09	71	3.6	0.83		0.00		0.00		0.00	0.00	0.43	1.09	0.36	1.19	76.0	200	1.34	37.97	0.03	1.21	0.54
	21A	22A	0.15		10	1.24	81	3.6	0.95		0.00		0.00		0.00	0.00	0.15	1.24	0.41	1.36	51.0	200	2.24	49.09	0.03	1.56	0.67
			3.03		197	4.27	278				0.00		0.00		0.00		3.03	4.27									
			0.18		20	4.45	298				0.00		0.00		0.00		0.18	4.45									
	22A	25A	0.18		12	4.63	310	3.5	3.47		0.00		0.00		0.00	0.00	0.18	4.63	1.53	5.00	74.5	200	1.19	35.78	0.14	1.14	0.80
			0.25		28	4.88	338				0.00		0.00		0.00		0.25	4.88									
	25A	28A	0.27		18	5.15	356	3.4	3.96		0.00		0.00		0.00	0.00	0.27	5.15	1.70	5.66	68.5	250	0.25	29.73	0.19	0.61	0.47
			0.23		26	5.38	382				0.00		0.00		0.00		0.23	5.38									
	28A	32A	0.25		17	5.63	399	3.4	4.42		0.00		0.00		0.00	0.00	0.25	5.63	1.86	6.28	72.5	250	0.43	39.00	0.16	0.79	0.58
			3.19		351	8.82	750				0.00		0.00		0.00		3.19	8.82									
			0.11		8	8.93	758				0.00		0.00		0.00		0.11	8.93									
	32A	33A	0.59		65	9.52	823	3.3	8.75		0.00		0.00		0.00	0.00	0.59	9.52	3.14	11.90	124.5	250	0.25	29.73	0.40	0.61	0.57
	33A	35A	0.30		33	9.82	856	3.3	9.08		0.00	2.51	2.51		0.00	0.81	2.81	12.33	4.07	13.96	58.0	250	0.25	29.73	0.47	0.61	0.60
			0.95		105	10.77	961				0.00		2.51		0.00		0.95	13.28									
			0.53		35	11.30	996				0.00		2.51		0.00		0.53	13.81									
	35A	34A	0.23		26	11.53	1022	3.2	10.71		0.00		2.51		0.00	0.81	0.23	14.04	4.63	16.16	66.5	250	0.28	31.47	0.51	0.64	0.64
To Trunk 3, Pipe 34A - 40A						11.53	1022				0.00		2.51		0.00			14.04									
Trunk 3																											
Contribution From Valecraft			19.33		1270	19.33	1270				0.00		0.00	1.71	1.71		21.04	21.04									
	2170A	9A	0.03		2	19.36	1272	3.2	13.13		0.00		0.00		1.71	0.18	0.03	21.07	6.95	20.26	34.5	375	0.15	67.91	0.30	0.61	0.53
To Trunk 3, Pipe 9A - 10A						19.36	1272				0.00		0.00		1.71			21.07									
Contribution From Trunk 3, Pipe 2170A - 9A						19.36	1272				0.00		0.00		1.71		21.07	21.07									
			0.82		91	20.18	1363				0.00		0.00		1.71		0.82	21.89									
			1.19		78	21.37	1441				0.00		0.00		1.71		1.19	23.08									
			0.25		28	21.62	1469				0.00		0.00		1.71		0.25	23.33									
	9A	10A	0.18		20	21.80	1489	3.1	15.18		0.00		0.00		1.71	0.18	0.18	23.51	7.76	23.12	13.5	375	0.15	67.91	0.34	0.61	0.55
	10A	14A	0.73		81	22.53	1570	3.1	15.94		0.00		0.00		1.71	0.18	0.73	24.24	8.00	24.12	128.0	375	0.26	89.40	0.27	0.81	0.68

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha		
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4

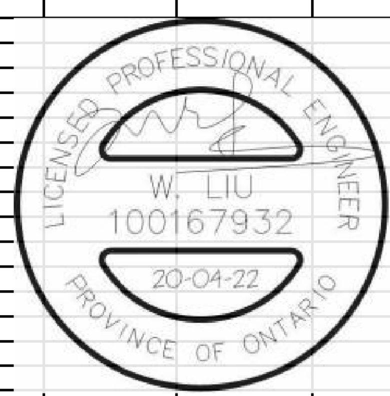
Designed: A.K.	PROJECT: Minto Kanata North		
Checked: W.L.	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref: 17-982	Date: April 2020	Sheet No 2 of 2

982_SAN3_FSR.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
			0.97		107	23.50	1677				0.00		0.00		1.71		0.97	25.21									
	14A	34A	0.41		46	23.91	1723	3.1	17.36		0.00		0.00		1.71	0.18	0.41	24.65	8.13	25.67	72.5	375	0.17	72.29	0.36	0.65	0.60
Contribution From Trunk 1, Pipe 33A - 34A						11.53	1022				0.00		2.51		0.00		14.04	38.69									
	34A	40A	0.43		28	35.87	2773	3.0	26.75		0.00		2.51		1.71	1.00	0.43	39.12	12.91	40.66	73.5	375	0.15	67.91	0.60	0.61	0.64
	40A	70A	0.43		28	36.30	2801	3.0	27.00		0.00		2.51		1.71	1.00	0.43	39.55	13.05	41.05	68.5	375	0.15	67.91	0.60	0.61	0.64
Contribution From Trunk 2, Pipe 68A - 70A						10.08	870				0.00		0.00		3.25		13.33	52.88									
Contribution From Trunk 2, Pipe 69A - 70A						0.06	0				0.00		0.00		0.00		0.06	52.94									
	70A	71A	0.58		64	47.02	3735	2.9	34.96		0.00		2.51		4.96	1.35	0.58	53.52	17.66	53.96	88.0	450	0.12	98.76	0.55	0.62	0.63
	71A	84A	0.66		43	47.68	3778	2.9	35.31		0.00		2.51		4.96	1.35	0.66	54.18	17.88	54.54	96.0	450	0.12	98.76	0.55	0.62	0.64
To Trunk 3, Pipe 84A - 85A						47.68	3778				0.00		2.51		4.96			54.18									
Contribution From Trunk 3, Pipe 71A - 84A						47.68	3778				0.00		2.51		4.96		54.18	54.18									
			0.04		3	47.72	3781				0.00		2.51		4.96		0.04	54.22									
			0.05		4	47.77	3785				0.00		2.51		4.96		0.05	54.27									
			2.29		149	50.06	3934				0.00		2.51		4.96		2.29	56.56									
			1.67		184	51.73	4118				0.00		2.51		4.96		1.67	58.23									
			0.72		47	52.45	4165				0.00		2.51		4.96		0.72	58.95									
	84A	85A	0.05		4	52.50	4169	2.9	38.56		0.00		2.51		4.96	1.35	0.05	59.00	19.47	59.37	52.0	450	0.12	98.76	0.60	0.62	0.65
	85A	86A				52.50	4169	2.9	38.56		0.00		2.51		4.96	1.35	0.00	59.00	19.47	59.37	61.5	450	0.12	98.76	0.60	0.62	0.65
	86A	87A				52.50	4169	2.9	38.56		0.00		2.51		4.96	1.35	0.00	59.00	19.47	59.37	120.0	450	0.12	98.76	0.60	0.62	0.65
	87A	88A				52.50	4169	2.9	38.56		0.00		2.51		4.96	1.35	0.00	59.00	19.47	59.37	17.5	450	0.12	98.76	0.60	0.62	0.65
	88A	225A				52.50	4169	2.9	38.56		0.00		2.51		4.96	1.35	0.00	59.00	19.47	59.37	5.0	450	0.12	98.76	0.60	0.62	0.65
	225A	224A	22.50		1648	75.00	5817	2.7	51.78		0.00		2.51		4.96	1.35	22.50	81.50	26.90	80.02	97.5	450	0.12	98.76	0.81	0.62	0.69
	224A	209A	0.22		11	75.22	5828	2.7	51.87		0.00		2.51		4.96	1.35	0.22	81.72	26.97	80.18	66.5	450	0.12	98.76	0.81	0.62	0.69
	209A	208A	9.05		553	84.27	6381	2.7	56.17		0.00		2.51		4.96	1.35	9.05	90.77	29.95	87.47	50.0	450	0.20	127.50	0.69	0.80	0.86
	208A	207A				84.27	6381	2.7	56.17		0.00		2.51		4.96	1.35	0.00	90.77	29.95	87.47	111.5	450	0.20	127.50	0.69	0.80	0.86



DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha		
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4

Designed: A.K.

Checked: W.L.

Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.

PROJECT: **Minto Kanata North**

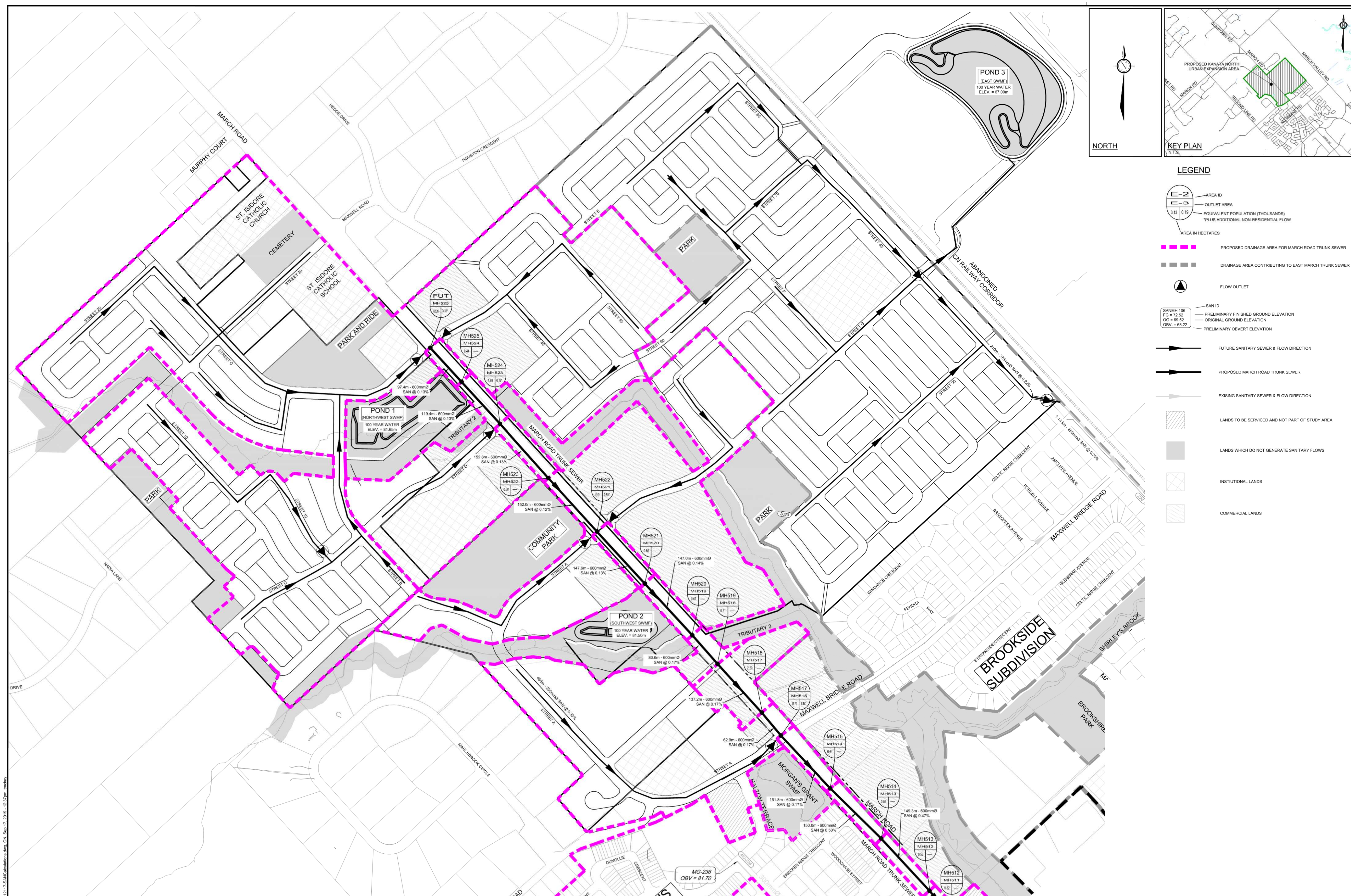
LOCATION: **City of Ottawa**

File Ref: 17-982

Date: **April 2020**

Sheet No 2 of 2

982_SAN3_FSR.xlsx



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
6.	ISSUED FOR MECP APPROVAL	SEPT 19/19	EDR
5.	RE-ISSUED FOR CITY REVIEW / COMMENT	JULY 05/19	EDR
4.	ISSUED WITH PRELIMINARY DESIGN REPORT	MARCH 29/19	FM
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

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL 20/9/19 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

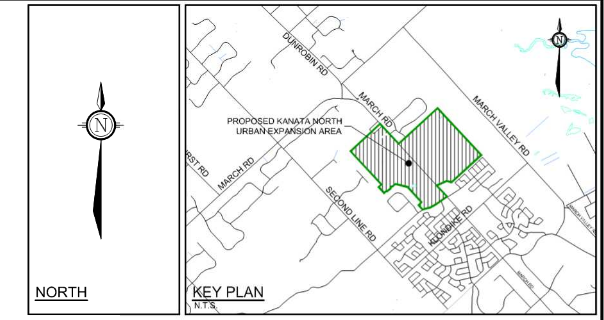
LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
ONSITE SANITARY DRAINAGE AREA PLAN

PROJECT No. 112117
REV REV # 6
DRAWING No. 112117-SAN1

D07-20-19-0001

#18009



LEGEND

- AREA ID (X-4)
- OUTLET AREA (X-5)
- EQUIVALENT POPULATION (THOUSANDS) *PLUS ADDITIONAL NON-RESIDENTIAL FLOW (0.19)
- CONTRIBUTING AREA IN HECTARES (3.13)
- PROPOSED DRAINAGE AREA FOR MARCH ROAD TRUNK SEWER
- DRAINAGE AREA CONTRIBUTING TO EAST MARCH TRUNK SEWER
- FLOW OUTLET
- SANMH 106 — SAN ID; FG = 72.52 — PRELIMINARY FINISHED GROUND ELEVATION; OG = 69.52 — ORIGINAL GROUND ELEVATION; OBV. = 68.22 — PRELIMINARY OBVERT ELEVATION
- FUTURE SANITARY SEWER & FLOW DIRECTION
- PROPOSED MARCH ROAD TRUNK SEWER
- EXISING SANITARY MAINLINE SEWER & FLOW DIRECTION
- UNDEVELOPED LANDS TO BE SERVICED AND NOT PART OF STUDY AREA
- LANDS WHICH DO NOT GENERATE SANITARY FLOWS
- INSTITUTIONAL 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.

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5.	RE-ISSUED FOR CITY REVIEW / COMMENT	JULY 05/19	EDR
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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

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL 20/9/19 PROVINCE OF ONTARIO

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LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
OFFSITE SANITARY DRAINAGE AREA PLAN

PROJECT No. 112117
REV REV # 6
DRAWING No. 112117-SAN2

D07-20-19-0001

#18009

BROOKSIDE SUBDIVISION
SANITARY SEWER DESIGN SHEET

LOCATION			RESIDENTIAL AREA AND POPULATION								IND			INST		ICI	INFILTRATION			FLOW	PIPE						
Street	From Node	To Node	Area (ha)	Dwellings SFH	Dwellings TH	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak Factor	Peak Flow (l/s)	Area (ha)	Accu. Area (ha)	Peak Factor	Area (ha)	Accu. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (l/s)	Total Flow (l/s)	Length (m)	Dia Act (mm)	Dia Nom (mm)	Slope (%)	Velocity (Full) (m/s)	Capacity (Full) (l/s)	Ratio Q/Qfull (%)
Area 1 - March Road																											
	Offsite	MH 261	6.10			610	6.10	610.0	3.93	9.7							6.1	6.1	1.7	11.4							
	MH 261	MH 260	0.19				6.29	610.0	3.93	9.7							0.2	6.3	1.8	11.5	92.0	203	200	0.33	0.61	19.6	58%
	MH 260	MH 259	0.17				6.46	610.0	3.93	9.7							0.2	6.5	1.8	11.5	71.0	203	200	1.13	1.12	36.3	32%
	MH 259	MH 258	0.13				6.59	610.0	3.93	9.7							0.1	6.6	1.8	11.6	54.4	203	200	0.37	0.64	20.8	56%
Area 3 - Brookside Subdivision																											
Maxwell Bridge Rd	MH 258	MH 256	0.24	3		10.2	6.83	620.2	3.92	9.9							0.2	6.8	1.9	11.8	42.6	203	200	2.35	1.62	52.4	22%
Windance Cres	MH 249	MH 257	0.47	7		23.8	0.47	23.8	4.00	0.4							0.5	0.5	0.1	0.5	54.7	203	200	2.00	1.49	48.3	1%
	MH 257	MH 256	0.37	5		17.0	0.84	40.8	4.00	0.7							0.4	0.8	0.2	0.9	51.5	203	200	0.82	0.95	31.0	3%
Maxwell Bridge Rd	MH 256	MH 255	0.60	9		30.6	8.27	691.6	3.90	10.9							0.6	8.3	2.3	13.2	80.5	203	200	1.11	1.11	36.0	37%
	MH 255	MH 250	0.38	6		20.4	8.65	712	3.89	11.2							0.4	8.7	2.4	13.6	56.4	203	200	1.35	1.22	39.7	34%
Pendra Way	MH 246	MH 254	0.44	7		23.8	0.44	23.8	4.00	0.4							0.4	0.4	0.1	0.5	52.0	203	200	0.90	1.00	32.4	2%
	MH 254	MH 253	0.22	2		6.8	0.66	30.6	4.00	0.5							0.2	0.7	0.2	0.7	11.5	203	200	0.61	0.82	26.7	3%
	MH 253	MH 252	0.00			0.0	0.66	30.6	4.00	0.5							0.0	0.7	0.2	0.7	35.2	203	200	0.57	0.80	25.8	3%
	MH 252	MH 251	0.11	1		3.4	0.77	34.0	4.00	0.6							0.1	0.8	0.2	0.8	10.6	203	200	0.66	0.86	27.8	3%
	MH 251	MH 250	0.54	9		30.6	1.20	61.2	4.00	1.0							0.5	1.2	0.3	1.3	67.8	203	200	0.60	0.82	26.5	5%
Maxwell Bridge Rd	MH 250	MH 242	0.42	6		20.4	10.27	793.6	3.86	12.4							0.4	10.3	2.9	15.3	82.0	203	200	0.80	0.94	30.6	50%
Windance Cres	MH 249	MH 248	0.15	2		6.8	0.15	6.8	4.00	0.1							0.2	0.2	0.0	0.2	20.2	203	200	1.00	1.05	34.2	0%
	MH 248	MH 247	0.23	2		6.8	0.38	13.6	4.00	0.2							0.2	0.4	0.1	0.3	13.1	203	200	2.30	1.60	51.8	1%
	MH 247	MH 246	0.49	6		20.4	0.87	34.0	4.00	0.6							0.5	0.9	0.2	0.8	81.5	203	200	2.90	1.80	58.2	1%
	MH 246	MH 245	0.94	14		47.6	1.81	81.6	4.00	1.3							0.9	1.8	0.5	1.8	123.0	203	200	1.20	1.15	37.4	5%
	MH 245	MH 244	0.20		3	8.1	2.01	89.7	4.00	1.5							0.2	2.0	0.6	2.0	11.2	203	200	0.36	0.63	20.5	10%
	MH 244	MH 243	0.18		5	13.5	2.19	103.2	4.00	1.7							0.2	2.2	0.6	2.3	29.8	203	200	0.34	0.61	19.9	11%
	MH 243	MH 242	0.79	7	12	56.2	2.80	145.9	4.00	2.4							0.8	2.8	0.8	3.1	108.0	203	200	0.32	0.60	19.3	16%
Maxwell Bridge Rd	MH 242	MH 240	0.39	5		17.0	13.46	956.5	3.81	14.8							0.4	13.5	3.8	18.5	82.0	254	250	0.38	0.75	38.2	49%
Celtic Ridge Cres	MH 233	MH 241	0.63		20	54.0	0.63	54.0	4.00	0.9							0.6	0.6	0.2	1.1	73.3	203	200	0.33	0.61	19.6	5%
	MH 241	MH 240	0.45		13	35.1	1.08	89.1	4.00	1.4							0.5	1.1	0.3	1.7	63.7	203	200	1.21	1.16	37.6	5%
Maxwell Bridge Rd	MH 240	MH 238	0.40		9	24.3	14.94	1069.9	3.78	16.4							0.4	14.9	4.2	20.6	82.0	254	250	0.24	0.60	30.4	68%
Celtic Ridge Cres	MH 233	MH 232	0.19		3	8.1	0.19	8.1	4.00	0.1							0.2	0.2	0.1	0.2	12.4	203	200	0.65	0.85	27.6	1%
	MH 232	MH 231	0.46		12	32.4	0.65	40.5	4.00	0.7							0.5	0.7	0.2	0.8	73.3	203	200	0.40	0.67	21.6	4%
Celtic Ridge Cres	MH 230	MH 231	0.41		11	29.7	0.41	29.7	4.00	0.5							0.4	0.4	0.1	0.6	82.1	203	200	0.33	0.61	19.6	3%
Braecreek Ave	MH 231	MH 239	0.92		28	75.6	1.98	145.8	4.00	2.4							0.9	2.0	0.6	2.9	120.0	203	200	0.33	0.61	19.6	15%
	MH 239	MH 238	0.17		4	10.8	2.15	156.6	4.00	2.5							0.2	2.2	0.6	3.1	27.4	203	200	1.82	1.42	46.1	7%
Maxwell Bridge Rd	MH 238	MH 236	0.42		13	35.1	17.51	1261.6	3.73	19.1							0.4	17.5	4.9	24.0	82.0	254	250	0.24	0.60	30.4	79%
Fordell Ave	MH 230	MH 237	0.86		30	81.0	0.86	81.0	4.00	1.3							0.9	0.9	0.2	1.6	110.0	203	200	0.32	0.60	19.3	8%
	MH 237	MH 236	0.23		6	16.2	1.09	97.2	4.00	1.6							0.2	1.1	0.3	1.9	39.1	203	200	2.30	1.60	51.8	4%

BROOKSIDE SUBDIVISION
SANITARY SEWER DESIGN SHEET

LOCATION			RESIDENTIAL AREA AND POPULATION								IND			INST		ICI	INFILTRATION			FLOW	PIPE						
Street	From Node	To Node	Area (ha)	Dwellings SFH	Dwellings TH	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak Factor	Peak Flow (l/s)	Area (ha)	Accu. Area (ha)	Peak Factor	Area (ha)	Accu. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (l/s)	Total Flow (l/s)	Length (m)	Dia Act (mm)	Dia Nom (mm)	Slope (%)	Velocity (Full) (m/s)	Capacity (Full) (l/s)	Ratio Q/Qfull (%)
Maxwell Bridge Rd	MH 236	MH 234	0.39		12	32.4	18.99	1391.2	3.70	20.9							0.4	19.0	5.3	26.2	82.0	305	300	0.24	0.68	49.4	53%
Arncliffe Ave	MH 229	MH 235	0.87		30	81.0	0.87	81.0	4.00	1.3							0.9	0.9	0.2	1.6	120.0	203	200	0.33	0.61	19.6	8%
	MH 235	MH 234	0.22		6	16.2	1.09	97.2	4.00	1.6							0.2	1.1	0.3	1.9	29.3	203	200	2.90	1.80	58.2	3%
Maxwell Bridge Rd	MH 234	MH 225	0.26		6	16.2	20.34	1504.6	3.68	22.4							0.3	20.3	5.7	28.1	79.8	305	300	0.25	0.69	50.4	56%
Celtic Ridge Cres	MH 230	MH 229	0.43		12	32.4	0.43	32.4	4.00	0.5							0.4	0.4	0.1	0.6	81.9	203	200	0.32	0.60	19.3	3%
	MH 229	MH 228	0.38		11	29.7	0.81	62.1	4.00	1.0							0.4	0.8	0.2	1.2	70.3	203	200	0.33	0.61	19.6	6%
	MH 228	MH 227	0.10		0	0.0	0.91	62.1	4.00	1.0							0.1	0.9	0.3	1.3	12.3	203	200	0.33	0.61	19.6	6%
	MH 227	MH 226	0.46		13	35.1	1.37	97.2	4.00	1.6							0.5	1.4	0.4	2.0	97.0	203	200	0.32	0.60	19.3	10%
	MH 226	MH 225	0.21		5	13.5	1.58	110.7	4.00	1.8							0.2	1.6	0.4	2.2	43.7	203	200	0.94	1.02	33.1	7%
Celtic Ridge Cres	MH 225	MH 224	0.58		12	32.4	22.50	1647.7	3.65	24.4							0.6	22.5	6.3	30.7	97.5	381	375	0.20	0.72	81.7	38%
	MH 224	MH 209	0.22		4	10.8	22.72	1658.5	3.65	24.5							0.2	22.7	6.4	30.9	66.5	381	375	0.20	0.72	81.7	38%
Streamside Cres	MH 217	MH 218	0.26	2		6.8	0.26	6.8	4.00	0.1							0.3	0.3	0.1	0.2	12.4	203	200	1.00	1.05	34.2	1%
	MH 218	MH 219	0.96	20		68.0	1.22	74.8	4.00	1.2							1.0	1.2	0.3	1.6	120.0	203	200	0.80	0.94	30.6	5%
	MH 219	MH 220	0.62	11		37.4	1.84	112.2	4.00	1.8							0.6	1.8	0.5	2.3	77.8	203	200	0.32	0.60	19.3	12%
Glenbrae Ave	MH 220	MH 221	0.96		28	75.6	2.80	187.8	4.00	3.0							1.0	2.8	0.8	3.8	118.9	203	200	0.32	0.60	19.3	20%
	MH 221	MH 222	1.04		33	89.1	3.84	276.9	4.00	4.5							1.0	3.8	1.1	5.6	119.0	203	200	0.32	0.60	19.3	29%
	MH 222	MH 223	0.20		3	8.1	4.04	285.0	4.00	4.6							0.2	4.0	1.1	5.7	12.9	203	200	0.39	0.66	21.3	27%
	MH 223	MH 210	0.22		4	10.8	4.26	295.8	4.00	4.8							0.2	4.3	1.2	6.0	72.9	203	200	0.33	0.61	19.6	30%
Streamside Cres	MH 217	MH 216	0.37	5		17.0	0.37	17.0	4.00	0.3							0.4	0.4	0.1	0.4	40.1	203	200	0.65	0.85	27.6	1%
	MH 216	MH 215	0.17	2		6.8	0.54	23.8	4.00	0.4							0.2	0.5	0.2	0.5	13.6	203	200	0.65	0.85	27.6	2%
	MH 215	MH 214	0.17	2		6.8	0.71	30.6	4.00	0.5							0.2	0.7	0.2	0.7	31.6	203	200	0.50	0.75	24.2	3%
	MH 214	MH 213	1.02	18		61.2	1.73	91.8	4.00	1.5							1.0	1.7	0.5	2.0	119.0	203	200	0.90	1.00	32.4	6%
	MH 213	MH 212	0.50	7		23.8	2.23	115.6	4.00	1.9							0.5	2.2	0.6	2.5	56.5	203	200	0.32	0.60	19.3	13%
Celtic Ridge Cres	MH 212	MH 211	1.04	16		54.4	3.27	170.0	4.00	2.8							1.0	3.3	0.9	3.7	124.9	203	200	0.32	0.60	19.3	19%
	MH 211	MH 210	0.94	16		54.4	4.21	224.4	4.00	3.6							0.9	4.2	1.2	4.8	122.0	203	200	0.33	0.61	19.6	25%
Celtic Ridge Cres	MH 210	MH 209	0.58	11		37.4	9.05	557.6	3.95	8.9							0.6	9.1	2.5	11.5	80.9	203	200	0.75	0.91	29.6	39%
Easement	MH 209	MH 208	0.06			0.0	31.83	2216.1	3.55	31.9							0.1	31.8	8.9	40.8	50.3	381	375	0.20	0.72	81.7	50%
	MH 208	MH 207	0.24			0.0	32.07	2216.1	3.55	31.9							0.2	32.1	9.0	40.9	111.6	381	375	0.20	0.72	81.7	50%
Area 4a - Phase 2 Lands																											
	MH 273	MH 272	0.57		9	24.3	0.57	24.3	4.00	0.4							0.6	0.6	0.2	0.6	66.0	203	200	0.65	0.85	27.6	2%
	MH 272	MH 271	0.92		16	43.2	1.49	67.5	4.00	1.1							0.9	1.5	0.4	1.5	90.2	203	200	0.40	0.67	21.6	7%
	MH 271	MH 270	1.06		19	51.3	2.55	118.8	4.00	1.9							1.1	2.6	0.7	2.6	113.0	203	200	0.40	0.67	21.6	12%
	MH 270	MH 207	0.00		0	0.0	2.55	118.8	4.00	1.9							0.0	2.6	0.7	2.6	16.0	254	250	0.32	0.69	35.1	8%
Easement	MH 207	MH 206	0.22			0.0	34.84	2240.4	3.55	32.2							0.2	34.8	9.8	41.9	100.0	457	450	0.20	0.81	132.9	32%
Area 2																											
	Area 2	MH 266	3.10			202	3.10	202.0	4.00	3.3							3.1	3.1	0.9	4.1	-	203	200	0.32	0.60	19.3	21%
Klondike Road & Area 4b																											
	MH 266	MH 265	0.24				3.34	202.0	4.00	3.3							0.2	3.3	0.9	4.2	93.7	203	200	0.32	0.60	19.3	22%
	Park	MH 265	1.89				1.89	0.0	4.00	0.0							1.9	1.9	0.5	0.5	13.0	203	200	0.32	0.60	19.3	3%
	MH 265	MH 264	0.31				5.54	202.0	4.00	3.3							0.3	5.5	1.6	4.8	120.0	203	200	0.32	0.60	19.3	25%

BROOKSIDE SUBDIVISION
SANITARY SEWER DESIGN SHEET

LOCATION			RESIDENTIAL AREA AND POPULATION								IND			INST		ICI	INFILTRATION			FLOW	PIPE						
Street	From Node	To Node	Area (ha)	Dwellings SFH	Dwellings TH	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak Factor	Peak Flow (l/s)	Area (ha)	Accu. Area (ha)	Peak Factor	Area (ha)	Accu. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (l/s)	Total Flow (l/s)	Length (m)	Dia Act (mm)	Dia Nom (mm)	Slope (%)	Velocity (Full) (m/s)	Capacity (Full) (l/s)	Ratio Q/Qfull (%)
Marconi Ave	MH 269	MH 268	0.14		3	8.1	0.14	8.1	4.00	0.1							0.1	0.1	0.0	0.2	21.3	203	200	1.00	1.05	34.2	0%
	MH 268	MH 267	0.11		2	5.4	0.25	13.5	4.00	0.2							0.1	0.3	0.1	0.3	26.6	203	200	0.56	0.79	25.6	1%
	MH 267	MH 264	0.95		26	70.2	1.20	83.7	4.00	1.4							1.0	1.2	0.3	1.7	120.0	203	200	0.67	0.86	28.0	6%
	MH 264	MH 263	0.78		20	54.0	7.52	339.7	4.00	5.5							0.8	7.5	2.1	7.6	100.0	254	250	0.24	0.60	30.4	25%
	MH 263	MH 262	0.91		27	72.9	8.43	412.6	4.00	6.7							0.9	8.4	2.4	9.0	88.3	254	250	0.24	0.60	30.4	30%
	MH 262	MH 206	0.95		29	78.3	9.38	490.9	3.98	7.9							1.0	9.4	2.6	10.5	118.0	254	250	0.24	0.60	30.4	35%
	MH 206	MH 205	0.10			0.0	44.32	2731.3	3.48	38.5							0.1	44.3	12.4	50.9	52.5	457	450	0.20	0.81	132.9	38%
Area 5a & 5b (KRP) - Klondike Road																											
	Area 5	MH 205									5.4	5.4	4.7			10.3	5.4	5.4	1.5	11.8	-	254	250	0.25	0.61	31.0	38%
Briar Ridge Pump Station Access Road + Area 6 (KRP)																											
	MH 205	MH 204					44.32	2731.3	3.48	38.5		5.4	4.7			10.3	0.0	49.7	13.9	62.7	79.7	457	450	0.20	0.81	132.9	47%
	MH 204	MH 203					44.32	2731.3	3.48	38.5		5.4	4.7			10.3	0.0	49.7	13.9	62.7	79.7	457	450	0.20	0.81	132.9	47%
	Area 6	MH 203									7.9	7.9	4.4			14.1	7.9	7.9	2.2	16.3	-	254	250	0.25	0.61	31.0	53%
	MH 203	MH 202					44.32	2731.3	3.48	38.5		13.3	3.9			21.0	0.0	57.6	16.1	75.6	90.0	457	450	0.26	0.92	151.6	50%
	MH 202	MH 201B					44.32	2731.3	3.48	38.5		13.3	3.9			21.0	0.0	57.6	16.1	75.6	95.0	457	450	0.26	0.92	151.6	50%
	MH 201B	MH 201A					44.32	2731.3	3.48	38.5		13.3	3.9			21.0	0.0	57.6	16.1	75.6	85.0	457	450	0.25	0.91	148.6	51%
	MH 201A	MH 201					44.32	2731.3	3.48	38.5		13.3	3.9			21.0	0.0	57.6	16.1	75.6	90.0	457	450	0.25	0.91	148.6	51%
	MH 201	PS					44.32	2731.3	3.48	38.5		13.3	3.9			21.0	0.0	57.6	16.1	75.6	21.6	457	450	0.15	0.70	115.1	66%
Area 7 (KRP - Ex. Golf Course)																											
	Ex. MH	PS									15.2	15.2	3.9			24.0	15.2	15.2	4.3	28.3							
Area 8 (Claridge Lands)																											
	Ex. MH	PS	45.57			3100	45.57	3100.0	3.43	43.1							45.6	45.6	12.8	55.8							
Pump Station (Areas 1-8)							89.89	5831.3	3.18	75.2		28.5	3.4			39.3	0.0	118.4	33.1	147.6							

DESIGN PARAMETERS

Average Daily Flow=	350	L/cap/day	Industrial Peak Factor= per MOE graph			
Comm/Inst Flow=	50000	L/ha/day	Extraneous Flow=	0.28 L/s/ha	0.3	L/s/ha
Industrial Flow=	35000	L/ha/day	Minimum Velocity=	0.60 m/s	0.60	m/s
Max Res Peak Factor=	4.00		Manning's n=	0.013	0	
Comm/Inst Peak Factor=	1.50					

Designed: MAB

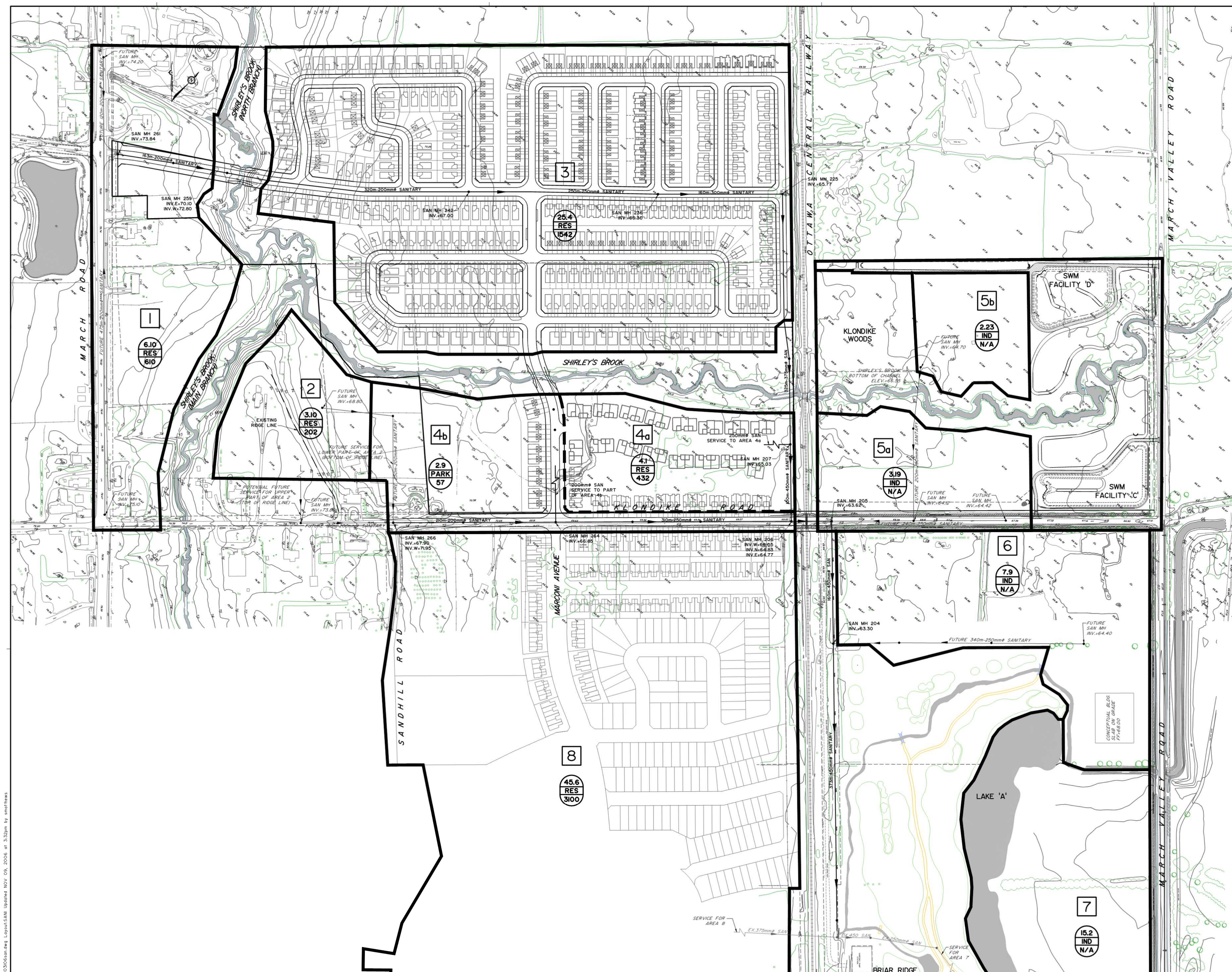
Checked: JGR

Dwg. Reference: 103106-SAN1
103106-SAN2

PROJECT:
Brookside Subdivision

CLIENT:
Klondike Developments Inc

Date: August 29, 2007



LEGEND

3	AREA I.D.
10.5	AREA IN HECTARES
RES	LANDUSE TYPE: RES = RESIDENTIAL, IND = LIGHT INDUSTRIAL
500	POPULATION ESTIMATE
(heavy line)	SANITARY DRAINAGE AREA BOUNDARY

NOTES:

1. SANITARY DRAINAGE AREAS AND POPULATION VALUES DEPICTED ON THIS DRAWING WERE TAKEN FROM THE "BRIAR RIDGE SANITARY PUMP STATION PRE-DESIGN REPORT" BY CCL (REPORT No. xxxxxxx). THE BOUNDARY LINES ON THIS PLAN HAVE BEEN APPROXIMATED FROM THAT REPORT. PRECISE BOUNDARY LOCATIONS SHOULD BE TAKEN FROM THE APPROVED PUMPING STATION REPORT.

2. AREA No.1 AS BOUNDED HAS A LAND AREA OF 9.0ha. A SIZEABLE PORTION IS ATTRIBUTED TO FUTURE STORMWATER MANAGEMENT FACILITY 'A' WHICH HAS YET TO BE DESIGNED. THE BALANCE OF THE LAND AREA IS ATTRIBUTED TO RESIDENTIAL AND ROADWAY USES. THE DEVELOPMENT AREA=6.10ha WITH POPULATION 610 IS TAKEN DIRECTLY FROM THE "BRIAR RIDGE SANITARY PUMP STATION PRE-DESIGN REPORT".

3. AREA No.2 CURRENTLY EXCLUDES A SMALL PARCEL OF LAND (±1.1ha) ON THE NORTH SIDE OF KLONDIKE ROAD BETWEEN SANDHILL ROAD AND SHIRLEY'S BROOK. THE CITY OF OTTAWA MAY CHOOSE TO EXPLORE SERVICING THIS PARCEL WITH A CONNECTION TO A FUTURE SANITARY SEWER WITHIN KLONDIKE ROAD. RESIDUAL FREE FLOW CAPACITY APPEARS TO EXIST IN THE SANITARY SEWER LINES TO THE PUMP STATION.

4. FOR AREAS No. 3, No. 5 AND No.6 THE POPULATION AND AREA VALUES HAVE BEEN UPDATED FROM THE NOVEMBER 2000 CCL REPORT "BRIAR RIDGE SANITARY PUMP STATION PRE-DESIGN REPORT" TO REFLECT THE LATEST LANDUSE PLANS.

5. ALL PIPE DISTANCES AND SLOPE VALUES IDENTIFIED ON THIS PLAN ARE NOMINAL.

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
9.	AS-BUILT	JAN 16/14	MAB
8.	ISSUED FOR MOE APPROVAL	NOV 09/06	MAB
7.	ISSUED TO CLIENT	OCT 10/06	MAB
6.	ISSUED FOR CONSTRUCTION	AUG 17/06	MAB
5.	ISSUED WITH MOE APPLICATION	AUG 08/06	MAB
4.	ISSUED FOR TENDER	MAY 26/06	MAB
3.	ISSUED FOR MOE APPROVAL	MAY 01/06	MAB
2.	REVISED PER CITY COMMENTS	APR 24/06	MAB
1.	ISSUED TO CITY FOR REVIEW	MAR 20/06	MAB

LICENSED PROFESSIONAL ENGINEER M.A. BISSETT PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J.G. RIDDELL PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
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Facsimile (613) 254-5867
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DESIGN	MAB
CHECKED	SAY
DRAWN	SM
CHECKED	MAB
APPROVED	JGR
SCALE	1:2000

CITY OF OTTAWA

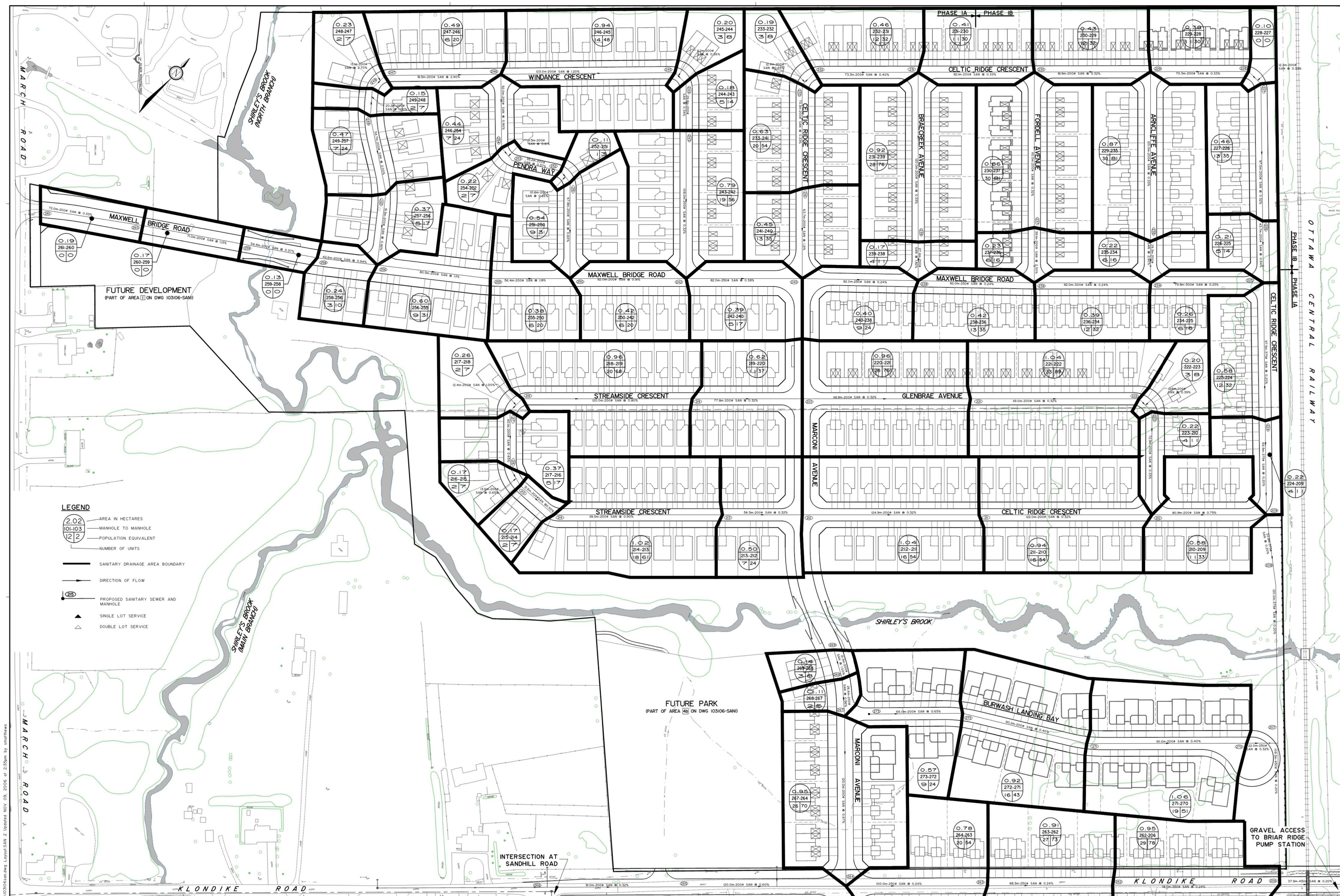
BROOKSIDE SUBDIVISION

BRIAR RIDGE PUMP STATION SANITARY DRAINAGE PLAN

PROJECT No. 103106-0
DATE AUGUST 2005
DRAWING No. 103106-SANI

Drawing:M:\2003\103106\CAD\design\103106san.dwg Layout:SANI Updated NOV 09, 2006 at 3:32pm by smatthews

PLANBI.DWG - 1000mmX707mm



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	No.	REVISION	DATE	BY
				7.	ISSUED FOR TENDER	MAY 26/06	MAB
13.	AS-BUILT	JAN 16/14	MAB	6.	ISSUED FOR MOE APPROVAL	MAY 01/06	MAB
12.	PHASE 2 DRAINAGE AREAS ADDED	AUG 29/07	MAB	5.	REVISED PER CITY COMMENTS	APR 24/06	MAB
11.	ISSUED FOR MOE APPROVAL	NOV 09/06	MAB	4.	ISSUED TO CITY FOR REVIEW	MAR 20/06	MAB
10.	ISSUED TO CLIENT	OCT 10/06	MAB	3.	ISSUED TO CITY FOR REVIEW	FEB 22/06	MAB
9.	ISSUED FOR CONSTRUCTION	AUG 17/06	MAB	2.	ISSUED TO CITY FOR REVIEW	JAN 20/06	MAB
8.	ISSUED WITH MOE APPLICATION	AUG 08/06	MAB	1.	ISSUED TO CITY FOR REVIEW	NOV 11/05	MAB

LICENSED PROFESSIONAL ENGINEER — M.A. BISSETT — PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER — J.G. RIDDELL — PROVINCE OF ONTARIO

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DESIGN	MAB
CHECKED	SAY
DRAWN	SM
CHECKED	MAB
APPROVED	JGR
SCALE	1:1000

CITY OF OTTAWA

BROOKSIDE SUBDIVISION

BROOKSIDE SUBDIVISION SANITARY DRAINAGE PLAN

PROJECT No.	103106-0
DATE	AUGUST 2005
DRAWING No.	103106-SAN2

PLANBLDWG - 1000mmX707mm

KANATA NORTH URBAN EXPANSION AREA

COMMUNITY DESIGN PLAN

Table C-3: East March Trunk Sewer Capacity Analysis to March Pump Station (Buildout in 2031)

PROJECT : 112117
DESIGNED BY: ARM
CHECKED BY: CJR
DATE: Mar-16

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION					EXISTING SEWER PIPE								CHECK
Area [1]	FROM MH	TO MH	PEAK INFLOW Q(p) (L/s) [1]	CUUMUL. FLOW Q(d) (L/s)	LENGTH (m)[3]	DIA. (mm)	PIPE ID (mm)	TYPE OF PIPE	SLOPE (%)[3]	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	AVAIL. CAPACITY (L/s)	Qpeak/ Qcap[3]
A1-a6 & KNUEA	1	2	255.00	255.00	115.6	750	762.0	CONC	0.27	603.5	1.32	348.5	42.3%
	2	3		255.00	97.8	750	762.0	CONC	0.10	367.3	0.81	112.3	69.4%
	3	4		255.00	89.6	750	762.0	CONC	0.08	328.5	0.72	73.5	77.6%
	4	5		255.00	92.3	750	762.0	CONC	0.05	259.7	0.57	4.7	98.2%
	5	6		255.00	68.9	750	762.0	CONC	0.15	449.8	0.99	194.8	56.7%
	6	7		255.00	126.0	750	762.0	CONC	0.06	284.5	0.62	29.5	89.6%
	7	8		255.00	74.8	750	762.0	CONC	0.13	418.8	0.92	163.8	60.9%
	8	9		255.00	92.5	750	762.0	CONC	0.16	464.6	1.02	209.6	54.9%
	9	10		255.00	234.7	750	762.0	CONC	0.07	307.3	0.67	52.3	83.0%
	10	11		255.00	132.6	750	762.0	CONC	0.12	402.3	0.88	147.3	63.4%
	11	12		255.00	67.6	750	762.0	CONC	0.25	580.7	1.27	325.7	43.9%
	12	13		255.00	67.0	750	762.0	CONC	0.15	449.8	0.99	194.8	56.7%
	13	14		255.00	75.0	750	762.0	CONC	0.13	418.8	0.92	163.8	60.9%
	14	15		255.00	70.2	750	762.0	CONC	0.13	418.8	0.92	163.8	60.9%
	15	16		255.00	56.5	750	762.0	CONC	0.18	492.7	1.08	237.7	51.8%
	16	17		255.00	65.4	750	762.0	CONC	0.14	434.6	0.95	179.6	58.7%
	17	18		255.00	58.3	750	762.0	CONC	0.34	677.2	1.48	422.2	37.7%
	18	19		255.00	46.1	750	762.0	CONC	0.41	743.7	1.63	488.7	34.3%
	19	20		255.00	69.6	750	762.0	CONC	0.10	367.3	0.81	112.3	69.4%
	20	21		255.00	54.9	750	762.0	CONC	0.10	367.3	0.81	112.3	69.4%
	21	22		255.00	56.7	750	762.0	CONC	0.35	687.1	1.51	432.1	37.1%
	22	23		255.00	71.7	750	762.0	CONC	0.28	614.6	1.35	359.6	41.5%
	23	24		255.00	48.8	750	762.0	CONC	0.18	492.7	1.08	237.7	51.8%
	24	25		255.00	57.0	750	762.0	CONC	0.18	492.7	1.08	237.7	51.8%
	25	26		255.00	51.0	750	762.0	CONC	0.18	492.7	1.08	237.7	51.8%
	26	27		255.00	53.1	750	762.0	CONC	0.17	478.9	1.05	223.9	53.3%
	27	28		255.00	58.8	750	762.0	CONC	0.10	367.3	0.81	112.3	69.4%
	28	29		255.00	51.4	750	762.0	CONC	0.31	646.6	1.42	391.6	39.4%
	29	30		255.00	88.2	750	762.0	CONC	0.19	506.2	1.11	251.2	50.4%
	30	31		255.00	25.7	750	762.0	CONC	0.27	603.5	1.32	348.5	42.3%
	31	32		255.00	6.4	750	762.0	CONC	0.10	367.3	0.81	112.3	69.4%
	Overall			255.00	2324.2	750	762.0	CONC	0.18	492.7	1.08	237.7	51.8%

Notes:
1. 255L/s in 2031 per 2013 IMP includes KNUEA build-out(as provided by City of Ottawa, email March 22, 2016) (Appendix C-2)
2. Lengths and slopes of EMT based on as-built elevations
3. Isolated sections may exceed 100% design capacity, and may temporarily surcharge. Due to the depth of the trunk sewer, general excess capacity and lack of direct connections, there should be no adverse impacts of localised surcharging.

KANATA NORTH URBAN EXPANSION AREA

EMT Analysis - KNUEA and Future Lands West of Copperwood Estate

NOVATECH
Engineers, Planners & Landscape Architects

PROJECT :	116132
DESIGNED BY:	ARM
CHECKED BY:	CJR
DATE:	Mar-16
Revised:	December 23, 2021

LOCATION					EXISTING SEWER PIPE								CHECK
Area [1]	FROM MH	TO MH	PEAK INFLOW Q(p) (L/s) [1]	CUUMUL. FLOW Q(d) (L/s)	LENGTH (m)[3]	DIA. (mm)	PIPE ID (mm)	TYPE OF PIPE	SLOPE (%)[3]	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	AVAIL. CAPACITY (L/s)	Qpeak/ Qcap[3]
A1-a6 & KNUEA	1	2	341.90	341.90	115.6	750	762.0	CONC	0.27	603.5	1.32	261.6	56.7%
	2	3		341.90	97.8	750	762.0	CONC	0.10	367.3	0.81	25.4	93.1%
	3	4		341.90	89.6	750	762.0	CONC	0.08	328.5	0.72	-13.4	104.1%
	4	5		341.90	92.3	750	762.0	CONC	0.05	259.7	0.57	-82.2	131.7%
	5	6		341.90	68.9	750	762.0	CONC	0.15	449.8	0.99	107.9	76.0%
	6	7		341.90	126.0	750	762.0	CONC	0.06	284.5	0.62	-57.4	120.2%
	7	8		341.90	74.8	750	762.0	CONC	0.13	418.8	0.92	76.9	81.6%
	8	9		341.90	92.5	750	762.0	CONC	0.16	464.6	1.02	122.7	73.6%
	9	10		341.90	234.7	750	762.0	CONC	0.07	307.3	0.67	-34.6	111.3%
	10	11		341.90	132.6	750	762.0	CONC	0.12	402.3	0.88	60.4	85.0%
	11	12		341.90	67.6	750	762.0	CONC	0.25	580.7	1.27	238.8	58.9%
	12	13		341.90	67.0	750	762.0	CONC	0.15	449.8	0.99	107.9	76.0%
	13	14		341.90	75.0	750	762.0	CONC	0.13	418.8	0.92	76.9	81.6%
	14	15		341.90	70.2	750	762.0	CONC	0.13	418.8	0.92	76.9	81.6%
	15	16		341.90	56.5	750	762.0	CONC	0.18	492.7	1.08	150.8	69.4%
	16	17		341.90	65.4	750	762.0	CONC	0.14	434.6	0.95	92.7	78.7%
	17	18		341.90	58.3	750	762.0	CONC	0.34	677.2	1.48	335.3	50.5%
	18	19		341.90	46.1	750	762.0	CONC	0.41	743.7	1.63	401.8	46.0%
	19	20		341.90	69.6	750	762.0	CONC	0.10	367.3	0.81	25.4	93.1%
	20	21		341.90	54.9	750	762.0	CONC	0.10	367.3	0.81	25.4	93.1%
	21	22		341.90	56.7	750	762.0	CONC	0.35	687.1	1.51	345.2	49.8%
	22	23		341.90	71.7	750	762.0	CONC	0.28	614.6	1.35	272.7	55.6%
	23	24		341.90	48.8	750	762.0	CONC	0.18	492.7	1.08	150.8	69.4%
	24	25		341.90	57.0	750	762.0	CONC	0.18	492.7	1.08	150.8	69.4%
	25	26		341.90	51.0	750	762.0	CONC	0.18	492.7	1.08	150.8	69.4%
	26	27		341.90	53.1	750	762.0	CONC	0.17	478.9	1.05	137.0	71.4%
	27	28		341.90	58.8	750	762.0	CONC	0.10	367.3	0.81	25.4	93.1%
	28	29		341.90	51.4	750	762.0	CONC	0.31	646.6	1.42	304.7	52.9%
	29	30		341.90	88.2	750	762.0	CONC	0.19	506.2	1.11	164.3	67.5%
	30	31		341.90	25.7	750	762.0	CONC	0.27	603.5	1.32	261.6	56.7%
	31	32		341.90	6.4	750	762.0	CONC	0.10	367.3	0.81	25.4	93.1%
	Overall			341.90	2324.2	750	762.0	CONC	0.18	492.7	1.08	150.8	69.4%

Notes:

1. 341.9L/s in 2031 per 2013 IMP includes KNUEA build-out plus areas A1-A6 adjacent to the EMT. Areas in reference to KNMSS - East March Trunk Sanitary Drainage Area Plan.
2. Lengths and slopes of EMT based on as-built elevations
3. Isolated sections may exceed 100% design capacity, and may temporarily surcharge. Due to the depth of the trunk sewer, general excess capacity and lack of direct connections, there should be no adverse impacts of localised surcharging.

Steve Zorgel

From:	Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent:	Friday, September 24, 2021 9:44 AM
To:	Steve Zorgel
Cc:	Marc St.Pierre
Subject:	FW: March PS - SAN HGL
Attachments:	D-695305-C302.pdf; EMT_OverflowAnalysis_2031.jpg

Hi Steve,

See response below and attached.

Regards,

Gabrielle (Gabi) Schaeffer, P.Eng
Senior Engineer - Infrastructure Applications

City of Ottawa
Development Review - West Branch
Planning, Infrastructure and Economic Development Department
110 Laurier Ave West, 4th Floor East;
Ottawa ON K1P 1J1
Mail Code 01-14
Tel: 613-580-2424 x 22517
Cell: 613-227-7419
Fax: 613-560-6006

From: Bougadis, John <John.Bougadis@ottawa.ca>
Sent: September 23, 2021 4:33 PM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: March PS - SAN HGL

Novatech can use the sanitary model prepared for the Kanata North MSS. The overflow elevation at the March PS lift station will be 71.6m (see 1st attachment). The 2031 peak flow at March PS is 256 l/s (see below). Do not use the 2060 projected flow rate (scenario assumed lands outside of the current Urban Boundary which Council rejected as part of the 2021 OP).

out of service 490L/s.

3.2 FLOW PROJECTIONS

The 2014 City of Ottawa Wastewater Infrastructure Master Plan provides peak dry weather and design wet weather flows for the pump station following the gravity connection of the Marchwood Trunk Sewer to North Kanata Gravity Trunk Sewer (NKTS). These projections ar anticipated future flows in the East March Trunk Sewer that will be the sole feed into the M Road PS. The City's projections are presented below in **Table 1**.

Table 1: Future Flow Projections

Flow Conditions (L/s)	2017	2031	2060
Average Dry Weather Flow (ADWF)	18*	45†	103†
Peak Dry Weather Flow (PDWF)	29*	171	367
Peak Wet Weather Flow (PWWF)	125	256	586

* 2011 flow values provided by the 2014 Infrastructure Master Plan.

† 2031 and 2060 ADWFs calculated using a peaking factor of 5.7. This peaking factor was taken as th of the 2017 ADWF/PWWF.

Note that the average and peak dry weather flows (ADWF and PDWF) are expected to m than double from 2017 to 2031 and from 2031 to 2060. Similarly, the design wet weather fl are also expected to double between each projection period. This represents significant increases in all flow conditions over the design period.

I completed a high-level HGL assessment back in 2017 to support the March PS FDR assignment (see attached). My assessment considered a station failure under a 2031 planning horizon with the proposed overflow elevation at the future March Lift station. The HGL elevation of 72.88 m at MHSA 12546 located on the East March Trunk near Shirley's Brooke can be used as a BC for Novatech's assessment.

Hope this helps!

John
x14990

From: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent: 2021/09/23 16:01
To: Bougadis, John <John.Bougadis@ottawa.ca>
Subject: FW: March PS - SAN HGL

Hi John,

Is there someone who can provide this in your absence?

Gabi

From: Steve Zorgel <s.zorgel@novatech-eng.com>
Sent: September 23, 2021 3:06 PM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: Marc St.Pierre <m.stpierre@novatech-eng.com>
Subject: March PS - SAN HGL

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Hi Gabrielle,

We are looking over previous comments for CU Developments during the draft plan stage and would like to confirm this comment from Round 1 comments (Nov. 30, 2018):

59. *In light of recent works undertaken for the March PS project, the sanitary overflow at the March station may not provide relief to the Kanata North Urban Expansion Area (KNUEA) during a station failure. An update to the analysis to ensure HGLs do not rise above the USFs in this development is required during detailed design. The City can provide Novatech with additional information to minimize time and effort (i.e. 2017 calibrated PCSWMM model expected to be complete this fall, future overflow elevation at the station PS, etc.).*
Noted.

Can you kindly provide the calibrated model to confirm sanitary HGL levels for our site in the event of a station failure?

Please let us know, thank you.

Steve Zorgel, **P.Eng.,** Project Coordinator | Engineering
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x298 | Fax: 613.254.5867
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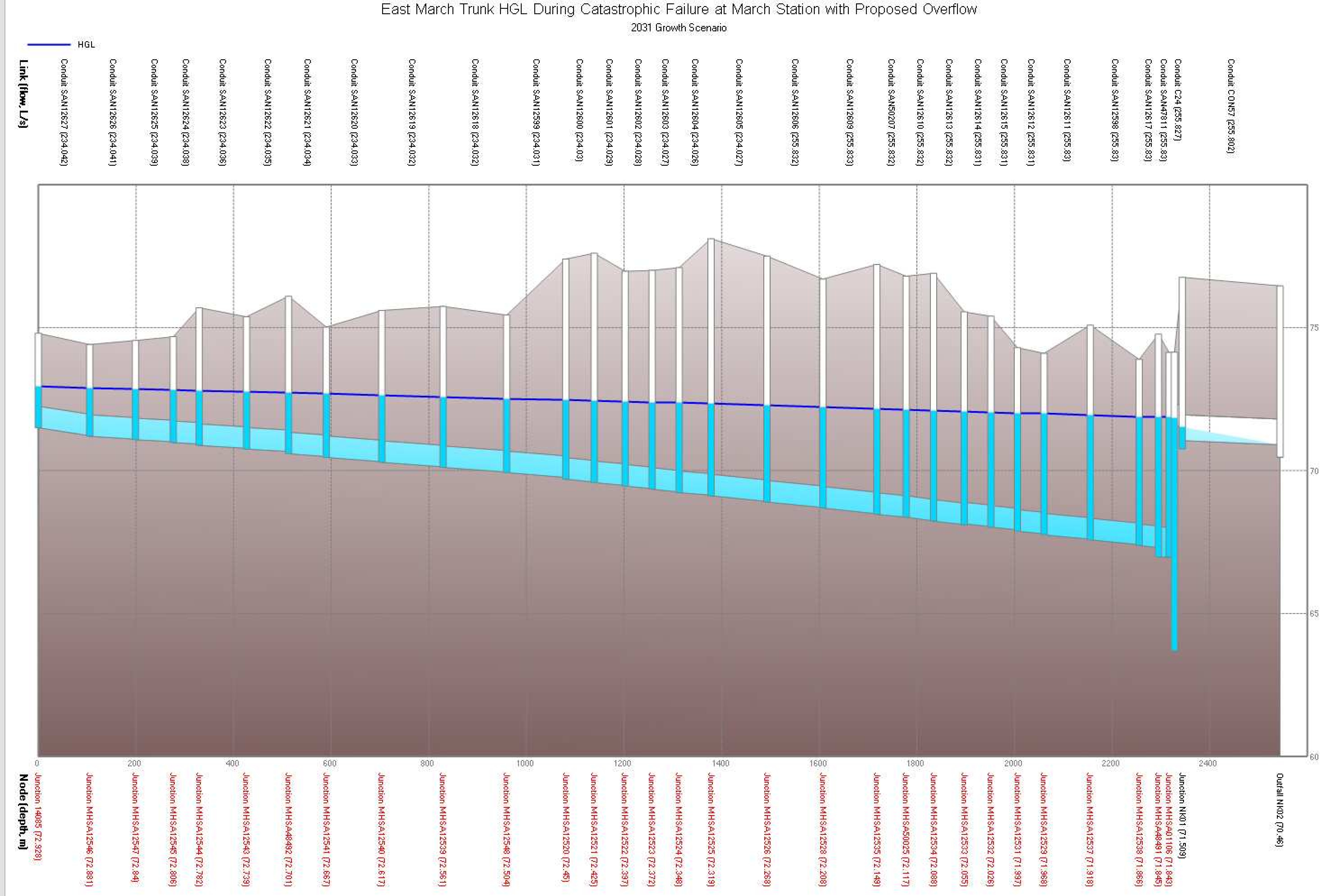
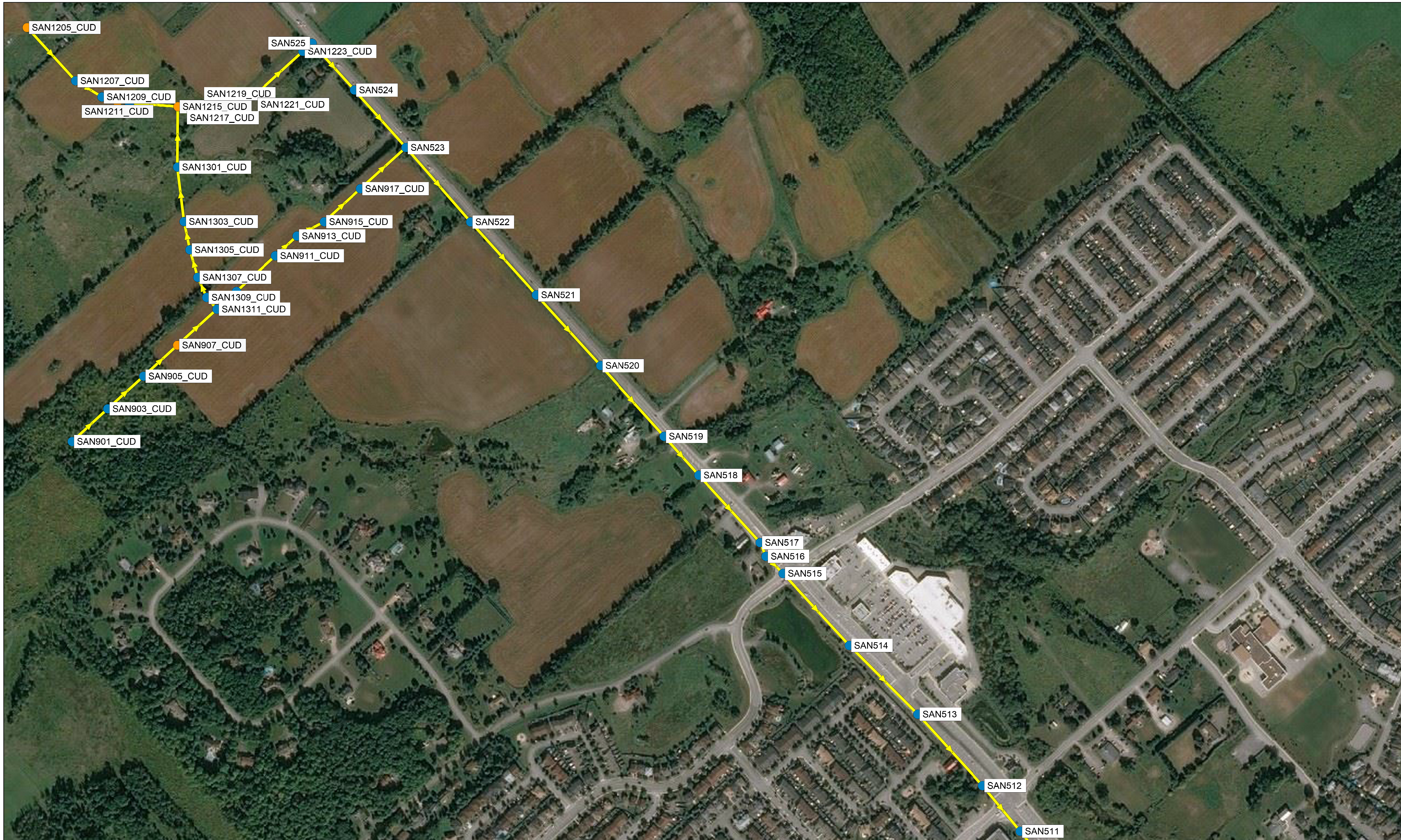

East March Trunk HGL During Catastrophic Failure at March Station with Proposed Overflow
2031 Growth Scenario
HGL
Link (flow, L/s)
Conduit SAN12627 (234.042)
Conduit SAN12626 (234.041)
Conduit SAN12625 (234.039)
Conduit SAN12624 (234.038)
Conduit SAN12623 (234.036)
Conduit SAN12622 (234.035)
Conduit SAN12621 (234.034)
Conduit SAN12620 (234.033)
Conduit SAN12619 (234.032)
Conduit SAN12618 (234.032)
Conduit SAN12599 (234.031)
Conduit SAN12600 (234.03)
Conduit SAN12601 (234.029)
Conduit SAN12602 (234.028)
Conduit SAN12603 (234.027)
Conduit SAN12604 (234.026)
Conduit SAN12605 (234.027)
Conduit SAN12606 (255.832)
Conduit SAN12609 (255.833)
Conduit SAN50207 (255.832)
Conduit SAN12610 (255.832)
Conduit SAN12613 (255.832)
Conduit SAN12614 (255.831)
Conduit SAN12615 (255.831)
Conduit SAN12612 (255.831)
Conduit SAN12611 (255.83)
Conduit SAN12598 (255.83)
Conduit SAN12617 (255.83)
Conduit SAN47811 (255.83)
Conduit C24 (255.827)
Conduit CON57 (255.802)
75
70
65
60
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
Node (depth, m)
Junction 14085 (72.928)
Junction MHSA12546 (72.881)
Junction MHSA12547 (72.84)
Junction MHSA12545 (72.806)
Junction MHSA12544 (72.782)
Junction MHSA12543 (72.739)
Junction MHSA48492 (72.701)
Junction MHSA12541 (72.667)
Junction MHSA12540 (72.617)
Junction MHSA12539 (72.561)
Junction MHSA12548 (72.504)
Junction MHSA12520 (72.45)
Junction MHSA12521 (72.425)
Junction MHSA12522 (72.397)
Junction MHSA12523 (72.372)
Junction MHSA12524 (72.348)
Junction MHSA12525 (72.319)
Junction MHSA12526 (72.268)
Junction MHSA12528 (72.208)
Junction MHSA12535 (72.149)
Junction MHSA50025 (72.117)
Junction MHSA12534 (72.088)
Junction MHSA12533 (72.055)
Junction MHSA12532 (72.028)
Junction MHSA12531 (71.997)
Junction MHSA12529 (71.968)
Junction MHSA12537 (71.918)
Junction MHSA12538 (71.866)
Junction MHSA48481 (71.845)
Junction MHSA01106 (71.843)
Junction NK01 (71.509)
Outfall NK02 (70.46)



SAN1205_CUD
SAN1207_CUD
SAN1209_CUD
SAN1211_CUD
SAN1215_CUD
SAN1217_CUD
SAN1219_CUD
SAN1221_CUD
SAN525
SAN1223_CUD
SAN524
SAN523
SAN1301_CUD
SAN917_CUD
SAN1303_CUD
SAN915_CUD
SAN913_CUD
SAN1305_CUD
SAN911_CUD
SAN1307_CUD
SAN1309_CUD
SAN1311_CUD
SAN907_CUD
SAN905_CUD
SAN903_CUD
SAN901_CUD
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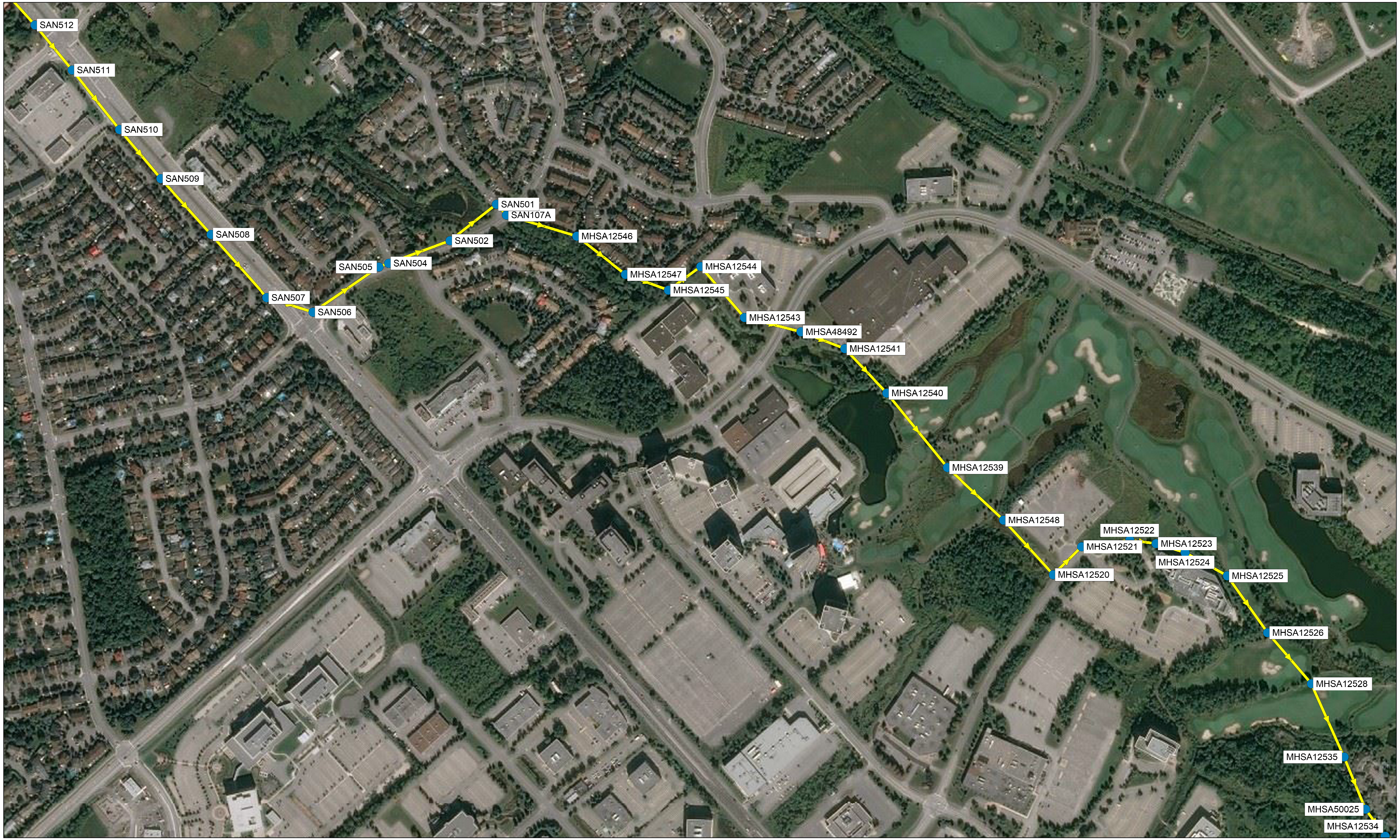
SAN512
SAN511



SAN512
SAN511
SAN510
SAN509
SAN508
SAN507
SAN506
SAN505
SAN504
SAN502
SAN501
SAN107A
MHSA12546
MHSA12547
MHSA12544
MHSA12545
MHSA12543
MHSA48492
MHSA12541
MHSA12540
MHSA12539
MHSA12548
MHSA12522
MHSA12521
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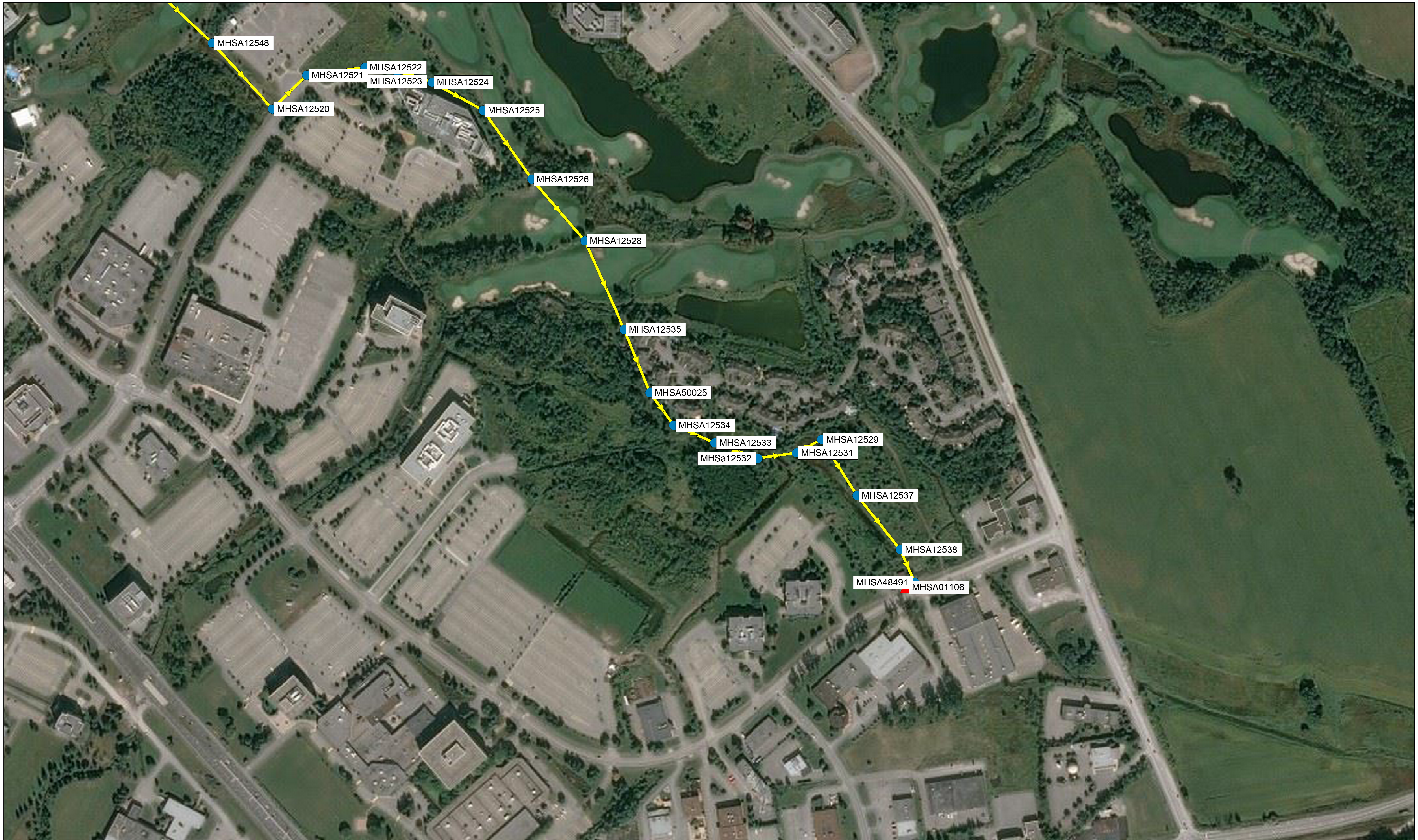
MHSA50025
MHSA12534



MHSA12548
MHSA12521
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MHSA12525
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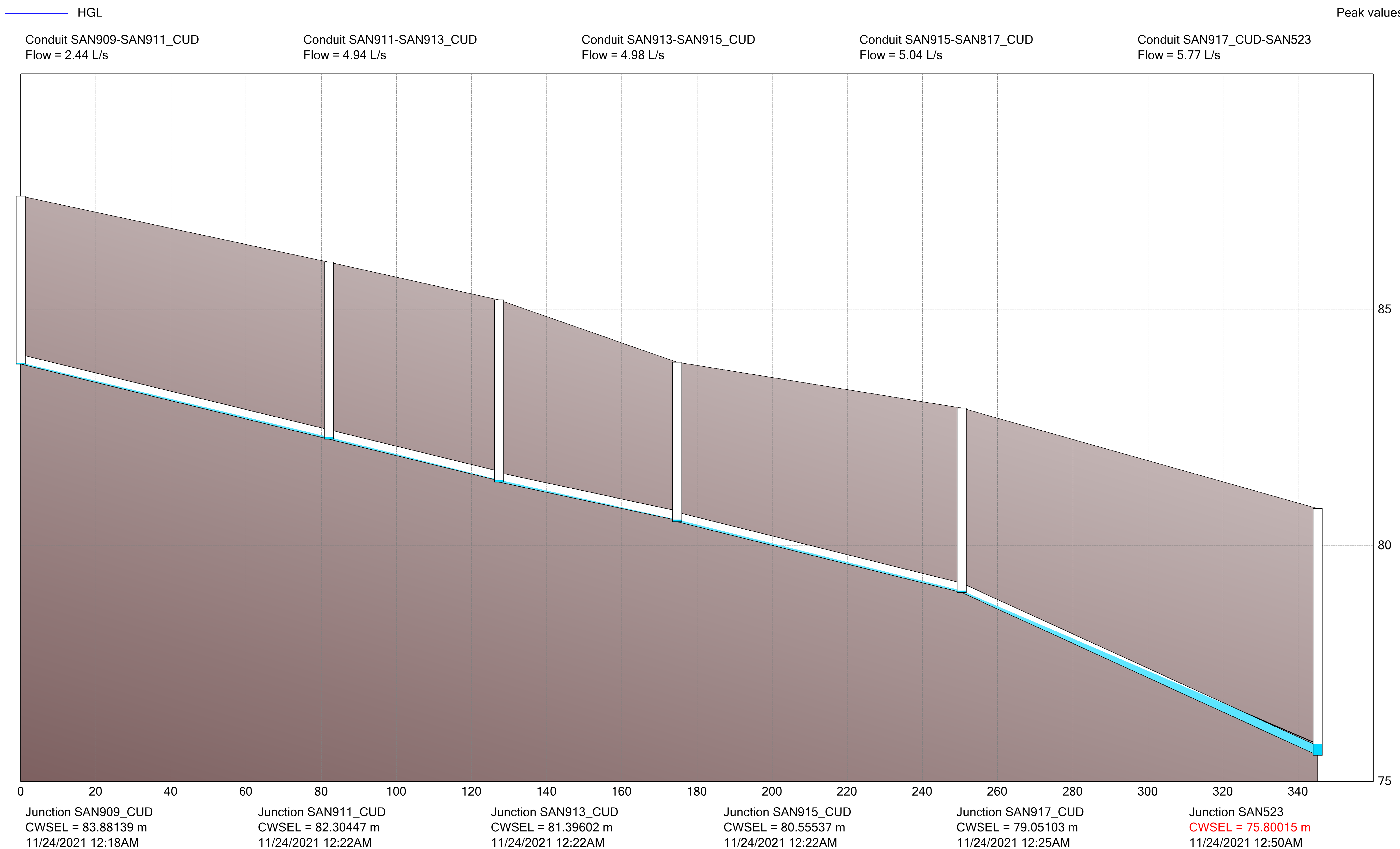
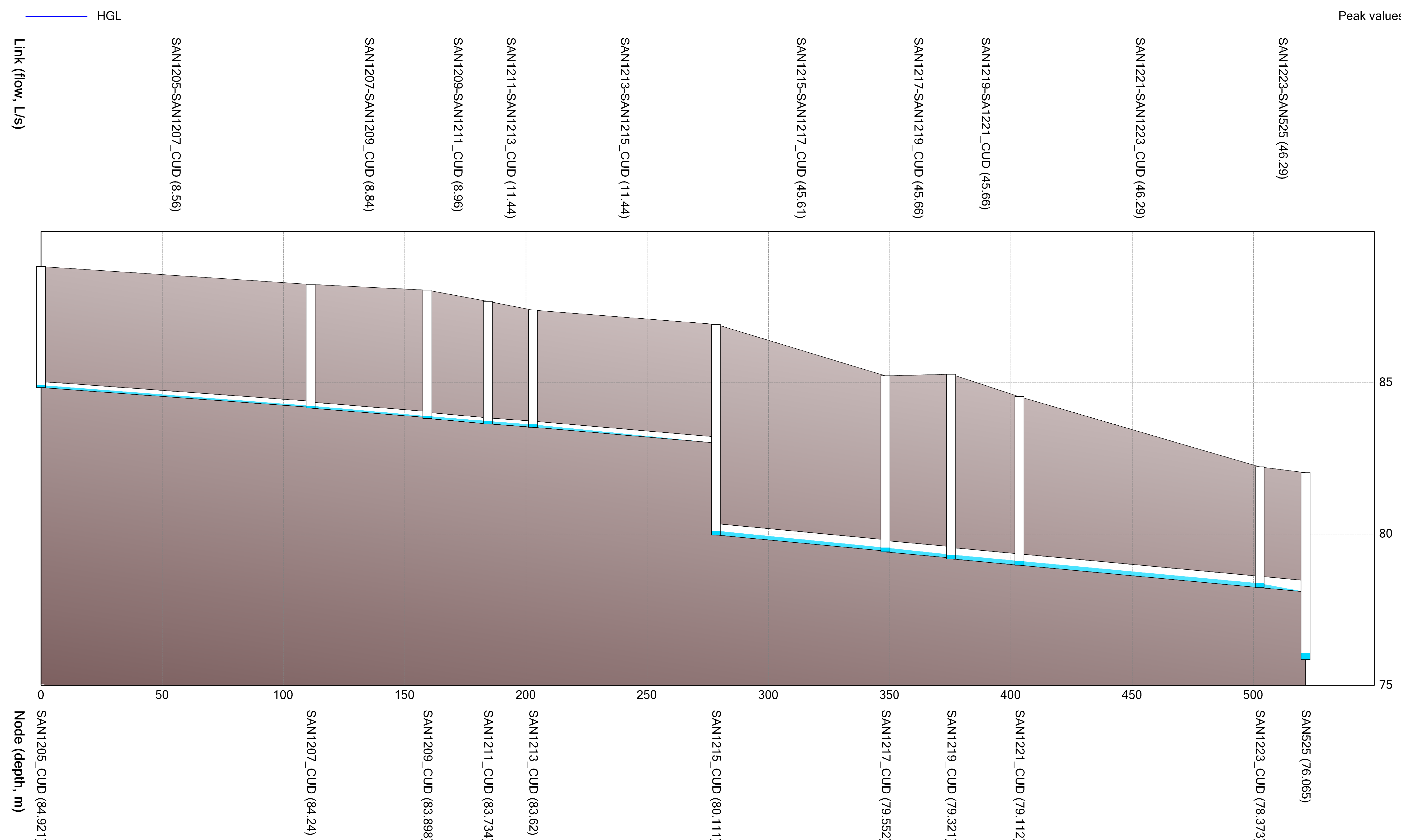
MHSA12528
MHSA12535
MHSA50025
MHSA12534
MHSA12533
MHSA12529
MHSa12532
MHSA12531
MHSA12537
MHSA12538
MHSA48491
MHSA01106

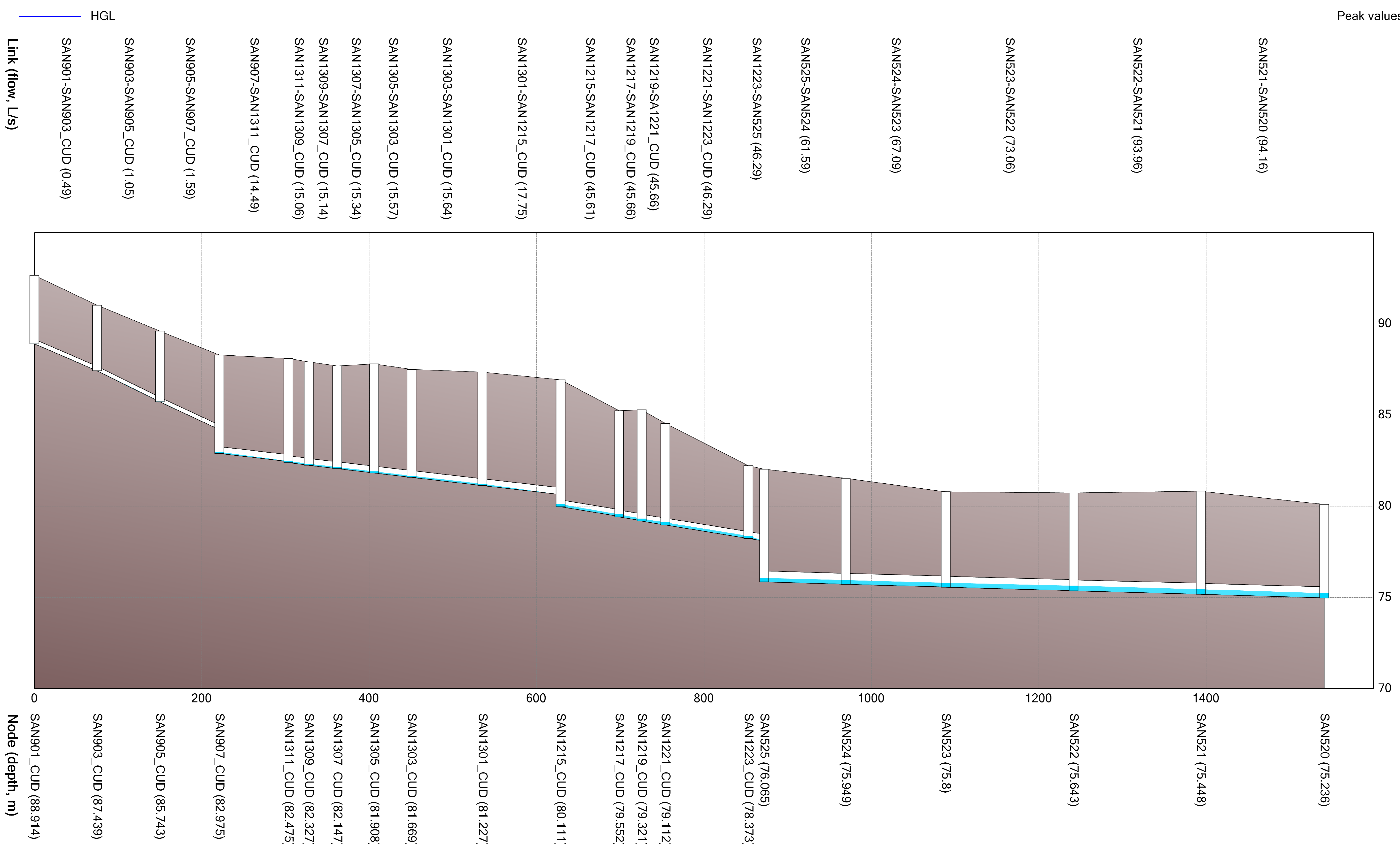
HGL Analysis - KNUEA including Copperwood Estate



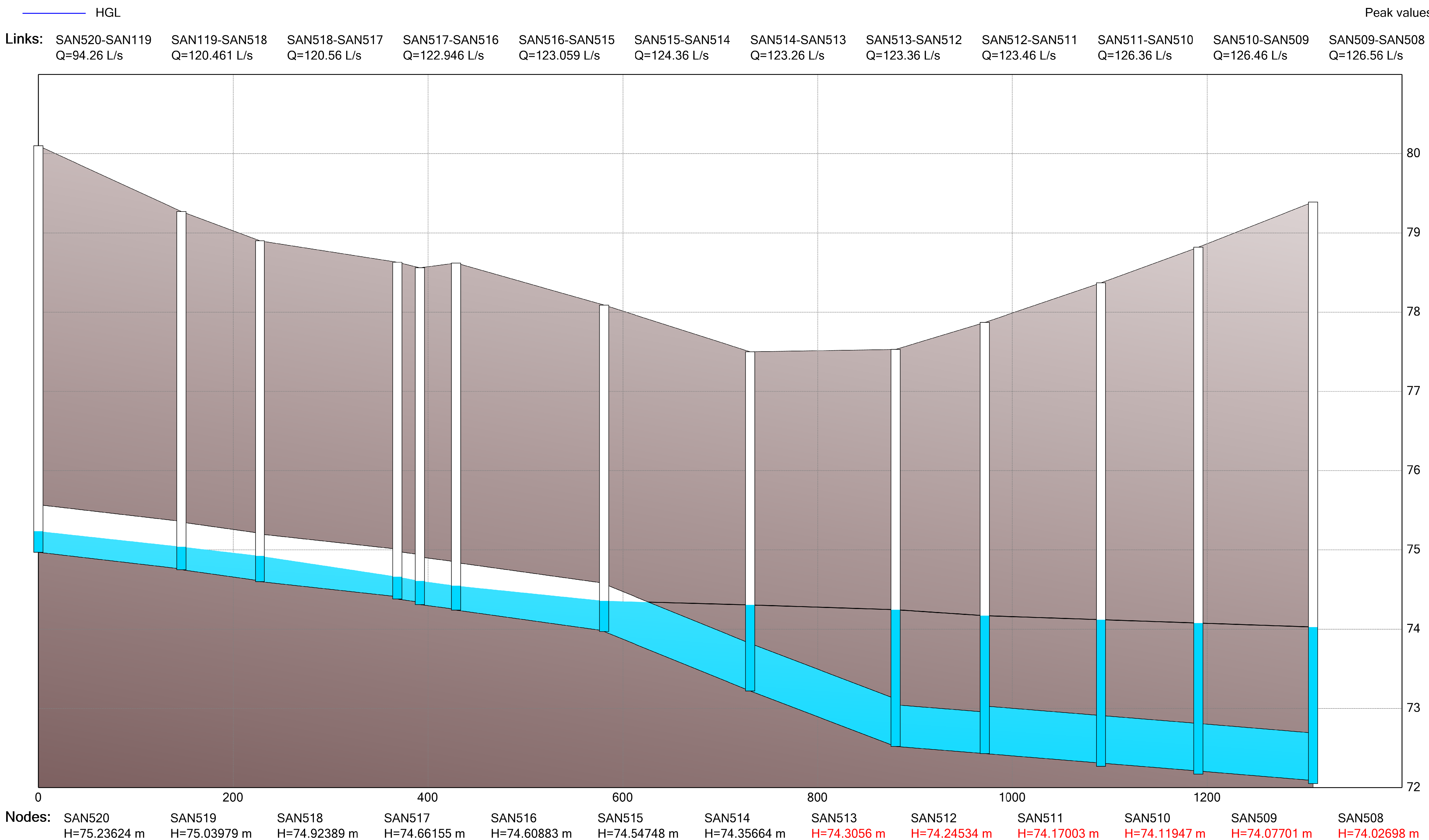
HGL Analysis - KNUEA including Copperwood Estate



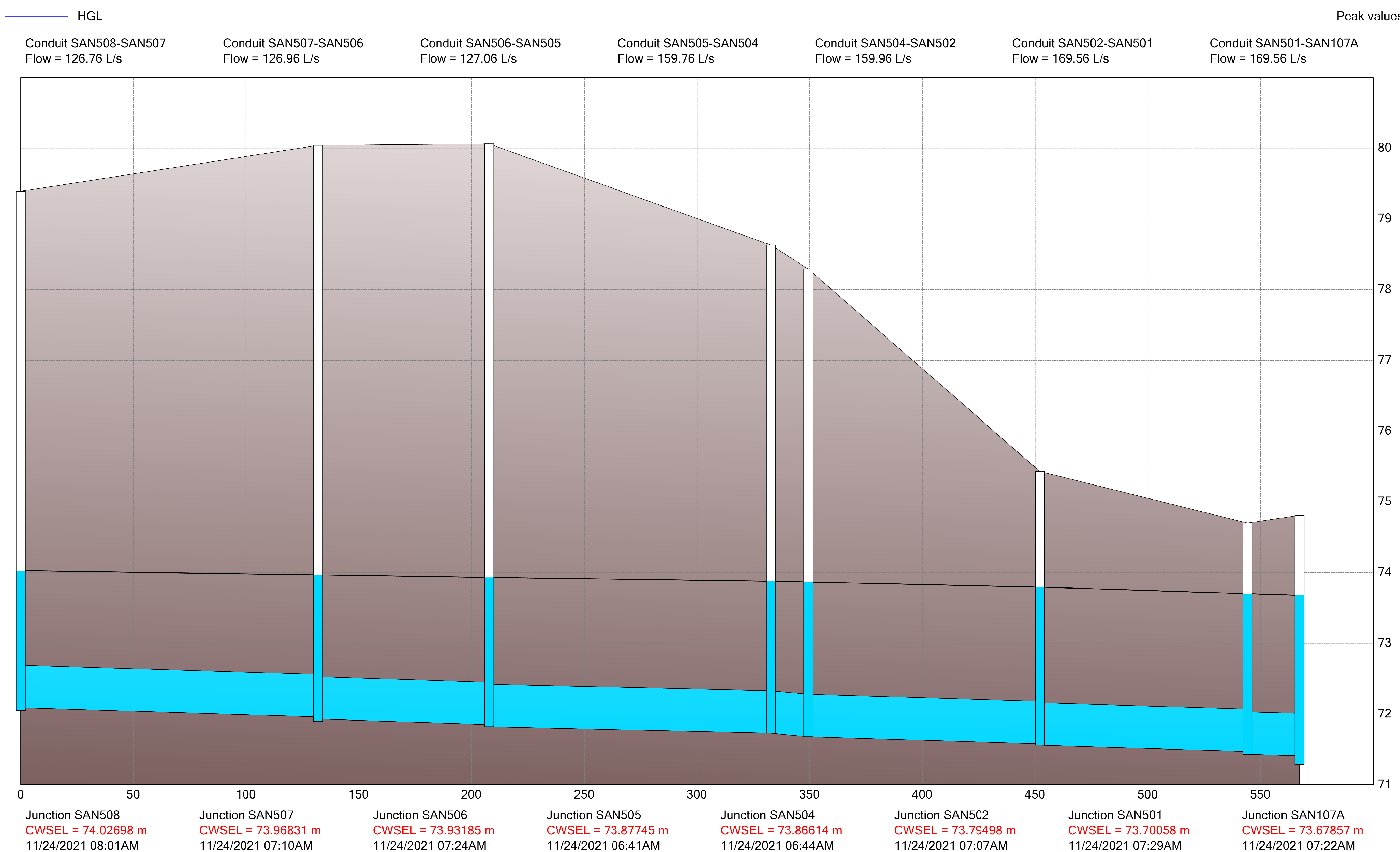
HGL Analysis - KNUEA including Copperwood Estate



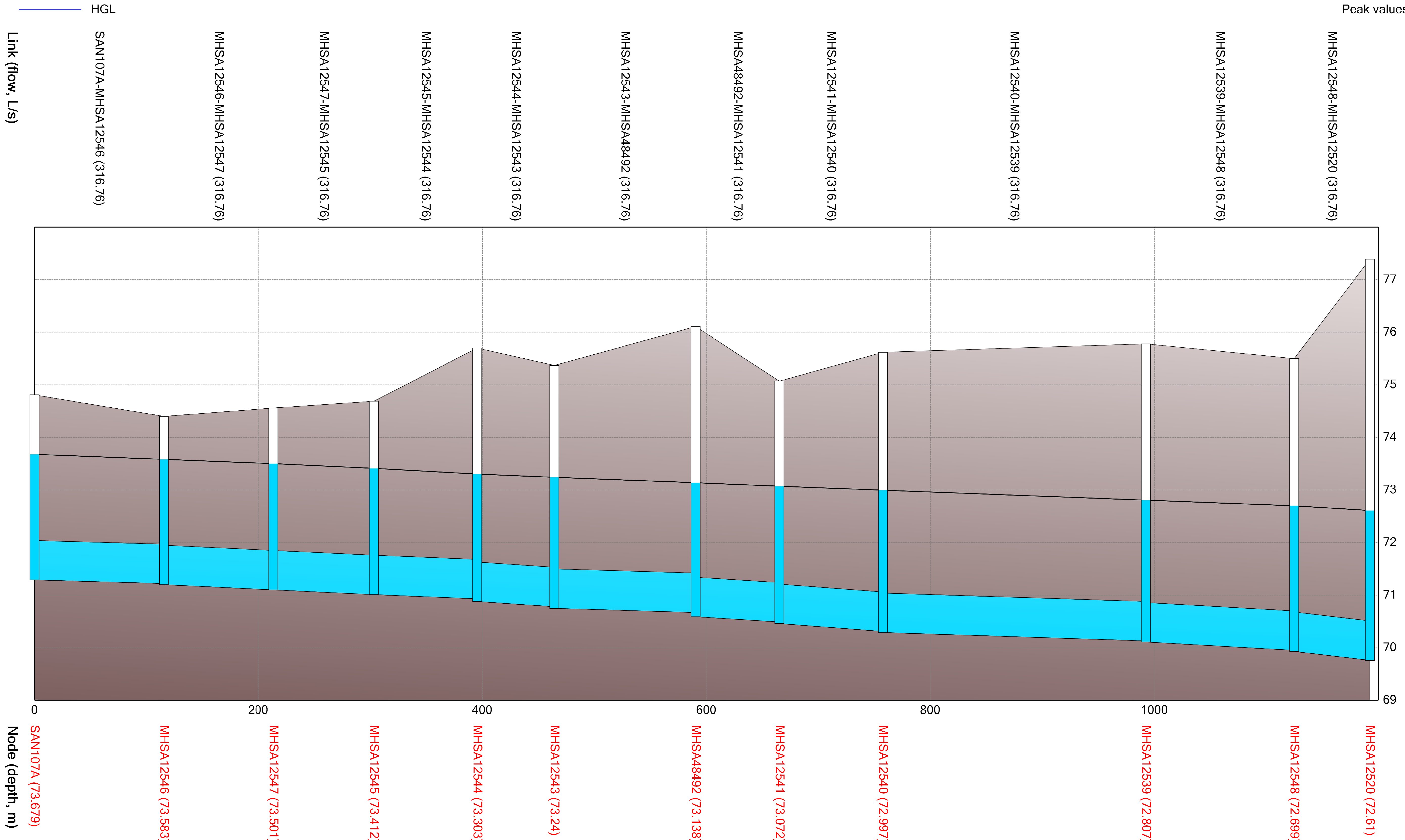
HGL Analysis - KNUEA including Copperwood Estate



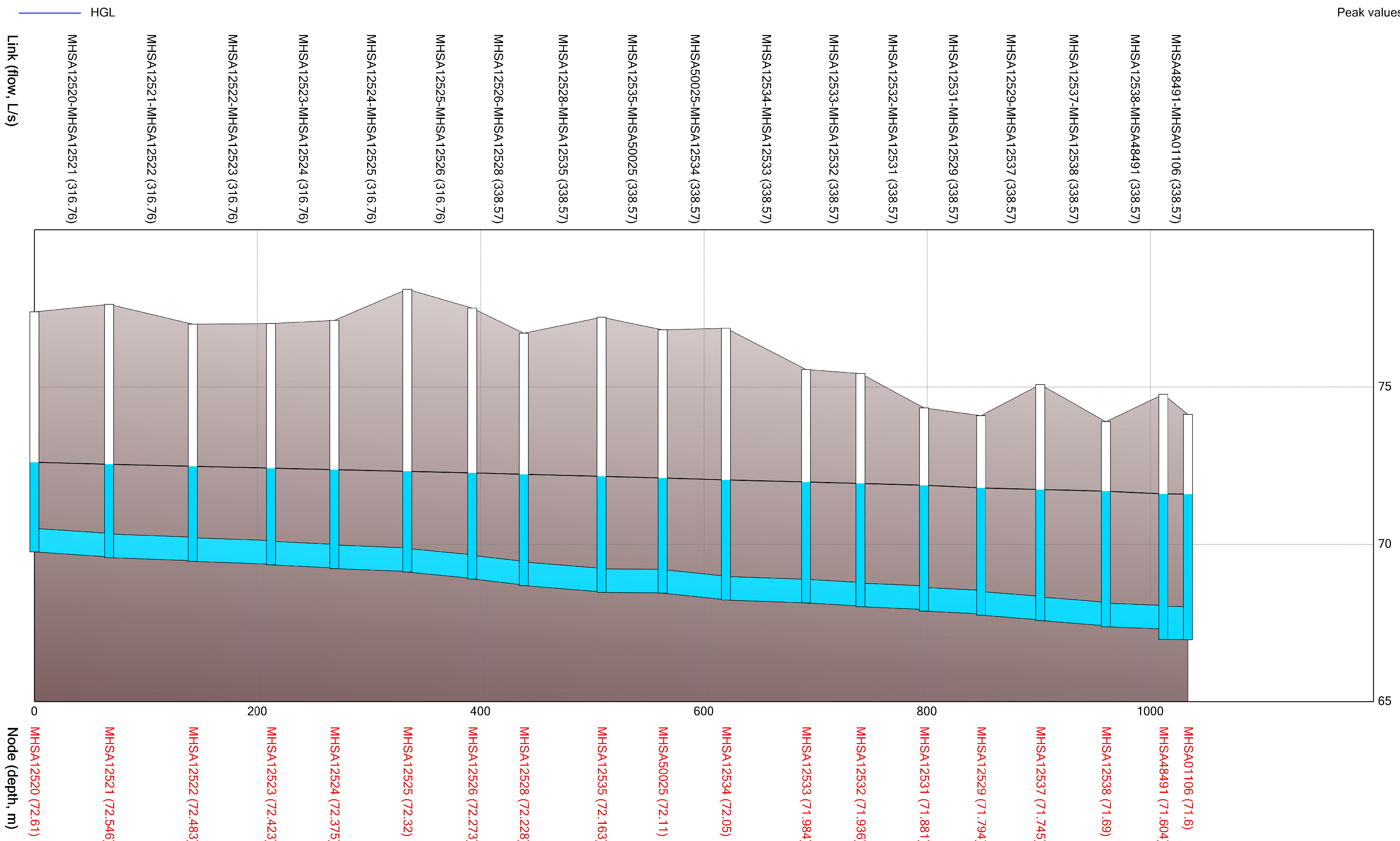
HGL Analysis - KNUEA including Copperwood Estate



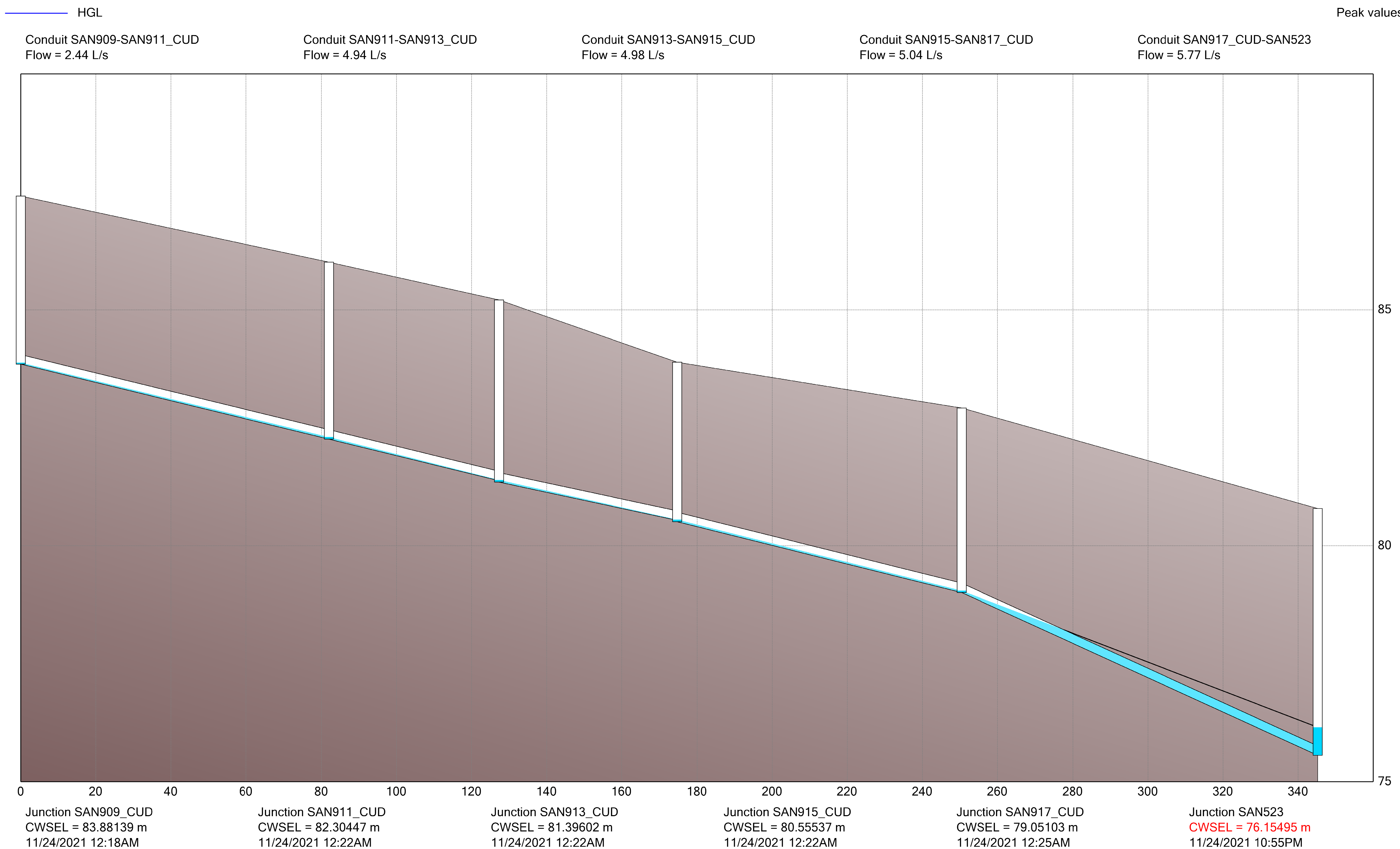
HGL Analysis - KNUEA including Copperwood Estate



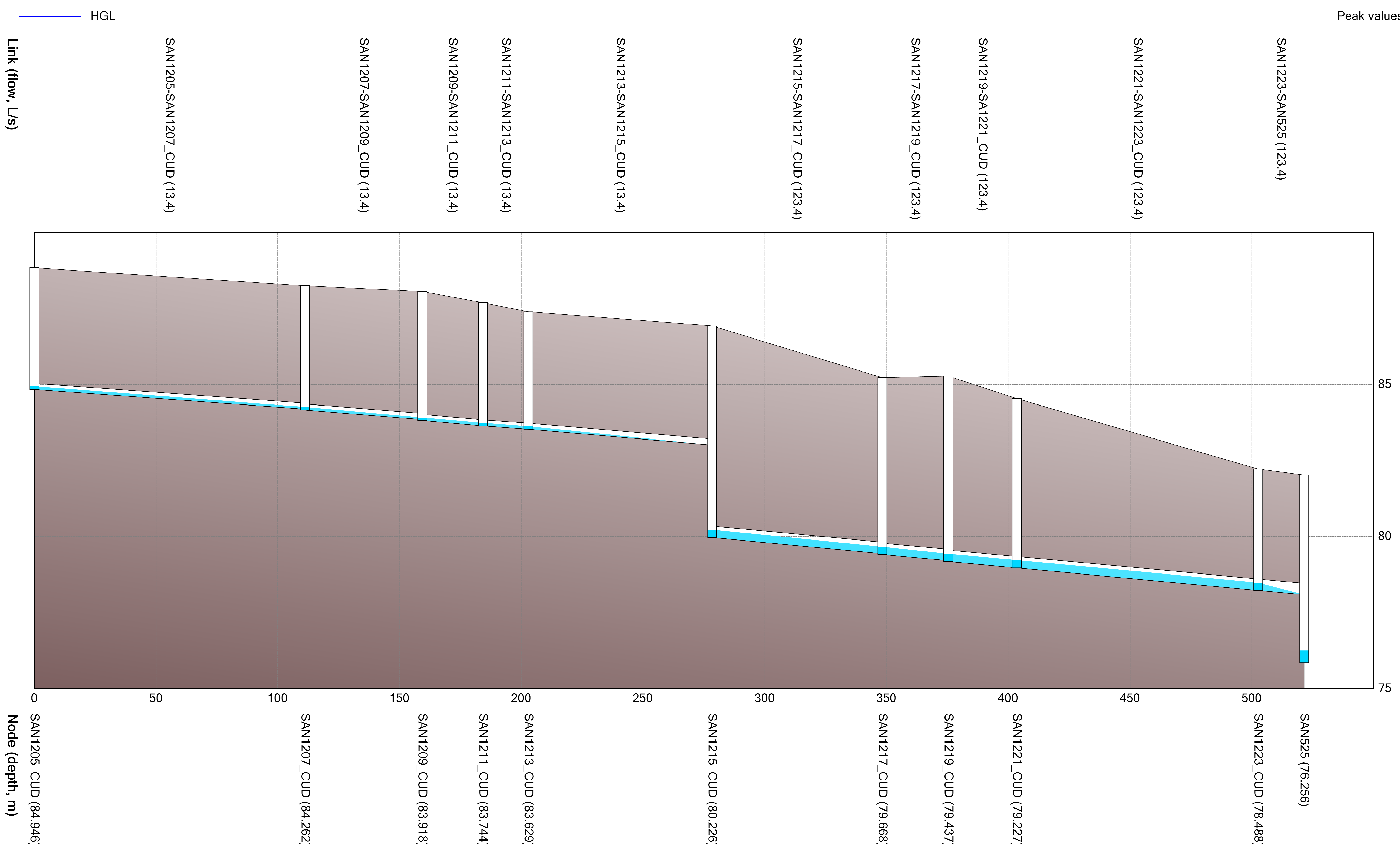
HGL Analysis - KNUEA including Copperwood Estate



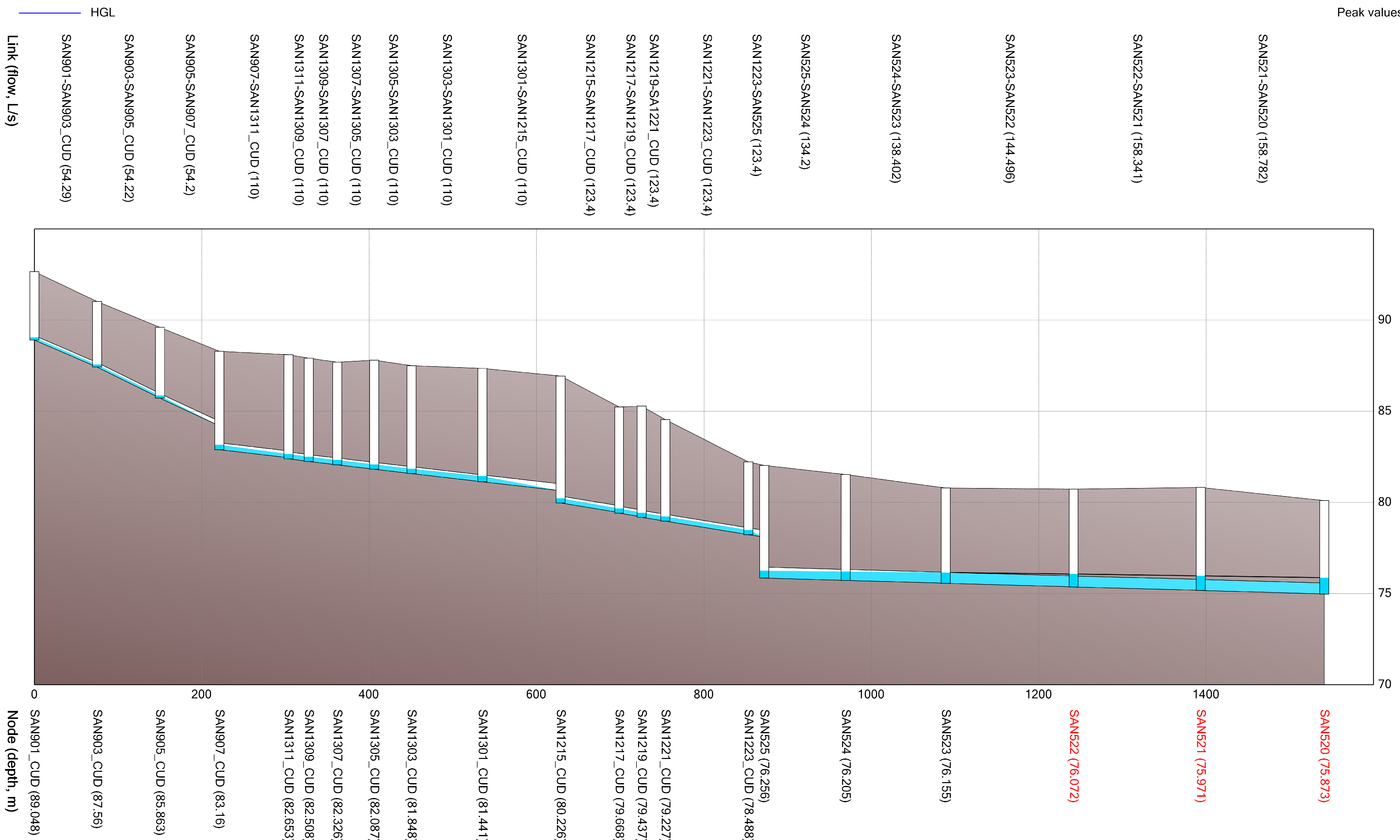
HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



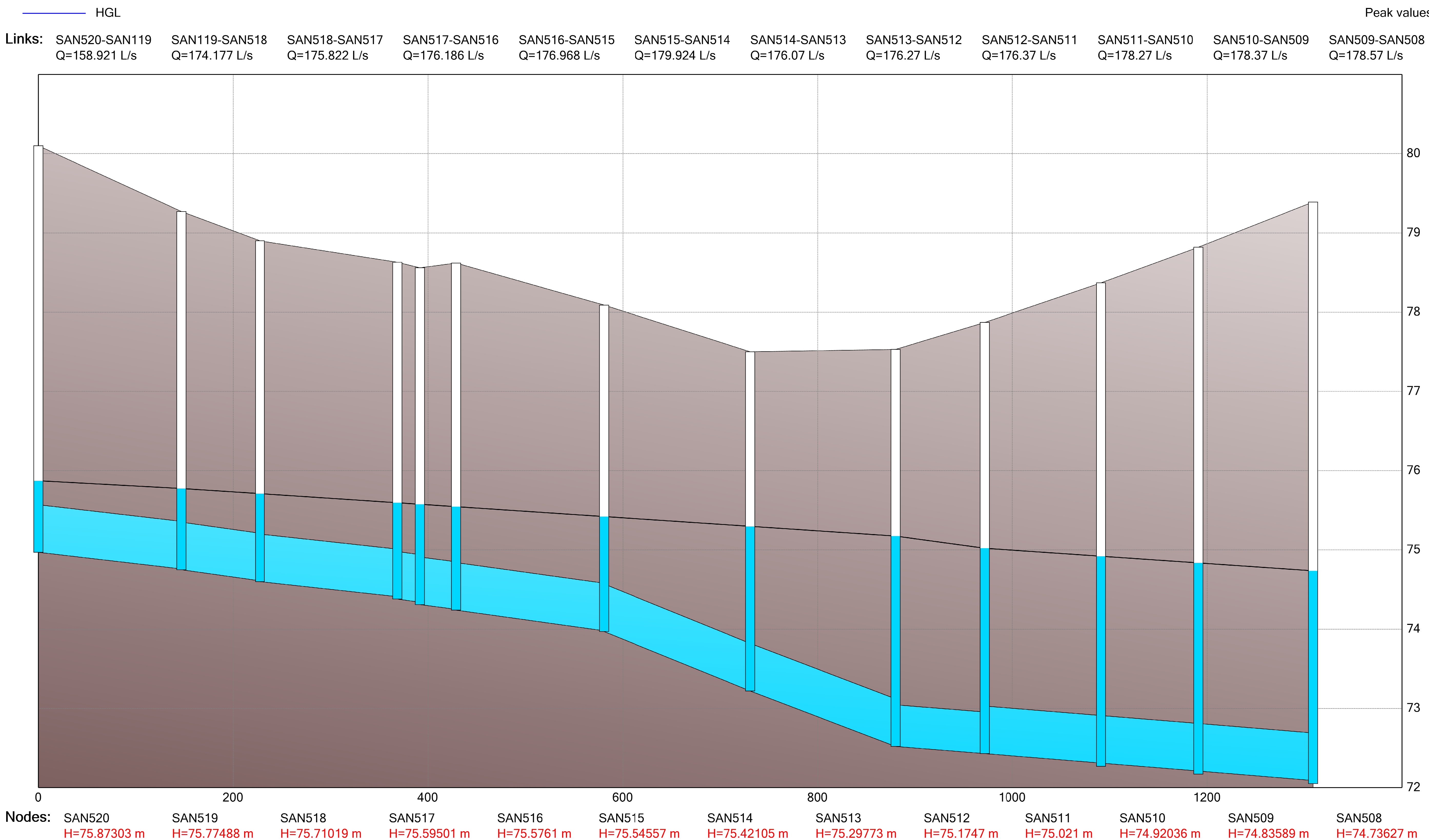
HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



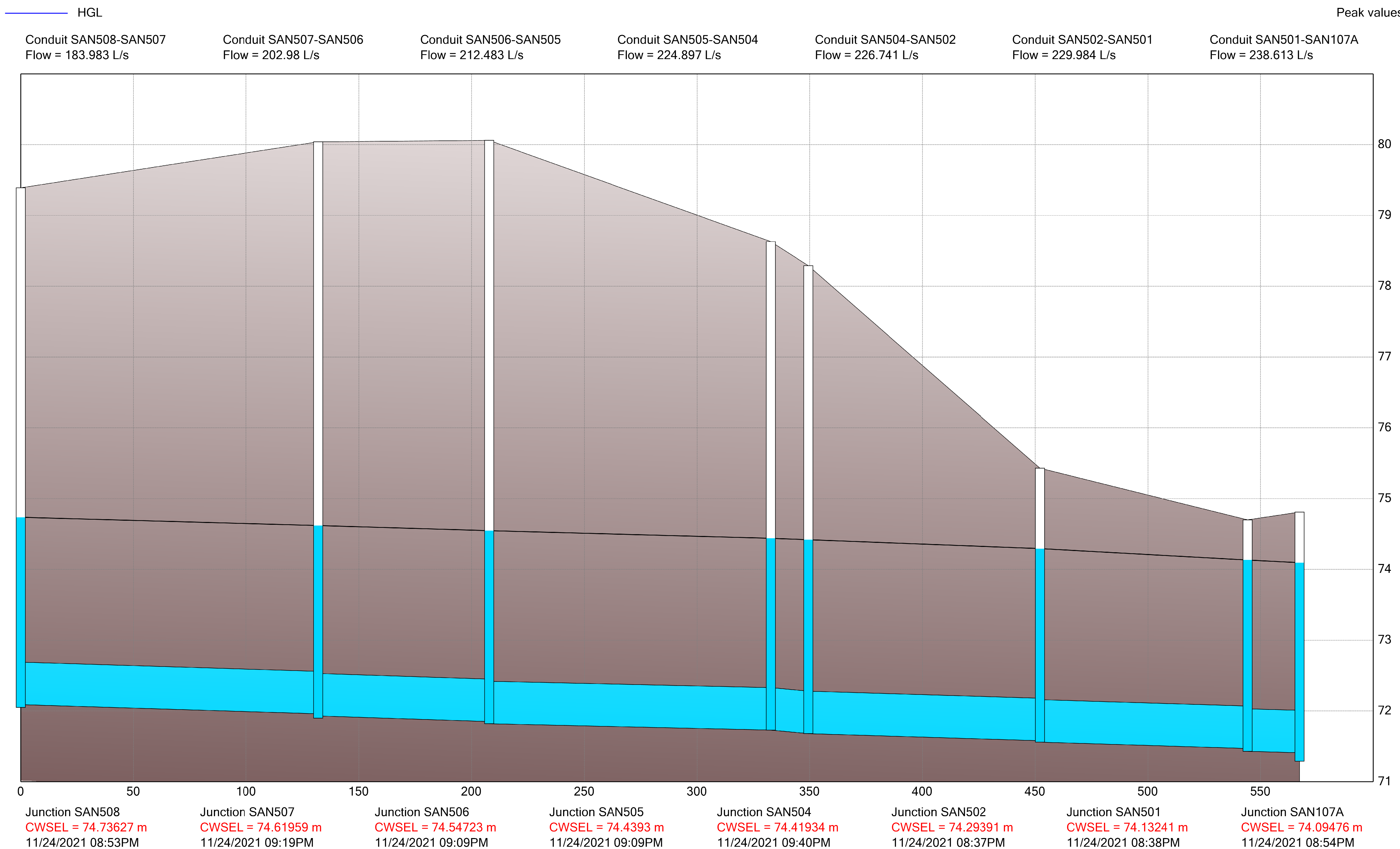
HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



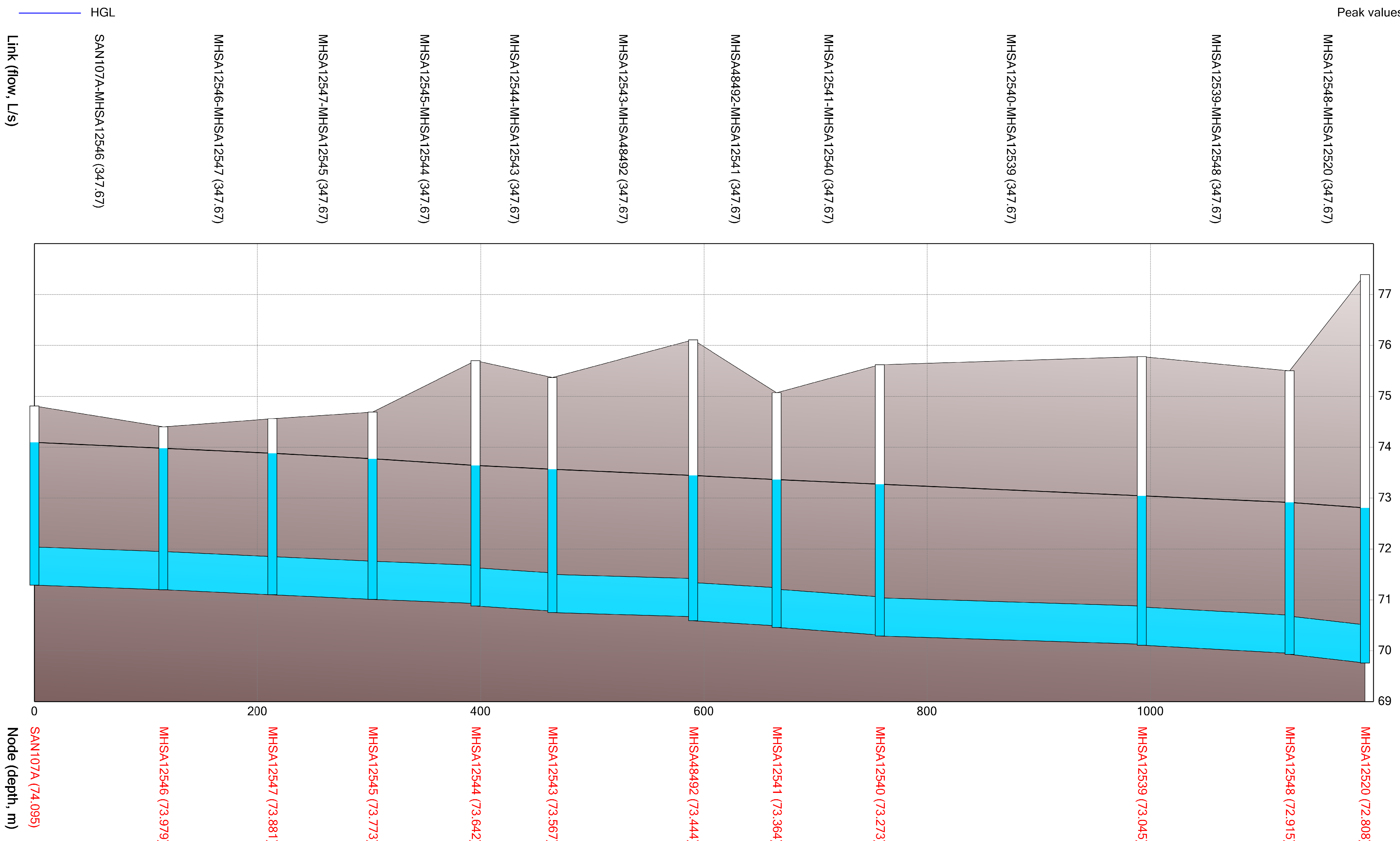
HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



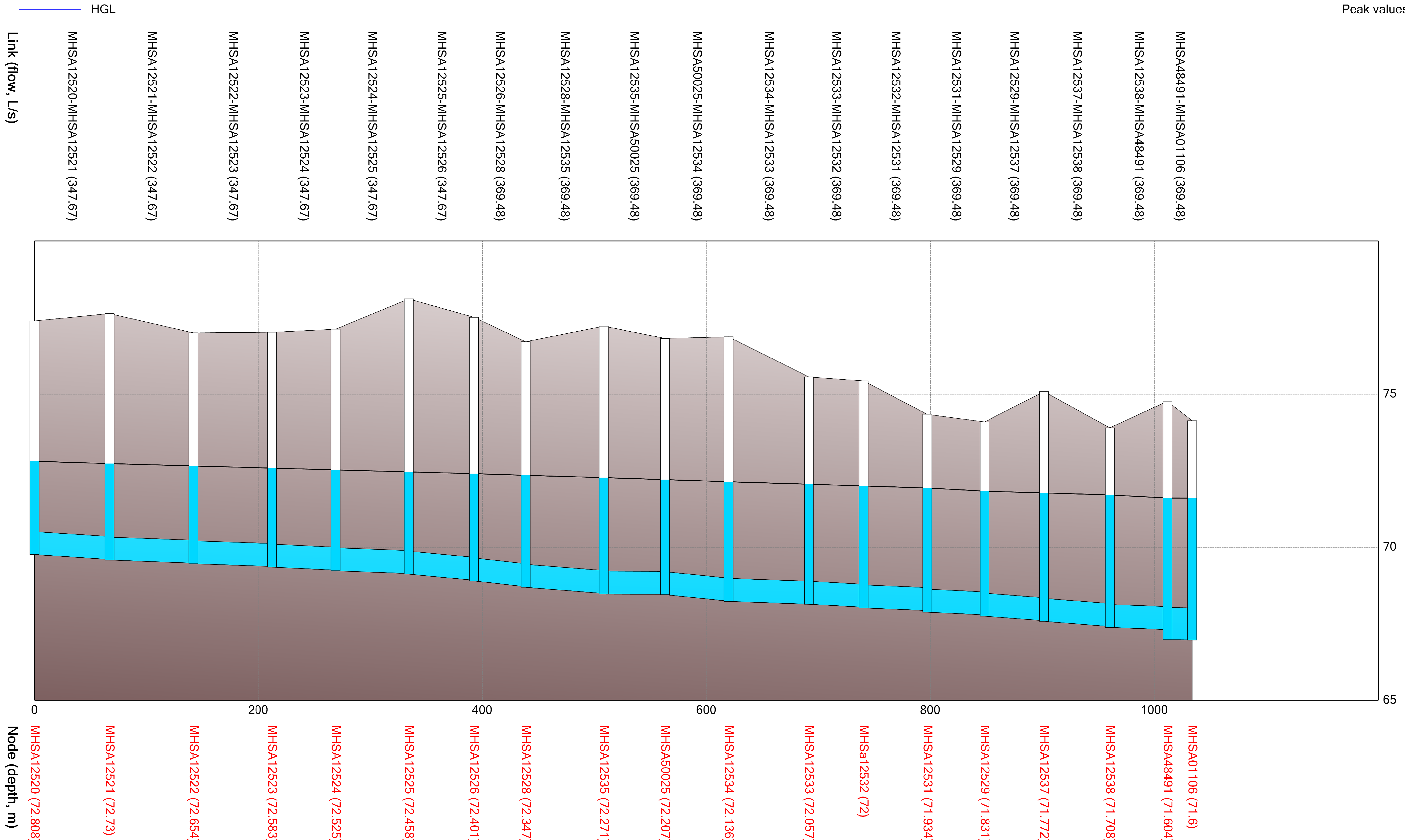
HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



HGL Analysis - KNUEA including Copperwood Estate and Future West Lands



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.		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%

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.		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)	(%)
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

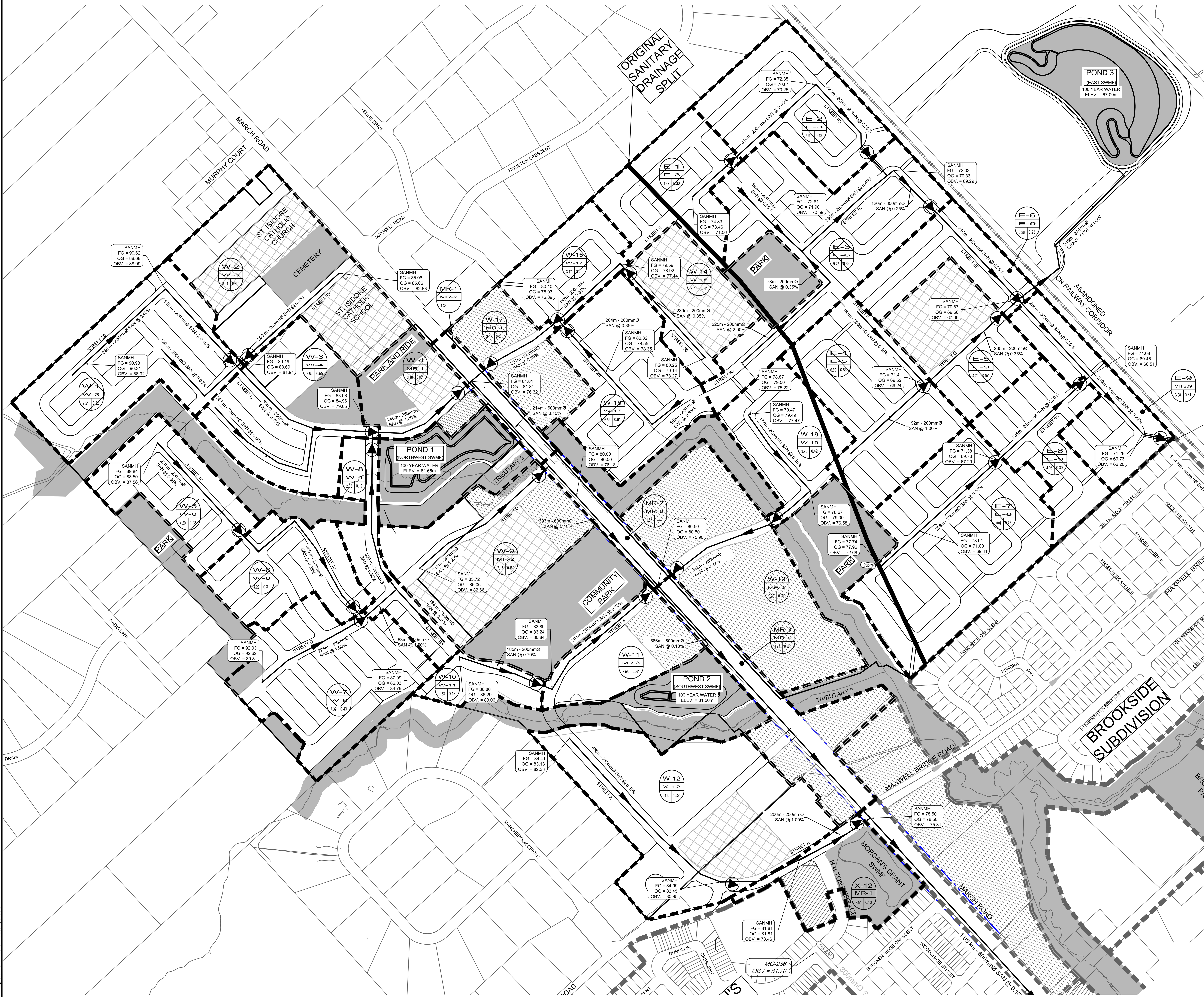
Average Daily Flow (Future)=	350	L/cap/day
Average Daily Flow (Existing)=	200	L/cap/day
Indust/Comm/Inst Flow (Future)=	50000	L/ha/day
Indust/Comm/Inst Flow (Existing)=	20000	L/ha/day
Max Res Peak Factor=	4.00	
Comm/Inst Peak Factor=	1.50	

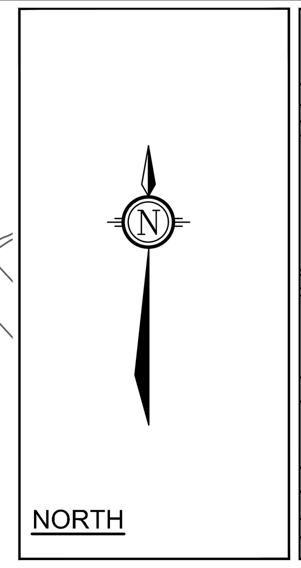
Industrial Peak Factor= per MOE graph		
Extraneous Flow (Future)=	0.28	L/s/ha
Extraneous Flow (Existing)=	0.35	L/s/ha (Jan 2008 monitored event)
Minimum Velocity=	0.60	m/s
Manning's n=	0.013	

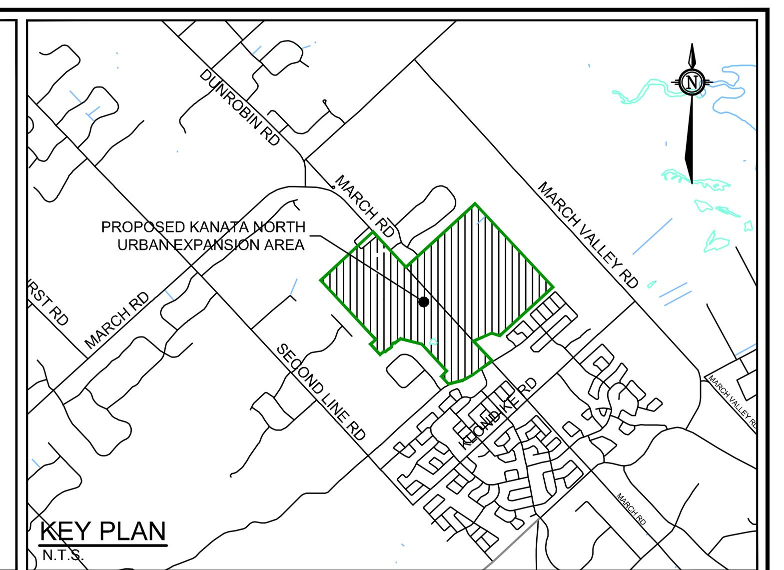
Designed:	Alex McAuley	PROJECT: Kanata North Community Design Plan
Checked:	CJR	CLIENT: Kanata North Land Owners
Dwg. Reference:	112117-SAN1 112117-SAN2	Date: May, 2016

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 — AREA ID
- E-3 — OUTLET AREA
- 3.13 | 0.19 — EQUIVALENT POPULATION (THOUSANDS) *PLUS ADDITIONAL NON-RESIDENTIAL FLOW; AREA IN HECTARES
- PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA
- FLOW OUTLET
- SANMH 106 — SAN ID
- FG = 72.52 — PRELIMINARY FINISHED GROUND ELEVATION
- OG = 69.52 — ORIGINAL GROUND ELEVATION
- OBV. = 68.22 — 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

1:3000 0 30 60 90 120

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
ONSITE SANITARY
DRAINAGE AREA PLAN

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

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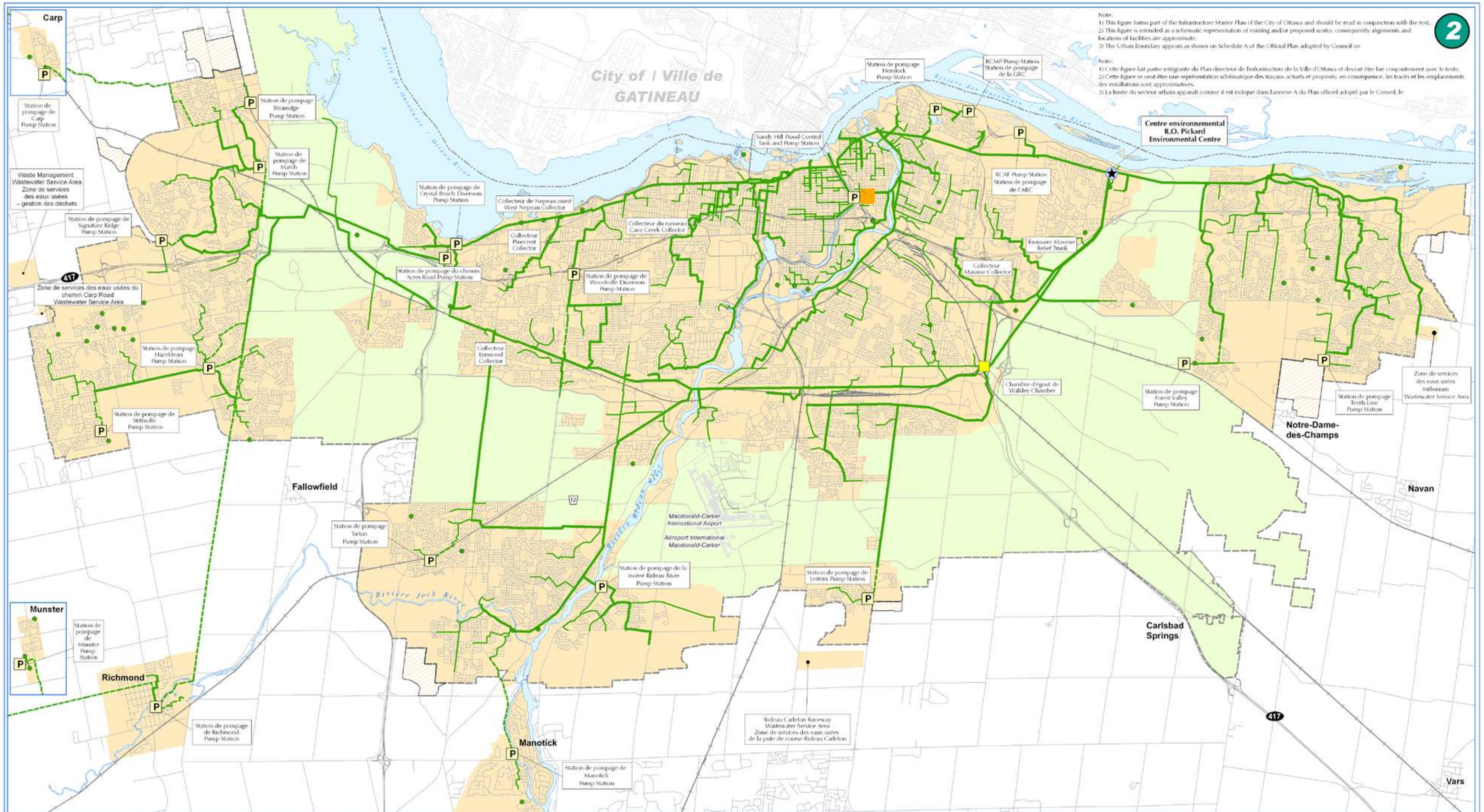
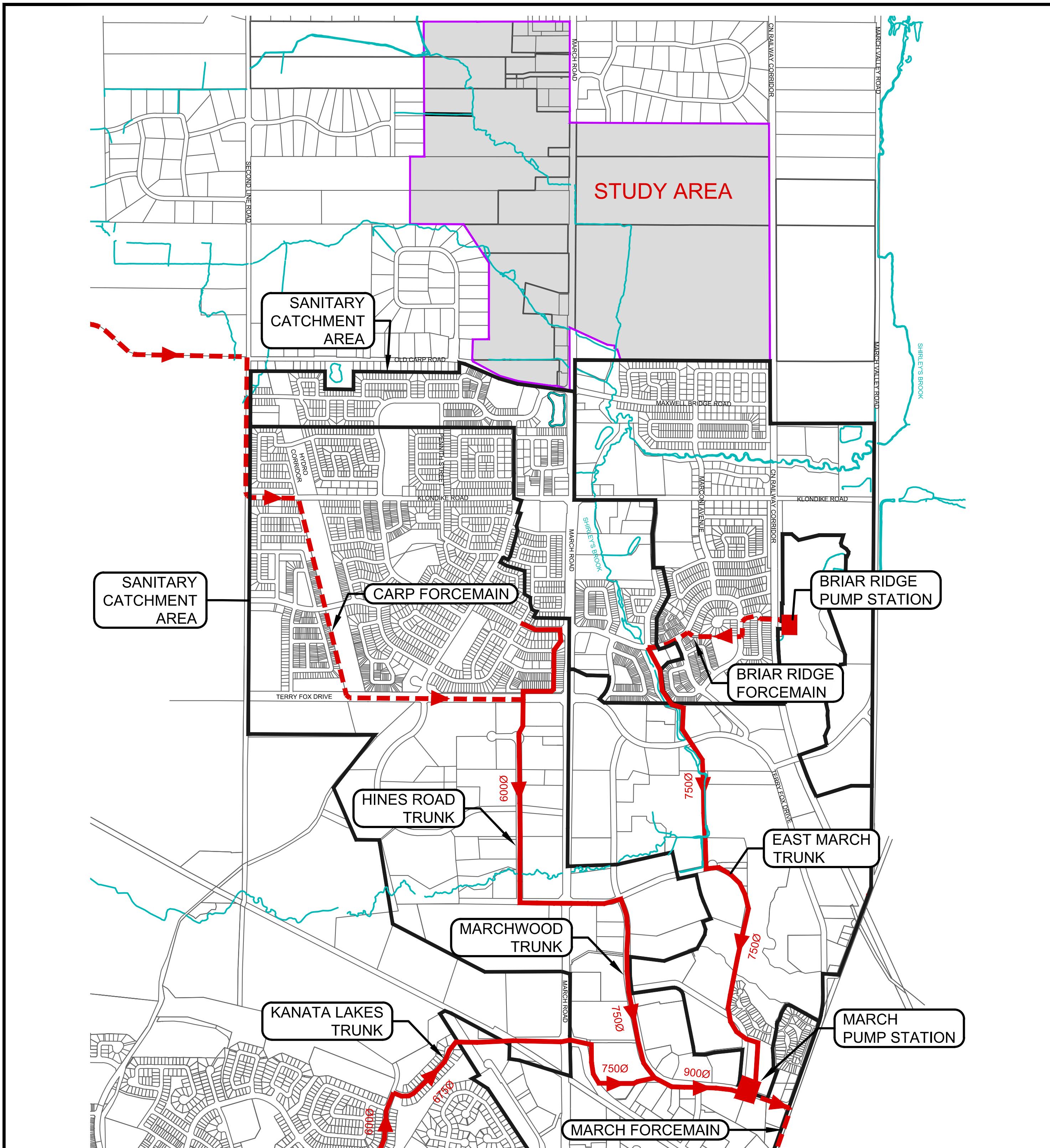


INFRASTRUCTURE MASTER PLAN - Figure 2
Existing Wastewater Collection System: Schematic

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



KANATA NORTH
COMMUNITY DESIGN PLAN

NOVATECH
Engineers, Planners & Landscape Architects

FIGURE NO. 6.2

NORTH KANATA WASTEWATER TRUNK INFRASTRUCTURE

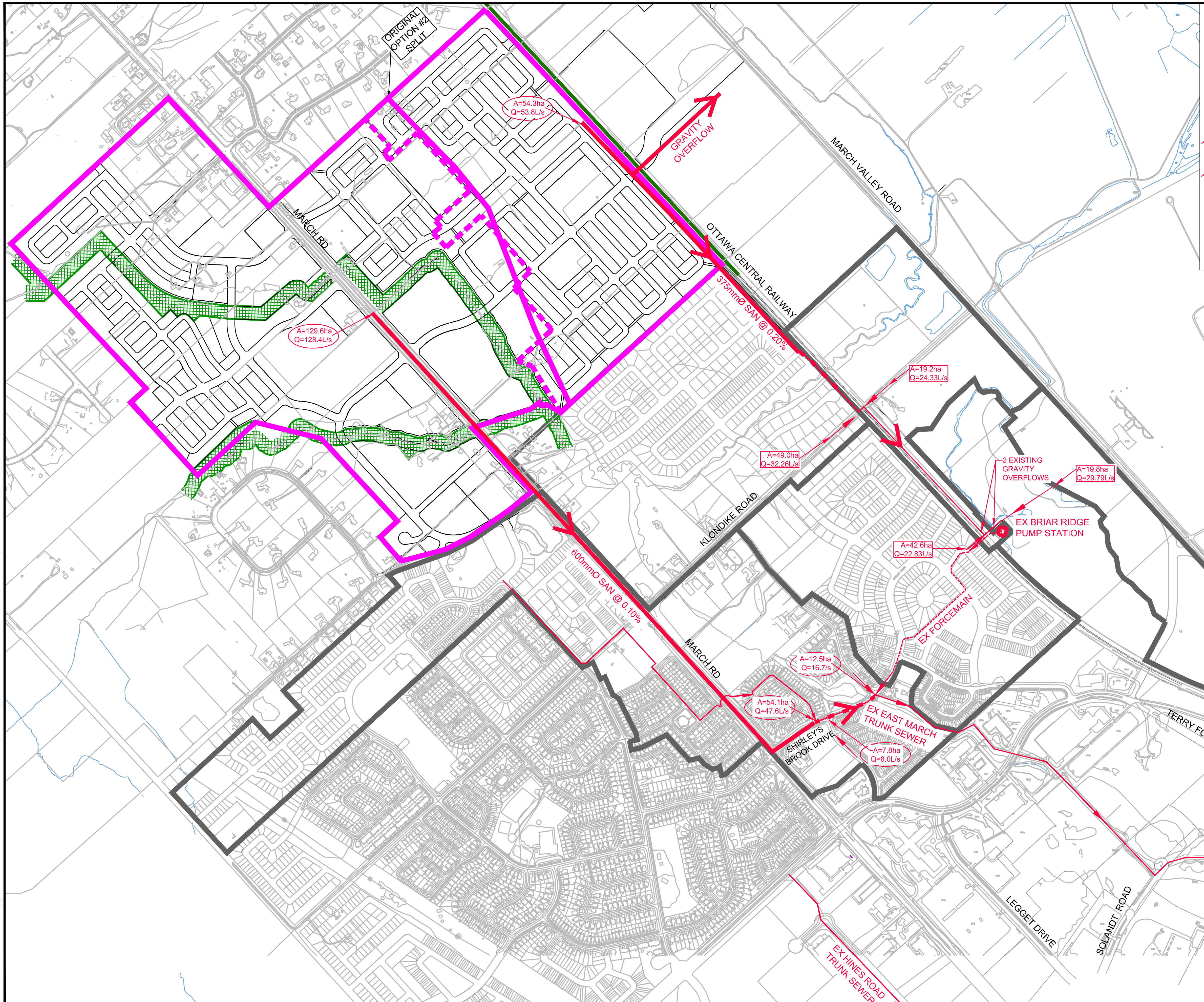
DATE FEB 2016

JOB 112117

SCALE N.T.S.

SHT8x11.DWG - 216mmx279mm

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



KN

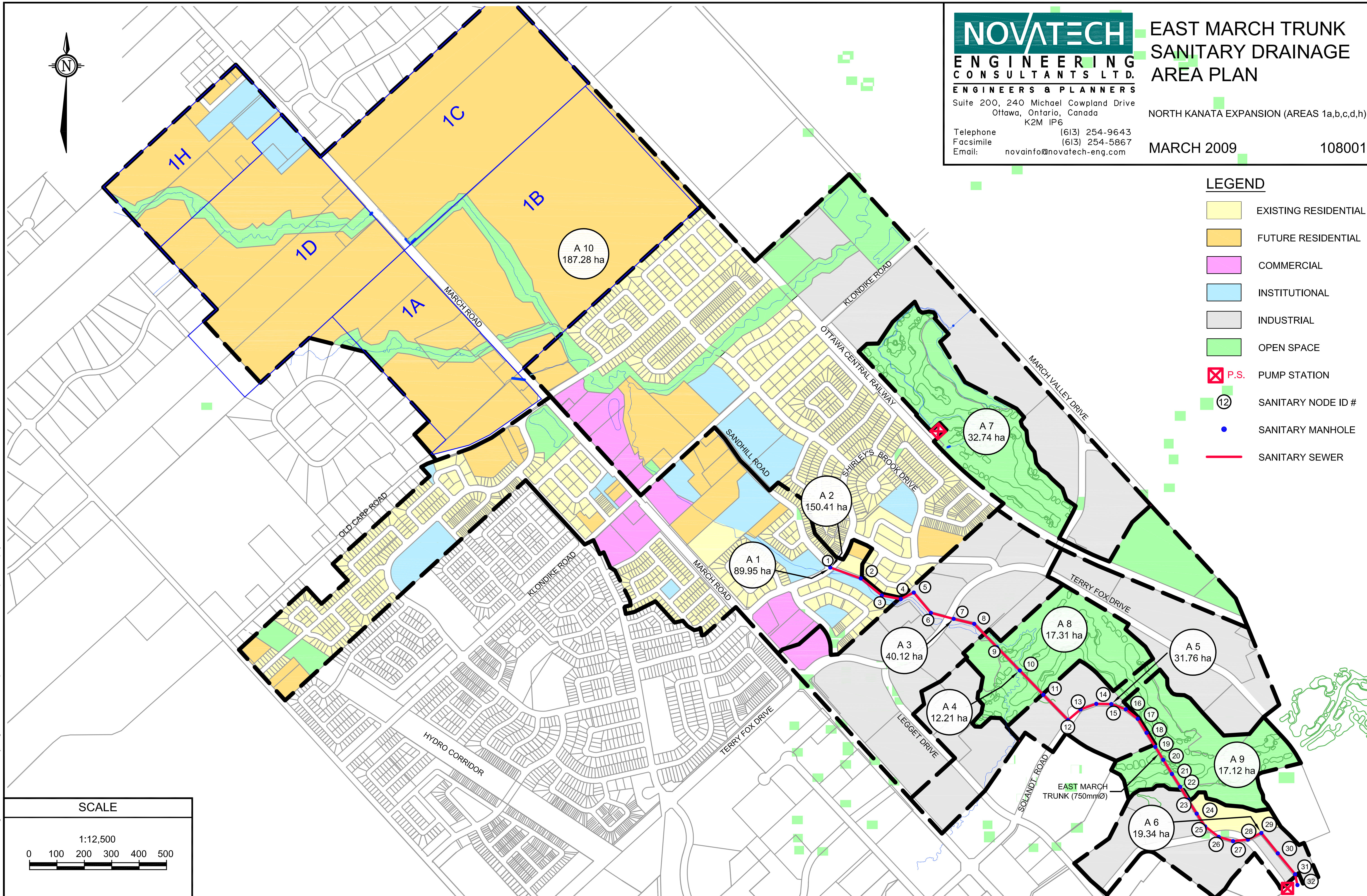
KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 6.6.1.1
PREFERRED WASTEWATER OPTION #2 - DETAILED

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

NOVATECH
Engineers, Planners & Landscape Architects

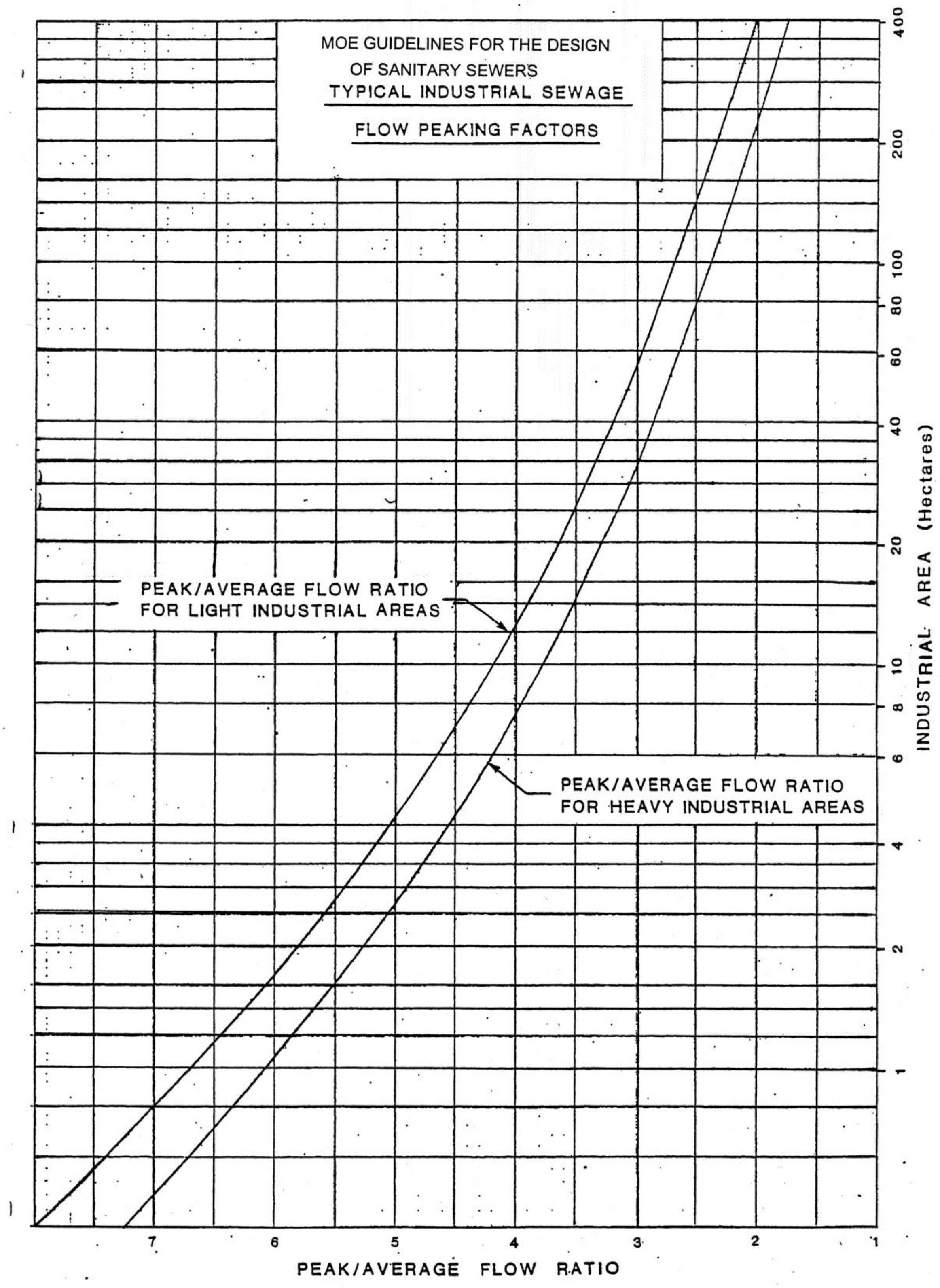
SHT11x17.DWG - 279mmx432mm



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

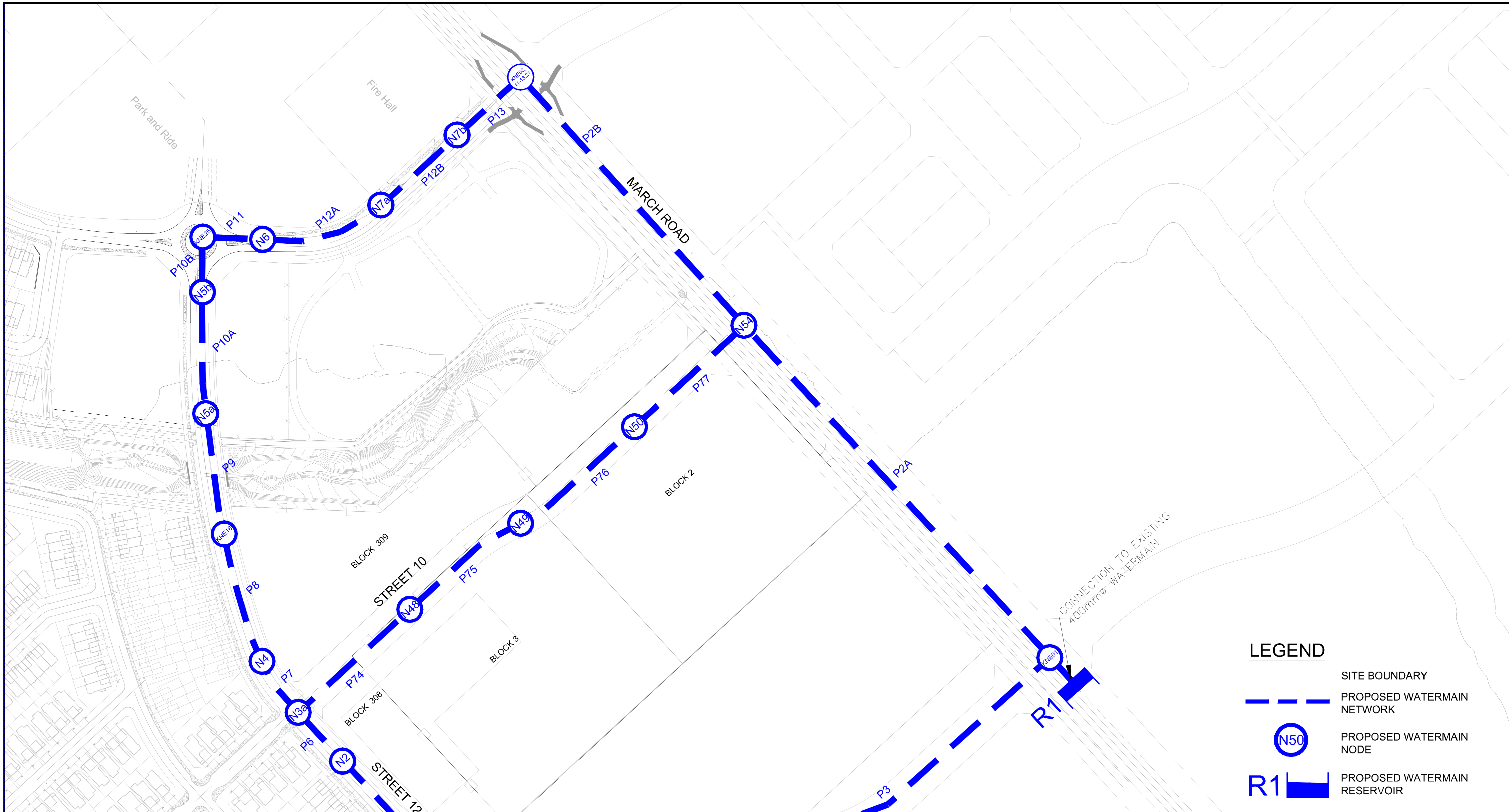
Connection 1 – March Road

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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1015 MARCH ROAD

PROPOSED WATERMAIN NODE NETWORK

SCALE		
DATE AUG 2022	JOB 121247	FIGURE 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
						3.07	0	0.99	1.49	2.69
N49				28			50	0.16	0.41	0.90
N50					2.36		0	0.76	1.15	2.07
TOTAL	**315**	**336**	**96**	**165**	**2.36**	**8.20**	**2534**	**11.64**	**25.67**	**54.41**

*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.

AVERAGE DAY DEMAND / HIGH PRESSURE CHECK

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi	Age hours
Resvr R1	130.70	-11.63	130.70	0.00	0.00	0.00	0.0
Junc N2	87.95	0.06	130.69	42.74	0.00	0.00	3.3
Junc N3a	88.12	2.48	130.69	42.57	417.61	60.57	3.8
Junc N4	87.80	0.06	130.69	42.89	420.75	61.02	4.1
Junc N5a	87.35	0.25	130.69	43.34	425.17	61.67	5.5
Junc N5b	86.80	0.00	130.69	43.89	430.56	62.45	6.3
Junc N6	86.00	0.00	130.69	44.69	438.41	63.59	4.2
Junc N7a	84.20	0.00	130.69	46.49	456.07	66.15	3.8
Junc N7b	82.39	0.27	130.69	48.30	473.82	68.72	3.4
Junc N48	86.66	1.24	130.69	44.03	431.93	62.65	3.2
Junc N49	84.50	0.16	130.69	46.19	453.12	65.72	2.6
Junc N50	82.68	0.76	130.69	48.01	470.98	68.31	2.0
Junc N54	80.50	0.00	130.69	50.19	492.36	71.41	1.4
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	3.2
Junc KNE04,5-6,20	83.65	0.00	130.70	47.05	461.56	66.94	1.7
Junc KNE07	88.25	0.08	130.69	42.44	416.34	60.38	2.8
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	5.2

(orange)	Maximum Pressure
(cyan)	Maximum Age

AVERAGE DAY DEMAND / HIGH PRESSURE CHECK

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	11.63	0.09	0.04	0.034
Pipe P2A	305.00	400	120	8.10	0.06	0.02	0.033
Pipe P2B	223.00	400	120	4.35	0.03	0.01	0.036
Pipe P3	298.00	300	120	3.53	0.05	0.02	0.036
Pipe P4	193.00	300	120	3.53	0.05	0.02	0.036
Pipe P5	91.00	300	120	3.45	0.05	0.01	0.036
Pipe P6	44.00	300	120	3.39	0.05	0.01	0.036
Pipe P7	42.00	300	120	-2.50	0.04	0.01	0.038
Pipe P8	90.00	300	120	-2.44	0.03	0.01	0.038
Pipe P9	82.00	300	120	2.35	0.03	0.01	0.038
Pipe P10A	80.00	300	120	2.10	0.03	0.01	0.039
Pipe P10B	38.00	300	120	2.10	0.03	0.01	0.038
Pipe P11	40.00	300	120	-4.08	0.06	0.02	0.035
Pipe P12A	85.00	300	120	-4.08	0.06	0.02	0.035
Pipe P12B	85.00	300	120	-4.08	0.06	0.02	0.035
Pipe P13	45.00	300	120	-4.35	0.06	0.02	0.035
Pipe P74	85.00	300	120	-1.58	0.02	0.00	0.040
Pipe P75	85.00	300	120	-2.82	0.04	0.01	0.037
Pipe P76	85.00	300	120	-2.98	0.04	0.01	0.037
Pipe P77	120.00	300	120	-3.74	0.05	0.02	0.036

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	123.60	-54.43	123.60	0.00	0.00	0.00
Junc N2	87.95	0.34	123.44	35.49	348.16	50.50
Junc N3a	88.12	13.65	123.43	35.31	346.39	50.24
Junc N4	87.80	0.34	123.42	35.62	349.43	50.68
Junc N5a	87.35	1.36	123.40	36.05	353.65	51.29
Junc N5b	86.80	0.00	123.39	36.59	358.95	52.06
Junc N6	86.00	0.00	123.40	37.40	366.89	53.21
Junc N7a	84.20	0.00	123.44	39.24	384.94	55.83
Junc N7b	82.39	0.73	123.47	41.08	402.99	58.45
Junc N48	86.66	4.04	123.44	36.78	360.81	52.33
Junc N49	84.50	0.90	123.46	38.96	382.20	55.43
Junc N50	82.68	2.07	123.47	40.79	400.15	58.04
Junc N54	80.50	0.00	123.51	43.01	421.93	61.20
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	123.52	39.87	391.12	56.73
Junc KNE07	88.25	0.43	123.47	35.22	345.51	50.11
Junc KNE18	87.60	0.48	123.41	35.81	351.30	50.95
Junc KNE25	87.00	30.09	123.39	36.39	356.99	51.78

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	54.43	0.43	0.60	0.025
Pipe P2A	305.00	400	120	37.66	0.30	0.30	0.026
Pipe P2B	223.00	400	120	20.75	0.17	0.10	0.029
Pipe P3	298.00	300	120	16.77	0.24	0.27	0.029
Pipe P4	193.00	300	120	16.77	0.24	0.27	0.029
Pipe P5	91.00	300	120	16.34	0.23	0.26	0.029
Pipe P6	44.00	300	120	16.00	0.23	0.25	0.029
Pipe P7	42.00	300	120	-12.25	0.17	0.15	0.030
Pipe P8	90.00	300	120	-11.91	0.17	0.14	0.030
Pipe P9	82.00	300	120	11.43	0.16	0.13	0.030
Pipe P10A	80.00	300	120	10.07	0.14	0.11	0.031
Pipe P10B	38.00	300	120	10.07	0.14	0.11	0.031
Pipe P11	40.00	300	120	-20.02	0.28	0.38	0.028
Pipe P12A	85.00	300	120	-20.02	0.28	0.38	0.028
Pipe P12B	85.00	300	120	-20.02	0.28	0.38	0.028
Pipe P13	45.00	300	120	-20.75	0.29	0.40	0.028
Pipe P74	85.00	300	120	-9.90	0.14	0.10	0.031
Pipe P75	85.00	300	120	-13.94	0.20	0.19	0.029
Pipe P76	85.00	300	120	-14.84	0.21	0.22	0.029
Pipe P77	120.00	300	120	-16.91	0.24	0.28	0.029

MAXIMUM DAY + FIREFLOW DEMAND AT N48

Junction Report

Node ID	Elevation m	Demand LPS	Total Head m	Pressure m	Pressure kPa	Pressure psi
Resvr R1	109.10	-325.63	109.10	0.00	0.00	0.00
Junc N2	87.95	0.15	104.41	16.46	161.47	23.42
Junc N3a	88.12	6.20	104.06	15.94	156.37	22.68
Junc N4	87.80	0.15	104.20	16.40	160.88	23.33
Junc N5a	87.35	0.62	104.76	17.41	170.79	24.77
Junc N5b	86.80	0.00	105.03	18.23	178.84	25.94
Junc N6	86.00	0.00	105.34	19.34	189.73	27.52
Junc N7a	84.20	0.00	105.75	21.55	211.41	30.66
Junc N7b	82.39	0.40	106.16	23.77	233.18	33.82
Junc N48	86.66	302.10	102.53	15.87	155.68	22.58
Junc N49	84.50	0.41	103.72	19.22	188.55	27.35
Junc N50	82.68	1.12	104.92	22.24	218.17	31.64
Junc N54	80.50	0.00	106.64	26.14	256.43	37.19
Junc KNE01	81.00	0.00	109.08	28.08	275.46	39.95
Junc KNE02,11-13,21	81.70	0.00	106.38	24.68	242.11	35.12
Junc KNE04,5-6,20	83.65	0.00	106.69	23.04	226.02	32.78
Junc KNE07	88.25	0.20	105.14	16.89	165.69	24.03
Junc KNE18	87.60	0.22	104.49	16.89	165.69	24.03
Junc KNE25	87.00	14.06	105.15	18.15	178.05	25.82

(orange)	Minimum Pressure
(green)	Fireflow Applied

MAXIMUM DAY + FIREFLOW DEMAND AT N48

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	325.63	2.59	16.34	0.019
Pipe P2A	305.00	400	120	221.53	1.76	8.01	0.020
Pipe P2B	223.00	400	120	79.18	0.63	1.19	0.024
Pipe P3	298.00	300	120	104.10	1.47	8.03	0.022
Pipe P4	193.00	300	120	104.10	1.47	8.03	0.022
Pipe P5	91.00	300	120	103.90	1.47	8.00	0.022
Pipe P6	44.00	300	120	103.75	1.47	7.98	0.022
Pipe P7	42.00	300	120	63.73	0.90	3.24	0.023
Pipe P8	90.00	300	120	63.88	0.90	3.25	0.023
Pipe P9	82.00	300	120	-64.10	0.91	3.27	0.023
Pipe P10A	80.00	300	120	-64.72	0.92	3.33	0.023
Pipe P10B	38.00	300	120	-64.72	0.92	3.33	0.023
Pipe P11	40.00	300	120	-78.78	1.11	4.79	0.023
Pipe P12A	85.00	300	120	-78.78	1.11	4.79	0.023
Pipe P12B	85.00	300	120	-78.78	1.11	4.79	0.023
Pipe P13	45.00	300	120	-79.18	1.12	4.84	0.023
Pipe P74	85.00	300	120	161.29	2.28	18.06	0.020
Pipe P75	85.00	300	120	-140.81	1.99	14.05	0.021
Pipe P76	85.00	300	120	-141.22	2.00	14.12	0.021
Pipe P77	120.00	300	120	-142.34	2.01	14.33	0.021

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	109.10	-325.55	109.10	0.00	0.00	0.00
Junc N2	87.95	0.15	105.73	17.78	174.42	25.30
Junc N3a	88.12	6.20	105.48	17.36	170.30	24.70
Junc N4	87.80	0.15	105.52	17.72	173.83	25.21
Junc N5a	87.35	0.62	105.65	18.30	179.52	26.04
Junc N5b	86.80	0.00	105.72	18.92	185.61	26.92
Junc N6	86.00	0.00	105.82	19.82	194.43	28.20
Junc N7a	84.20	0.00	105.97	21.77	213.56	30.97
Junc N7b	82.39	0.40	106.11	23.72	232.69	33.75
Junc N48	86.66	1.99	104.72	18.06	177.17	25.70
Junc N49	84.50	0.41	103.99	19.49	191.20	27.73
Junc N50	82.68	301.15	103.26	20.58	201.89	29.28
Junc N54	80.50	0.00	106.28	25.78	252.90	36.68
Junc KNE01	81.00	0.00	109.08	28.08	275.46	39.95
Junc KNE02,11-13,21	81.70	0.00	106.19	24.49	240.25	34.84
Junc KNE04,5-6,20	83.65	0.00	107.37	23.72	232.69	33.75
Junc KNE07	88.25	0.20	106.26	18.01	176.68	25.62
Junc KNE18	87.60	0.22	105.59	17.99	176.48	25.60
Junc KNE25	87.00	14.06	105.75	18.75	183.94	26.68

Legend	
(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	325.55	2.59	16.33	0.019
Pipe P2A	305.00	400	120	238.54	1.90	9.18	0.020
Pipe P2B	223.00	400	120	45.36	0.36	0.42	0.026
Pipe P3	298.00	300	120	87.01	1.23	5.76	0.022
Pipe P4	193.00	300	120	87.01	1.23	5.76	0.022
Pipe P5	91.00	300	120	86.81	1.23	5.74	0.022
Pipe P6	44.00	300	120	86.66	1.23	5.72	0.022
Pipe P7	42.00	300	120	29.91	0.42	0.80	0.026
Pipe P8	90.00	300	120	30.06	0.43	0.80	0.026
Pipe P9	82.00	300	120	-30.28	0.43	0.82	0.026
Pipe P10A	80.00	300	120	-30.90	0.44	0.85	0.026
Pipe P10B	38.00	300	120	-30.90	0.44	0.85	0.026
Pipe P11	40.00	300	120	-44.96	0.64	1.70	0.025
Pipe P12A	85.00	300	120	-44.96	0.64	1.70	0.025
Pipe P12B	85.00	300	120	-44.96	0.64	1.70	0.025
Pipe P13	45.00	300	120	-45.36	0.64	1.72	0.025
Pipe P74	85.00	300	120	110.38	1.56	8.95	0.022
Pipe P75	85.00	300	120	108.39	1.53	8.65	0.022
Pipe P76	85.00	300	120	107.98	1.53	8.59	0.022
Pipe P77	120.00	300	120	-193.17	2.73	25.23	0.020

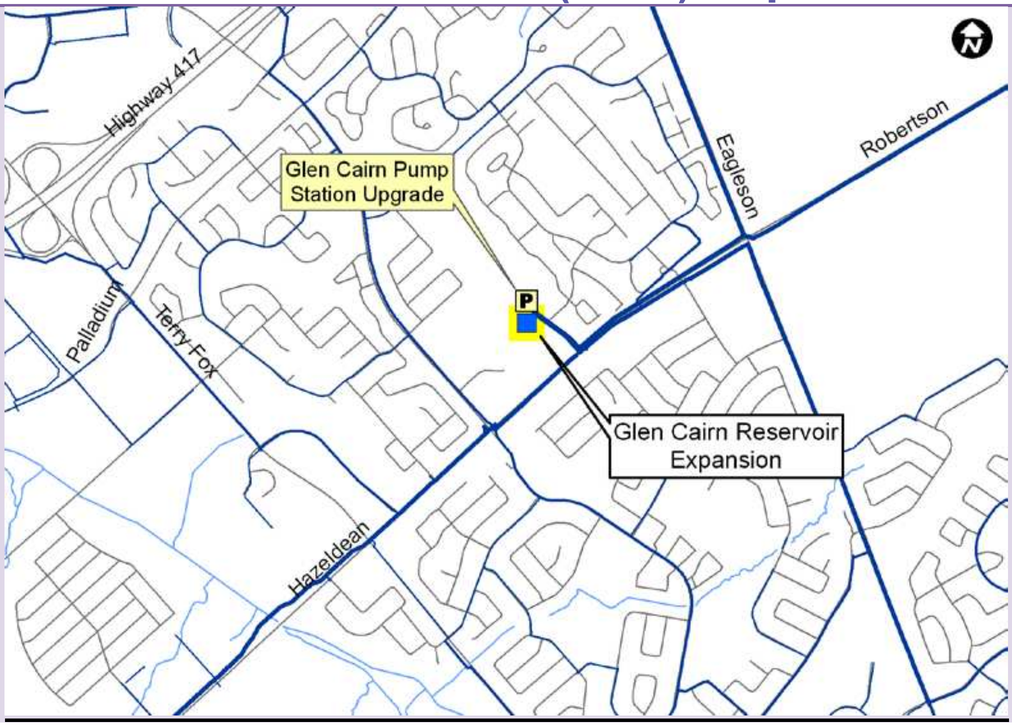
MAXIMUM DAY + FIREFLOW DEMAND SUMMARY

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	2.10	300.00	302.10	15.87	155.68	22.58	N48
N50	1.15	300.00	301.15	17.36	170.30	24.70	N3a

Note:
1) From the provided boundary conditions, the largest fireflow demand was used to analyze the system.
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.

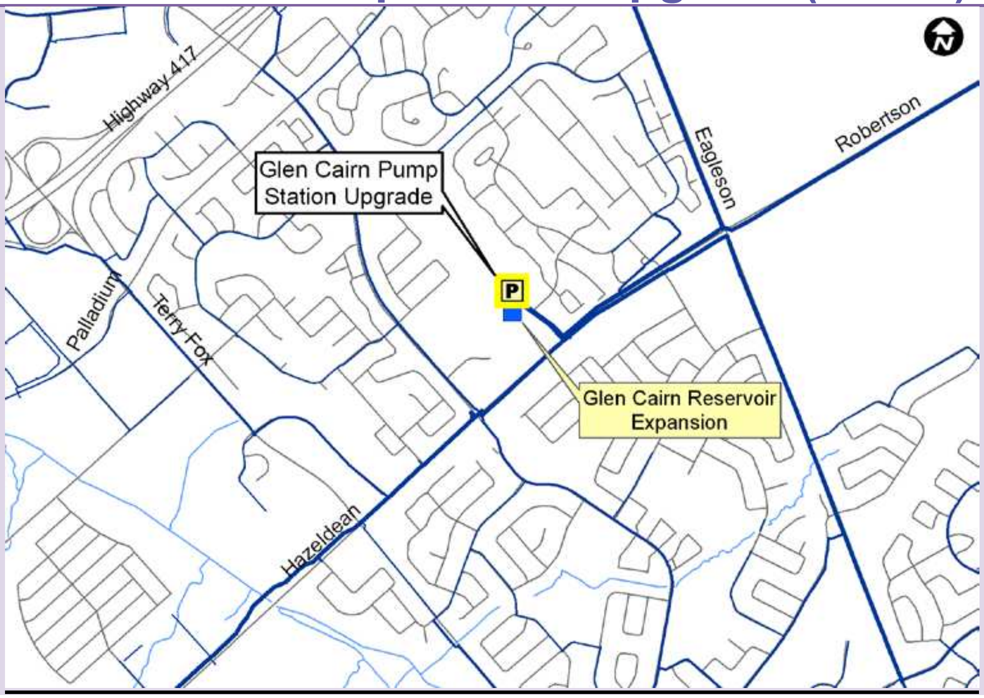
Timing
2019-2024: Increase storage at GCPS

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.

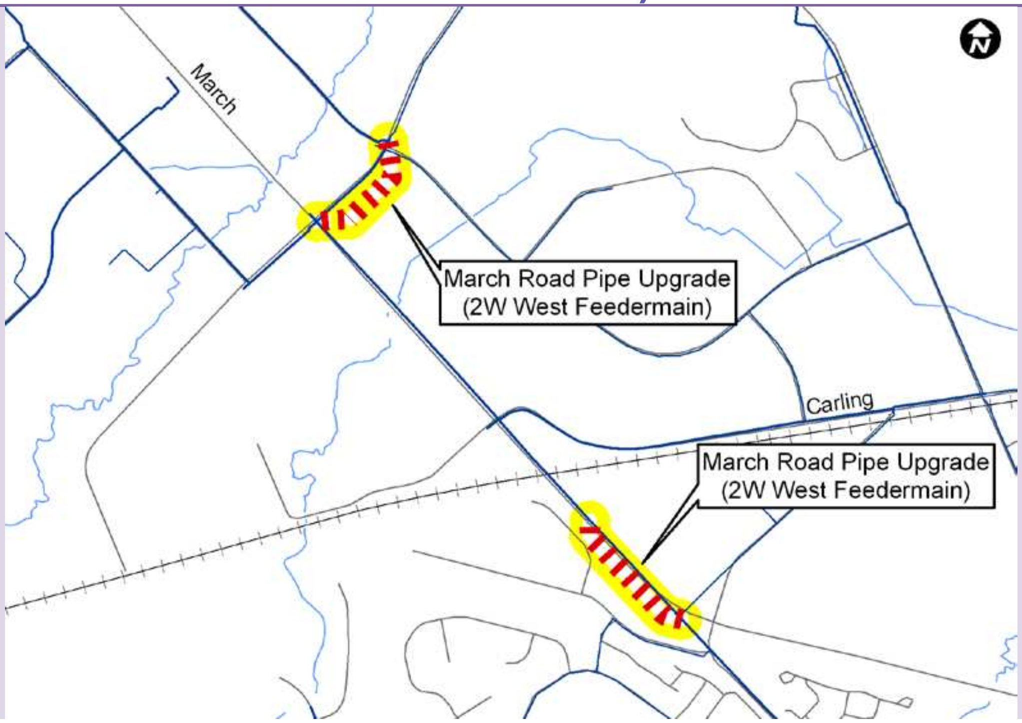
Timing
2019-2024: Upgrade PS

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)



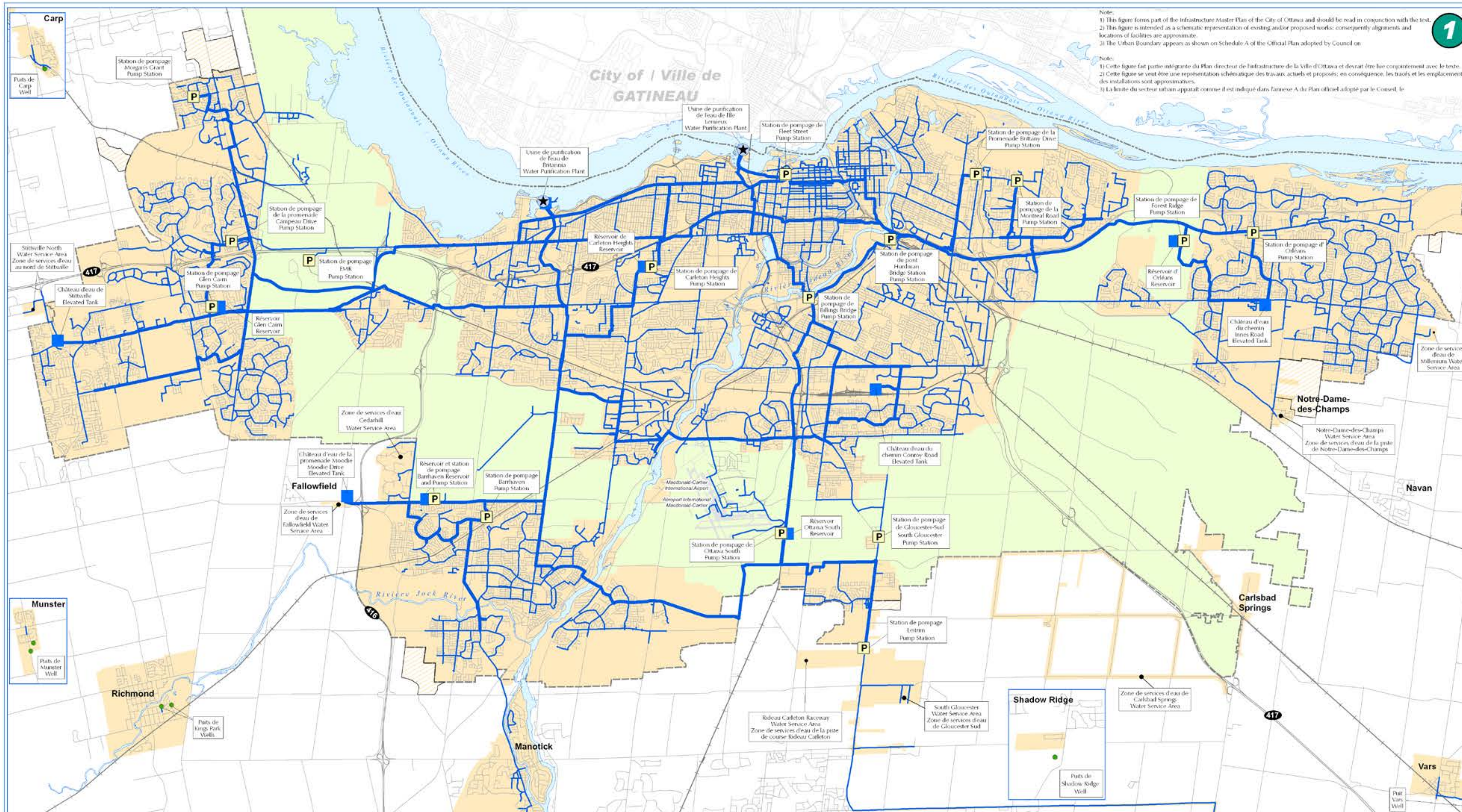
Scope and Justification
Upgrade existing watermain segments in the North Kanata area, on March Road and Solandt Road.

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.



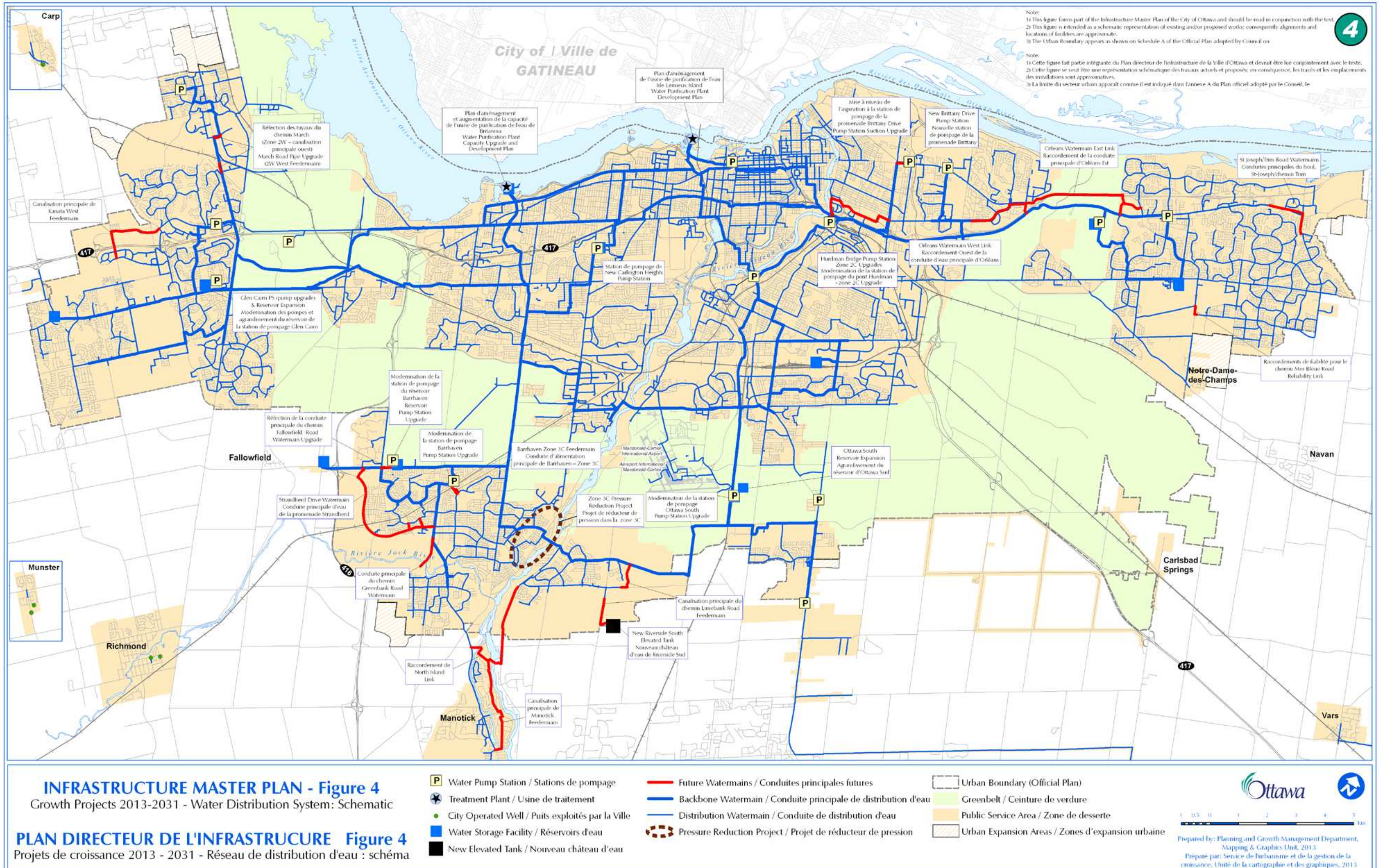
INFRASTRUCTURE MASTER PLAN - Figure 1
Existing Water Distribution System: Schematic

PLAN DIRECTEUR DE L'INFRASTRUCURE Figure 1
Réseau de distribution d'eau existant : schéma

- P 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

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


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

Kanata North Urban Expansion Potable Water Assessment

Final Report

Prepared for:
Novatech Engineering Consultants

Prepared by:
Stantec Consulting Ltd.
400-1331 Clyde Avenue
Ottawa, ON, K2C 3G4

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.

Prepared by ____
(signature)

Megan Young, E.I.T

Reviewed by ____
(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.

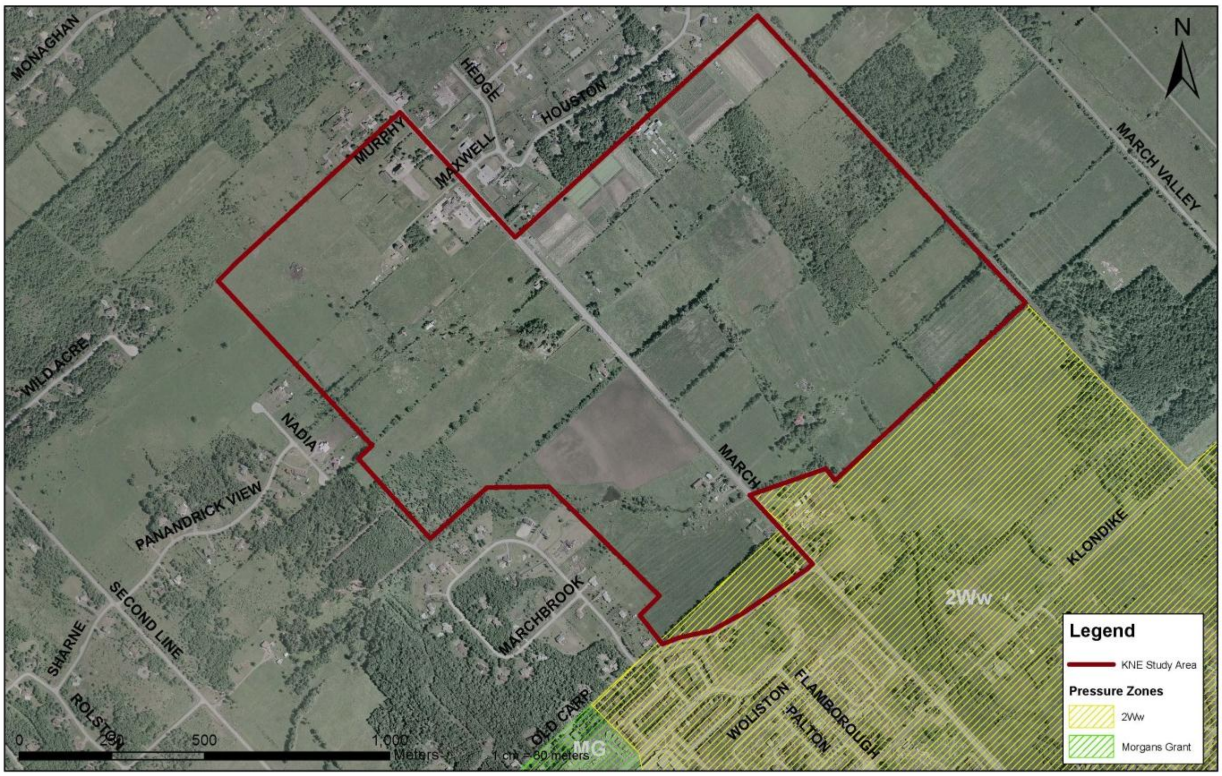


Figure 1-1: Proposed Development Site Location

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.

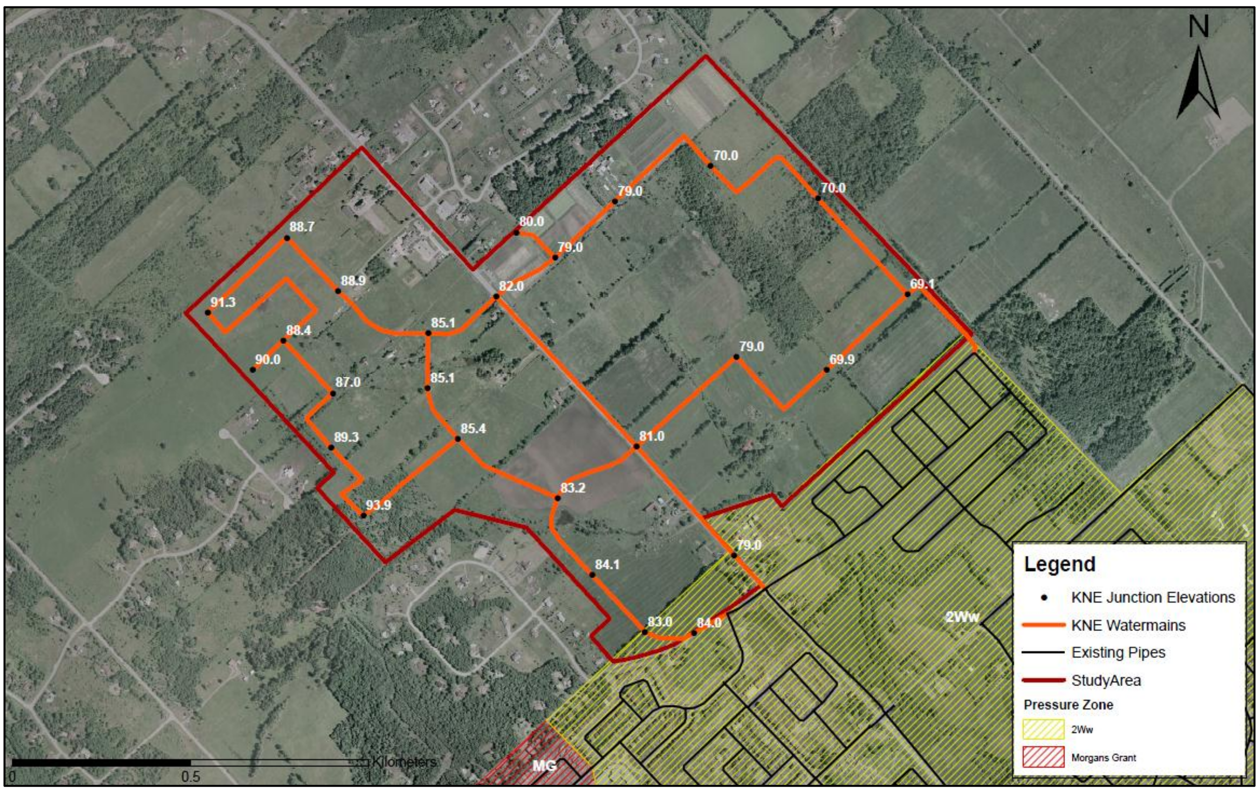


Figure 1-2: Development Site Elevations

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.

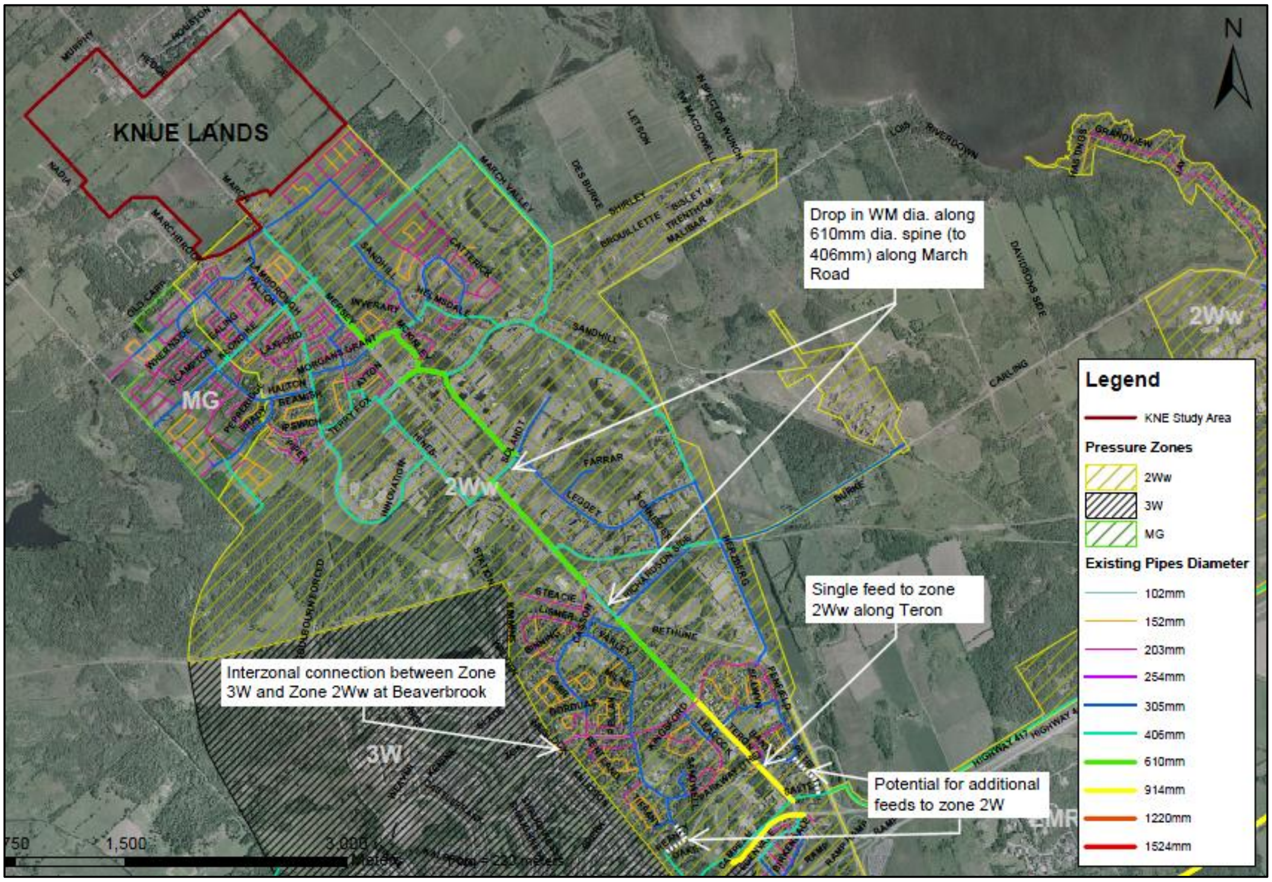


Figure 1-3: Existing Zone 2Ww Pipe Network (diameter shown in mm)

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**.

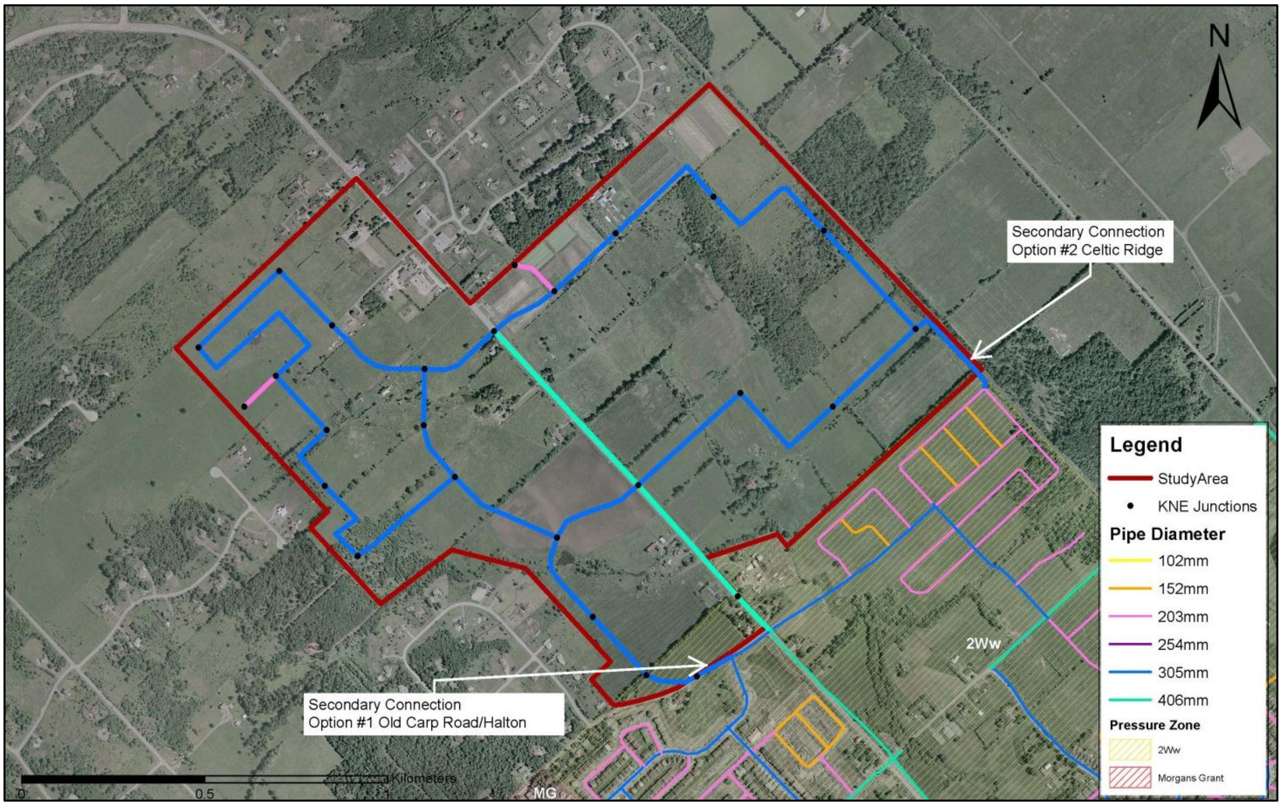


Figure 2-1: Proposed KNUE Pipe Diameters (mm) & Access Points to Existing Infrastructure

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).

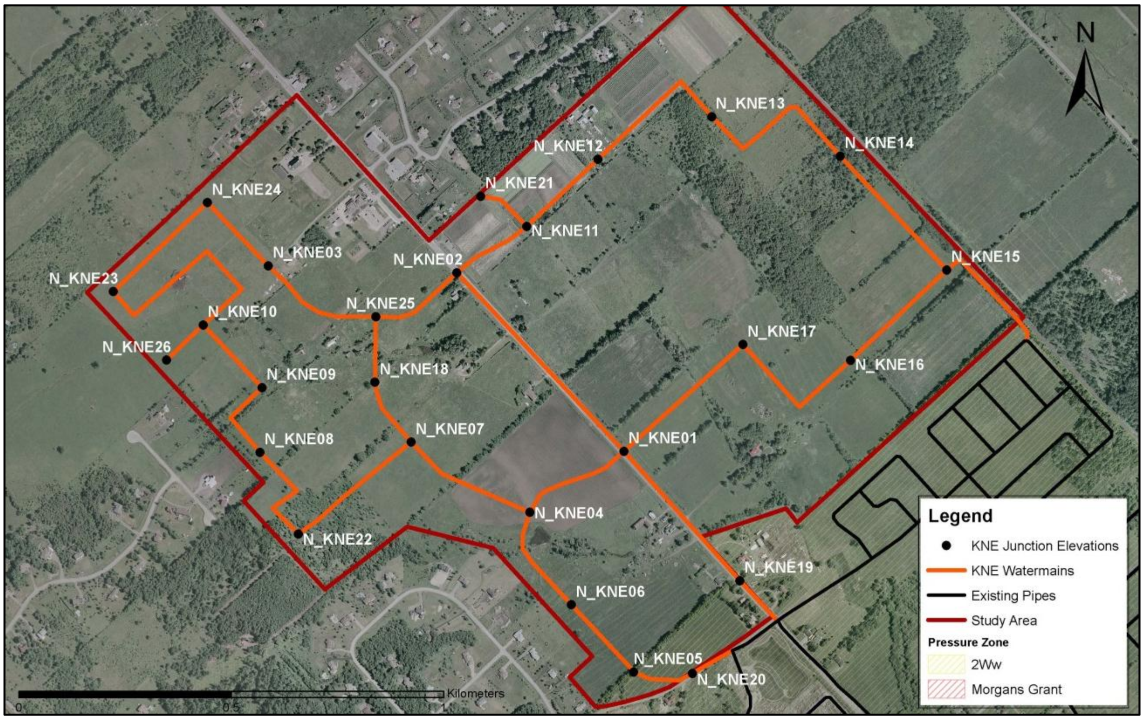


Figure 3-1: KNUE Lands Model Node ID's

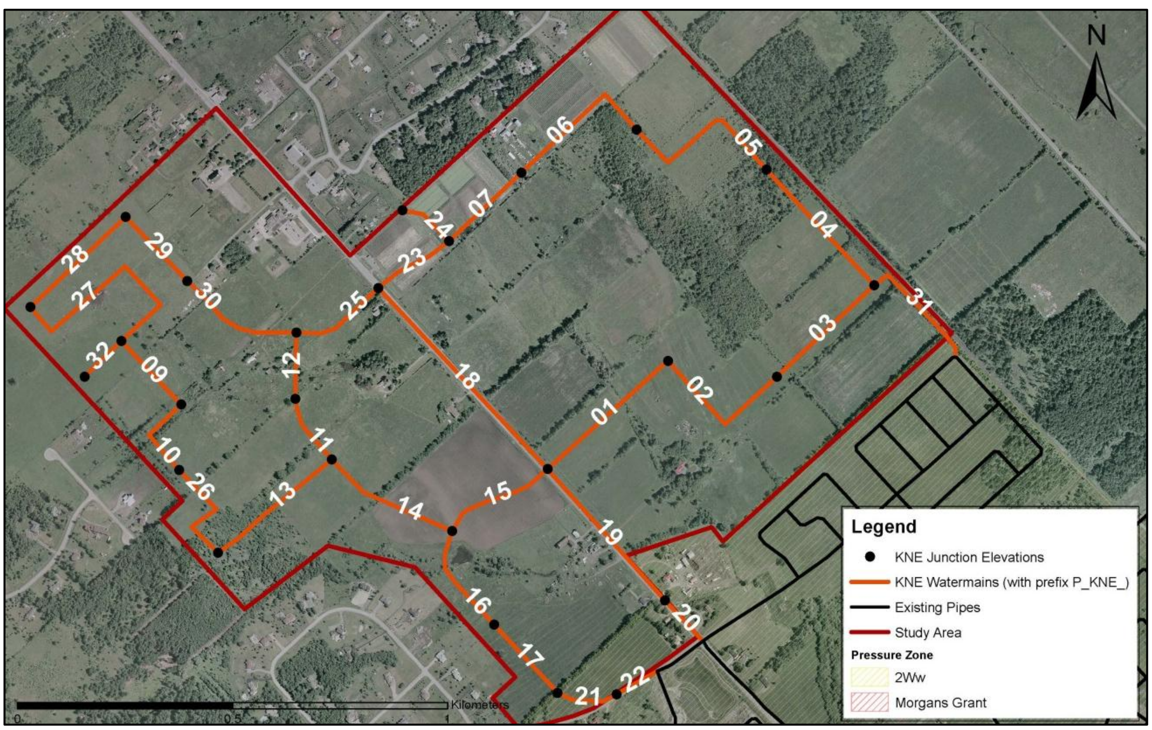


Figure 3-2: KNUE Lands Model Pipe ID's

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.

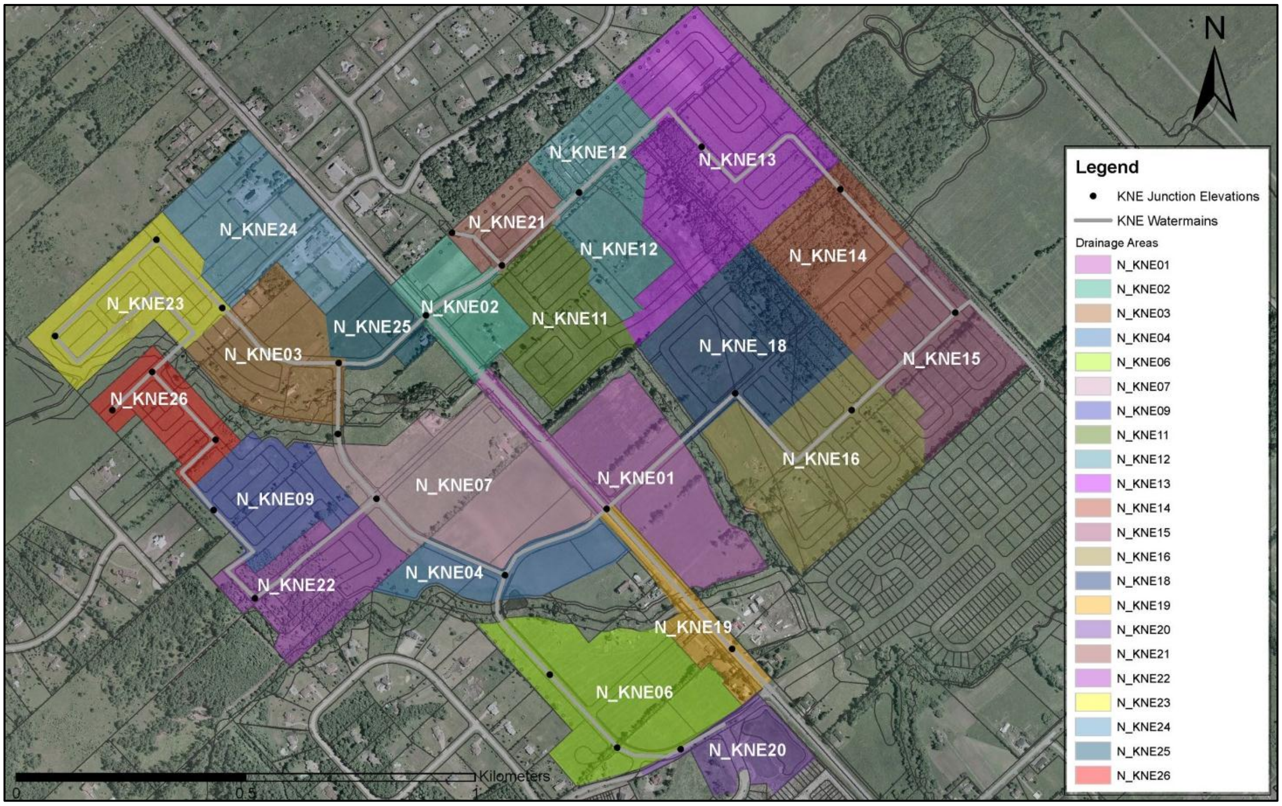


Figure 3-3: Area Demand Allocation

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).

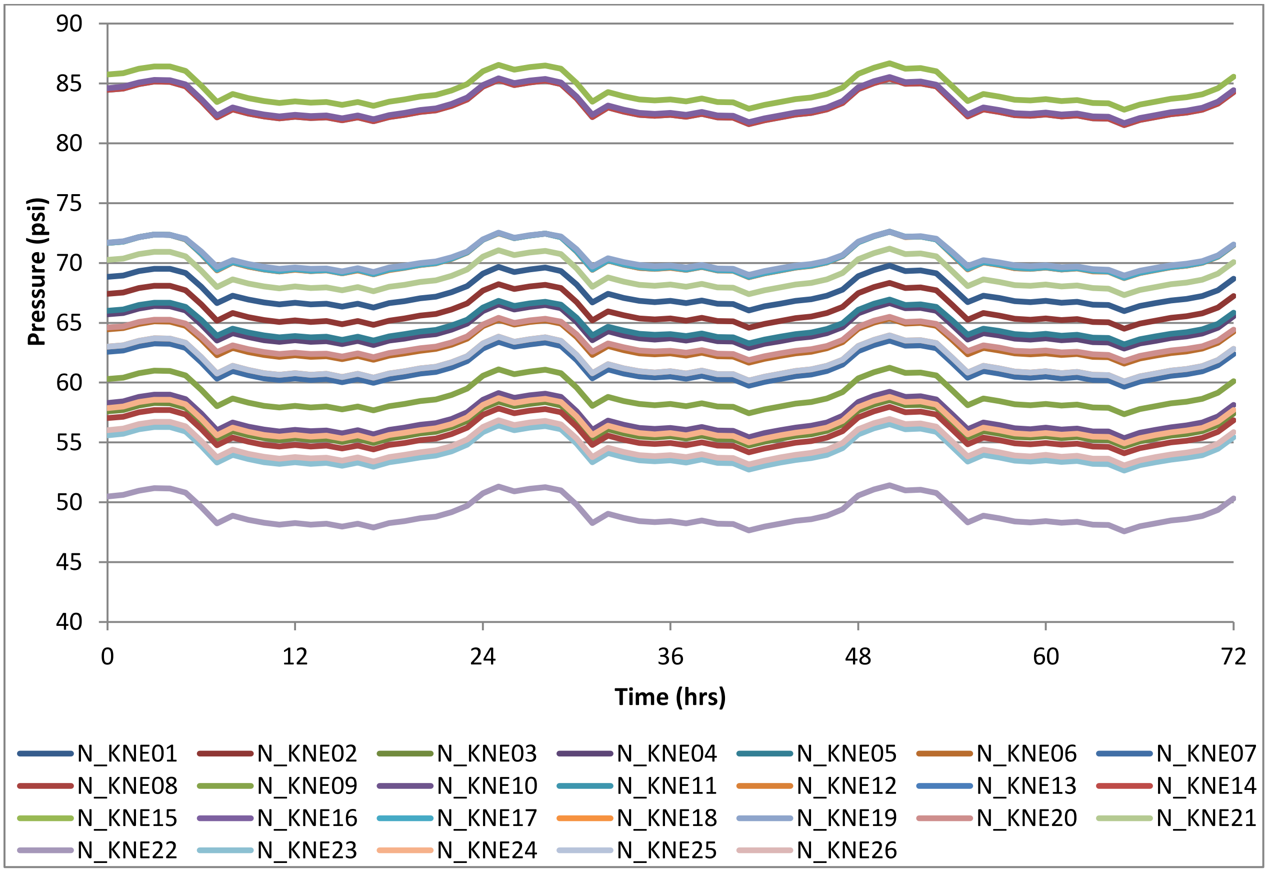


Figure 3-4: Pressures under Existing (2012) Plus KNUE Build-out AVDY Demands

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.

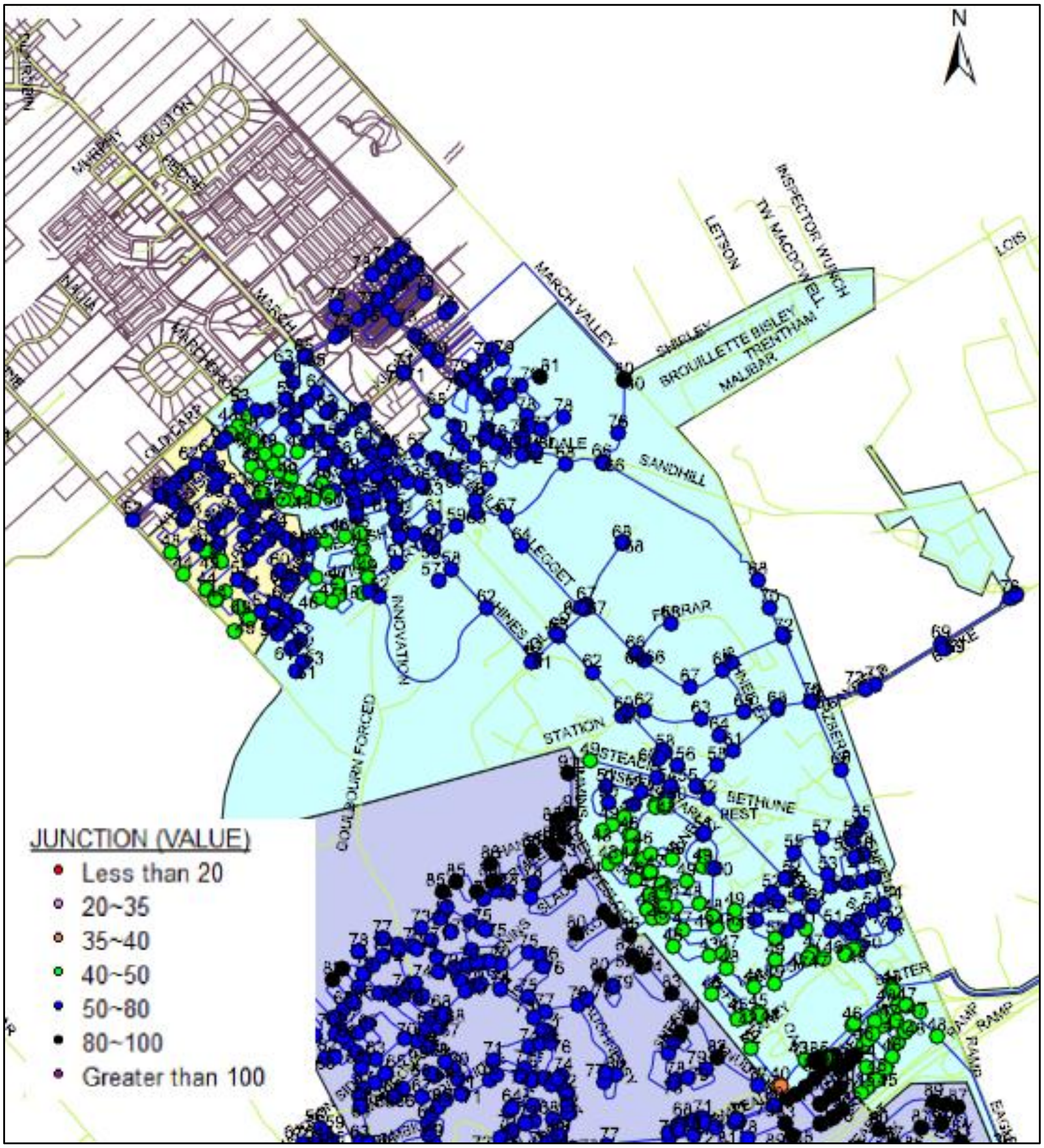


Figure 3-5: Zone 2Ww Minimum Pressures under Existing Network & Existing 2012 PKHR Demands (no KNUE)

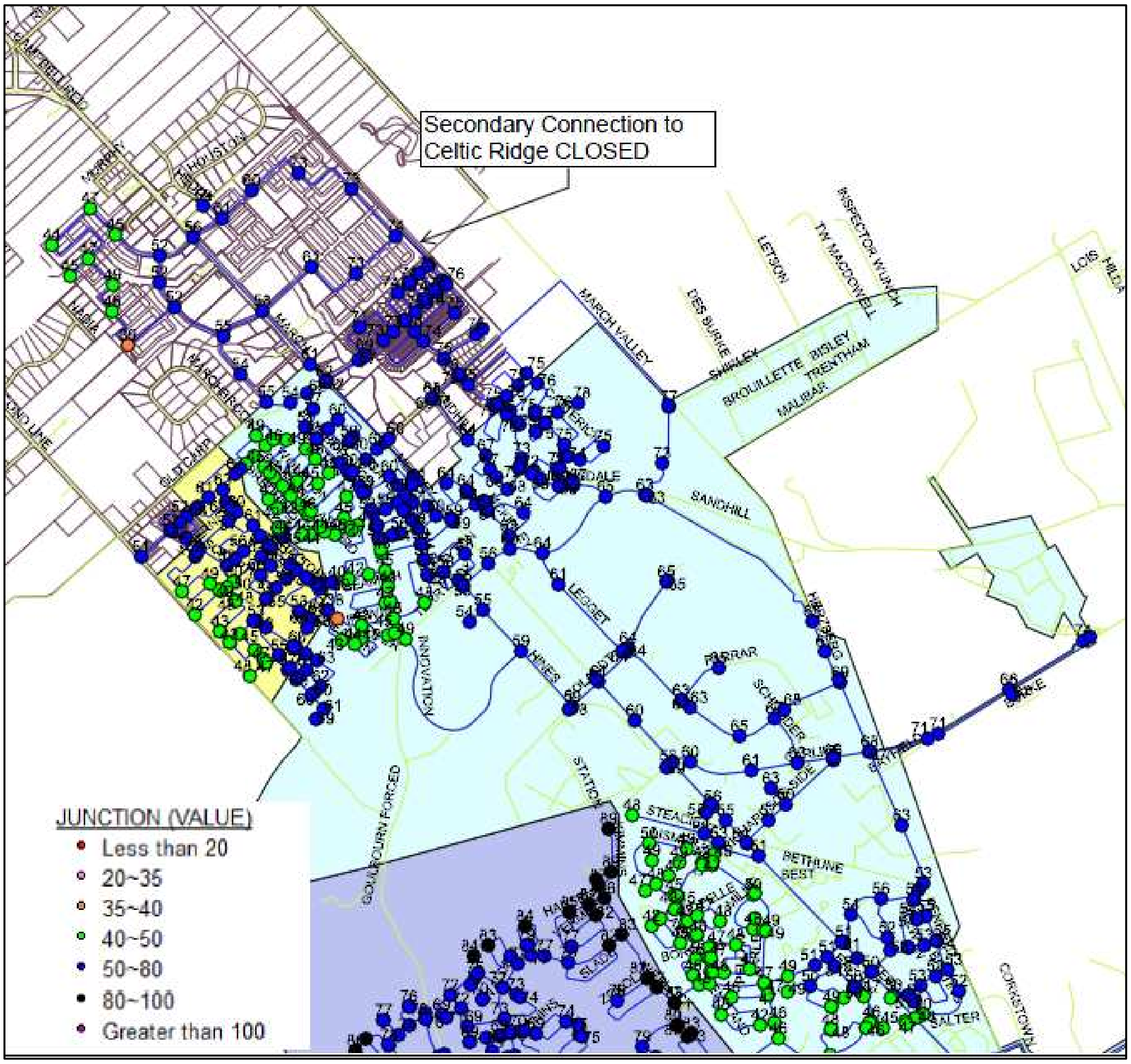


Figure 3-6: Zone 2Ww Minimum Pressures with Existing Network & Existing + KNUE 2012 PKHR Demands

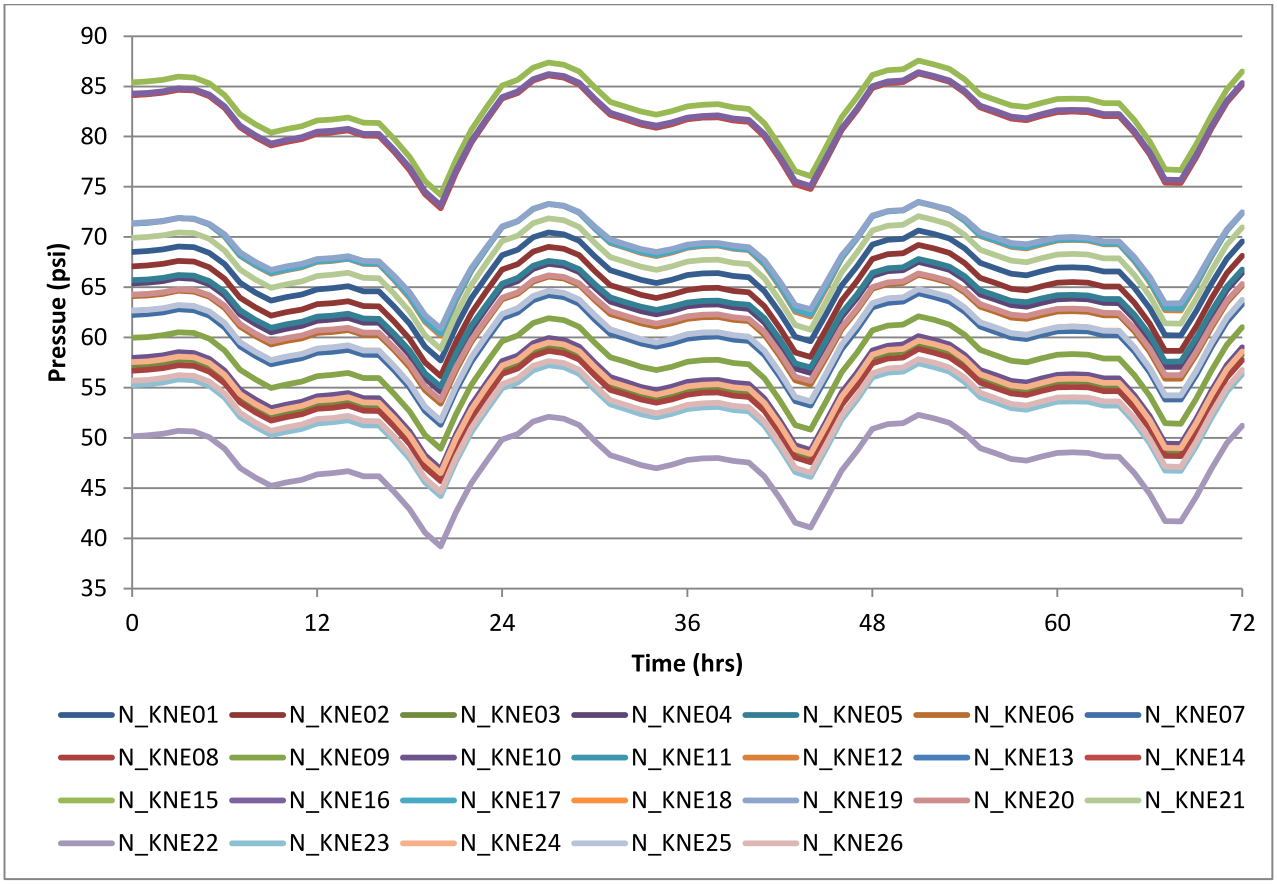


Figure 3-7: Pressures under Existing Network & Existing + KNUE 2012 PKHR EPS Demands

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.

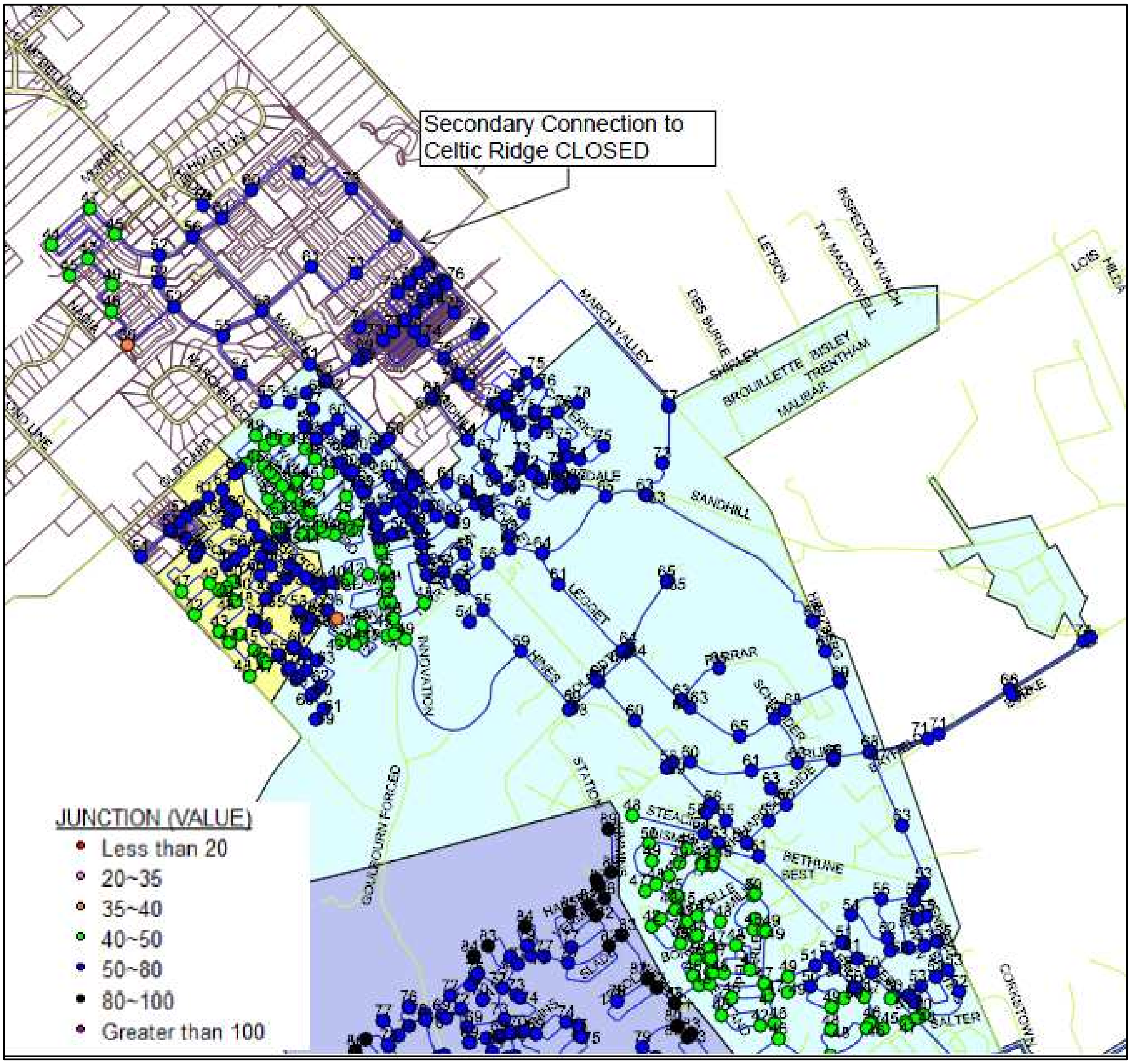


Figure 3-8: Minimum Pressures (psi) with Upgraded 2Ww Network & Existing + KNUE PKHR Demands

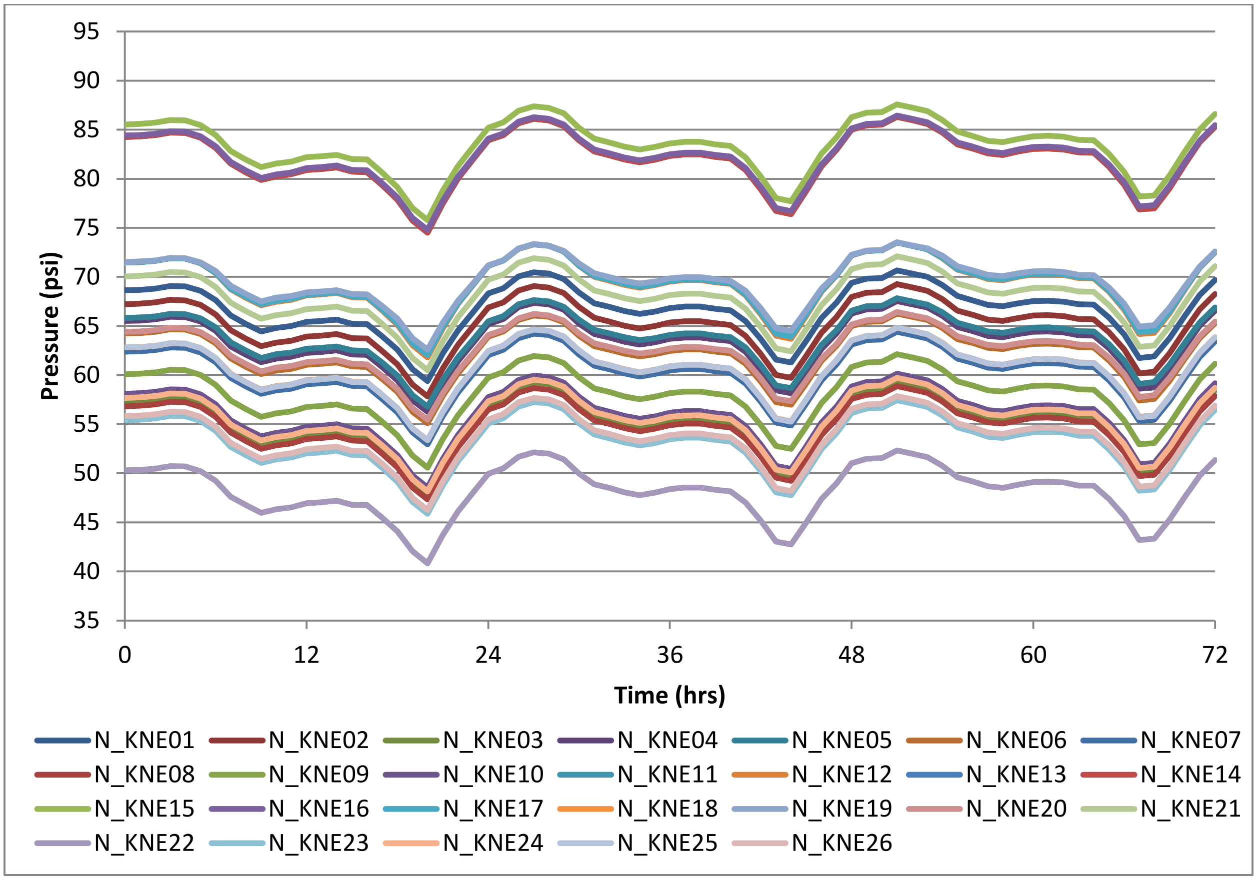


Figure 3-9: Pressures with upgraded 2Ww Network & Existing + KNUE 2012 MXDY EPS Demands

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.

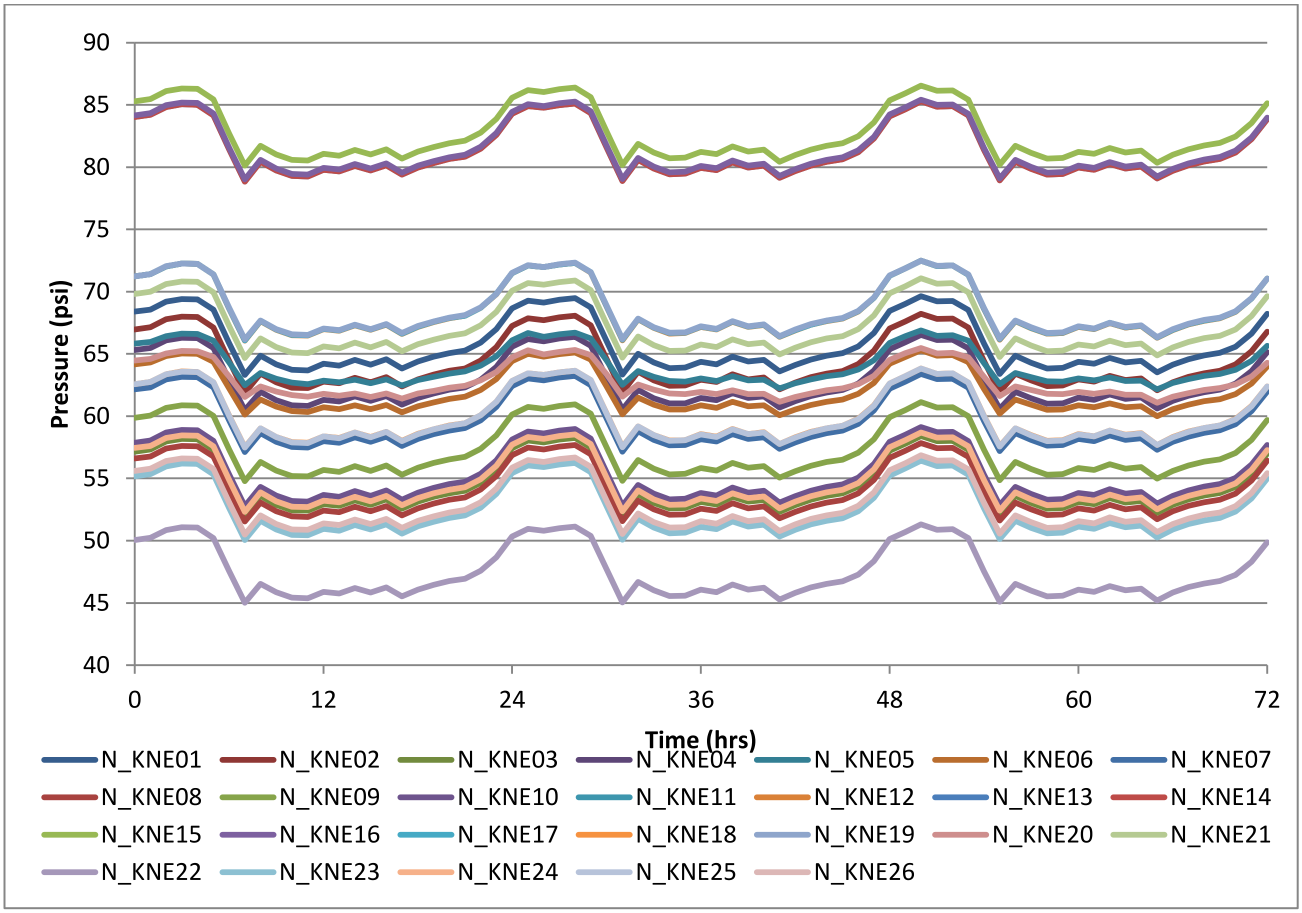


Figure 3-10: KNUE Pressures under Existing 2Ww Pipe Network & Existing + KNUE 2012 BSDY Demands with a pipe failure along the KNUE March Road feed.

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.

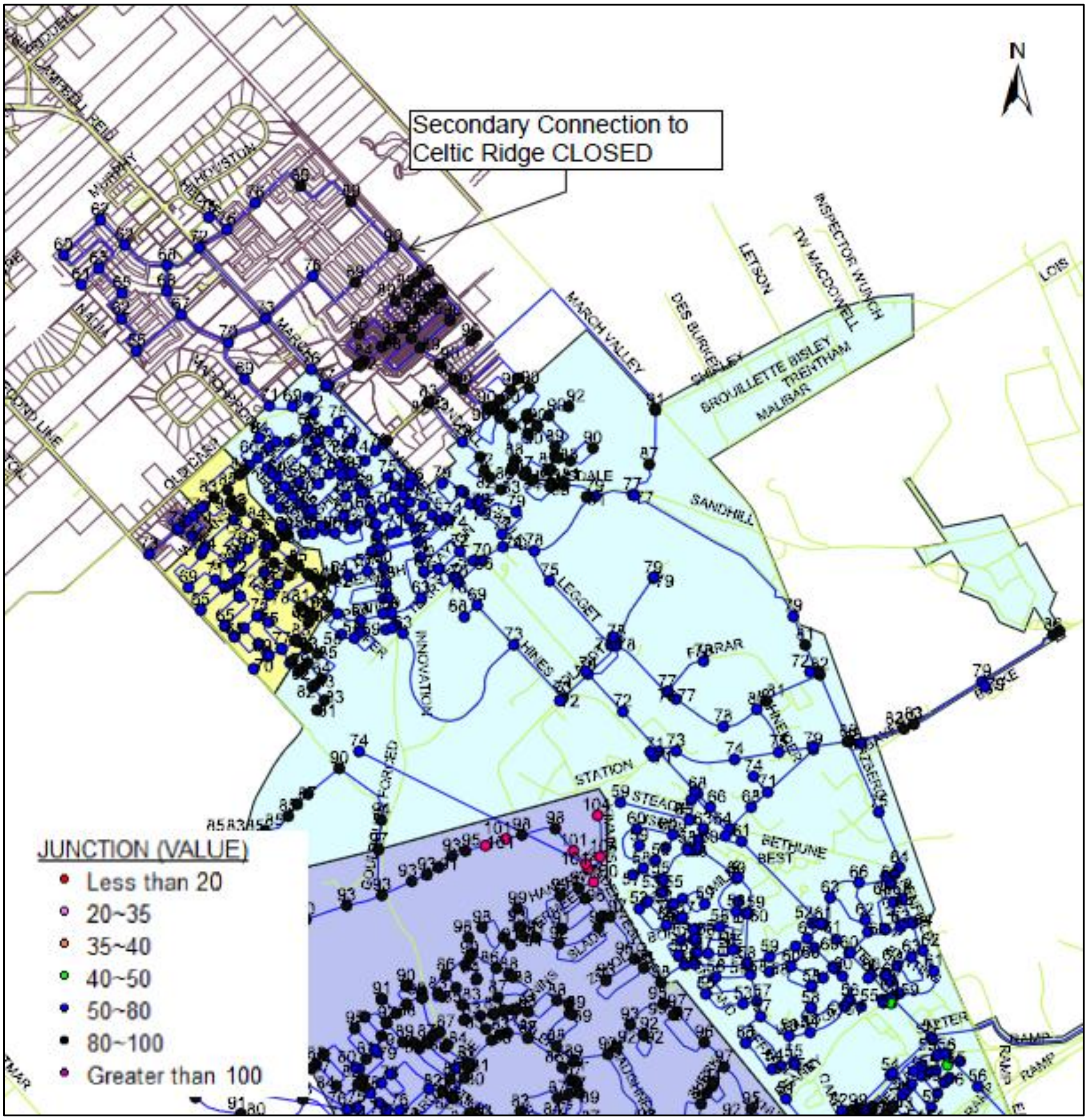


Figure 3-11: Resulting Maximum Pressures Under 2031 Average Day Demands

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.

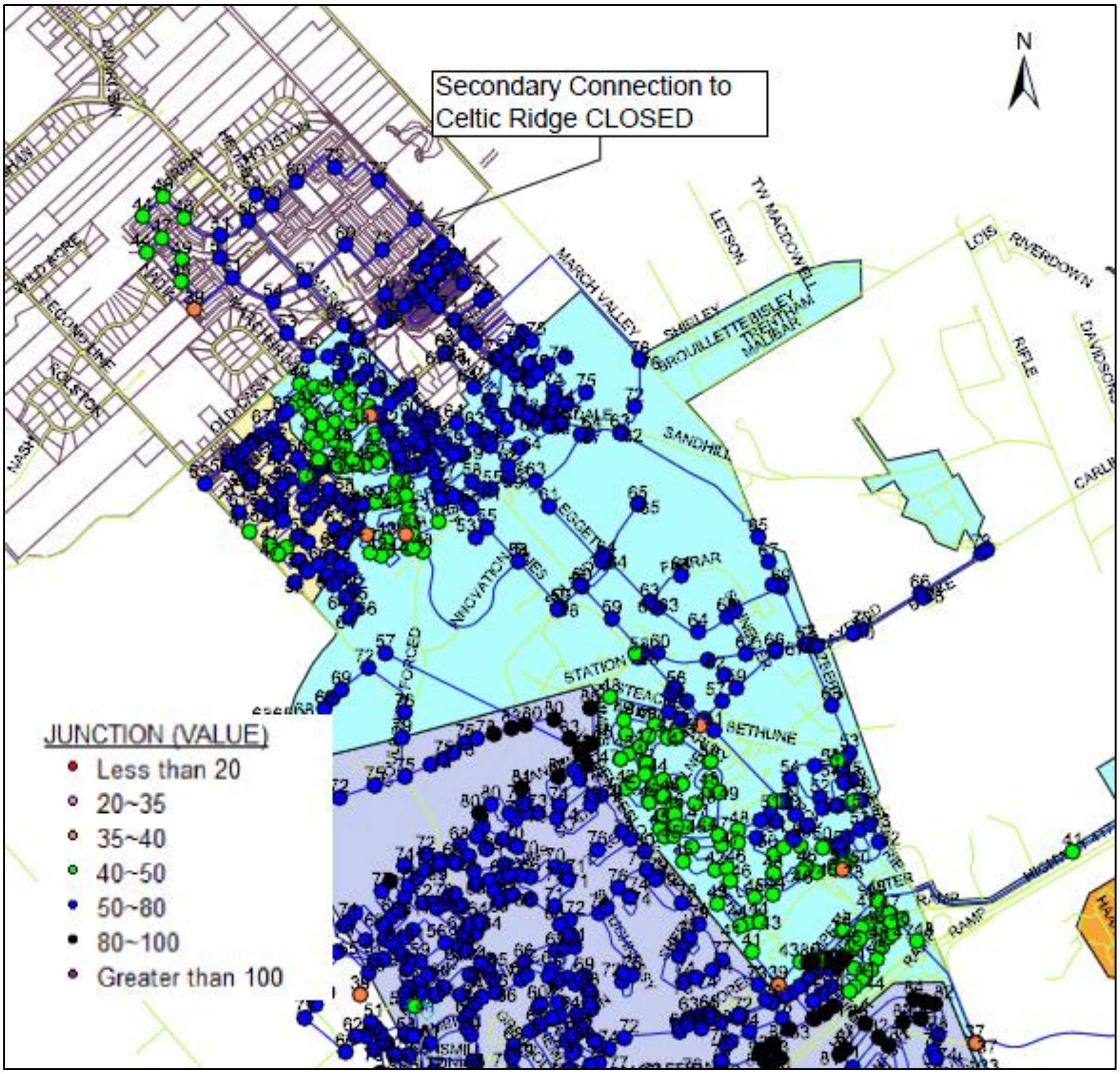


Figure 3-12: Resulting Minimum Pressures Under 2031 Peak Hour Demands

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.

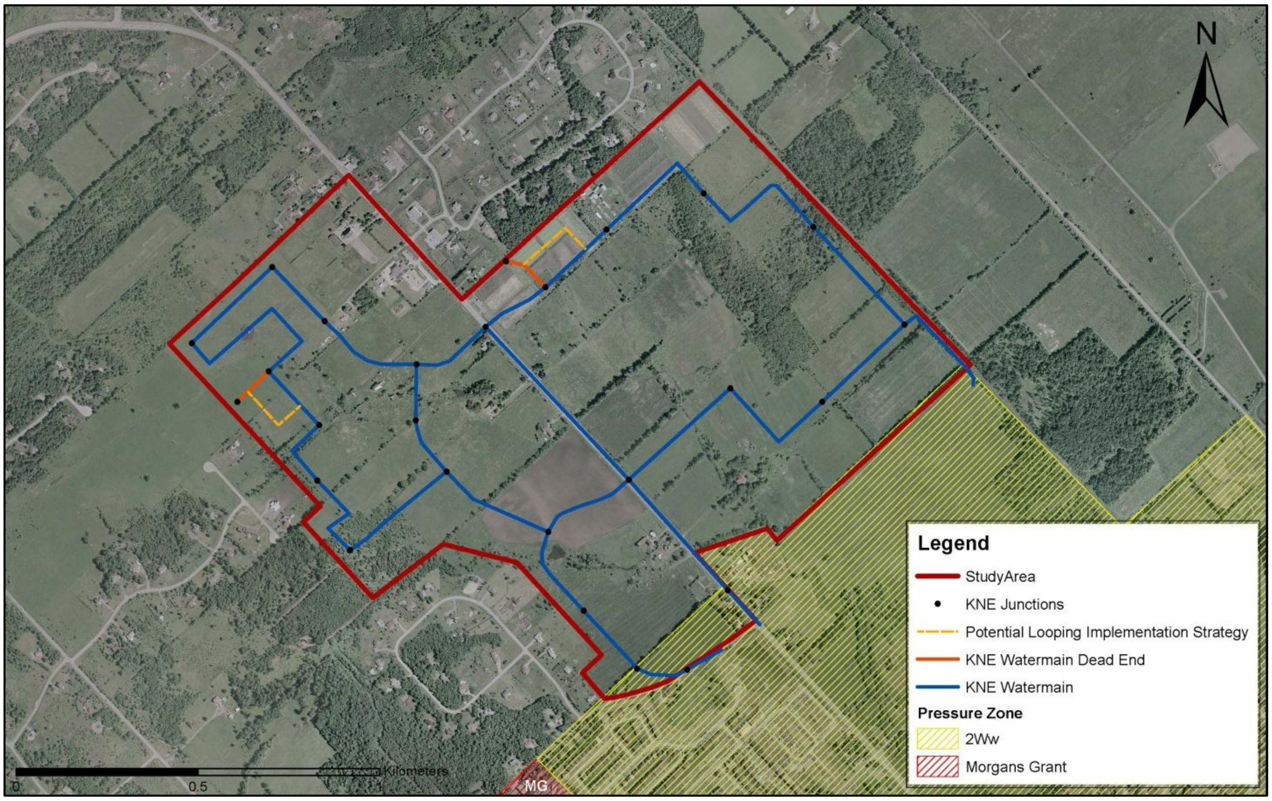


Figure 3-13: Dead End Implementation Strategy

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:

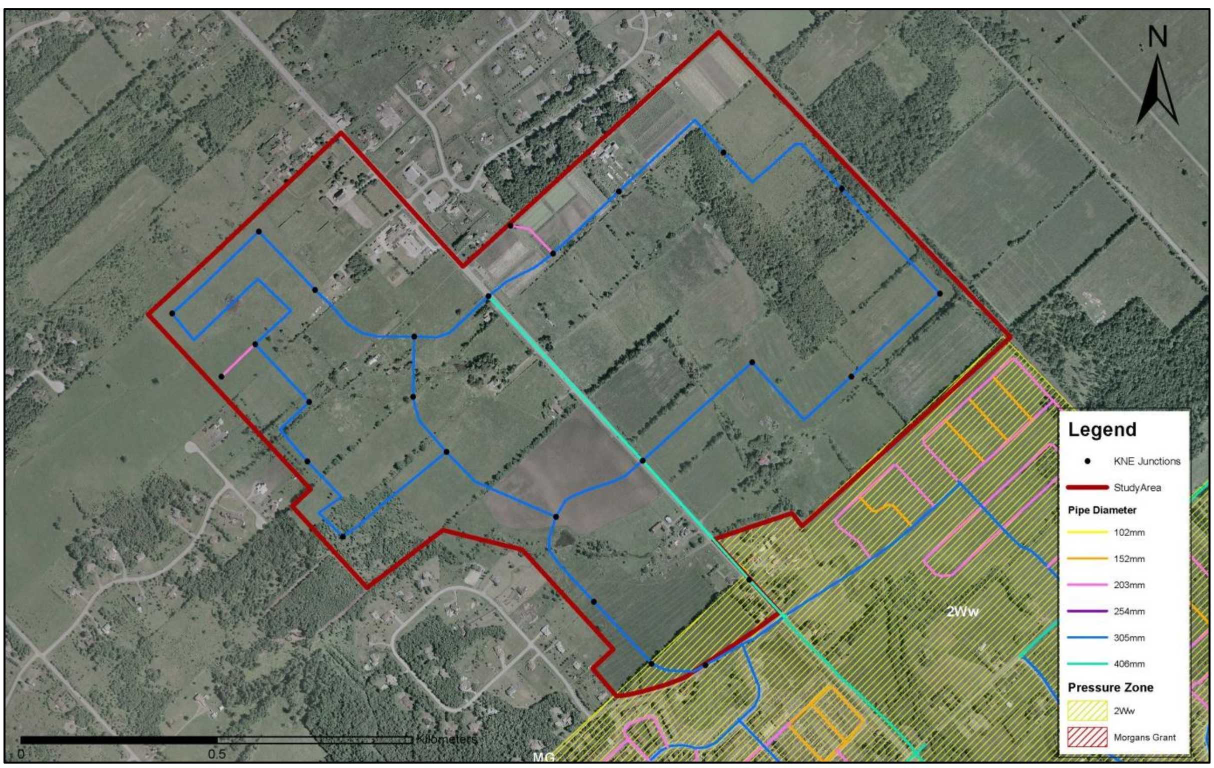


Figure 4-1: Preferred Watermain Layout

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:

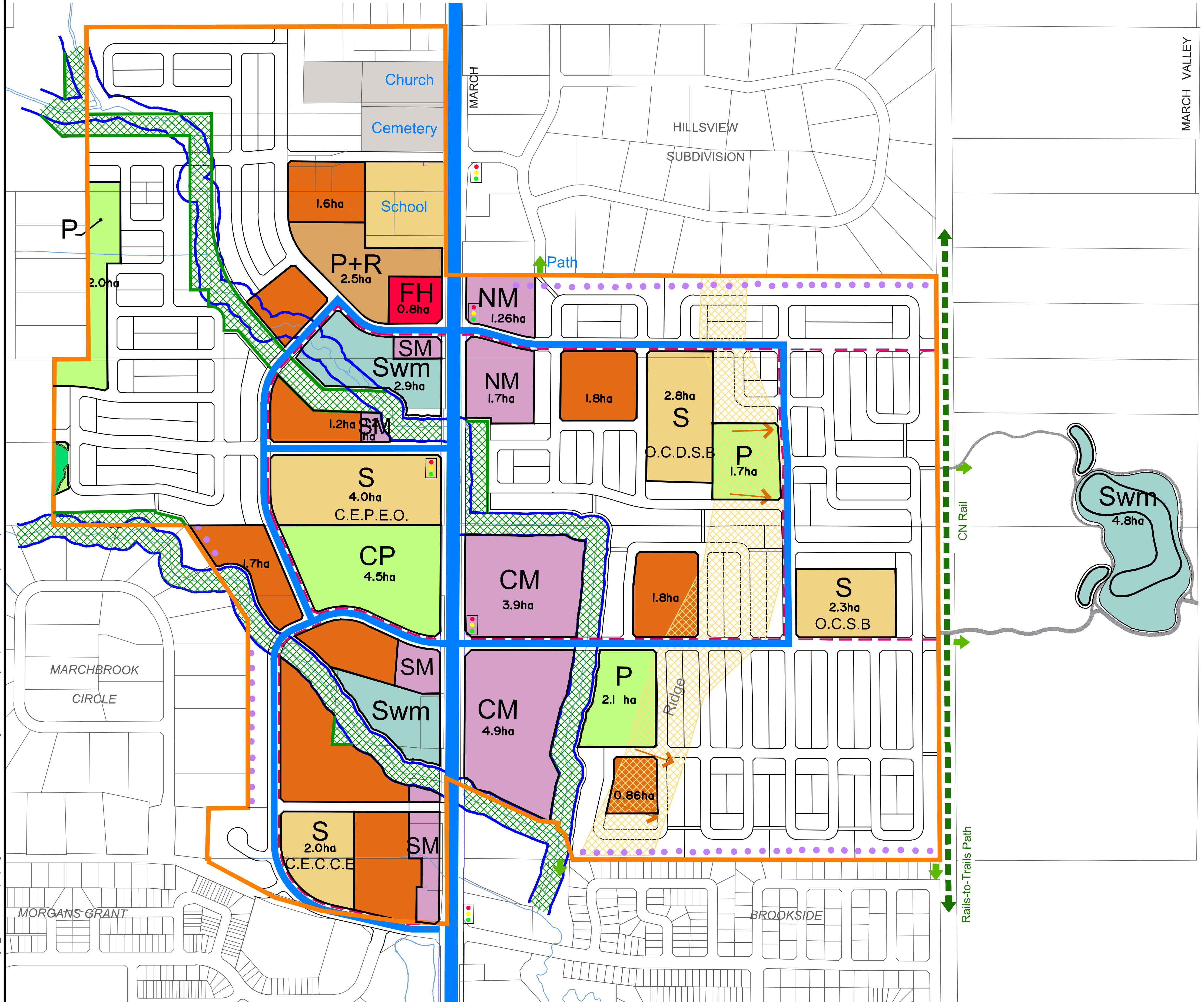
- ROW adjustments to allow for improved watermain looping;
- reduce maximum elevation of serviced land; and/or
- adjust development characteristics to reduce fire flow requirements.

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



LEGEND

- CM — Community Mixed Use
- NM — Neighbourhood Mixed Use
- SM — Service Mixed Use
- CP — Community Park
- P — Park
- Natural Heritage Feature
- S — School
- FH — Fire Hall
- Swm — Stormwater Management Pond
- P+R — Park and Ride
- Institutional
- Residential Multi-Unit [1]
- Residential Street-Oriented [2]
- Limit of Study Area
- Transition appropriate to adjacent residential
- Arterial Road (45.0m)
- Collector Road (24.0m)
- Existing Creek Corridor
- Re-aligned Creek Corridor
- Mutli-Use Pathway (MUP)

[1] Townhouses, Stacked Townhouses, Back-to-Back Townhouses, Low-rise Apartments (Max 4 Storeys)

[2] Singles, Semis, Townhouses (Max 3 Storeys)

KANATA NORTH
COMMUNITY DESIGN PLAN

FIGURE NO. 4.2
PRELIMINARY DEMONSTRATION PLAN

DATE FEB 2016
JOB 112117
SCALE 1 : 7500 (0, 75, 150)

NOVATECH
Engineers, Planners & Landscape Architects

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

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.	REVISED PER CITY OF OTTAWA COMMENTS	NOV 25/22	DDB
2.	REVISED PER CITY OF OTTAWA COMMENTS	AUG 10/22	DDB
1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	FEB 1/22	DDB

SCALE 1:500

DESIGN	BM
CHECKED	DDB
DRAWN	RBG
CHECKED	BM
APPROVED	DDB

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
D. D. BLAIR
100122737
NOV. 25 2022
PROVINCE OF ONTARIO

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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 # 3
DRAWING No. 121247-GR

D07-16-22-0002