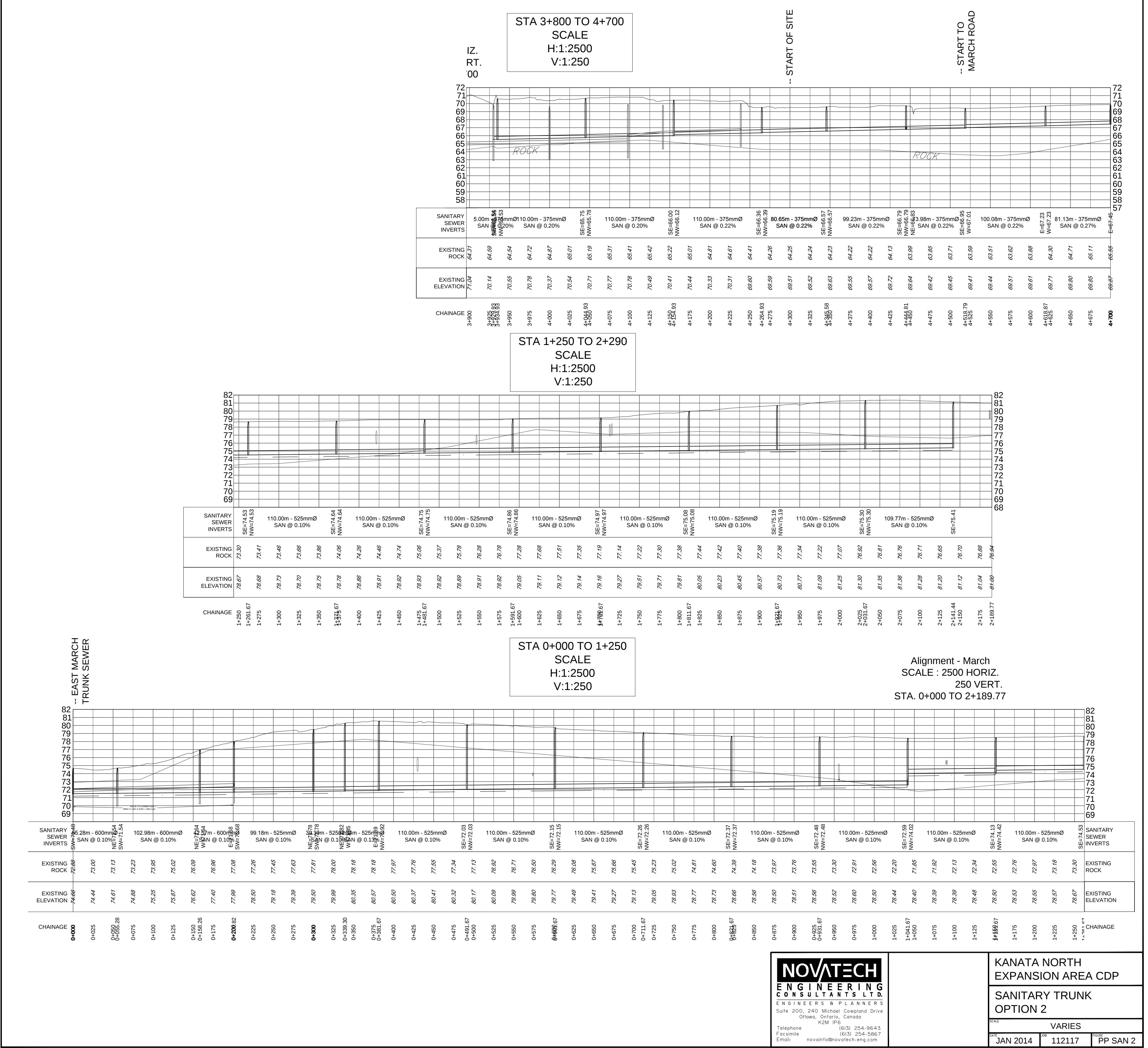
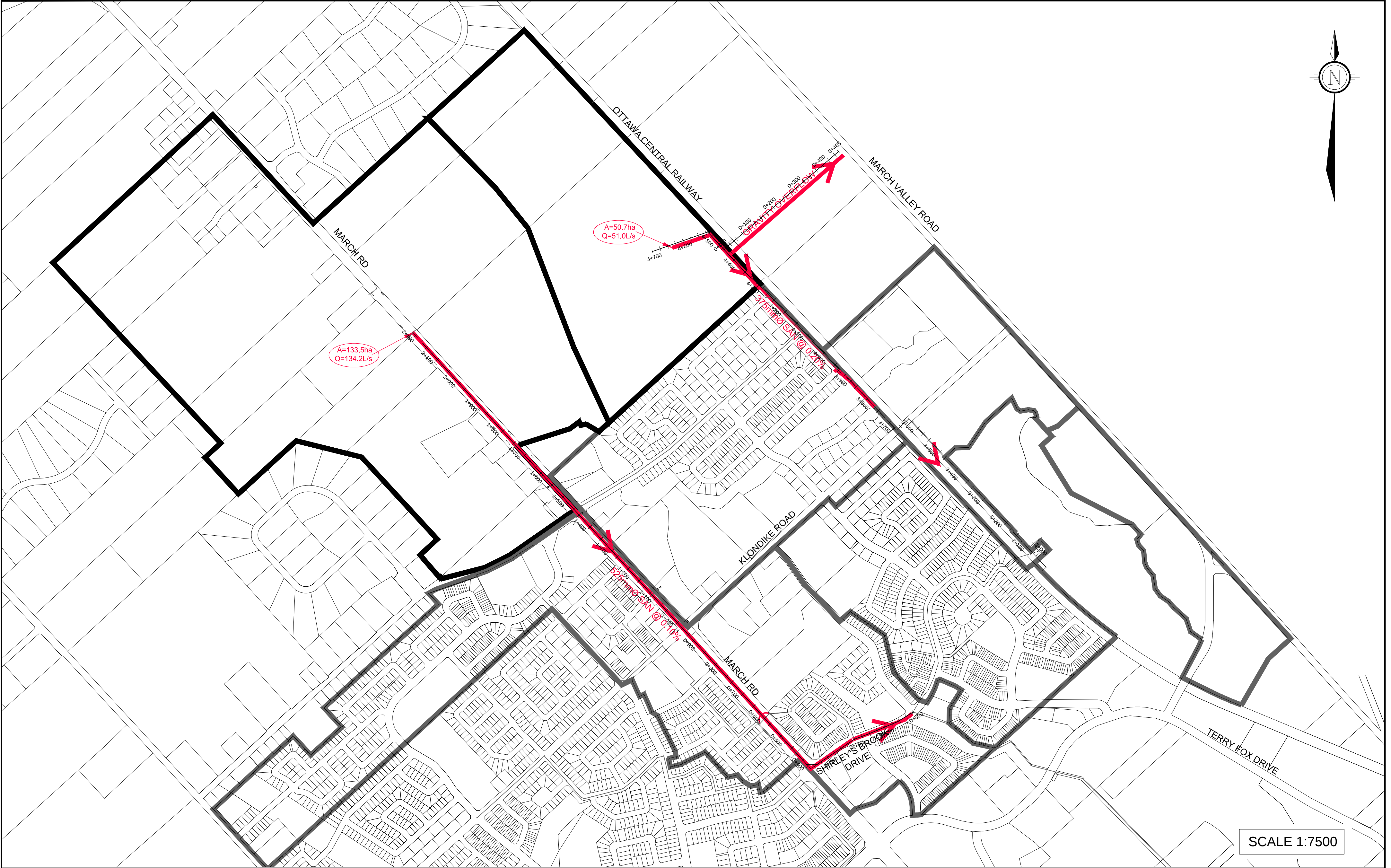
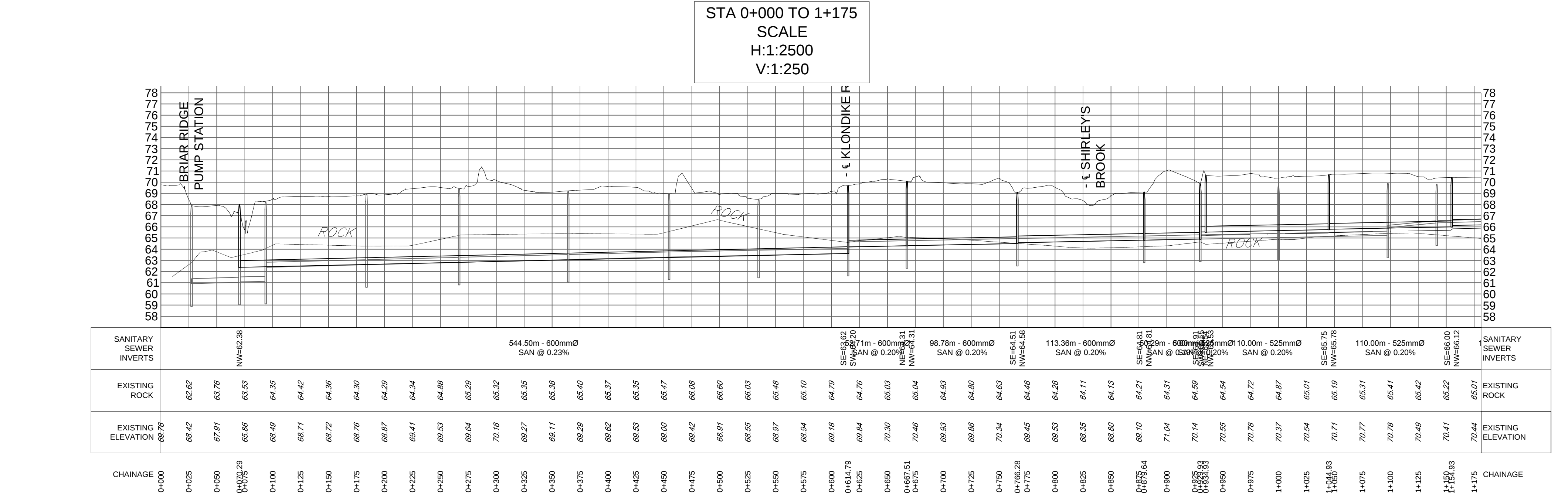
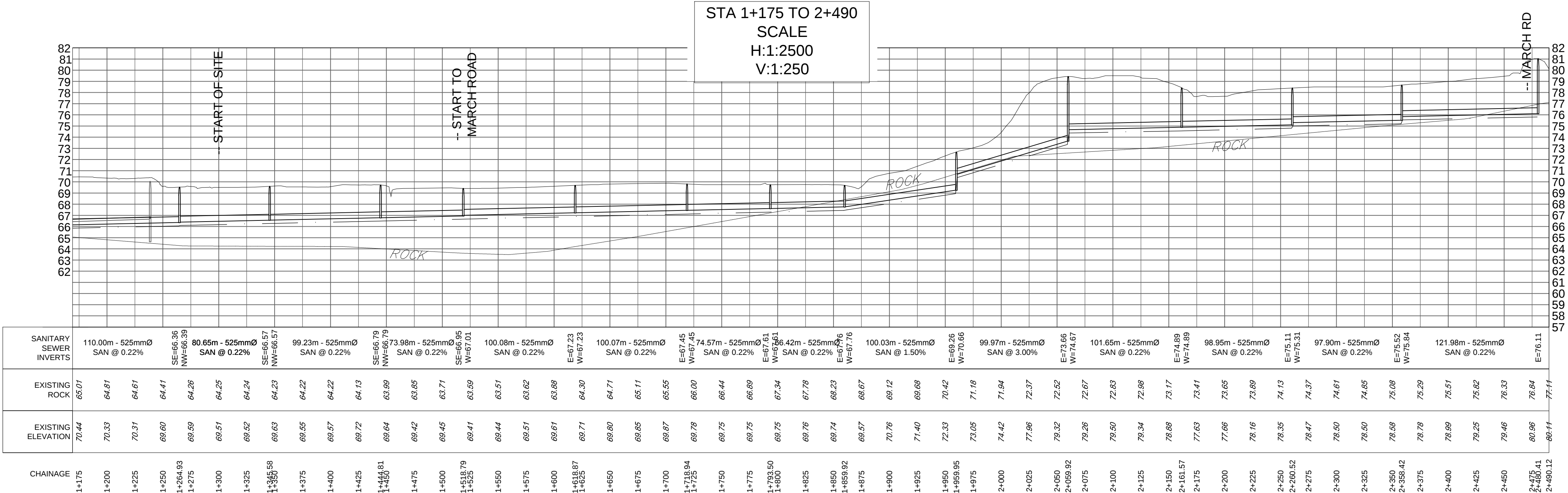
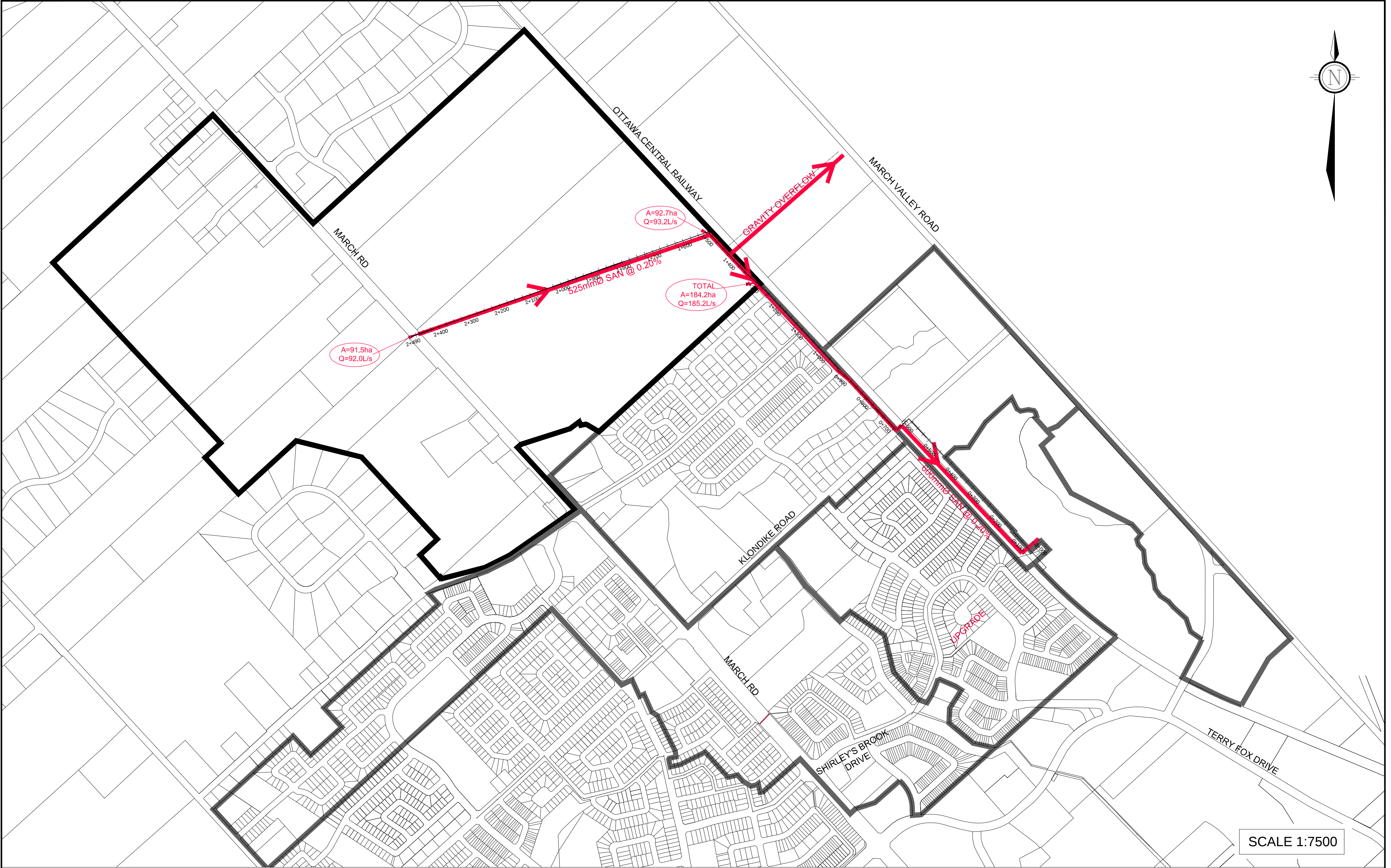
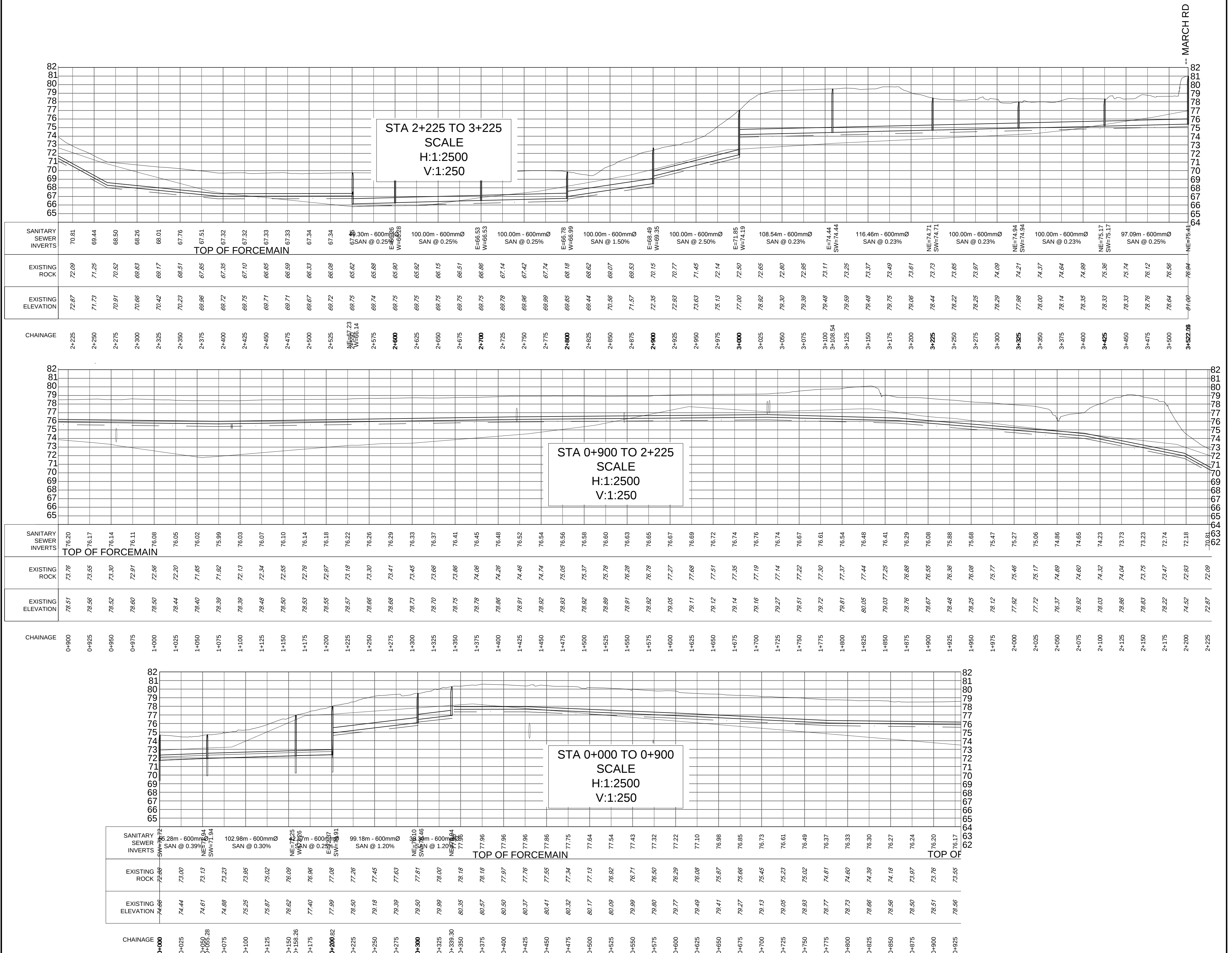
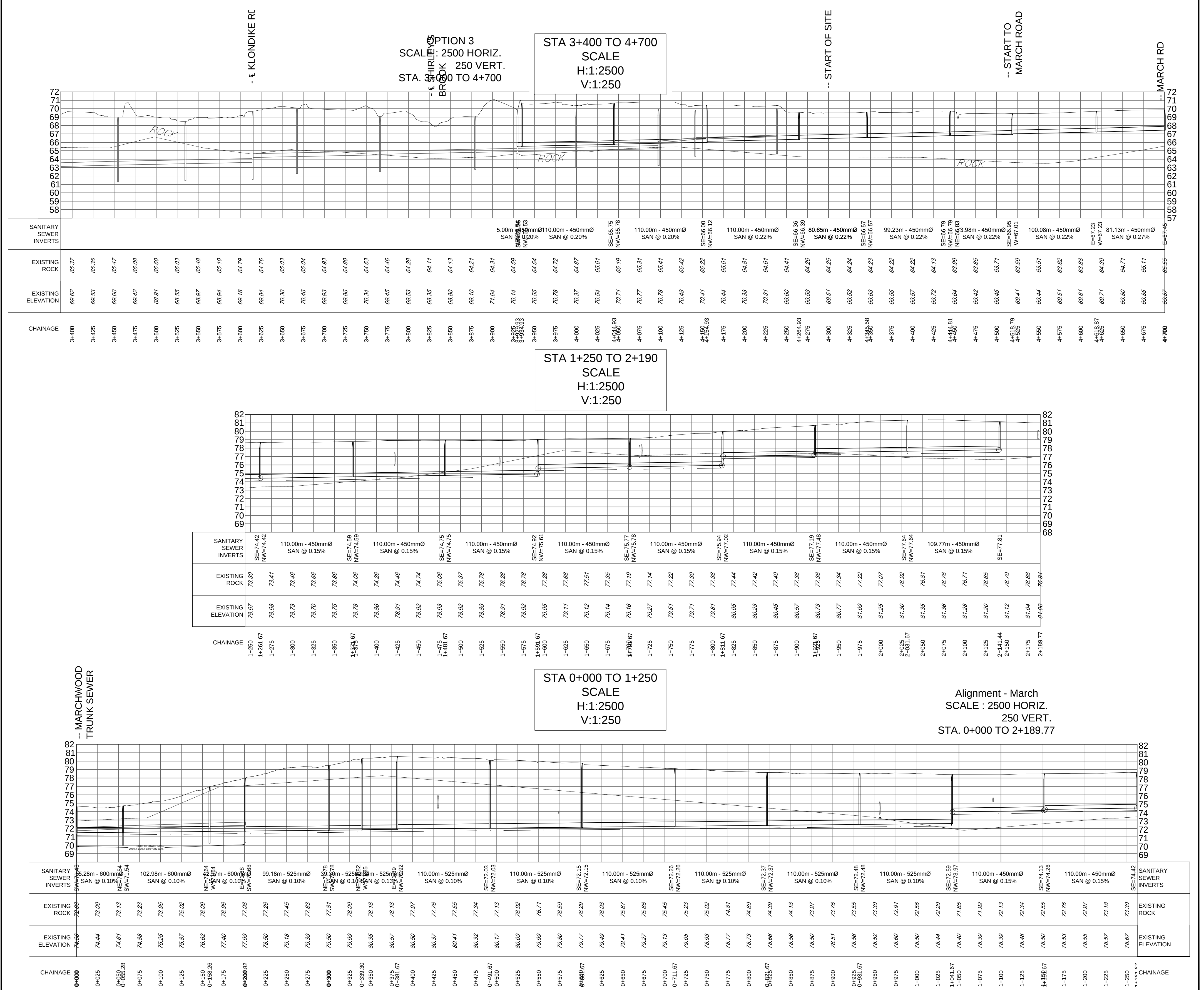
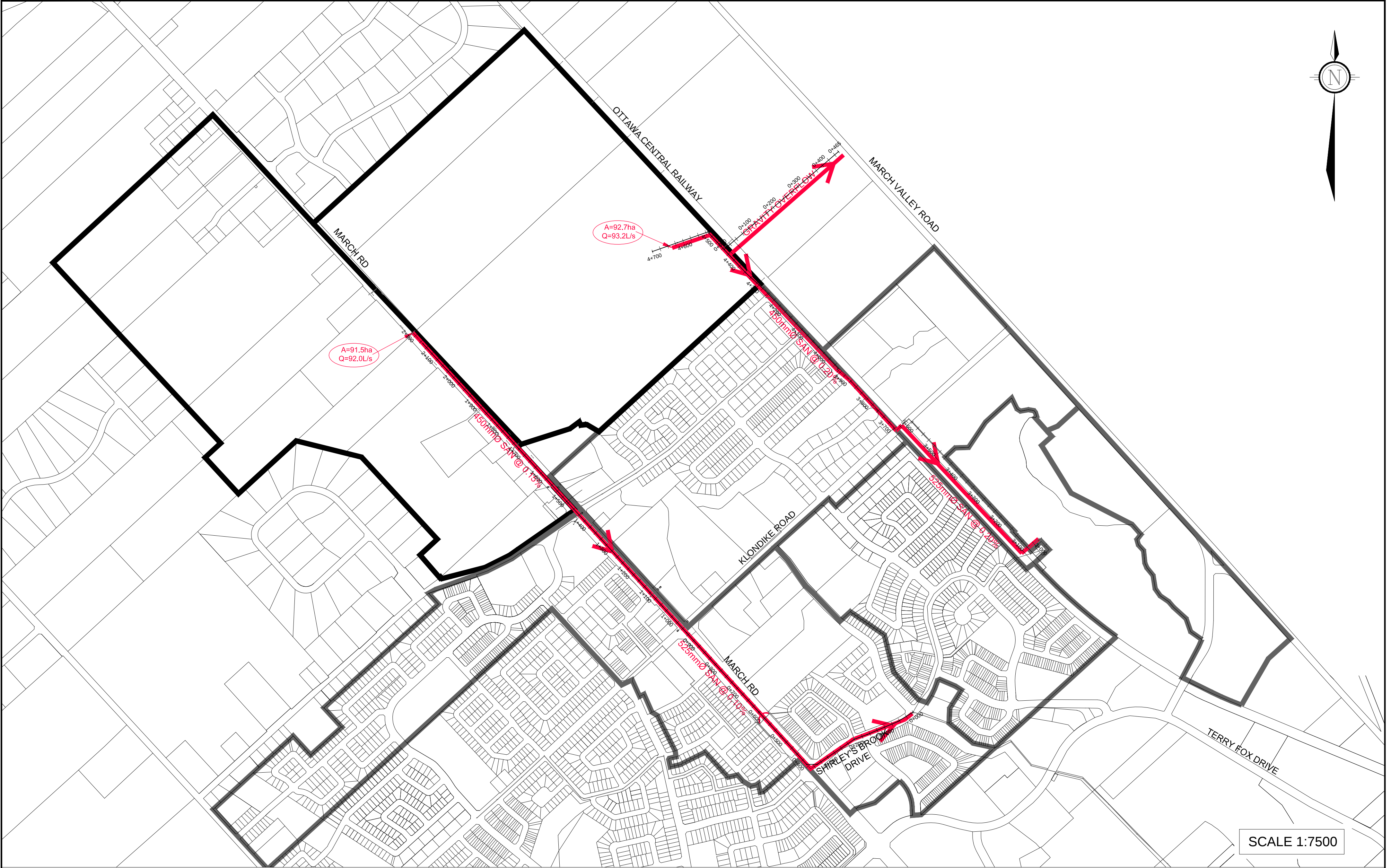










Lee Sheets

From: Zagorski, Joseph <Joseph.Zagorski@ottawa.ca>
Sent: Wednesday, May 21, 2014 5:14 PM
To: Cara Ruddle; Lee Sheets
Cc: Diduch, Roman; John Riddell; Tse, Wendy; Ogilvie, Chris; Whittaker, Damien
Subject: FW: Kanata North - sanitary memo 2

Hi Cara and Lee,

Please see my comments regarding your April 9 2014 Sanitary Servicing memorandum for the Kanata North Urban Expansion Area:

1. Provide table summarizing the design and existing flows. (land area, population, design parameters, source of info, etc.)
2. Provide description of the existing Briar Ridge PS. (current capacity and serviced population, future design capacity and population as per existing CofA, existing max flows to the station, projected additional flows from Kanata North expansion, info on existing forcemains, etc.)
3. Since Options 5a and 5B are almost identical and very similar to the Option 2 I would delete Options 5A and 5B. Final balance of land for Option 2 splits what goes to Briar PS versus to trunk along March Road can be determined at the later stages of the design process.
4. Split Option 4 in 4A and 4B with 4B showing forcemain connection to Marchwood trunk since in the near future the Marchwood Trunk will drain by gravity to the North Kanata Phase 2 Trunk bypassing the Existing March Road PS.
5. Show functional plans and profiles for all of the options.
6. Add 60% of capital cost allowance to the estimated construction cost to get total capital cost estimate for each option.
7. Provide total capital cost for each option (remove Section C of cost estimate table since it is confusing).

Let me know if you have any questions or comments. Thx.

M. Joseph Zagorski, P.Eng.
Senior Project Manager
Infrastructure Policy, Policy Development and Urban Design
Planning and Growth Management Department
City of Ottawa, 110 Laurier Avenue West, 3th Floor, Ottawa, ON K1P 1J1
tel: (613) 580-2424, ext. 22611
fax: (613) 580-2578
e-mail: Joseph.Zagorski@ottawa.ca

From: Cara Ruddle [<mailto:c.ruddle@novatech-eng.com>]
Sent: May 16, 2014 3:06 PM
To: Zagorski, Joseph
Cc: Lee Sheets
Subject: Kanata North - sanitary memo 2

Joe:
Please find attached a pdf copy of the cost estimate information from the sanitary memo as presented in the April 9 TAC meeting. Please respond to confirm receipt of this email.

Please call or email if you have any questions.

Cara Ruddle, P.Eng.
Project Manager

Novatech Engineering Consultants Ltd
200-240 Michael Cowpland Drive
Ottawa . Ontario . Canada . K2M 1P6

Office: 613-254-9643 x 220
Fax: 613-254-5867

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APPENDIX C-6

MEMORANDUM

DATE: MAY 13, 2016
TO: KANATA NORTH LANDOWNERS' GROUP
FROM: MURRAY CHOWN
RE: PRELIMINARY DEMONSTRATION PLAN A-26 – UNIT COUNTS AND DENSITIES
PROJECT NO.: 112117-0
CC: LEE SHEETS, CARA RUDDLE, ALEX MCAULEY

The following discussion of unit counts and densities is based on Preliminary Demonstration Plan A-26, dated May 12, 2016. The total net residential area for this demonstration plan is 80.10 ha. Given the Official Plan requirement to achieve a minimum average residential density of 34 uph, the demonstration plan must accommodate a minimum of 2,725 dwelling units.

Subject to the assumptions discussed below, the total number of units that could develop under Preliminary Demonstration Plan A-26 is 2,950 dwelling units for an average residential density of 36.8 uph. The potential distribution of total units by unit type is as follows:

- 1,040 Multi-Unit Residential;
- 960 single family units;
- 950 street townhouses;

Saleable street frontage has been split between singles and townhouses so as to provide roughly 50% singles and 50% townhouses. This is reasonable reflection of the market preference between these two forms of housing.

With this distribution of units, 960 single family units represent just over 32% of the total of 2,950 units. This does not meet the Official Plan requirement to accommodate a minimum of 45% singles. 960 single family units represent just over 35% of the minimum of 2,725 dwelling units. (1,225 single family units would represent 45% of 2,725 units.)

A minimum of 295 apartments will be required to meet the minimum Official Plan requirement of 10% of total units. If 30% of the potential Multi-Unit Residential units are constructed as apartments this requirement will be met.

Multi-Unit Residential:

The density of the Foxwoods (EQ Homes) in Kanata is 49 uph. The density of Klondike Crossing (Minto) is 63 uph. The density of Fairwinds West (Mattamy) is 77 uph. The density of Heritage Hills (Birgil) is 164 uph. For the purposes of this memo, an average density of 65 uph was assumed for the 15.96 ha. of Multi-Unit Residential land for a total of approximately 1040 dwelling units.

Note that as the average density for Multi-Unit Residential units goes up, the total number of units in the development will increase, requiring a proportional increase in the number of single family dwellings to respect current Official Plan policies (45% singles).

Single Family Units:

Demonstration Plan A-19 provides a total of approximately 59,350 feet of saleable street frontage. Assuming an average lot width of 40 feet for single family dwellings, 960 singles would take up 38,400 feet of available saleable street frontage.

Street Townhouses:

Assuming an average lot width of 22 feet for street townhouses, 950 street townhouses would take up 20,950 of the saleable street frontage.

KANATA NORTH URBAN EXPANSION AREA **COMMUNITY DESIGN PLAN**

Global Wastewater Flows

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



Table C-6a - Based on Demonstration Plan "A-26"

	Area (ha)	Units*	Population	Population Flow (L/s)	Peak Factor	Infiltration (L/s)	Total Sanitary Flow (L/s)
Schools	11.12			9.7	1.5	3.1	12.8
Creek Corridor	12.22			0.0	0.0	0.0	0.0
Swm Blocks	4.08			0.0	0.0	0.0	0.0
Parks	10.65			0.0	0.0	0.0	0.0
Commercial - Mixed Use	15.91			13.8	1.5	4.5	18.3
Park and Ride	2.54			0.0	0.0	0.7	0.7
Misc. Ex. Lands (School)	5.70			4.9	1.5	1.6	6.5
Fire Hall	0.83			0.7	1.5	0.2	1.0
Residential	80.10					22.4	22.4
Singles	64.14	1056	3590	43.6	3.0	0.0	0.0
Street Townhouse		1045	2822	34.3	3.0	0.0	0.0
Multi-Unit Residential	15.96	1144	2574	31.3	3.0	0.0	0.0
Roads	40.21			0.0	0.0	11.3	11.3
Total	183.36	3245	8986	138.4		43.8	182.2

* Based on May 13, 2016 Novatech Memo + 10%

Commercial/Institutional flows = 50,000 L/ha/day

Population Flow = 350 L/person/day

Infiltration = 0.28 L/s/ha

Singles = 3.4 persons per unit

Street Townhouse = 2.7 persons per unit

Multi-Unit Residential = 50% Towns @ 2.7 persons per unit & 50% Apartments @ 1.8 persons per unit

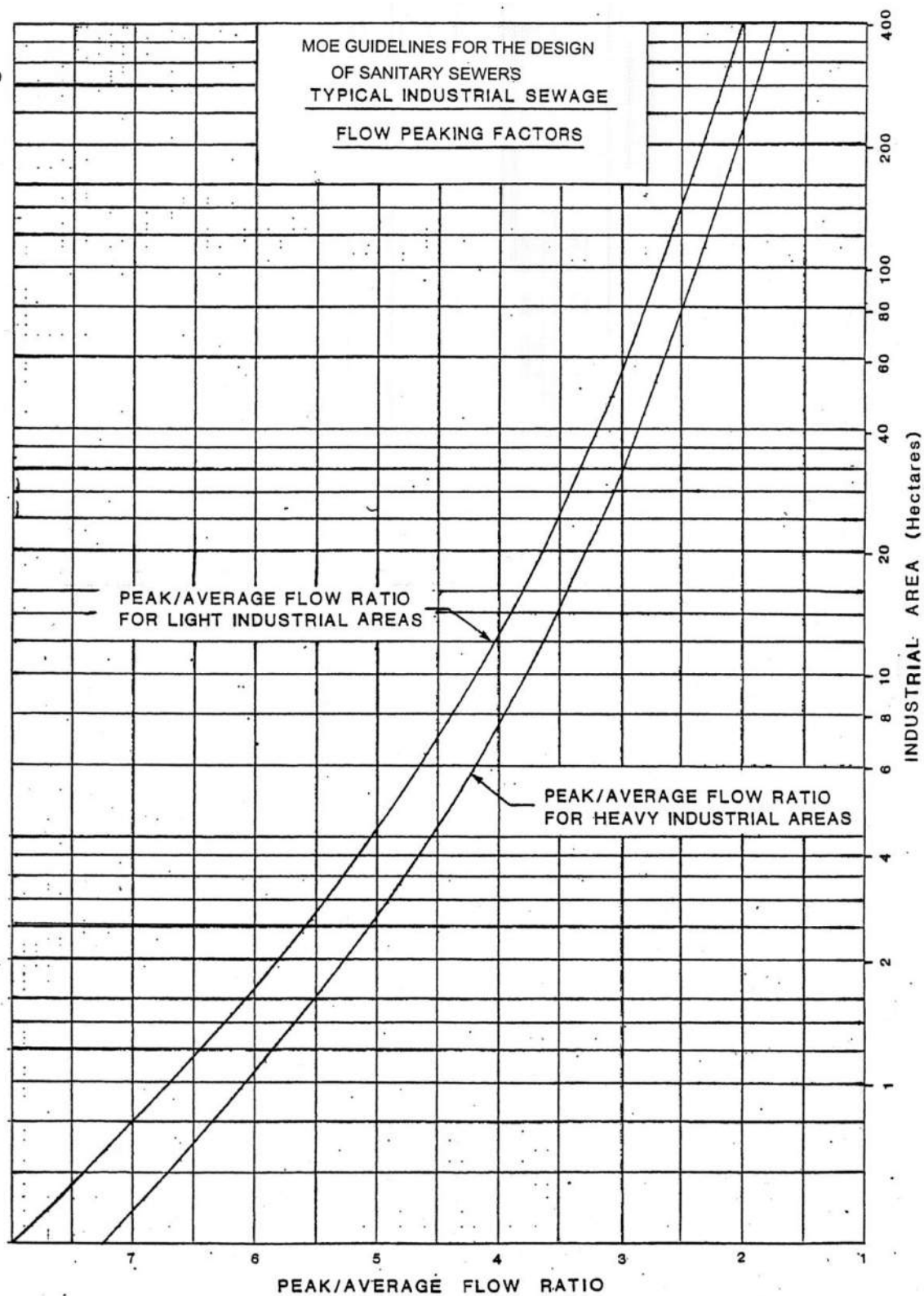
Date: February 25, 2016

Revised: May 11, 2016

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

APPENDIX 4-B

PEAKING FACTOR FOR INDUSTRIAL AREAS



Kanata North Urban Expansion Area

Community Design Plan

Preliminary Servicing Costs Sanitary Sewer Installation

Preferred Option 2 - Detailed

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
Outlet - East March Trunk Sewer					
SECTION A - GENERAL					
1	Erosion and Sediment Control	1	LS	\$75,000.00	\$75,000.00
2	Ground Water Pumping & Management	1	LS	\$180,000.00	\$180,000.00
3	Traffic Control	1	LS	\$95,000.00	\$95,000.00
TOTAL SECTION A - GENERAL					\$350,000.00

SECTION B - SANITARY SEWER & APPURTENANCES					
1	Sanitary Sewer				
	i) 600mm dia. Conc. 65-D (3 - 4m deep)	660	m	\$450.00	\$297,000.00
	ii) 600mm dia. Conc. 65-D (4 - 5m deep)	150	m	\$550.00	\$82,500.00
	iii) 600mm dia. Conc. 65-D (5 - 6m deep)	441	m	\$650.00	\$286,650.00
	iv) 600mm dia. Conc. 65-D (6 - 7m deep)	694	m	\$750.00	\$520,500.00
	v) 600mm dia. Conc. 65-D (7 - 8m deep)	200	m	\$850.00	\$170,000.00
	vi) 600mm dia. Conc. 65-D (8 - 9m deep)	200	m	\$950.00	\$190,000.00
	vii) Upsize Ex. 375 to 600mm (2 - 6m) (SB Drive)	201	m	\$1,300.00	\$261,300.00
2	Sanitary Manholes				
	i) 1200mm dia. (3m - 4m in height)	5	ea	\$6,000.00	\$30,000.00
	ii) 1200mm dia. (4m - 5m in height)	3	ea	\$7,000.00	\$21,000.00
	iii) 1200mm dia. (5m - 6m in height)	5	ea	\$9,000.00	\$45,000.00
	iv) 1200mm dia. (6m - 7m in height)	7	ea	\$10,000.00	\$70,000.00
	v) 1200mm dia. (7m - 8m in height)	3	ea	\$11,000.00	\$33,000.00
	vi) 1200mm dia. (8m - 9m in height)	2	ea	\$12,000.00	\$24,000.00
	vii) Upsize ex 1200mm MH to 1500mm	4	ea	\$20,000.00	\$80,000.00
3	Rock Excavation	9,200	m ³	\$120.00	\$1,104,000.00
4	Roadway Reinstatement	14,000	m ²	\$100.00	\$1,400,000.00
5	Iron Adjustment	24	ea	\$500.00	\$12,000.00
6	TV (x2)	2,546	m	\$10.00	\$25,460.00
7	By Pass Pumping	201	m	\$200.00	\$40,200.00
8	Storm Sewer - Remove & Reinstall On Shirley's Brook Dr, parallel to Sanitary	1	LS	\$218,480.00	\$218,480.00
TOTAL SECTION B - SANITARY SEWER & APPURTENANCES					\$4,911,090.00

Construction Total	\$5,261,090.00
60% Capital Cost Allowance	\$3,156,654.00

Total	\$8,417,744.00
--------------	-----------------------

Total Flow	L/s	131.9
Gross Cost	\$(/L/s)	\$63,819.00

Kanata North Urban Expansion Area

Community Design Plan

Preliminary Servicing Costs Sanitary Sewer Installation

Preferred Option 2 - Detailed

Outlet - Briar Ridge Pump Station

SECTION A - GENERAL

1	Erosion and Sediment Control	1	LS	\$10,000.00	\$10,000.00
2	Ground Water Pumping & Management	1	LS	\$20,000.00	\$20,000.00
3	Traffic Control	1	LS	\$10,000.00	\$10,000.00
TOTAL SECTION A - GENERAL					\$40,000.00

SECTION B - SANITARY SEWER & APPURTENANCES

1	Sanitary Sewer				
	i) 375mm dia. PVC (4 - 5m deep) [no Reinstale]	102	m	\$300.00	\$30,600.00
	ii) 375mm dia. PVC (5 - 6m deep) [no Reinstale]	219	m	\$350.00	\$76,650.00
	iii) 375mm dia. PVC (4 - 5m deep) [Reinstale]	118	m	\$300.00	\$35,400.00
	iv) 375mm dia. PVC (5 - 6m deep) [Reinstale]	225	m	\$350.00	\$78,750.00
	v) Upsize Ex. 375 to 450mm (3 - 6m) (Under SB)	164	m	\$1,300.00	\$213,200.00
2	Sanitary Manholes				
	i) 1200mm dia. (4m - 5m in height)	4	ea	\$7,000.00	\$28,000.00
	ii) 1200mm dia. (5m - 6m in height)	4	ea	\$9,000.00	\$36,000.00
	iii) Recore ex manholes	3	ea	\$5,000.00	\$15,000.00
3	Sanitary Overflow				
	i) 375mm dia. PVC (1 - 2m deep) [no Reinstale]	378	m	\$300.00	\$113,400.00
	ii) 1200mm dia. (1m - 2m in height)	4	ea	\$5,000.00	\$20,000.00
4	Roadway Reinstatement	2,600	m ²	\$100.00	\$260,000.00
5	Iron Adjustment	15	ea	\$500.00	\$7,500.00
6	TV (x2)	1,206	m	\$10.00	\$12,060.00
7	By Pass Pumping	164	m	\$200.00	\$32,800.00
8	BRPS Upgrades to meet firm capacity	1	LS	\$500,000.00	\$500,000.00
TOTAL SECTION B - SANITARY SEWER & APPURTENANCES					\$1,459,360.00

SECTION C - BRIAR RIDGE PUMP STATION COST SHARING

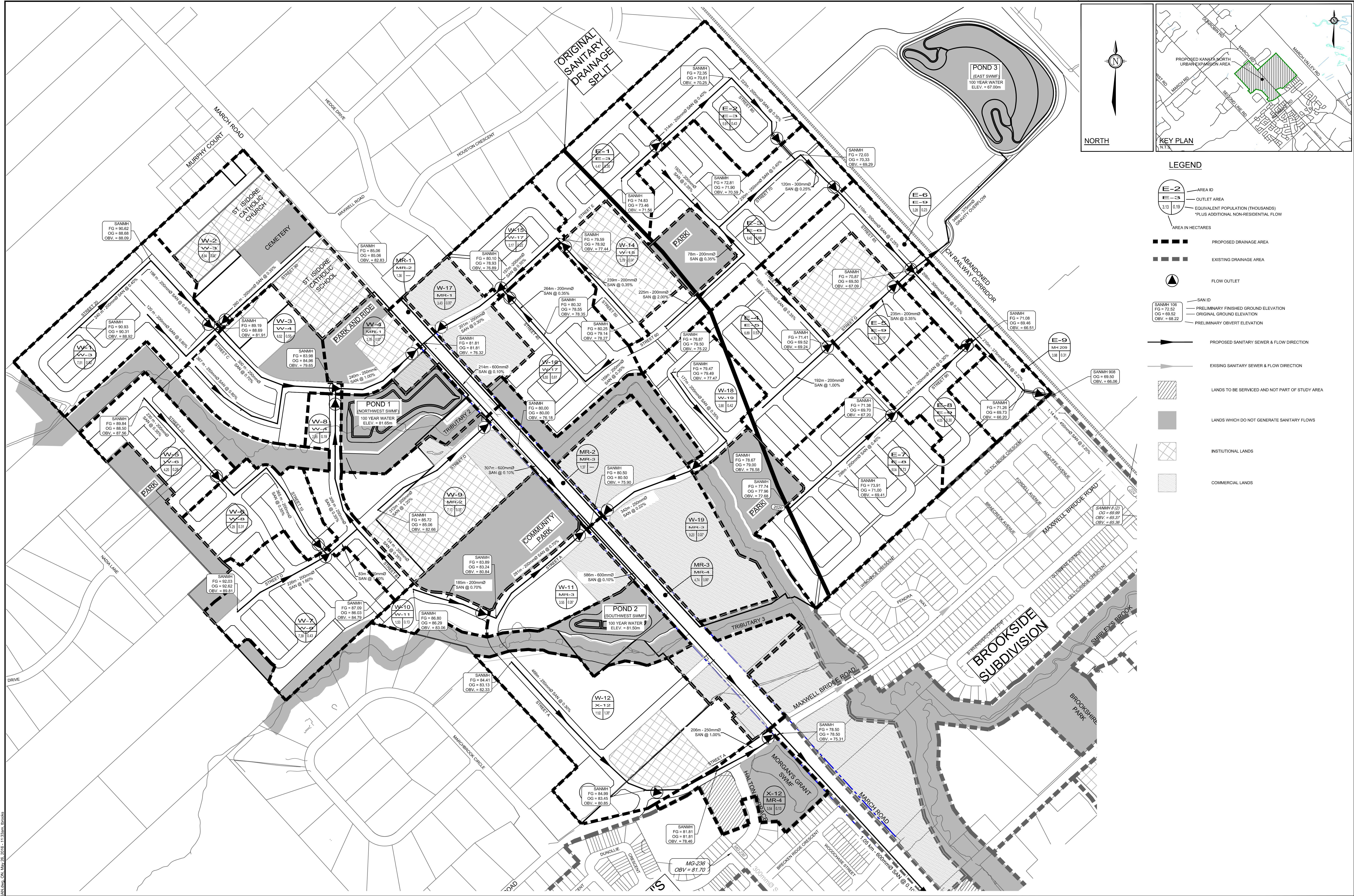
1	BRPS/Forcemain = 50.5L/s / (50.5+183)L/s	21.6%	LS	\$1,866,101.90	\$403,078.01
2	Trunk Sewer Along Rail Corridor = 50.5L/s / Pipe Cap (132.9L/s)	38.0%	LS	\$673,248.00	\$255,834.24
TOTAL SECTION C - BRIAR RIDGE PUMP STATION COST SHARING					\$658,912.25

Construction Total	\$2,158,272.25
60% Capital Cost Allowance	\$1,294,963.35

Total	\$3,453,235.60
--------------	-----------------------

Total Flow	L/s	50.3
Gross Cost	\$/L/s	\$68,653.00

Note: DC recoverable Items are highlighted in blue



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS,
WATERMANS, 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

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
ONSITE SANITARY
DRAINAGE AREA PLAN

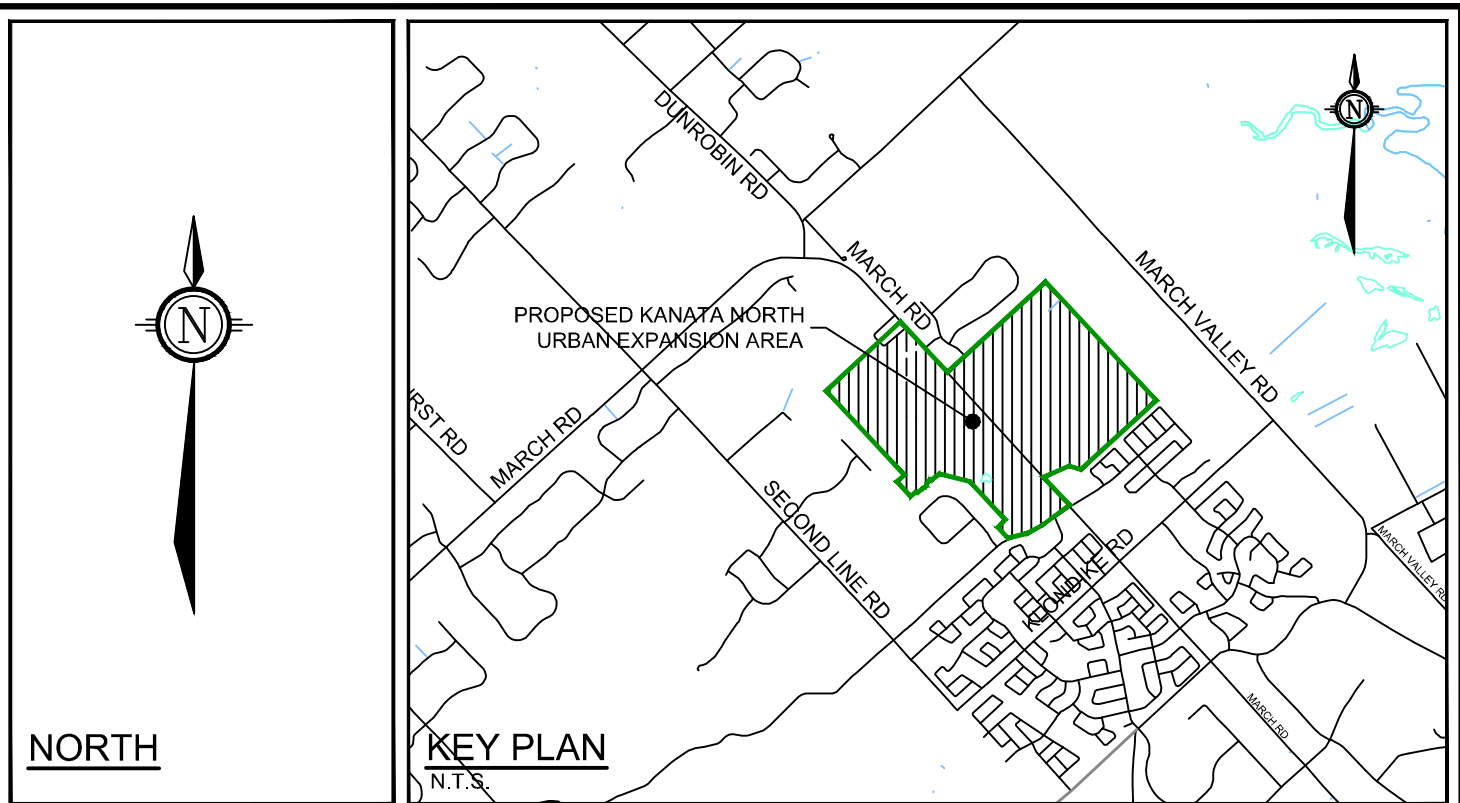
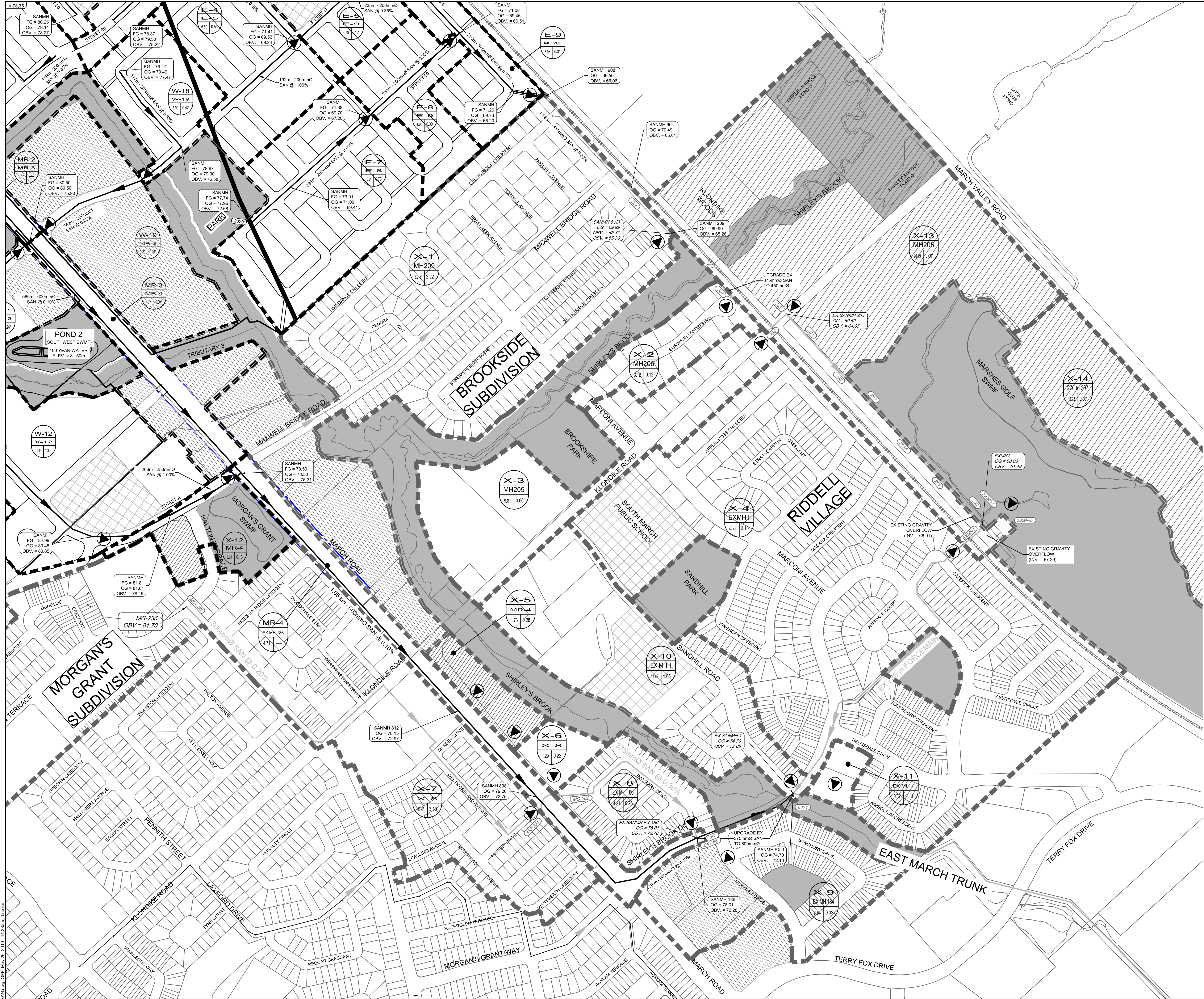
PROJECT NO.
112117-04

REV
REV # 3

DRAWING NO.
112117-SAN1

\\020121171217240\Design\112117-SAN.dwg, C:\Users\jls\Documents\112117-SAN.dwg, 25 May 2016 11:33am, JLS

PL-SAN1-0102 - 105mm x 70mm



LEGEND

- AREA ID
- OUTLET AREA
- EQUIVALENT POPULATION (THOUSANDS)
- *PLUS ADDITIONAL NON-RESIDENTIAL FLOW
- CONTRIBUTING AREA IN HECTARES
- PROPOSED DRAINAGE AREA
- EXISTING DRAINAGE AREA
- FLOW OUTLET
- SAN ID
- PRELIMINARY FINISHED GROUND ELEVATION
- ORIGINAL GROUND ELEVATION
- PRELIMINARY OVERT ELEVATION
- PROPOSED SANITARY SEWER & FLOW DIRECTION
- EXISTING 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,
WATERMANS, SEWERS AND OTHER
UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON
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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



LOCATION
KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN

DRAWING NAME
OFFSITE SANITARY
DRAINAGE AREA PLAN

PROJECT No.	112117-04
REV	REV # 3
DRAWING No.	112117-SAN2

APPENDIX C-7

Lee Sheets

From: Lee Sheets
Sent: Friday, June 13, 2014 11:19 AM
To: Zagorski, Joseph; Damien.Whittaker@ottawa.ca; Chris.Ogilvie@Ottawa.ca
Cc: Cara Ruddle (c.ruddle@novatech-eng.com)
Subject: KNU EA - Sanitary HGL and Overflow Issue
Attachments: 112117-SAN PP OPT2-HGL.pdf

Hi Gentlemen

Further to our TAC meeting discussion and our subsequent conversation we have prepared this e-mail to provide background information related to the existing HGL issues in the trunk sanitary sewer outletting to the Briar Ridge Pumping Station.

The BRPS contains a primary overflow at an elevation of 67.29. The design of the Brookside subdivision proposed a secondary overflow at an invert elevation of 67.30. The resultant HGL for the sanitary upstream of this secondary overflow is 67.44. We have used this HGL as our starting point in our model.

Please find attached a graphical representation (Plan and Profile) for the HGL under four conditions:

- Condition # 1 – Original HGL resulting from the development of the Brookside subdivision – shown in black
- Condition # 2 – KNU EA flow of 52 L/s added to original HGL resulting from the development of the Brookside subdivision – shown in red
- Condition # 3 – KNU EA flow of 52 L/s added to original HGL resulting from the development of the Brookside subdivision. Possible upgraded trunk sewers downstream (approximately 900 metres of existing 450mm and 375mm required to be upgraded to 600mm – shown in green
- Condition # 4 – KNU EA flow of 52 L/s added to original HGL resulting from the development of the Brookside subdivision. Proposed Tertiary (third) overflow to the proposed SWM pond. Elevation of the overflow 67.50, resultant HGL 67.67 – shown in blue

The result of Condition # 2 (do nothing) is the HGL is out of the ground for our proposed development and well above existing USF's in Brookside. Condition # 3 is very expensive option resulting in the replacement of approximately 900 m of existing trunk sewer. Condition # 4 is the proposed solution resulting in no increase in the HGL in the Brookside Subdivision.

We are hoping that this e-mail and attachment will give you an understanding of our rationale behind proposing a third overflow pipe. We are trying to tie up these loose ends for our TAC on June 19.

Lee

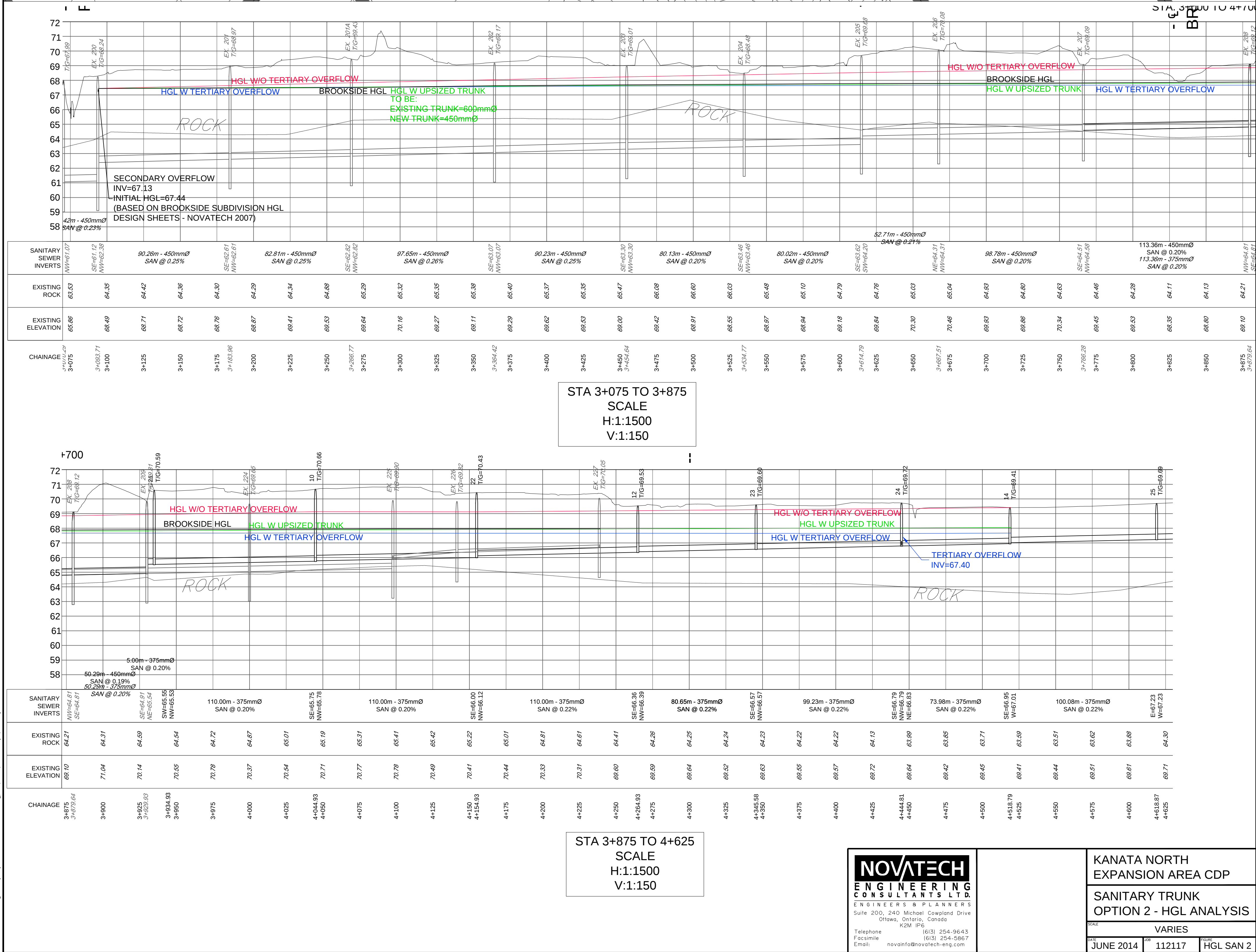
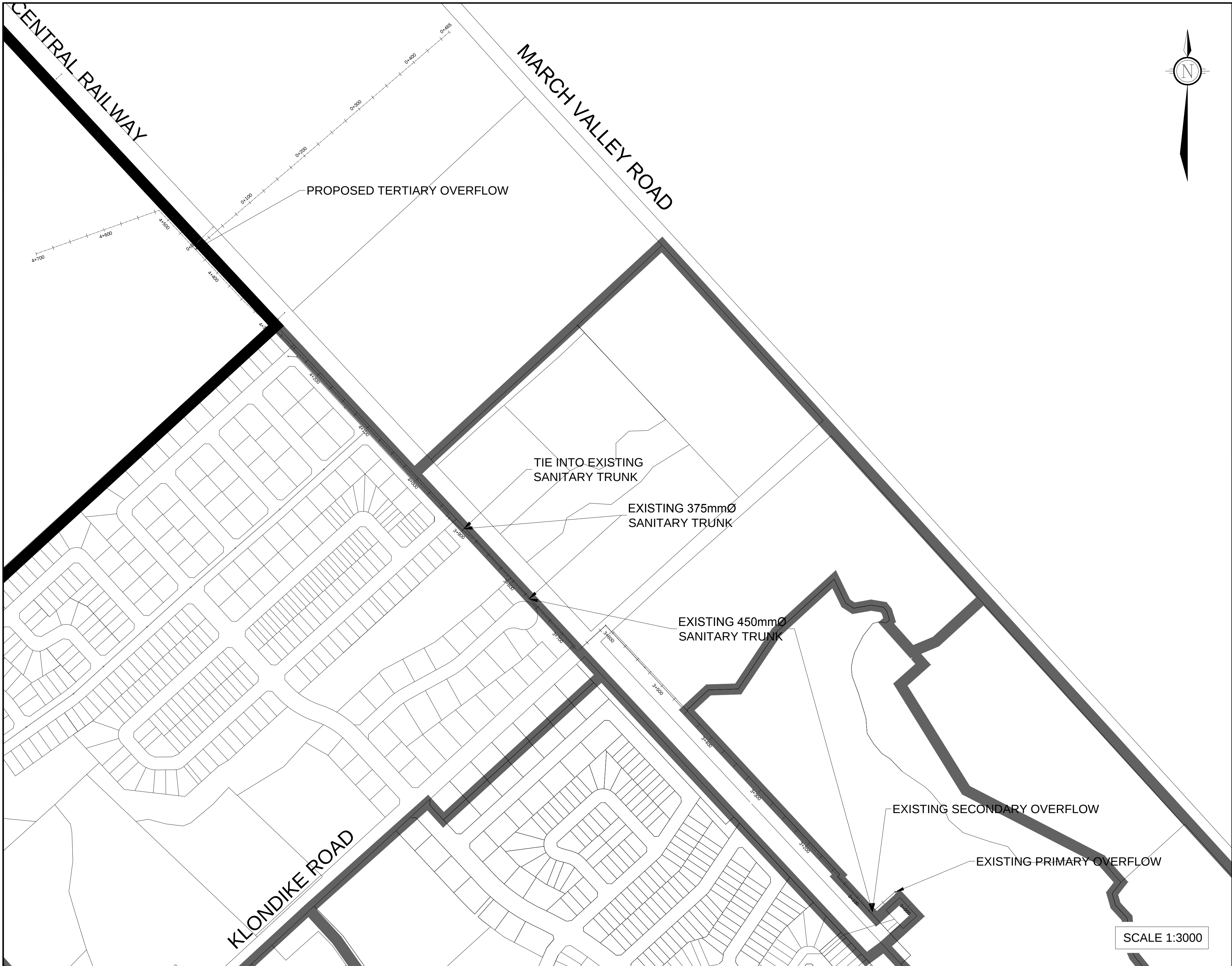
J. Lee Sheets, CET
Senior Project Manager

Novatech Engineering Consultants Ltd
200-240 Michael Cowpland Drive
Ottawa . Ontario . Canada . K2M 1P6

Office: 613-254-9643 X209

Fax: 613-254-5867

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**KANATA NORTH URBAN EXPANSION AREA
COMMUNITY DESIGN PLAN**

Table C-7: BRPS Trunk Sewer HGL Analysis with Additional Bypass (Buildout)

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



Comment	Node ID	Total Flow (L/s)		HGL (m)		Check	Preliminary USF	Freeboard (0.3m Min)
		Previous BRPS HGL Analysis*	KNCDP Analysis**	Previous BRPS HGL Analysis*	KNCDP Analysis	KNCDP minus Previous		
Overflow upstream of BRPS	201			67.44	67.44	0.00		
	201A	76	142.25	67.50	67.50	0.00		
	201B	76	142.25	67.56	67.55	-0.01		
	202	76	142.25	67.63	67.62	-0.01		
	203	76	142.25	67.69	67.67	-0.02		
	204	63	129.25	67.73	67.71	-0.02		
	205	63	129.25	67.78	67.74	-0.04		
	206	51	117.25	67.79	67.76	-0.03		
	207	42	108.25	67.82	67.77	-0.05		
	208	41	107.25	67.88	67.79	-0.09		
	209	41	107.25	67.90	67.80	-0.10		
Prop MH, connect to ex	KNCDP-9		66.25		67.80			
	KNCDP-8		66.25		67.79			
	KNCDP-7		66.25		67.79			
Limit of KNCDP	KNCDP-6		66.25		67.78			
	KNCDP-5		66.25		67.78		69.0	1.2
	KNCDP-4		66.25		67.78		69.0	1.2
	KNCDP-3		66.25		67.80		69.0	1.2
	KNCDP-2		66.25		67.77		69.2	1.4
	KNCDP-1		66.25		67.76		69.3	1.5
Overflow at KNCDP to Pond 3 (east)	KNCDP-OUT				67.51		69.3	1.8

* Refer to Briar Ridge Pump Station Hydraulic Grade Line Analysis (NECL #103106) included in

Appendix C-4

** Flows equal to previous BRPS HGL Analysis plus 66.25L/s peak KNCDP flow. Refer to Table C-6a for KNCDP flows to the BRPS.

APPENDIX C-8

APPENDIX D

Water Distribution

2013 Infrastructure Master Plan Excerpts

- Page 177 – Glen Cairn Reservoir (GCR) Expansion
- Page 178 – Glen Cairn Pump Station Upgrade (GCPS)
- Page 193 – March Road Pipe Upgrade (Zone 2W West Feedermain)
- Page 229 – Figure 1 Existing Water Distribution System: Schematic
- Page 232 – Figure 4 Growth Projects 2013-2031 - Water Distribution System: Schematic

City Comments on Draft Memo (email dated Oct 7, 2014)

City Comments on Feb 16, 2016 Draft MSS (email dated Mar 22, 2016)

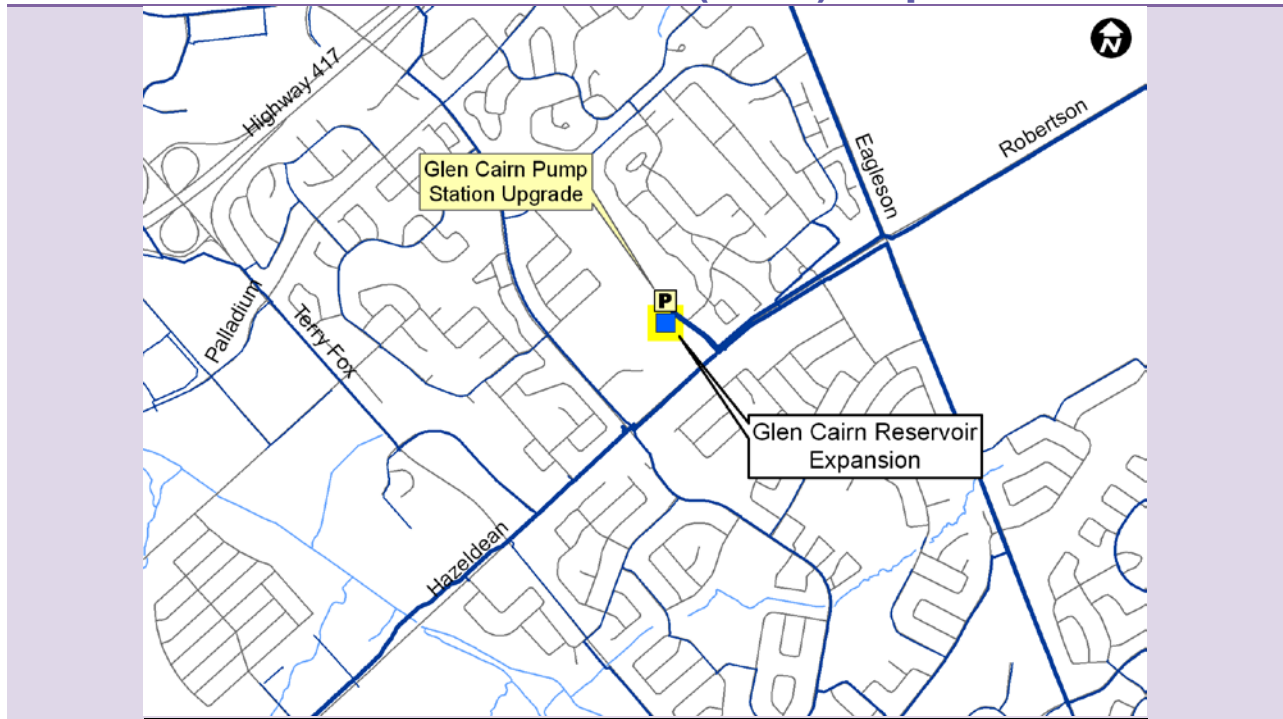
Preliminary Watermain Cost Estimate

Kanata North Urban Expansion Potable Water Assessment Report (Stantec, Mar 28, 2016)

Drawing List

- 112117-WM1 Watermain (onsite)
- 112117-WM2 Watermain (offsite)

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.

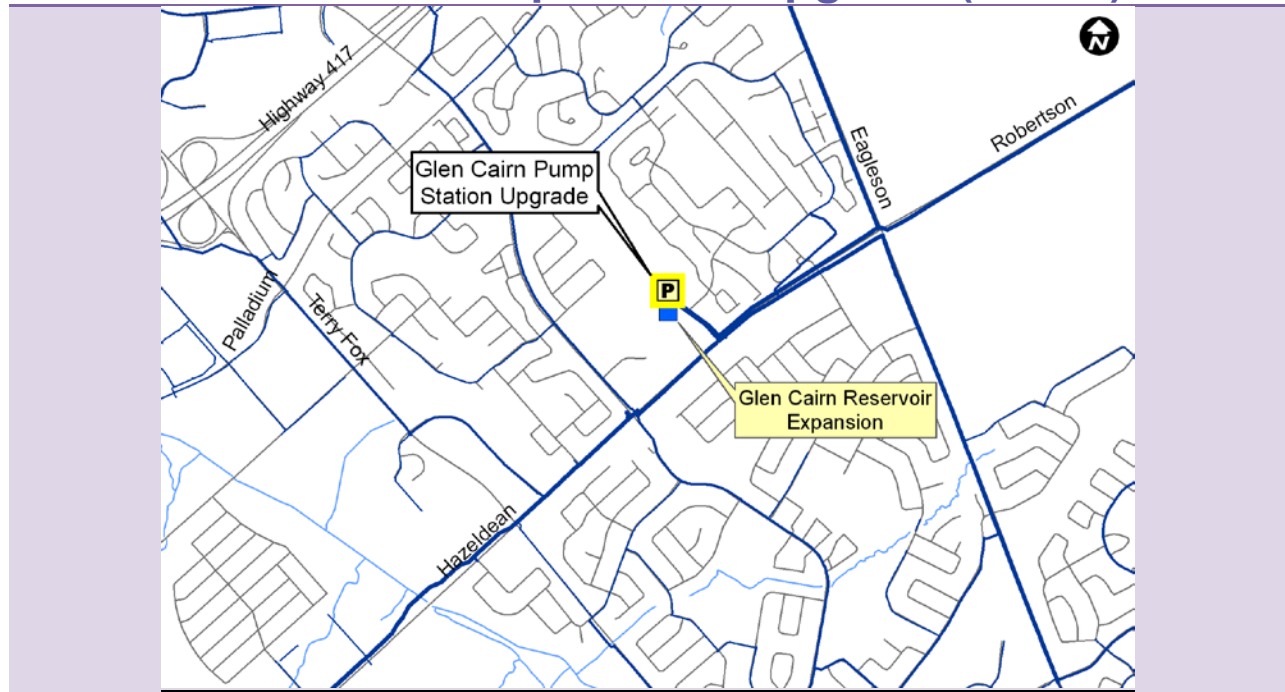
EA Requirements and Consultation

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.

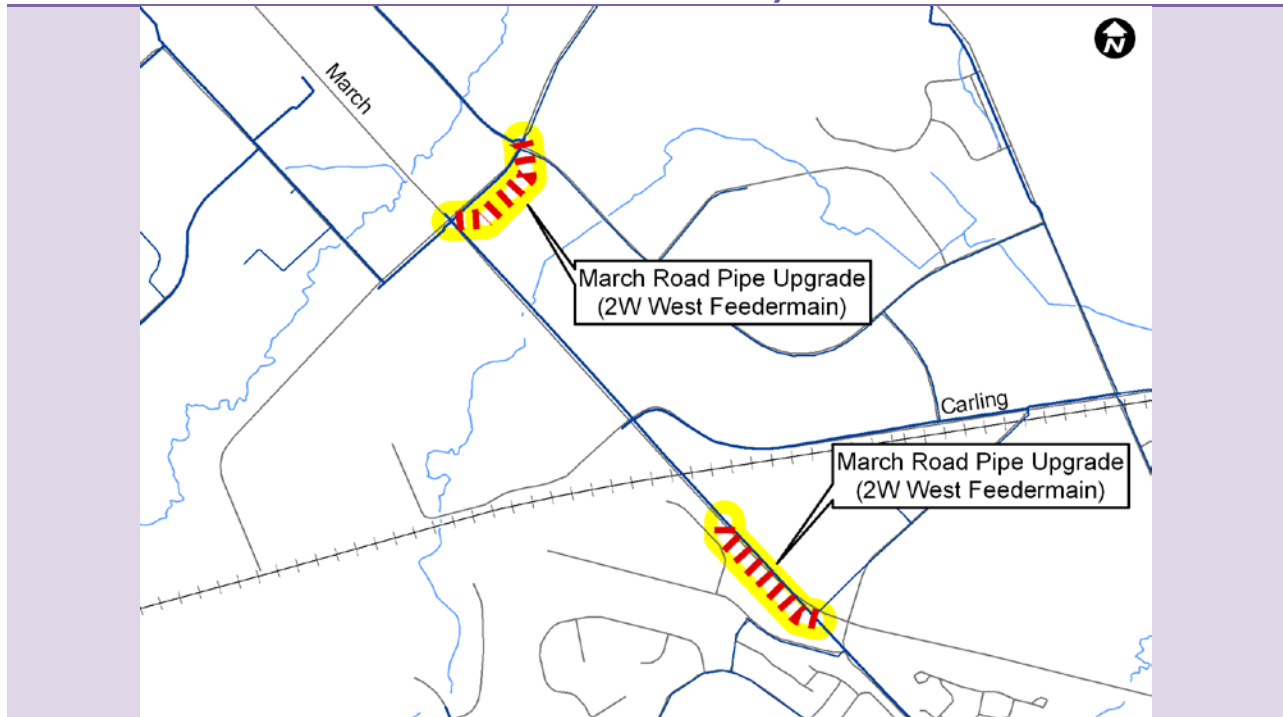
EA Requirements and Consultation

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.*

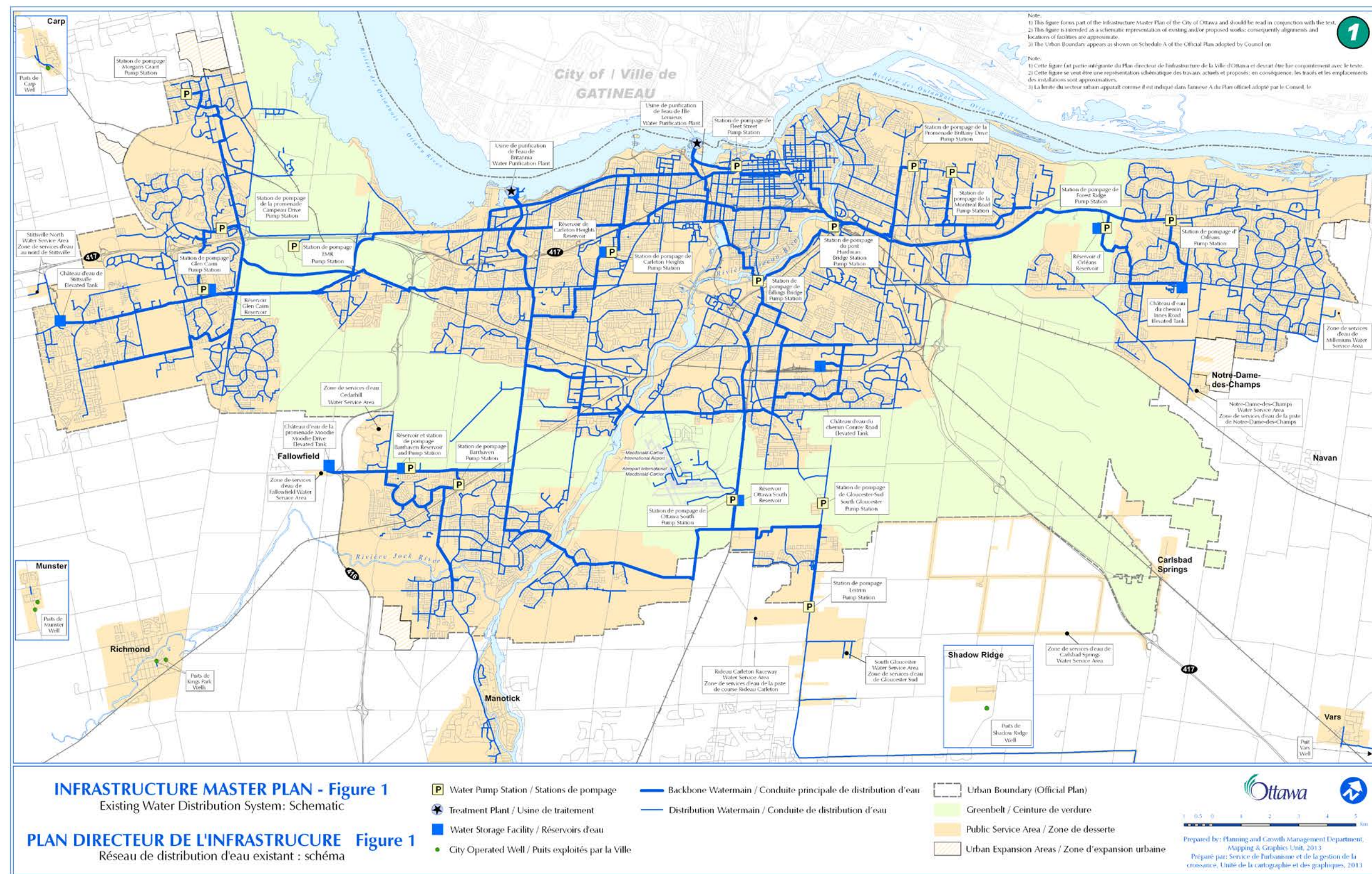
Funding split subject to review as part of 2014 Development Charges by-law.

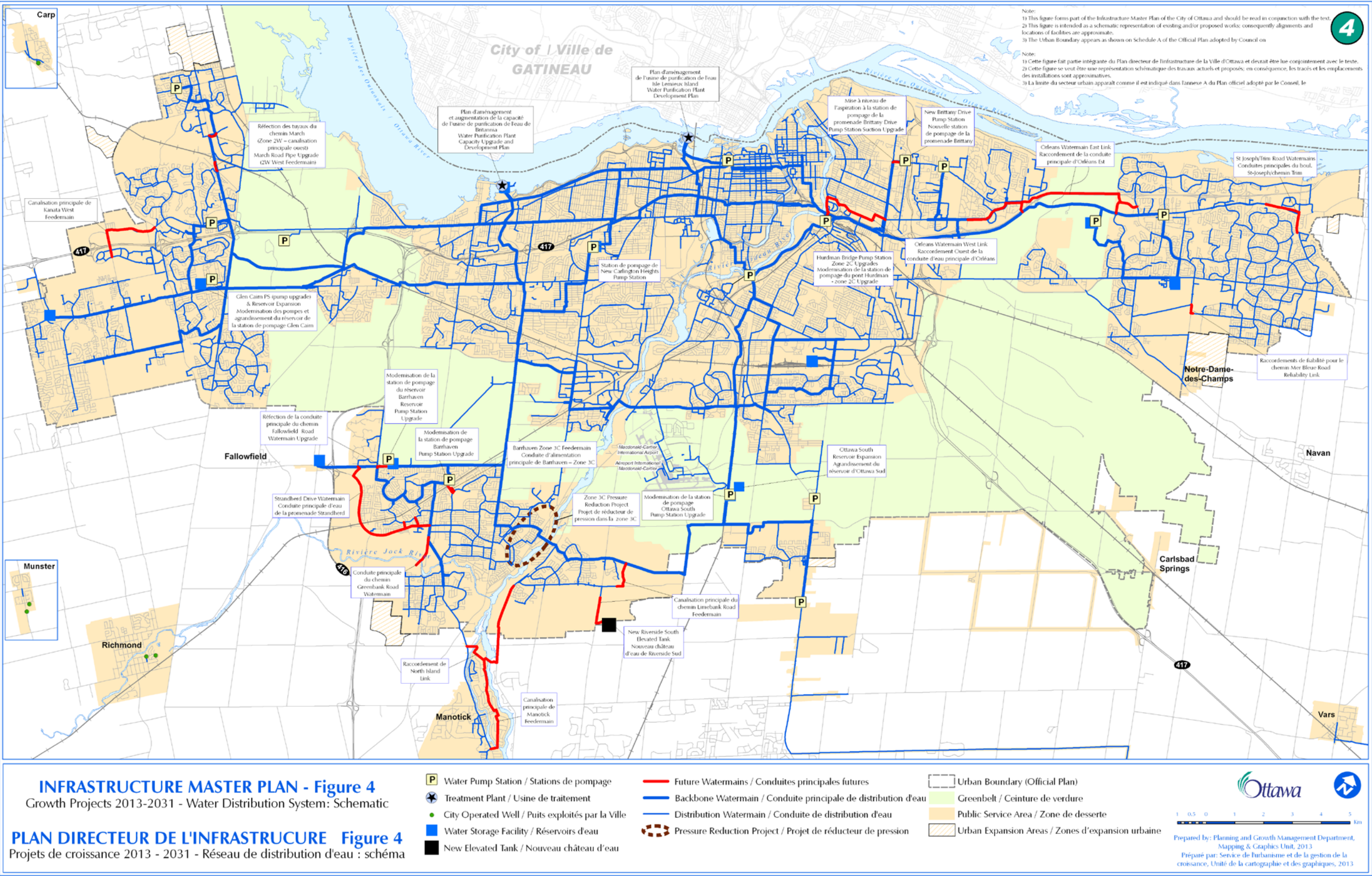
EA Requirements and Consultation

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.





Alex McAuley

From: Cara Ruddle
Sent: February-26-16 10:42 AM
To: Alex McAuley
Subject: FW: Kanata North Urban Expansion - Review of Water Servicing Proposal

Cara Ruddle, P.Eng.

Project Manager

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 220 | Fax: 613.254.5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Rogers, Christopher [mailto:Christopher.Rogers@ottawa.ca]
Sent: Tuesday, October 07, 2014 8:48 AM
To: Cara Ruddle <c.ruddle@novatech-eng.com>
Cc: Lee Sheets <l.sheets@novatech-eng.com>; Tse, Wendy <Wendy.Tse@ottawa.ca>
Subject: RE: Kanata North Urban Expansion - Review of Water Servicing Proposal

Cara,

Some comments on the revised water servicing report:

1. Figure 1-3 should identify the private watermains referred to in the text on p.1.3. An image illustrating private mains in the area of interest is attached (private mains buffered lime green).
2. The report should include a development concept plan map.
3. Identify which nodes are assigned ICI demands with reference to concept plan.
4. Identify proposed 305/406 pipe sizing on figure.
5. There is uncertainty regarding net head losses through the future local systems. 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.

This potential issue should be flagged in Section 4 of the report.

Regards,

Chris Rogers, M.A.Sc., P.Eng.

Senior Project Manager

Policy Development and Urban Design Branch

Gestionnaire principal de projet

Direction de l'élaboration des politiques et de l'esthétique urbaine





From: Cara Ruddle [<mailto:c.ruddle@novatech-eng.com>]
Sent: 2014/07/28 1:15 PM
To: Rogers, Christopher
Cc: Lee Sheets
Subject: FW: Kanata North Urban Expansion - Review of Water Servicing Proposal

Chris:

Please find attached a revised report for the Kanata North Urban Expansion Potable Water Assessment. This report has been revised per City comments.

Please call or email if you have any further questions or comments.

Thanks.

Cara Ruddle, P.Eng.
Project Manager

NOVATECH

Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive
Suite 200
Ottawa ON K2M 1P6

Tel: 613.254.9643
Fax: 613.254.5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Alemany, Kevin [<mailto:kevin.alemany@stantec.com>]
Sent: June-24-14 10:10 AM
To: Cara Ruddle; Lee Sheets
Cc: Ireland, Shawn; Simzer, Leah
Subject: RE: Kanata North Urban Expansion - Review of Water Servicing Proposal

Good morning,

Please find the attached revised Final Report of the Kanata North Urban Expansion Potable Water Assessment. The revision addresses the City's comments noted below and as discussed in follow up conversations/emails.

Sincerely, Kevin

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

Environmental Engineer
Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Phone: (613) 724-4091
Cell: (613) 292-4226
Fax: (613) 722-2799
kevin.alemany@stantec.com



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Please consider the environment before printing this email.

From: Cara Ruddle [<mailto:c.ruddle@novatech-eng.com>]
Sent: Monday, May 12, 2014 11:26 AM
To: Alemany, Kevin
Subject: FW: Kanata North Urban Expansion - Review of Water Servicing Proposal

Kevin:

The email below provides comments from the City from their report on your water analysis. Can you please provide a response to their comments.

Thanks.

Cara Ruddle, P.Eng.
Project Manager

Novatech Engineering Consultants Ltd
200-240 Michael Cowpland Drive
Ottawa . Ontario . Canada . K2M 1P6

Office: 613-254-9643 x 220
Fax: 613-254-5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Tse, Wendy [<mailto:Wendy.Tse@ottawa.ca>]
Sent: May-06-14 2:34 PM
To: Murray Chown; Mike Petepiece; Cara Ruddle; John Riddell
Cc: Ogilvie, Chris; Whittaker, Damien; Rogers, Christopher
Subject: FW: Kanata North Urban Expansion - Review of Water Servicing Proposal

Murray,
Below please find comments from Infrastructure Planning with respect to the water servicing.

The study identified the need for off-site works (in addition to the watermain extensions to the expansion area), involving upgrades to the existing water transmission system on March Road and Solandt. While these upgrades would not be needed initially, the City will require the inclusion of conditions to ensure the developer(s) pay for the upgrades.

Please let me know if there are any questions and whether our scheduled meeting for Thursday should still take place.
Regards,
Wendy

From: Rogers, Christopher
Sent: Wednesday, April 30, 2014 9:00 AM
To: Tse, Wendy
Cc: Zagorski, Joseph; Diduch, Roman
Subject: Kanata North Urban Expansion - Review of Water Servicing Proposal

Hi Wendy,

Comments on the Water Summary Memorandum (Novatech, April 8, 2014) are as follows:

- The information in this memorandum should be updated to reflect revisions to Stantec's water assessment that respond to comments provided below.
- The water assessment indicates that only land at an elevation of 92m or less can be serviced based on the proposed plan. An image is provided below which illustrates the land that is higher than 92m under existing conditions (the green boundary represents the CDP area). Unless the land is graded to a lower elevation, the area shown in red should not be serviced. Conversely, if land would have to be graded to a higher elevation, the unserviceable area would increase. The unserviceable area may also be subject to change, depending on the results of revisions that respond to the comments provided below.

Comments on the KNUE Potable Water Assessment (Stantec, March 7, 2014) which was appended to the Novatech memo are as follows:

Section 1.3

- Add point indicating full range of pressures across the 2Ww service area (~40-90 psi).

Section 1.4

- There are two redundant feeds to the 2Ww service area, however both include sections of private watermain which cannot be relied upon by the City for back-up supply purposes. The Critical Infrastructure Identification Study for Zone 2W recommended that ownership of some of these 406mm and 305mm sections of private watermain (in the Reaney Court area) be transferred to the City to ensure adequate back-up supply in the event of a major failure condition. This recommendation has yet to be implemented, but it is the City's intent to pursue it.

Section 2.2

- According to the projections supporting the recent IMP/OP updates, it was anticipated that about 1800 units and 490 jobs would be in place in the KNUE area by 2031. This translates to the 26.2 L/s MXDY demand referenced in Section 2.2. The 2060 projections for 2Ww would include build-out of KNUE plus speculation re: other potential future post-2031 development.
- The report implies that the 26.2 L/s increment in demand per 2031 IMP is associated with all of 2Ww/MG. The projected 2031 demand for this area is actually about 50.3 L/s, of which 26.2 L/s is projected for KNUE.
- The ICI area subtotal in Table 2-1 is incorrect.
- For system level water demand parameters, outdoor water demand (OWD) is only considered for single family homes. Thus, the OWD indicated is higher than necessary. Unit OWD rate should be explicitly stated.
- The system level parameters used do not account for water losses due to leakage, etc. Loss of 80 L/unit/day should be applied for this area.
- Table 2-1 indicates average daily flows per unit, however, the residential flows given are per capita. This should be clarified.
- Add statement to clarify that each individual subdivision within the expansion area must be designed in accordance with the design demand parameters in the City's WDG, which are significantly higher than the system level parameters.

Section 3.2.2

- Please verify that Figure 3-8 is correct. It appears to be the same plot as Figure 3-6.
- What is the change in minimum pressure in the existing Zone 2Ww with the proposed upgrades to the existing 2Ww backbone?

Section 3.2.3

- Identify expected ICI nodes and evaluate available fire flows in consideration of potentially higher fire demands for this type of development.

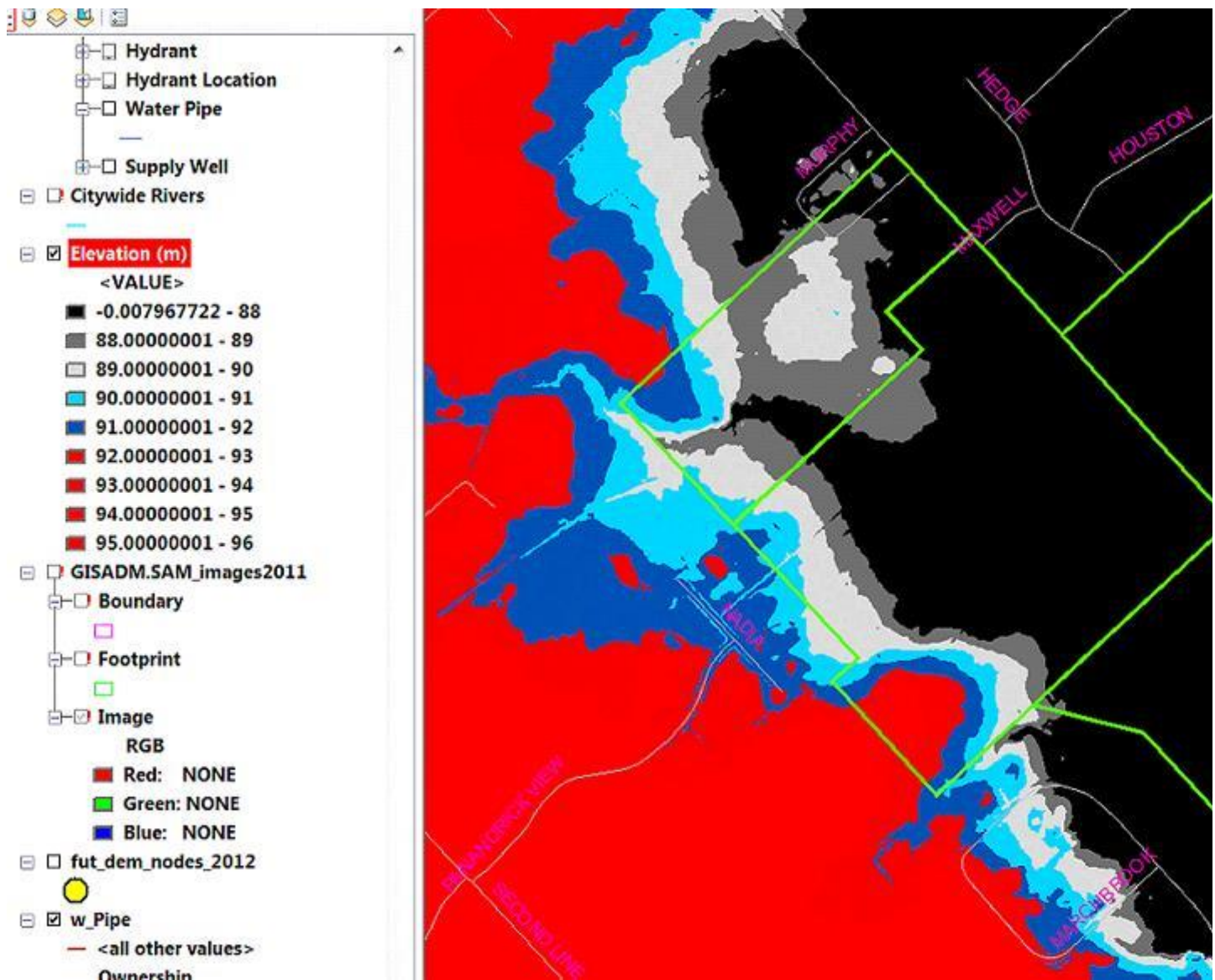
- A generalized analysis should be carried out to substantiate a reduced available fire flow for areas associated with each node of the skeletal network, in order to reflect losses that would be expected in the local network. Any assumptions related to looping and local pipe sizing should be stated. Any potential restrictions on development needed to ensure adequate fire flow should be flagged.

Section 3.2.4

- Results for a failure of the 406mm feed into KNUE for winter demand and no fire should be presented, to confirm that minimum pressures would remain above 40 psi under this condition.

Section 4.0

- Update this section to reflect revised analyses stemming from the above comments.
- Considering impact on existing 2Ww minimum pressures, what measures are recommended to ensure that these pressures remain above 40 psi?
- The Old Carp Road secondary feed should be selected given the difference in available fire flows under failure conditions.
- Last recommendation should reflect 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.



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Alex McAuley

From: Cara Ruddle
Sent: March-22-16 5:17 PM
To: John Riddell; Murray Chown; Greg Winters
Cc: Mike Petepiece; Alex McAuley; Lee Sheets
Subject: FW: Kanata North Urban Expansion Area - DRAFT Master Servicing Study
Attachments: 2031IMPFlows.xlsx; BRPS_MonitoredFlows_2014to2016.xlsx

Please find below comments received for water and wastewater sections of the MSS.

Cara Ruddle, P.Eng.

Project Manager

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 220 | Fax: 613.254.5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Zagorski, Joseph [mailto:Joseph.Zagorski@ottawa.ca]
Sent: Tuesday, March 22, 2016 4:57 PM
To: Cara Ruddle <c.ruddle@novatech-eng.com>
Cc: Lee Sheets <l.sheets@novatech-eng.com>; Rogers, Christopher <Christopher.Rogers@ottawa.ca>; Bougadis, John <John.Bougadis@ottawa.ca>
Subject: Kanata North Urban Expansion Area - DRAFT Master Servicing Study

Hi Cara ,

Please find below water and wastewater comments related to Kanata North Urban Expansion Area Master Servicing Study Draft February 16 , 2016 Report:

Water Servicing

Comments on main report (water distribution):

1. P.53, end of 2nd paragraph. HGL incorrect.
2. P.53, 3rd paragraph. Campeau PS serves Zone 3W. Not relevant to the KNUEA.
3. P.53, 4th paragraph. Hazeldean watermain is complete. Serves 3W, not relevant to KNUEA.
4. Table 7.2 is not relevant. System sizing and layout is based on Stantec use of City's system model.
5. Provide table summarizing projected water demands (average, max day, peak hour, max day plus fire flow) and related pressures for the KNUEA.
6. Figure 7.1: Density of 305mm watermain in NW is excessive and there is a high likelihood that on-going flushing operations would be needed to keep water fresh in this area. The layout in this area does not reflect the preferred layout as presented in Appendix D (Stantec report). Sizing should be reduced in this area. Note that Stantec assumed a dead-end in this area which will not exist (or be much shorter), and local watermain will generally improve fire flows,

thus minimum available fire flows may be greater than suggested in Appendix D. Please refer to current City guidelines (including recent technical bulletin) and development conditions regarding sizing of local mains and fire protection measures.

7. Feeder mains (300mm and larger) are not to be extended to the outer boundary of the KNUEA. Eliminate dead-end 300mm mains (as shown in Figure 7.1: in NW corner immediately south of the creek corridor; and to east of March Road, extending into the Hillview rural subdivision).
8. City requests that both the Carp Road secondary connection and the Celtic Ridge connection be implemented. This will improve system resiliency and operational flexibility at low cost.
9. Please provide phasing plan for watermain network, demonstrating that looping and all LOS criteria are met at each phase.
10. As per the Stantec report, the main report must identify the ~310m March Road watermain upgrade (north of Richardson Side Road and south of railway corridor) from 406mm to 610mm as a KNUE related requirement, in addition to the upgrade on Solandt. The former is the most important of the two, in terms of boosting peak hour pressures in 2Ww.
11. Identify the specific future development threshold that would trigger construction of the March/Solandt watermain upgrades. Clarify assumptions, provide supporting calculations and analysis.

Comments on Appendix D:

1. Section 1.2 – review this section – suspected error in cardinal direction reference
2. Figures 3-1 and 3-2 are unclear – node and pipe ID's are illegible
3. In figure 3-3, node allocation unclear for a few demand areas. Demand area ID's are illegible.
4. Figure 3-4 title is confusing. Please confirm that the curves represent existing (2012) demands plus future build-out of the KNUE area.
5. Clarify if results presented in Figure 3-12 are with or without March/Solandt upgrades.

Wastewater Servicing

Comments on main report (wastewater servicing):

1. Section 6.2 Existing Wastewater Infrastructure, page 36-37: The flow rates below should be used in Table 6.2. Use the 2031 IMP flow rates over the 2010 WUC since the IMP flows were generated with the latest projections, inflow and infiltration estimation technique and produce more conservative values (see attached monitored flows data).
 - 2031 Flows at the 750 mm East March Trunk upstream of the March Road Pump station is 255 l/s, which is higher than the flow rate of 172 l/s shown in the report.
 - 2031 flows at the 900 mm Marchwood Trunk upstream of the March PS is 592 l/s, which is slightly above the 574 l/s written in the report..

- 2031 flows at the 600 mm Hines Road Trunk upstream of Solandt Road is 135 l/s.
 - Wet weather flow should be shown for the Briar Ridge PS (see attached monitored flows data).
 - 2031 flows at the Briarridge PS is 80 l/s.
 - Replace “Design Flow at build-out” with “Design Flow” at Table 6.2.
2. Section 6.3 Planned Infrastructure , page 38: Remove statement “ With diversion of the Marchwood Trunk, there will be no urgency to complete this project”. The projected 2031 flow from the East March Trunk to the March PS is 255 l/s as per the 2013 IMP. The upgraded March station’s ultimate firm capacity of +/- 586 l/s should be mentioned as per March PS Class EA report. Section 6.4 Trunk Sewers, page 30: The inverts and capacities of trunk sewers should be determined with the review of as-built drawings. The 2013 Wastewater IMP model should be used to estimate flows for the 2031 period.
 3. Section 6.4.2 Briar Ridge Pump Station, page 40: Please review more recent monitored flow data recorded at the station (please refer BRPS_MonitoredFlows_2014to2016.xlsx) and confirm the results in Table C-4 are still valid. Please revise the text in last three paragraphs since description of existing and future design flows to Briar Ridge PS is confusing.
 4. Tables 6.5.1 and 6.5.2 It should be Option “5A”
 5. Provide table summarizing the HGL in relation to the underside of proposed footing elevation for the KNUEA to demonstrate that minimum 0.3 m freeboard is provided

General comments

Complete remaining sections.

Provide typical ROW cross-sections for future March Road and typical arterial, collector and residential street in the KNUEA including all underground infrastructure.

Stormwater comments to follow.

Call me if you have any questions. Thx.

M. Joseph Zagorski, P.Eng.

Senior Project Manager
Policy Development and Urban Design Branch
Gestionnaire principal de projet
Direction de l'élaboration des politiques et de l'esthétique urbaine



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Kanata North Urban Expansion Area

Community Design Plan

Preliminary Servicing Costs

Watermain Installation

ITEM NO.	ITEM	EST. QTY	UNIT	UNIT PRICE	TOTAL AMOUNT
On-Site Watermain Works					
SECTION A - GENERAL					
1	Erosion and Sediment Control	1	LS	\$15,000.00	\$15,000.00
2	Ground Water Pumping & Management	1	LS	\$10,000.00	\$10,000.00
3	Traffic Control	1	LS	\$20,000.00	\$20,000.00
TOTAL SECTION A - GENERAL					\$45,000.00

SECTION B - WATERMAIN					
1	Watermain				
	i) 406mm dia.	1,100	m	\$630.00	\$693,000.00
	ii) 305mm dia (secondary connections)	200	m	\$450.00	\$90,000.00
2	Valve Chambers				
	i) 406mm dia.	7	ea	\$18,000.00	\$126,000.00
	ii) 305 mm dia	2	ea	\$12,000.00	\$24,000.00
3	Hydrants	15	ea	\$6,000.00	\$90,000.00
4	Rock Excavation	400	m ³	\$120.00	\$48,000.00
5*	Roadway Reinstatment	1,300	m ²	\$100.00	\$130,000.00
6	Iron Adjustment	9	ea	\$500.00	\$4,500.00
7	City Connection Charges	3	ea	\$30,000.00	\$90,000.00
TOTAL SECTION B - WATERMAIN					\$1,295,500.00

* Reinstatement required for 2 connections, and approx 150m North of Maxwell Bridge Road, then no reinstatement required under future northbound lane

Construction Total	\$1,340,500.00
60% Capital Cost Allowance	\$804,300.00
Total	\$2,144,800.00

Offsite Watermain Upgrades					
SECTION C - GENERAL					
1	Erosion and Sediment Control	1	LS	\$10,000.00	\$10,000.00
2	Ground Water Pumping & Management	1	LS	\$10,000.00	\$10,000.00
3	Traffic Control	1	LS	\$20,000.00	\$20,000.00
TOTAL SECTION C - GENERAL					\$40,000.00

SECTION D - Watermain					
1	Watermain				
	i) Upsize Ex. 406mm to 610mm	570	m	\$1,800.00	\$1,026,000.00
2	Valve Chambers				
	i) Upsize Ex. 406 to 610mm	4	ea	\$40,000.00	\$160,000.00
4	Roadway Reinstatment	2,100	m ²	\$100.00	\$210,000.00
5	Iron Adjustment	4	ea	\$500.00	\$2,000.00
TOTAL SECTION D - WATERMAIN					\$1,398,000.00

Construction Total	\$1,438,000.00
60% Capital Cost Allowance	\$862,800.00
Total	\$2,300,800.00

Note: DC recoverable Items are highlighted in blue

**Kanata North Urban
Expansion Potable Water
Assessment**

Final Report



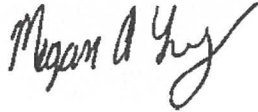
Prepared for:
Novatech Engineering
Consultants

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.

KANATA NORTH URBAN EXPANSION POTABLE WATER ASSESSMENT

March 28, 2016

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KANATA NORTH URBAN EXPANSION POTABLE WATER ASSESSMENT

March 28, 2016

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Appendix A – Development Concept Plan

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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

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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.

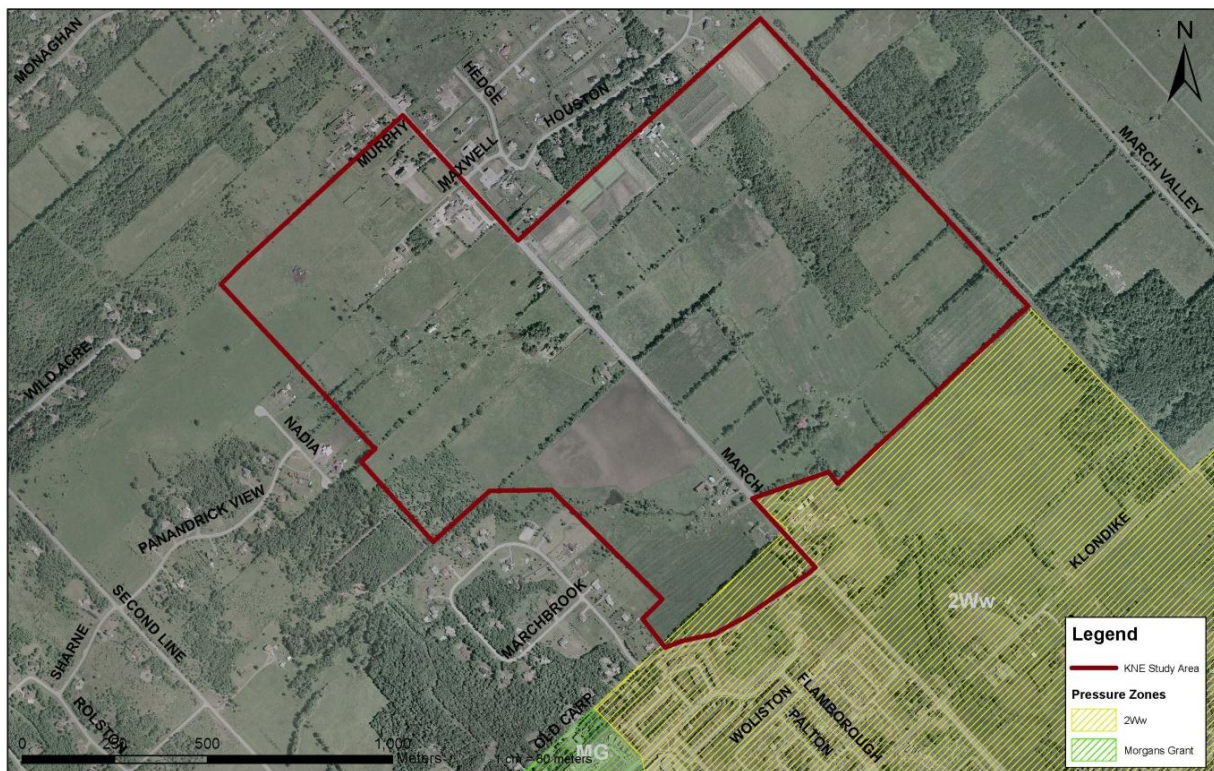


Figure 1-1: Proposed Development Site Location

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

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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.

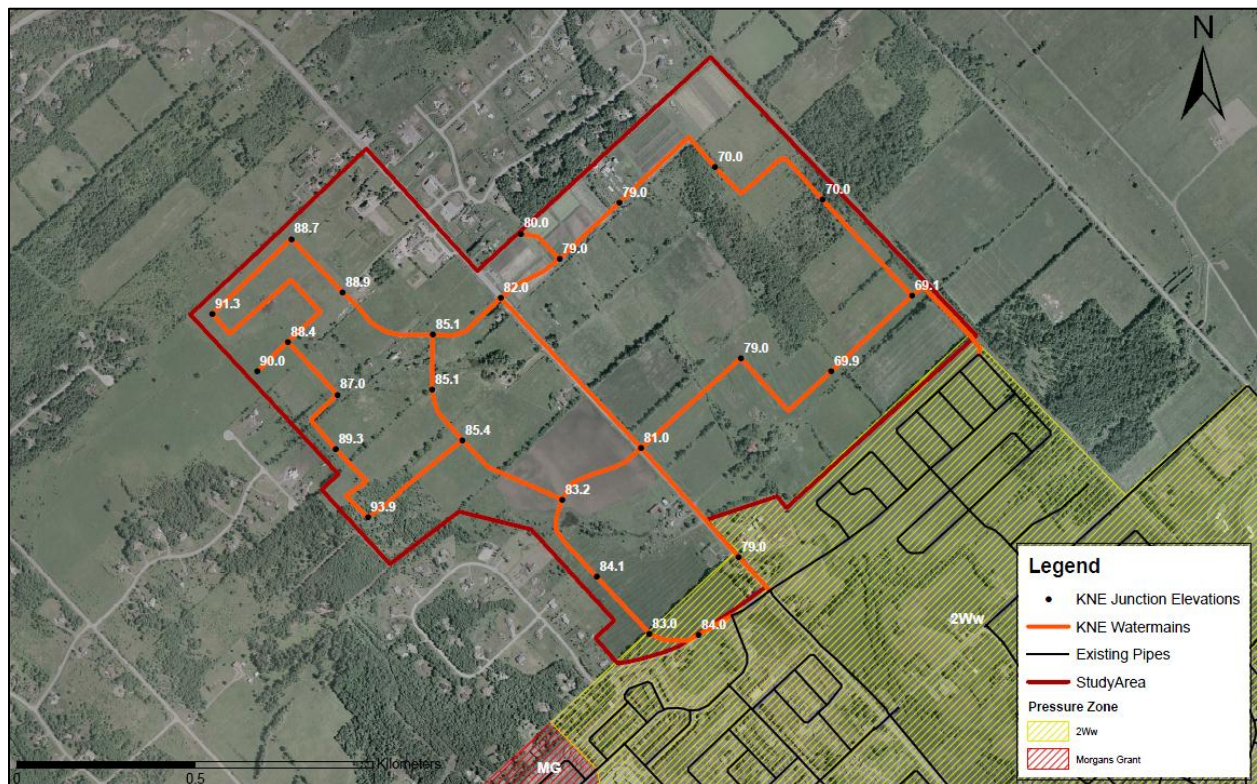


Figure 1-2: Development Site Elevations

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

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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 indicated that there 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.

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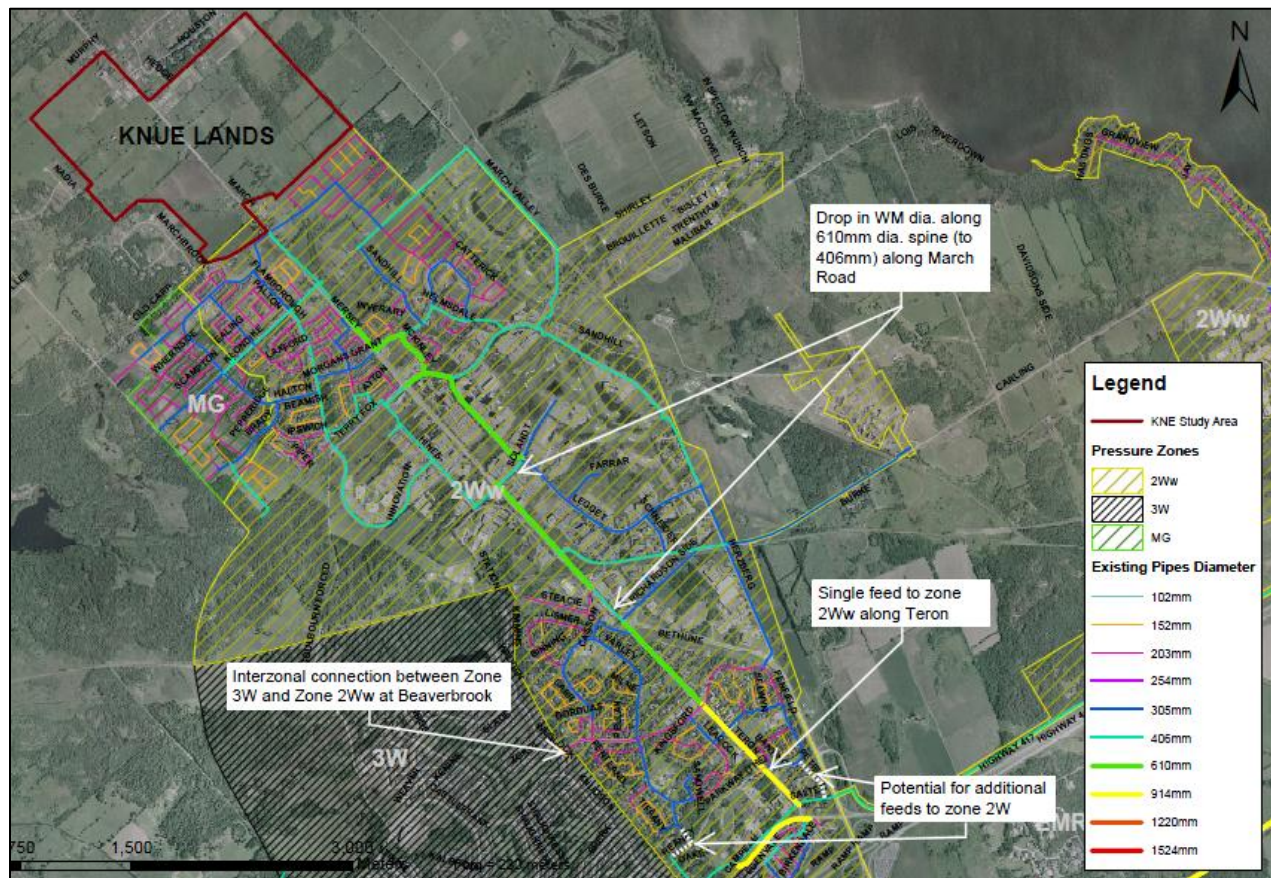


Figure 1-3: Existing Zone 2Ww Pipe Network (diameter shown in mm)

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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 Plumbing 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.

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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_O GB	INS_OGB	Total AVDY	OWD_OGB
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

Max Daily Demand	PKHR from Model:
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**.

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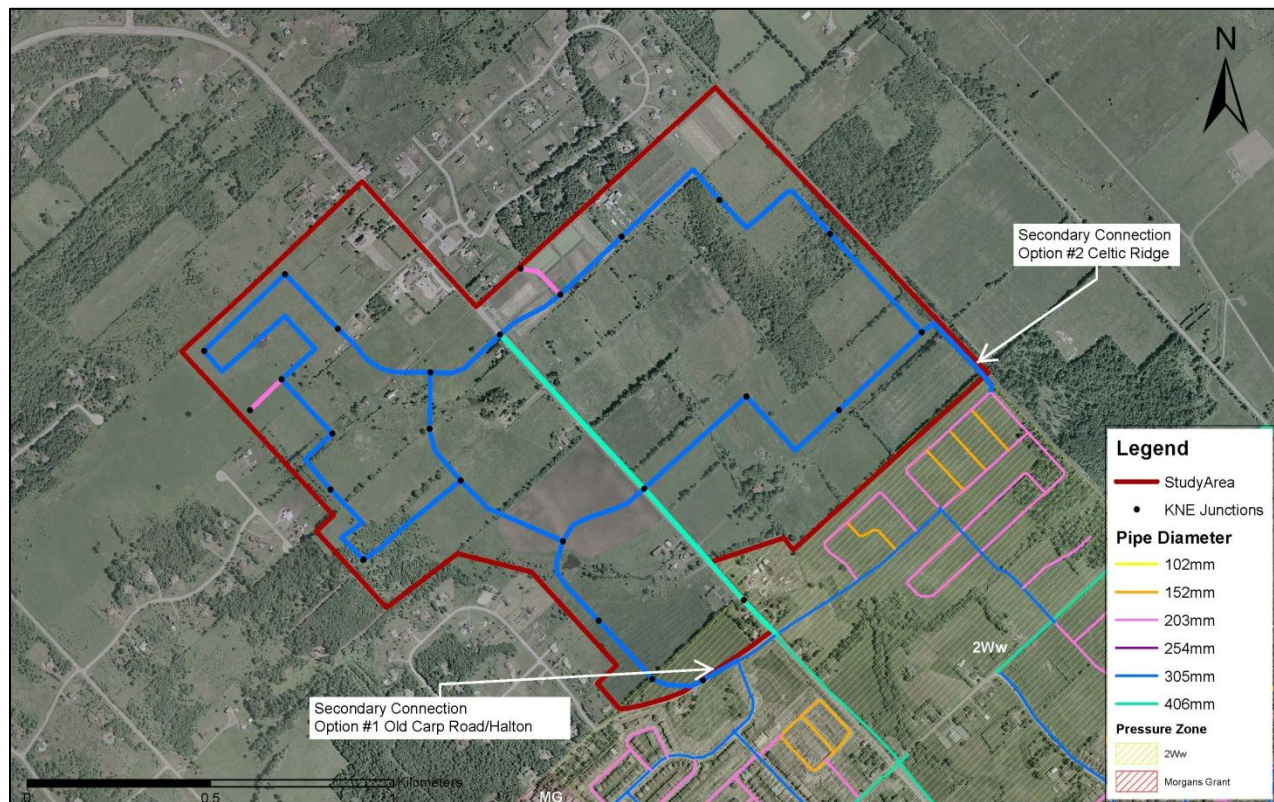


Figure 2-1: Proposed KNUE Pipe Diameters (mm) & Access Points to Existing Infrastructure

KANATA NORTH URBAN EXPANSION POTABLE WATER ASSESSMENT

Hydraulic Modeling
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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).

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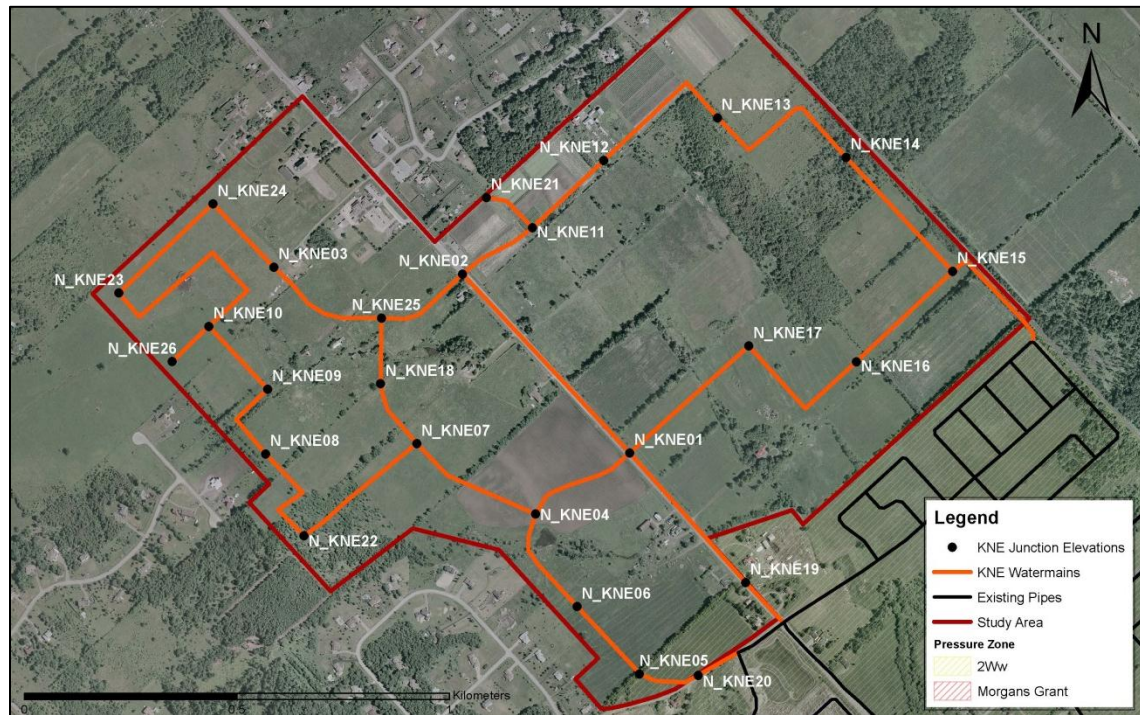


Figure 3-1: KNUE Lands Model Node ID's

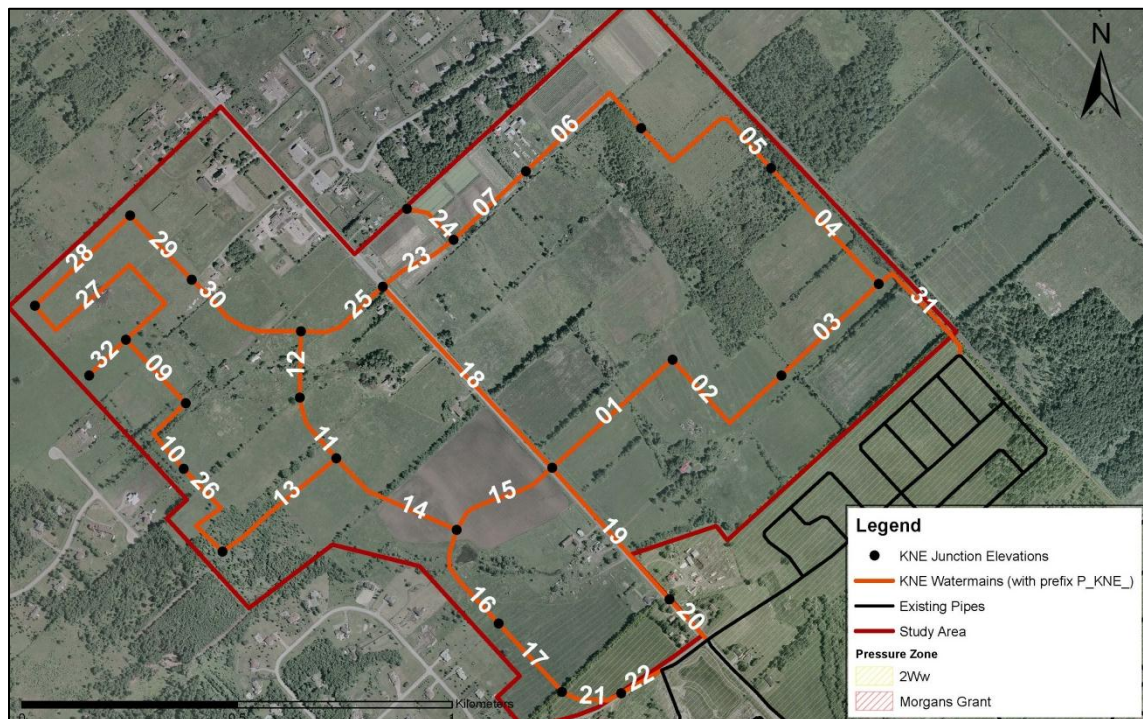


Figure 3-2: KNUE Lands Model Pipe ID's

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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.

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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



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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).

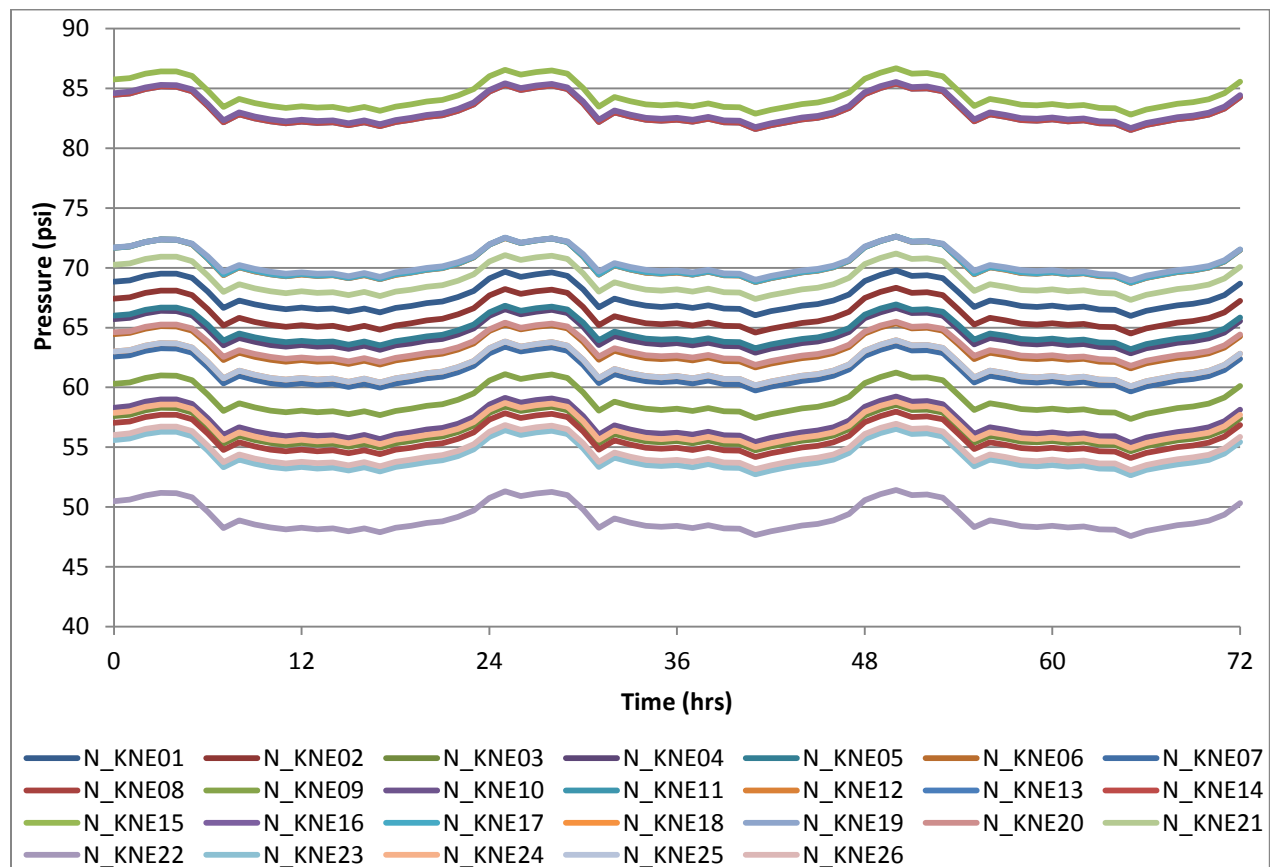


Figure 3-4: Pressures under Existing (2012) Plus KNUE Build-out AVDY Demands

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

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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.

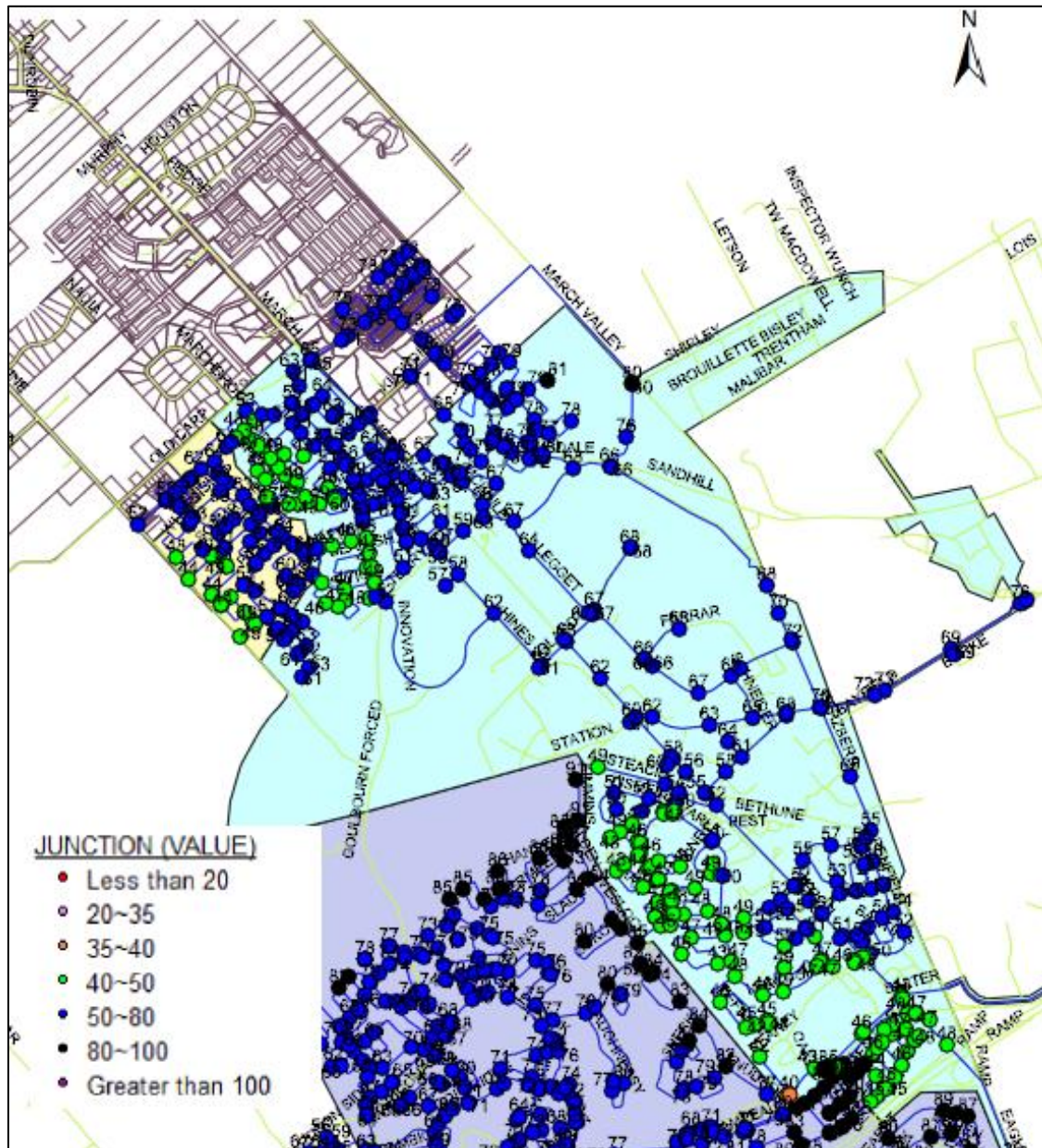


Figure 3-5: Zone 2Ww Minimum Pressures under Existing Network & Existing 2012 PKHR Demands (no KNUE)

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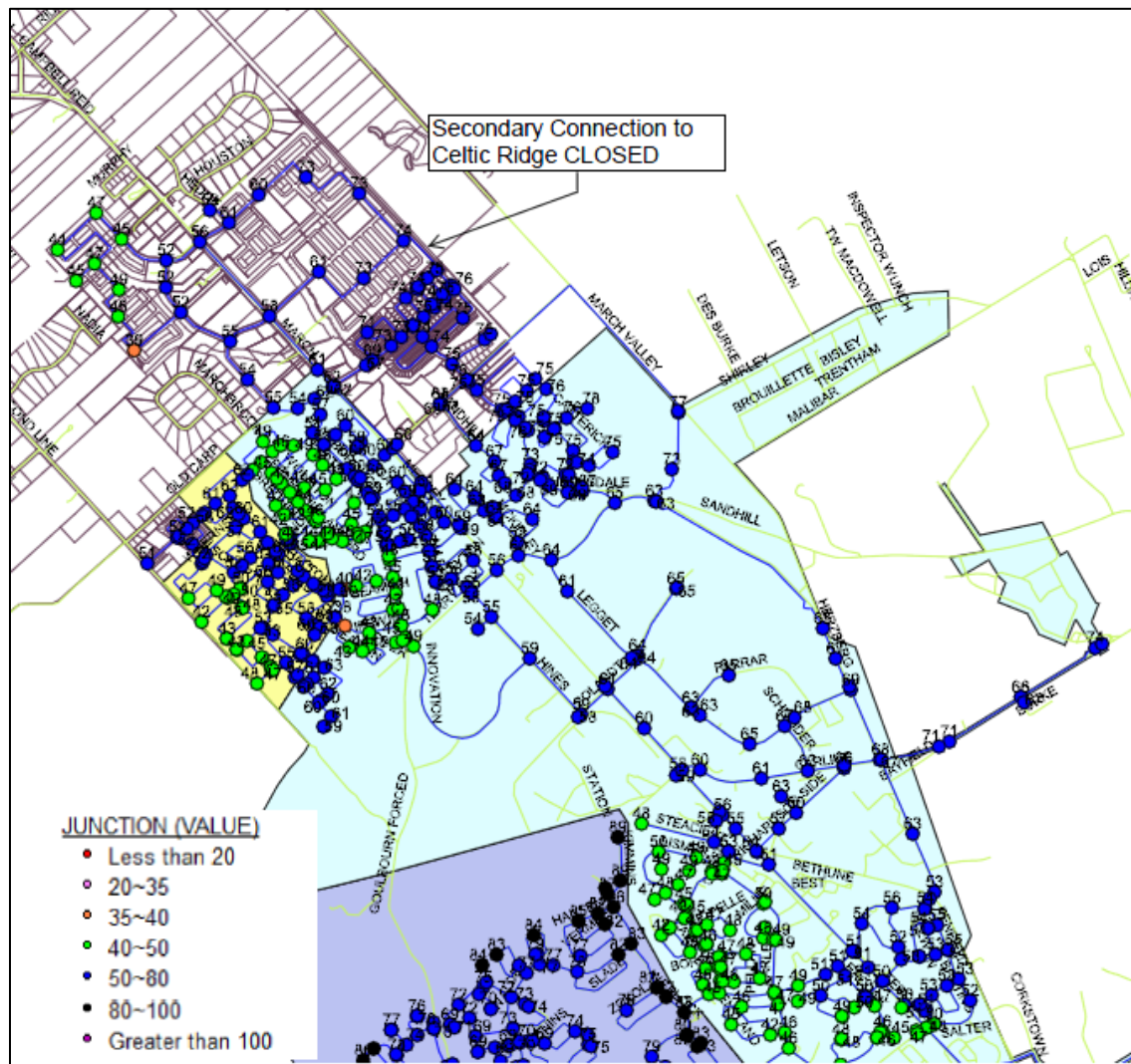


Figure 3-6: Zone 2Ww Minimum Pressures with Existing Network & Existing + KNUE 2012 PKHR Demands

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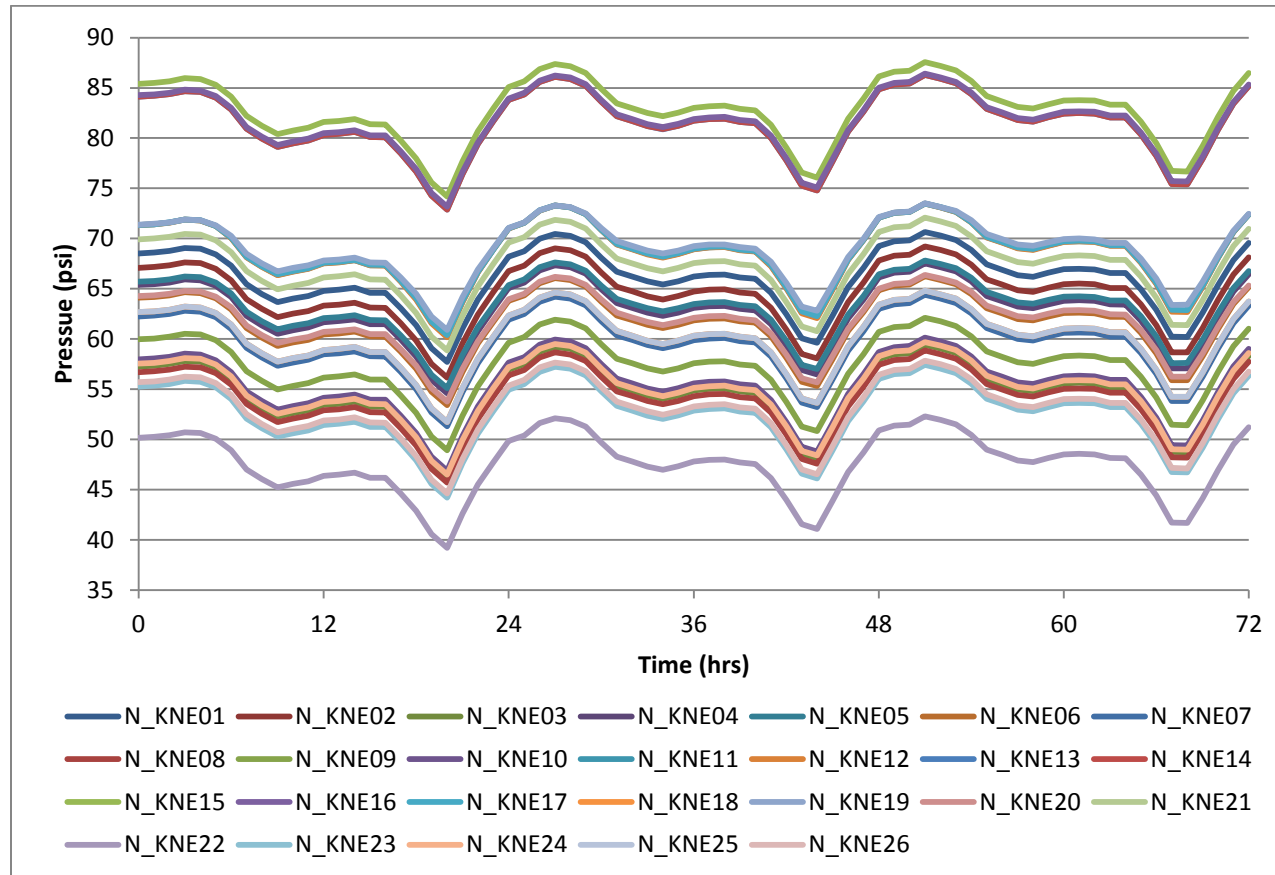


Figure 3-7: Pressures under Existing Network & Existing + KNUE 2012 PKHR EPS Demands

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.

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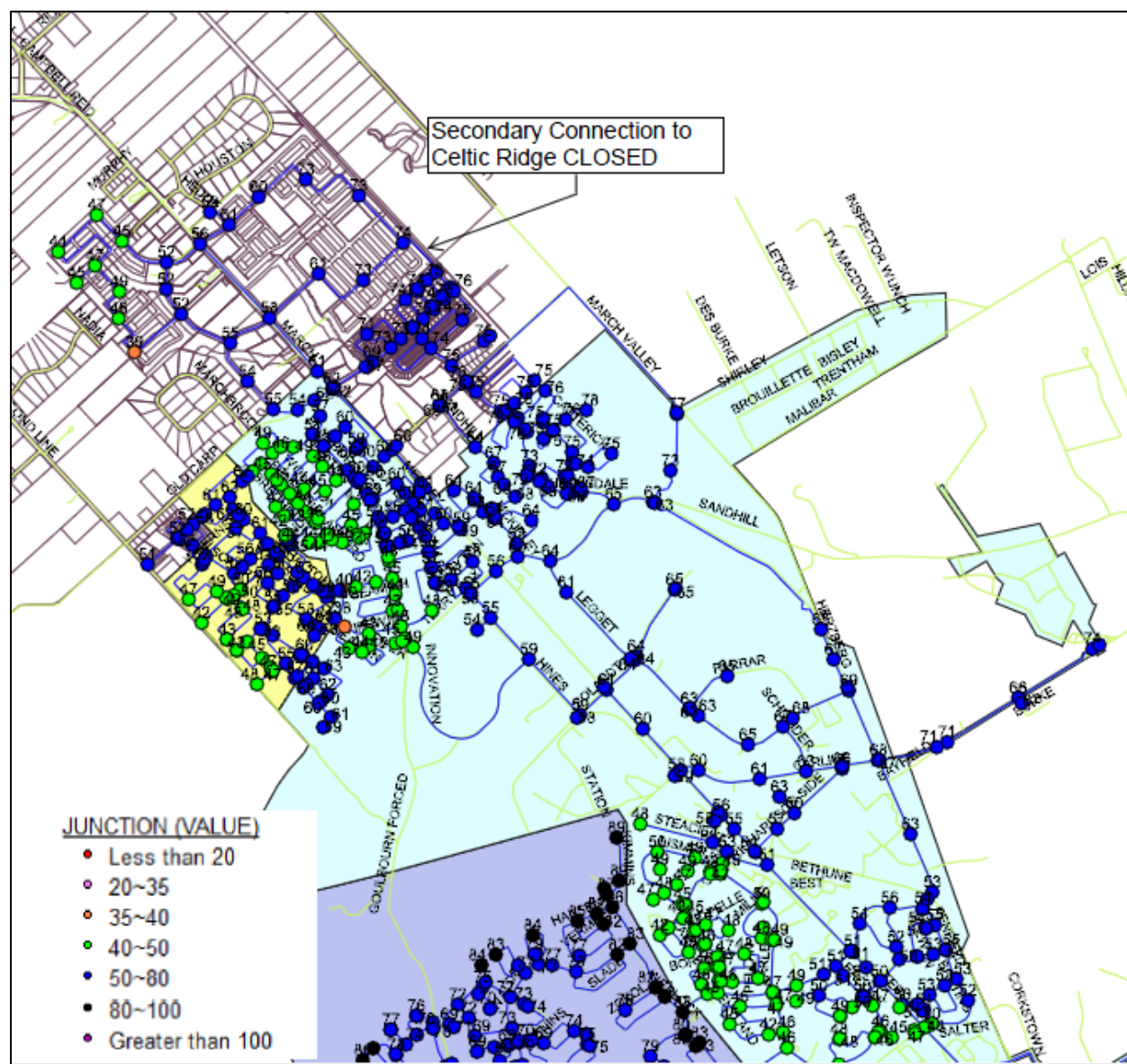


Figure 3-8: Minimum Pressures (psi) with Upgraded 2Ww Network & Existing + KNUE PKHR Demands

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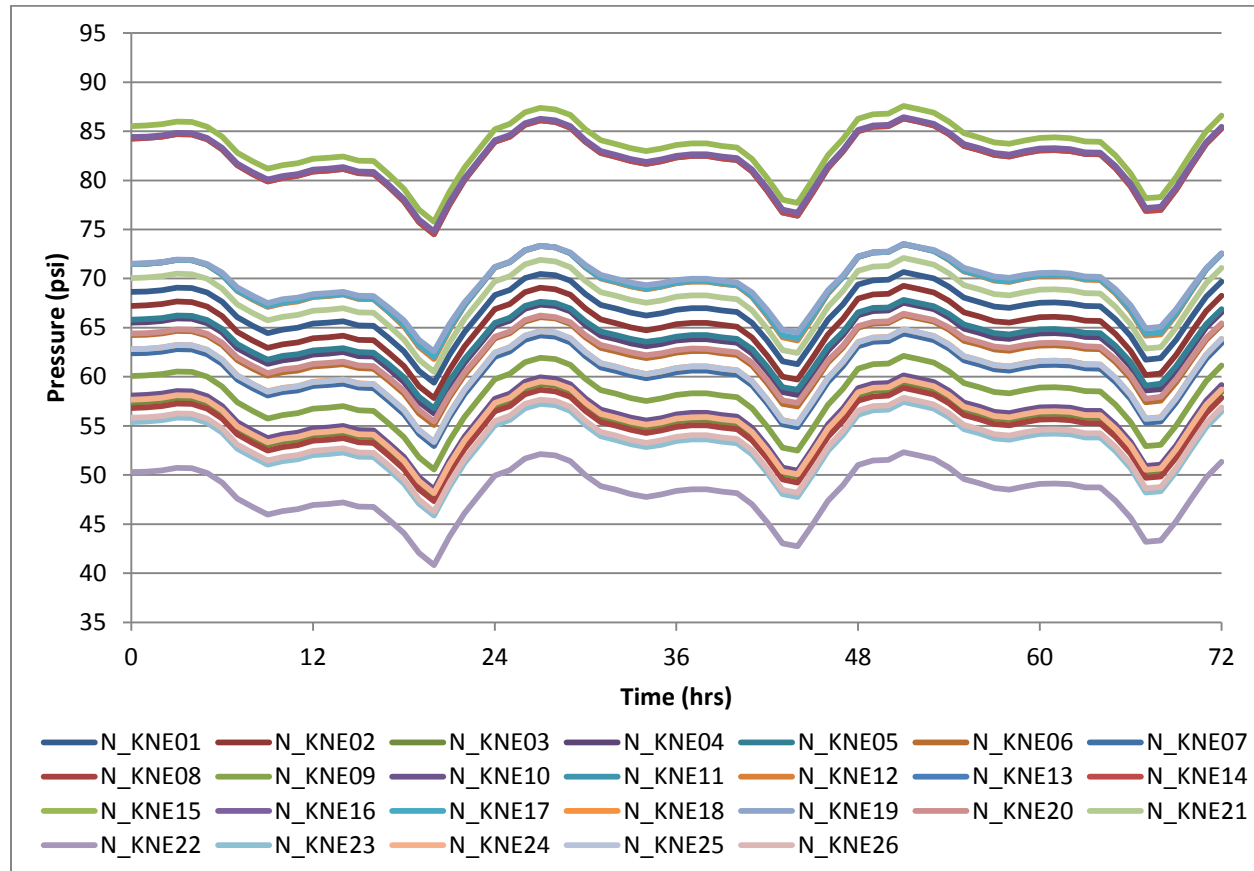


Figure 3-9: Pressures with upgraded 2Ww Network & Existing + KNUE 2012 MXDY EPS Demands

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.

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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

ID	Available Flow at Hydrant (L/s)	
	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

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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.

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

ID	Available Flow at Hydrant (L/s)		% Difference
	BSDY + Fire + 406 BRK March Feed from Old Carp Road	BSDY + Fire + 406 BRK March Feed from Celtic Ridge	
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%

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Hydraulic Modeling
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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.

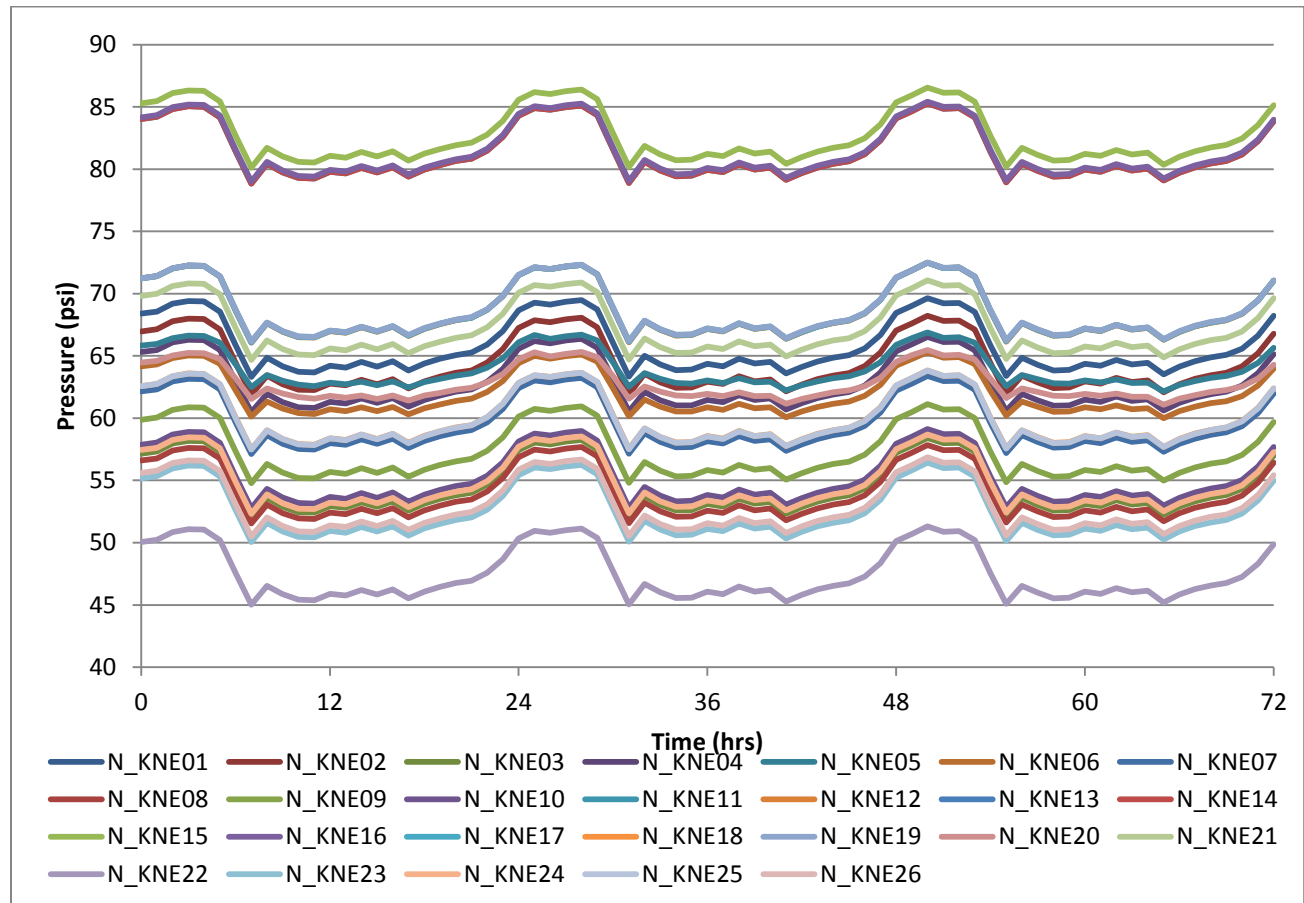


Figure 3-10: KNUE Pressures under Existing 2Ww Pipe Network & Existing + KNUE 2012 BSDY Demands with a pipe failure along the KNUE March Road feed.

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.

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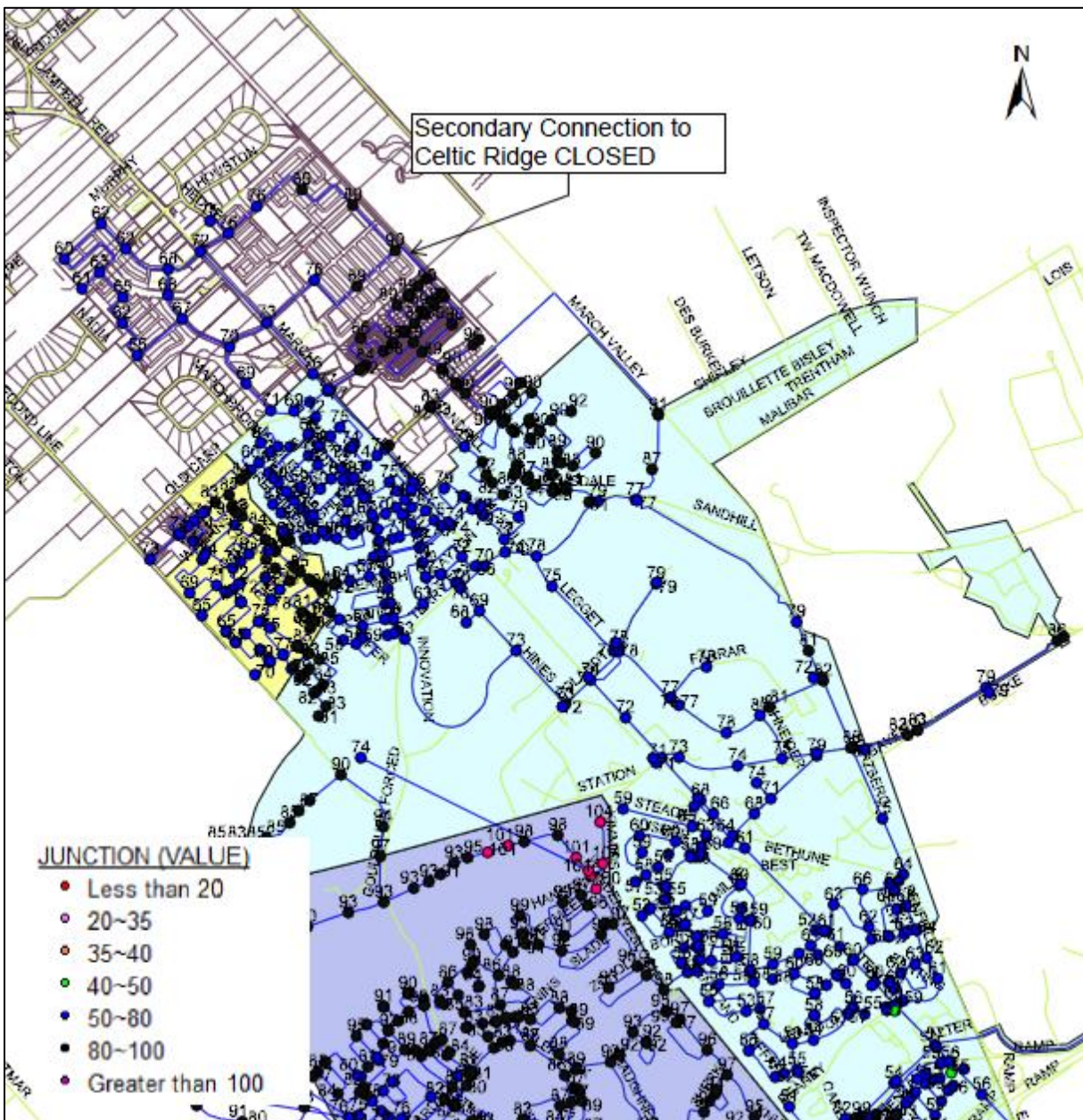


Figure 3-11: Resulting Maximum Pressures Under 2031 Average Day Demands

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.

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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 50m³/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.

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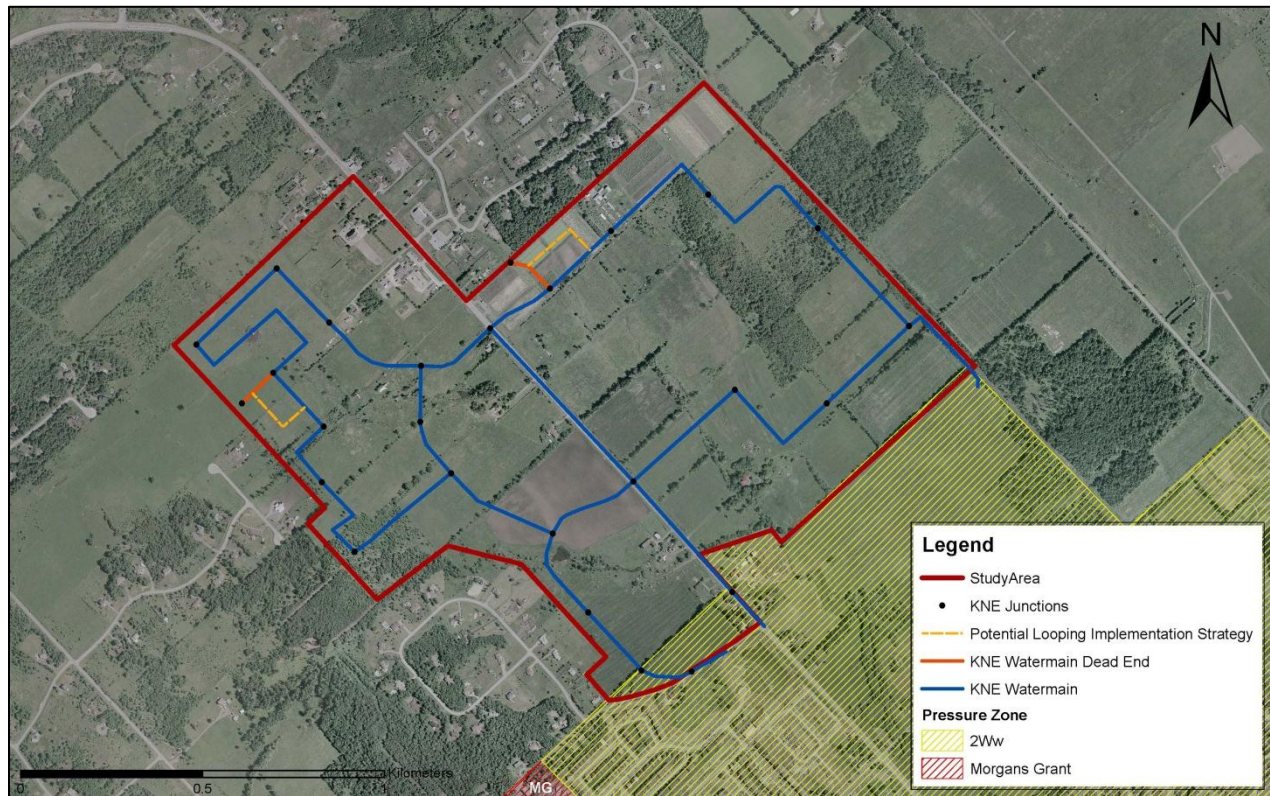


Figure 3-13: Dead End Implementation Strategy

KANATA NORTH URBAN EXPANSION POTABLE WATER ASSESSMENT

Recommendations
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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:

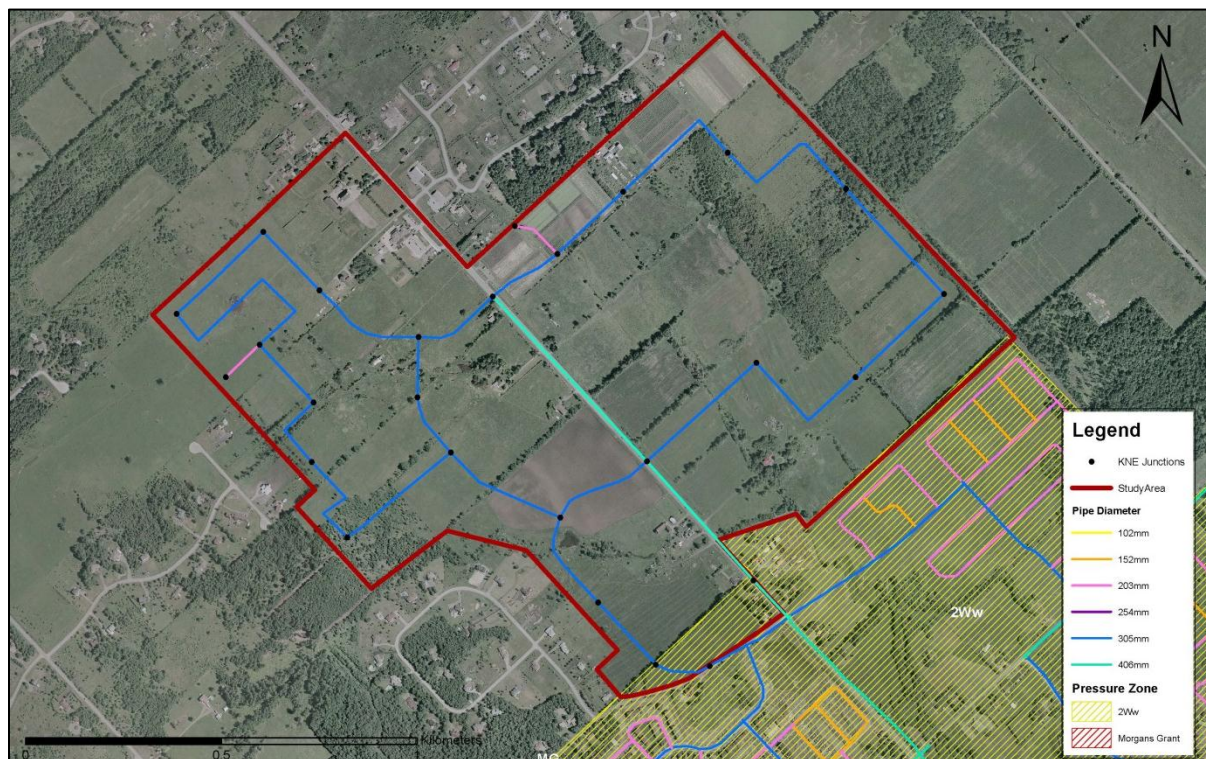


Figure 4-1: Preferred Watermain Layout

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

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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 “single 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.

KANATA NORTH URBAN EXPANSION POTABLE WATER ASSESSMENT

Works Cited
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5.0 Works Cited

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

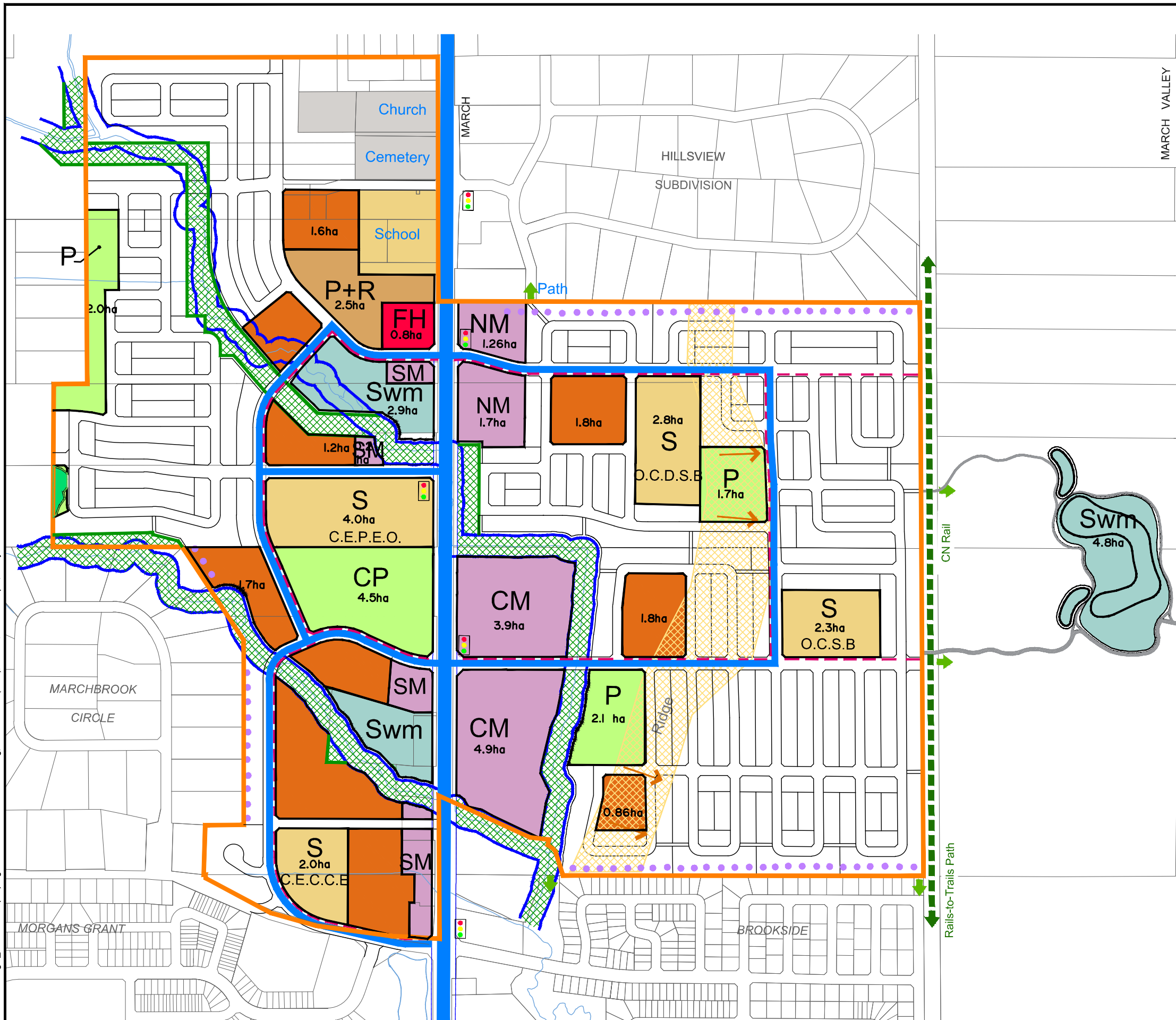
Newell, W.R. (2010). *Ottawa Design Guidelines - Water Distribution*. Ottawa: City of Ottawa.

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

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



LEGEND

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

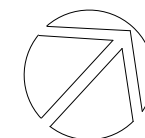
¹ Townhouses, Stacked Townhouses, Back-to-Back Townhouses, Low-rise Apartments (Max 4 Storeys)

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

NOVATECH
Engineers, Planners & Landscape Architects

