BYLAW NO. 1225-21

BEING A BYLAW OF
MACKENZIE COUNTY
IN THE PROVINCE OF ALBERTA

TO PROVIDE FOR OFF-SITE LEVIES FOR THE PURPOSE OF NORTH SANITARY TRUNK SEWER IN THE HAMLET OF LA CRETE

WHEREAS, pursuant to section 648 of the *Municipal Government Act,* RSA 2000, Chapter M-26, as amended, a municipality has the authority to pass an Off-Site Levy Bylaw; and

WHEREAS, the Council of Mackenzie County, in the province of Alberta, has deemed it necessary to establish an Off-Site Levy Bylaw to pay for the capital costs of new sanitary trunk sewer facilities in the Hamlet of La Crete; and

WHEREAS, the Council of Mackenzie County deems it necessary to require agreements to be entered into with owners of the lands within the boundaries of the Benefitting Areas that are to be subdivided or developed in respect of the payment of the Off-Site Levy; and

WHEREAS, Mackenzie County has prepared a La Crete North Sanitary Trunk Sewer Design Report;

NOW THEREFORE, the Council of Mackenzie County, in the province of Alberta, duly assembled, hereby enacts as follows:

1. **CITATION**

1.1 This bylaw may be cited as the La Crete North Sanitary Off-Site Levy Bylaw and referred to herein as “this Bylaw”.

2. **DEFINITIONS**

2.1 For the purposes of this Bylaw the following definitions shall apply:

a) Act – means the *Municipal Government Act*, RSA 2000, Chapter M-26, and amendments thereto;

b) Administration – means Mackenzie County Administrative Staff;

c) Benefiting Lands – means those areas located within Mackenzie County which will benefit from the Off-Site Infrastructure or Improvements subject of this Bylaw;

_____

_____

d) Council – means the Municipal Council of Mackenzie County in the Province of Alberta, as duly elected and defined in the Municipal Government Act, RSA 2000, Chapter M-26 and amendments thereto;

e) County – means the municipal district of Mackenzie County in the Province of Alberta;

f) Developer – means a person or entity who submits a Subdivision or Development Permit Application, pursuant to this Bylaw;

g) Off-Site Infrastructure *or* Off-Site Improvements – means the projects specified in Schedule "A" of this Bylaw for the purposes of sanitary trunk sewer in the Hamlet of La Crete.

3. APPLICATION

3.1 The total recoverable cost of the Off-Site Infrastructure, subject of this Bylaw is shown in Schedule "A" Section 6.0;

3.2 The Off-Site Levy fee is applicable to any Benefiting Lands as shown in Schedule "A" Figures 1 & 2;

3.3 The Off-Site Levy fee is charged in accordance with Schedule "A" Executive Summary;

3.4 Where it is determined that a development agreement is appropriate for an application for development or subdivision, the developer shall enter into a development agreement with the County and such development agreement shall ensure:

a. that provision is made for the payment of the Off-Site Levies as specified in this Bylaw with reasonable interest on the cost of improvements paid for in whole or in part by the municipality as established under the conditions of approval of the development permit for subdivision approval; or

b. that provision may be made for the deferring of payment of the Off-Site Levies to a future time certain or uncertain.

3.5 In the event that any of the Off-Site Levies imposed by this Bylaw or any other County Bylaw are not paid at the time specified in the development agreement, the County's Chief Administrative Officer is hereby authorized to impose the unpaid sums of money on the lands that are subject of the development agreement, and thereafter collect the same as unpaid taxes in accordance with the provisions of the Act.

4. SEVERABILITY

4.1 If at any time any provision of this Bylaw is declared or held to be illegal, invalid, or ultra vires, in whole or in part, then that provision shall not apply and the remainder of this Bylaw shall continue in full force and effect and shall be continued as if it had been enacted without the illegal, invalid, or ultra vires provision.

5. REPORTING

5.1 Administration will review the status of Off-Site Levies and provide a report to Council on an annual basis.

6. ENACTMENT

6.1 Schedule "A" forms part of this bylaw.

6.2 This Bylaw shall come into force and effect upon the date of passing of the third and final reading.

READ a first time this 26th day of May, 2021.

READ a second time this 23rd day of June, 2021.

READ a third time and finally passed this 23rd day of June, 2021.

(original signed)
Joshua Knelsen
Reeve

(original signed)
Lenard Racher
Chief Administrative Officer

Schedule "A"
La Crete North Sanitary Trunk Sewer Design Report

North Sanitary Trunk Sewer

Design Report

Mackenzie County

Hamlet of La Crete

November 16, 2020

HELIX Engineering Ltd.

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Grande Prairie, AB T8W 0K8
ph: 780.532.5731
fax: 780.532.5824

HELIX ENGINEERING LTD.

DISCLAIMER

This Design Report has been prepared by HELIX ENGINEERING LTD for use in preliminary design concepts for the North Sanitary Trunk Sewer for the Hamlet of La Crete in Mackenzie County. The information and data contained herein represent HELIX's best professional judgement in light of the knowledge and information available to HELIX at the time of preparation. This Report and the information and data contained herein are to be treated as confidential and may be used and relied on only by HELIX and its employees. HELIX denies any liability whatsoever to other parties who may obtain access to this document for any injury, loss, or damage suffered by such parties arising from their use of, or reliance upon, this study or any of its contents without the express written consent of HELIX ENGINEERING LTD.

CORPORATE AUTHORIZATION

This document entitled "North Sanitary Trunk Sewer Design Report" was prepared by Helix Engineering Ltd.

APEGA PERMIT
P11731
Nov 16/20

PROFESSIONAL ENGINEER ALBERTA
R. J. GLENN
Nov 16/20

APEGA 'Permit To Practice' # P11731

Randy Glenn, P. Eng

This is a scanned copy of the original.

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EXECUTIVE SUMMARY

Helix Engineering Ltd. has been retained to provide a sanitary sewer servicing strategy for the north and west area of La Crete. The final basin will service 1,442 ha of land with a mix of residential, commercial, and light industrial uses with an allowance for 672 ha of low-pressure sewer flows. The servicing strategy includes three (3) gravity trunk sewers. They are shown on Figure 4 and described as follows:

Phase 1

The Phase 1 basin services 575 ha of a mix of residential and commercial/industrial land including 224 ha of low pressure sewer. It also services the phase 2 and 3 lands. The trunk is located north of 109 Avenue at the Hamlet boundary. It flows west to east along the north boundary of the hamlet to the existing sewage lagoons. The trunk is 2,883m long ranging in size from 450 to 675mm diameter at depths of 3.6 to 9.8m. The trunk drains to a lift station and force main that transfer flows to the lagoon. The resulting peak wet weather flow is 356.5 l/s.

Phase 2

The Phase 2 basin services 610 ha of residential land including 448 ha of low pressure sewer. The trunk is located west of TWP RD 1060, flowing from south to north. The trunk is 1,305m long ranging in size from 375 to 450mm diameter at depths of 5.4 to 7.3m. The trunk drains to a lift station and force main that transfer flows to the phase 1 gravity trunk. The resulting peak wet weather flow is 138.6 l/s. The force main will be 2,223m of 400mm DR11 HDPE pipe.

Phase 3

The Phase 3 services 256 ha of light industrial land located north of the Hamlet. The gravity trunk is 2,200m long with pipes ranging in size from 300mm to 450mm diameter. The pipe depths range from 3.5 to 7.4m.. The peak wet weather flow in the trunk is estimated at 96.5 l/s. This trunk connects to the phase 1 gravity trunk at MH 613.

The estimated cost for the servicing strategy is $13,787,000 including engineering and contingencies. Based on this cost, levies have been calculated as follows:

Low Pressure	$2,940	/ha
Gravity Area	$15,900	/ha

1.0 GENERAL

The purpose of this report is to consider Sanitary Sewer Servicing Strategy for the north and west areas of La Crete. Final detailed engineering design will be in accordance with the latest Mackenzie County General Municipal Improvement Standards.

2.0 SERVICE AREA

The service area is shown in Figure 1. The lands included area as follows:

West of TWP RD 1060

- East half of 8-106-15-5
- NE5-106-15-5

North of 109 Avenue (TWP RD 1060)

- South half of SW16-106-15-5
- NW16-106-15-5
- East half of 16-106-15-5 and 21-106-15-5
- West half of 15-106-15-5 and 22-106-15-5

The original scope of work included the 3 quarter sections west of TWP RD 1060 and the 3 quarter sections north of and adjacent to 109 Avenue. The alignment of the proposed trunk was changed to allow the additional areas to the north to be serviced within the same trunk system.

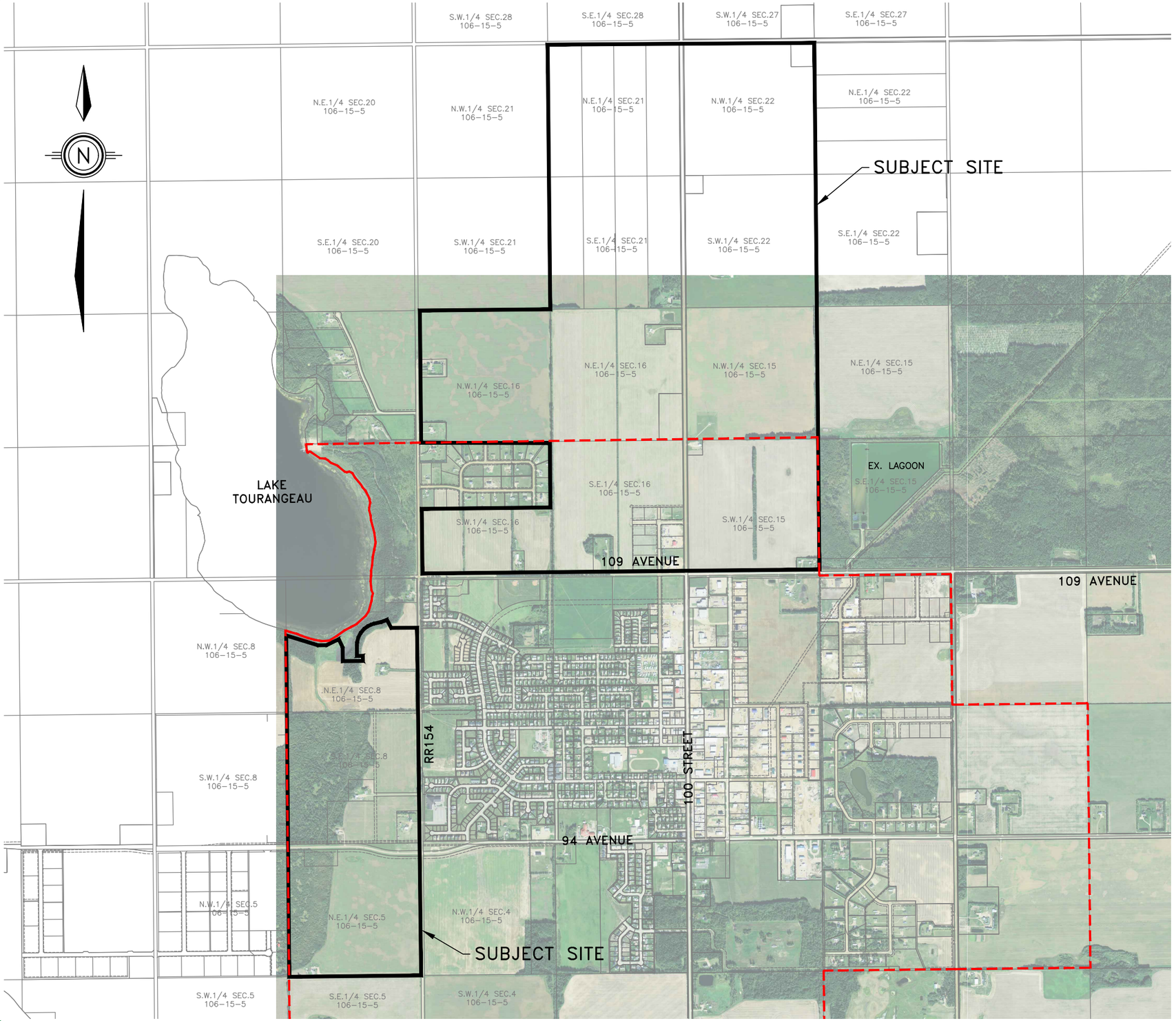
The service area has been discretized into 3 phases. Phase 1 is basin that drains directly into the gravity trunk connecting to the existing lagoon. Phase 2 is the residential area west of RR514 which connects to the phase 1 trunk with a lift station and force main. Phase 3 is the light industrial area to the north, as identified in the Growth Study by 02 Planning in 2020, which connects to the phase 1 trunk by a north expansion gravity trunk.

3.0 PROPOSED LAND USE

The proposed land use for the basin is shown on Figure 2. The area is predominantly residential with a mix of commercial and industrial. Typically, land uses are based on Area Structure Plans. In the absence of this planning document, the preliminary design is based on the following assumptions:

- Net development land is the gross area less potential Environmental Reserve
- Future arterial road widenings – 12.3m 109 Avenue and 10m each side of the Range Roads
- Parks – 10% land allocated in residential areas and assumed cash in lieu in industrial areas
- School areas are included in the park allocation
- Residential areas 2% MF and 98% SF
- A School site has been allocated to Phase 2

The existing topography is shown on Figure 3.



NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 1
LOCATION PLAN

HAMLET BOUNDARY

BENEFITTING LANDS

SCALE
1:25,000

0 0.25 0.5 1.0km

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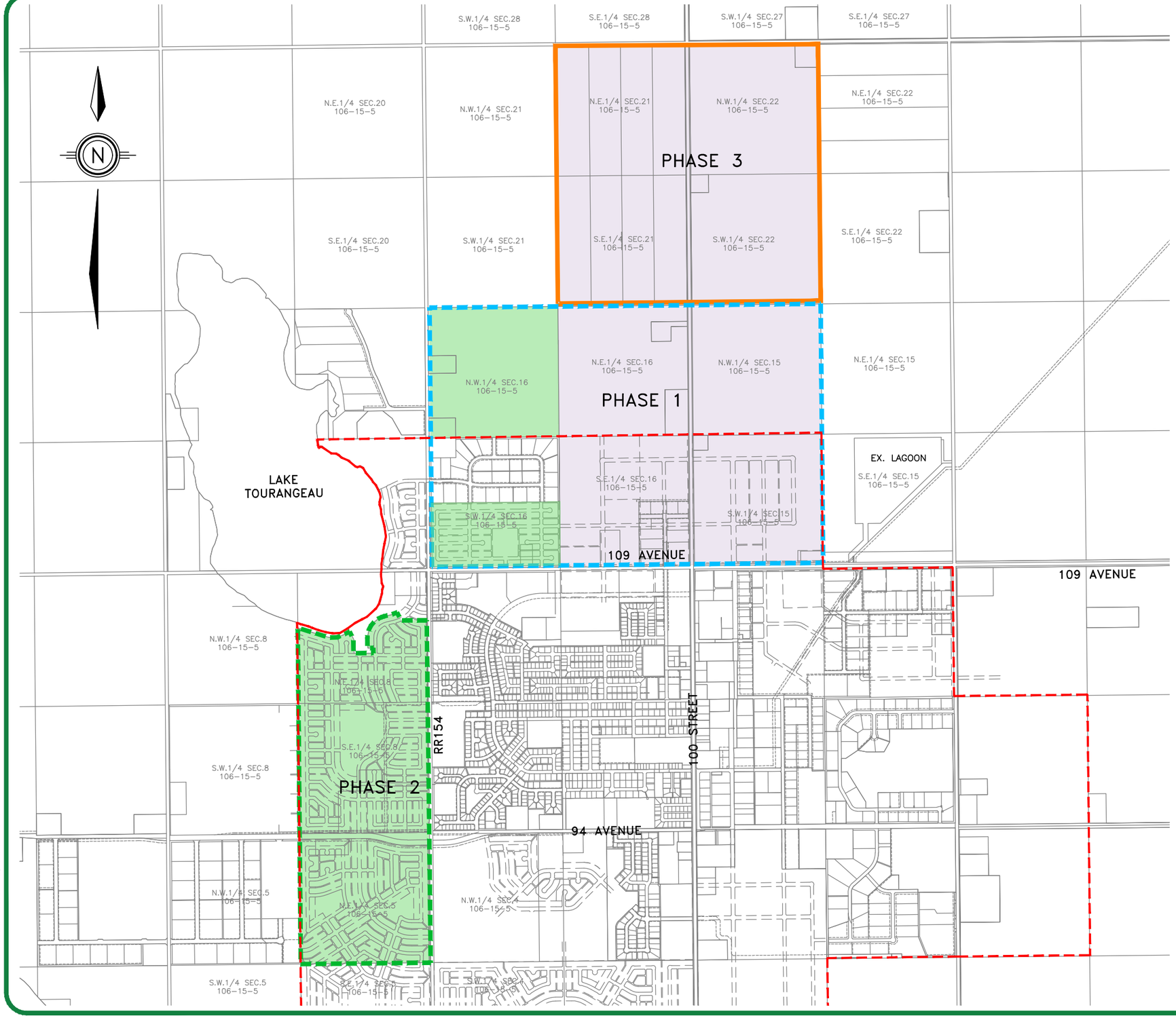

HAMLET BOUNDARY

COMMERCIAL/INDUSTRIAL

RESIDENTIAL

SCALE
1:25,000

0 0.25 0.5 1.0km

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 2
BENEFITTING AREA WITH LAND USE

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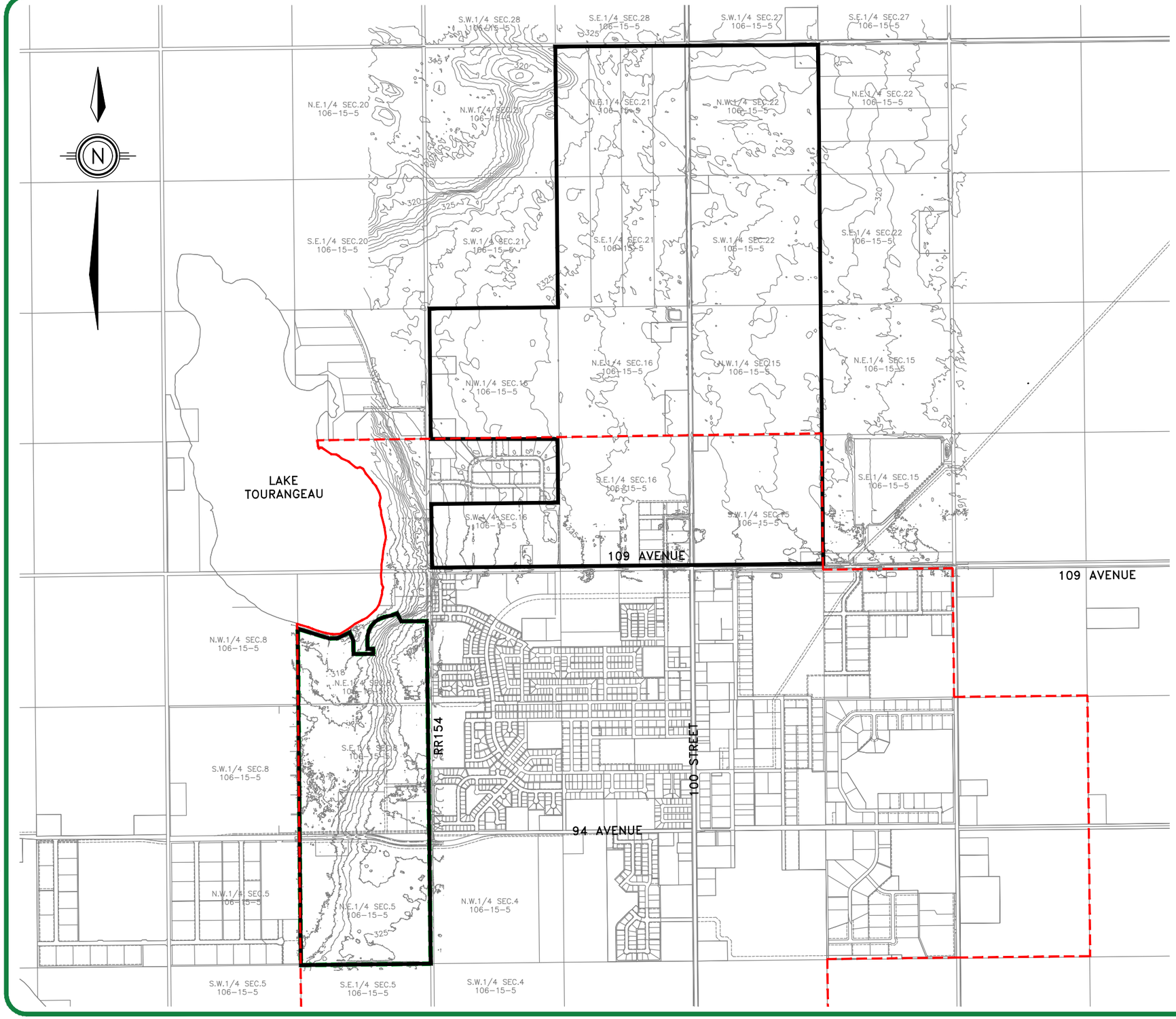

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

HAMLET BOUNDARY

SCALE
1:25,000

0 0.25 0.5 1.0km

FIGURE 3
EXISTING TOPOGRAPHY

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The resulting contributing areas are presented in Table 1.

TABLE 1 - LAND USE FOR FLOW CALCULATIONS

Land Use	Phase 1	Phase 2	Phase 3	Total
Gross Area	575.5	610.2	256.0	1,441.7
ER	-	-	-	-
Gross Developable	575.5	610.2	256.0	1,441.7
Road Widenings	4.7	2.7	1.9	9.3
Stormwater Management	12.1	-	8.1	20.2
Parks (net of Schools)	9.6	4.3	-	13.9
Subtotal	26.4	7.0	10.0	43.4
Net Developable	549.1	603.2	246.0	1,398.4
LPS	224.0	448.0	-	672.0
Residential	81.4	146.2	-	227.7
Schools	-	9.0	-	9.0
Com/Ind	243.7	-	246.0	489.7
Total	549.2	603.2	246.0	1,398.4

Land areas in ha. Phase 3 is the industrial expansion area.

4.0 DESIGN CRITERIA

The design criteria used in the preliminary design is in accordance with the County Mackenzie County General Municipal Improvement Standards dated July 2014. Where gaps occurred, standards were used from other municipalities. The preliminary design is based on the following criteria:

- Residential Flow Generation 350 l/p/d (equates to 0.00405 l/s/p)
- Single Family Density of 35 p/ha
- Multi-family Density of 105 p/ha
- Commercial / Industrial / Institutional 3,000 l/ha/d (equates to 0.035 l/s/ha)
- Low Pressure Sewer (LPS) servicing 4.16 l/s/ quarter section (based on 30 lots per quarter)
- Peaking Factor – Residential $PF = 1 + \frac{14}{4+(P/1000)^{0.5}}$ 2.5<PF<5
- Peaking Factor – Ind/Com/Inst $PF = 10xQave^{-0.45}$ 2.5<PF<5
- Inflow and Infiltration 17,000 l/s/ha (equates to 0.20 l/s/ha); peaking factor does not apply
- Force main maximum velocity 2.0 m/s
- Force main roughness co-efficient 140
- LPS is not subject to peaking factors or inflow/infiltration
- Maximum manhole spacing 150m

In addition to the criteria listed above, Mackenzie County and Helix Engineering Ltd, in consultation with Aquatera Utilities, have agreed on the following:

- Historical data for light industrial areas in the Clairmont area of the Aquatera service area indicate that the generated flows are significantly less than the industrial standard would predict. It is expected that development would be of a similar nature in this area of La Crete. As a result, the flow generation rate has been lowered from the County's standard of 17,000 l/ha/day to 3,000 l/ha/day.
- The LPS flows have the potential to deteriorate concrete manholes when entering the gravity system. Manholes can be lined to protect against corrosion. The County inspected manholes from the connection point of the existing LPS systems and found some deterioration in the first couple of manholes only. Thus, this report includes lining of the first three manholes, the connection manhole and two downstream.
- The use of Vortex systems where LPS or force mains connect to the gravity trunk should be investigated. When the turnover in the pressure pipe takes longer than a day, the use of a vortex may be warranted. This will be the case in the early stages of development when there are minimal flows in the system and the pipes are sized for the ultimate. The Vortex system will reduce odors and corrosion. Vortex systems have been included at the LPS connection, but not at the force main connection at the lagoon.

Based on the design criteria, the peak wet weather flows have been calculated for each inflow manhole to be used in sizing the trunk sewer. The resulting flows are presented in Table 2.

TABLE 2 - DESIGN FLOWS

Land Use	Phase - Stand Alone						System Total	
	1		2		3			
LPS	14.6	9.5%	29.1	21.0%	-	0.0%	43.7	12.3%
Residential & Schools	57.7	37.6%	109.5	79.0%	-	0.0%	167.2	46.9%
Com/Ind	81.3	52.9%	-	0.0%	81.9	100.0%	145.7	40.9%
Total	153.6	100.0%	138.6	100.0%	81.9	100.0%	356.6	100.0%
Flows are Peak Wet Weather (l/s)								

5.0 TRUNK DESIGN

The land within the basin slopes from south to north and west to the east. The general design concept is for three gravity trunks and 2 lift stations to convey flows from the west to the east, to the existing sewage lagoon.

The Phase 1 gravity trunk will flow into a sanitary lift station. The lift station will be located at the existing sewage lagoon and will pump flow to the sewage lagoon in a short force main.

The Phase 2 gravity trunk will collect flows in the west basin and connect to a lift station. The lift station will pump the flows into the top of the Phase 1 trunk thru a force main.

The Phase 3 gravity trunk will collect flows in the north basin and connect to the Phase 1 trunk.

Detailed flow calculations are included in Appendix A.

The alignments were selected in consultation with County staff. It was also agreed that the trunk designs would allow for LPS flows, 3.5 quarters into Phase 1 and 7 quarters into Phase 2. Phase 3 does not have an LPS contribution.

Design of the trunk sewer considers the depth required for the lateral connections servicing the basin. Details of each phase are as follows:

Phase 1

The Phase 1 gravity trunk sewer is 2,883m long with pipe sizes ranging from 450mm to 675mm diameter. The peak dry weather flow is 242.3 l/s and the peak wet weather flow is 356.5 l/s. These flows include an allowance for 14.6 l/s of LPS inflow, representing 224 ha of development, of which approximately 26.2 ha (1.7 l/s) is existing. The depth of the trunk ranges from 3.6m to 9.8m. The trunk connects to a lift station at the existing lagoon. The lift station will convey flows from the trunk to the lagoon. Ultimately, the force main will be 50m of 600mm HDPE with a pressure of 20 psi. Given the short distance for the force main, the sizing of pumps and force main should be staged as warranted by development within the basin.

Phase 2

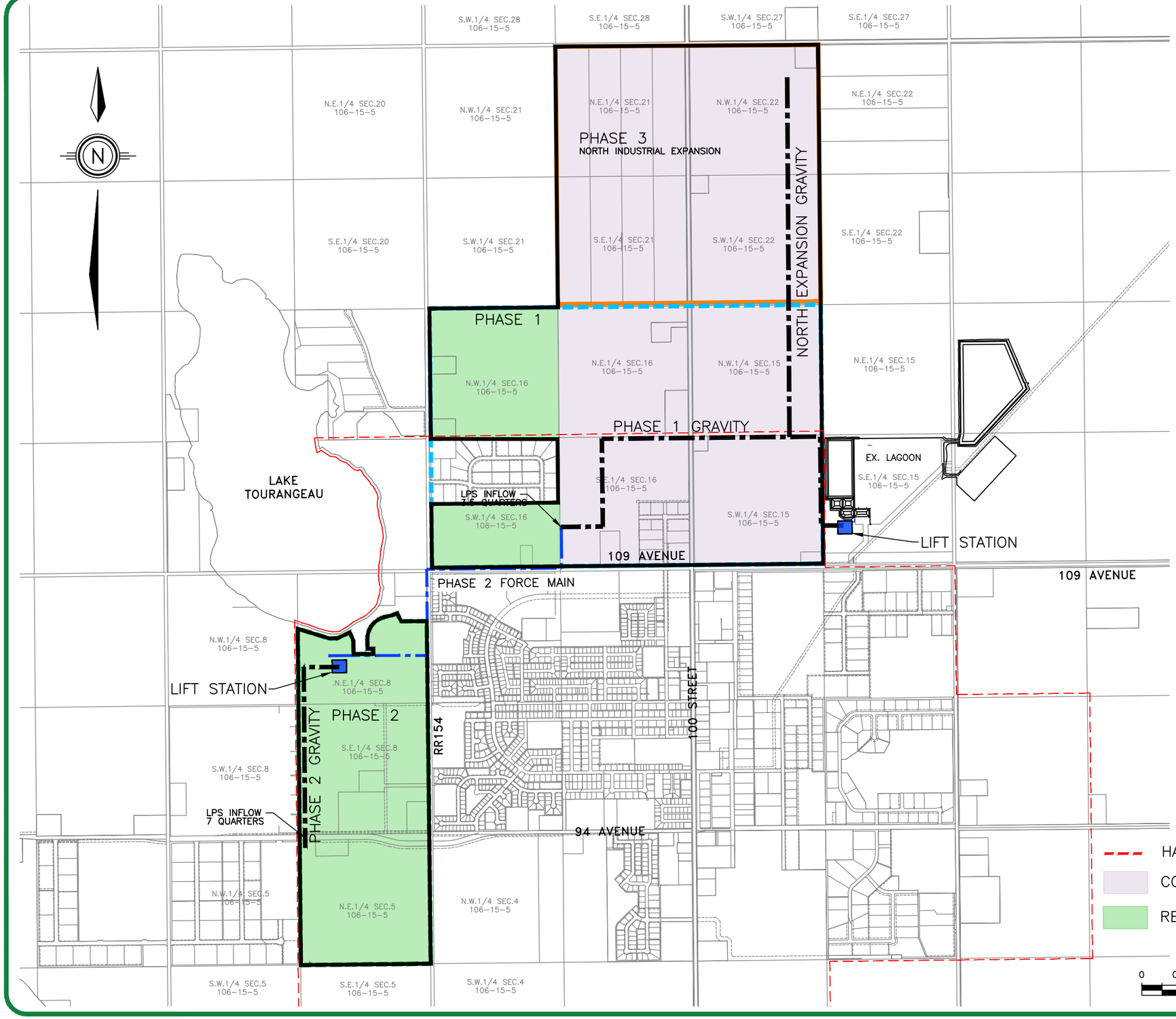
The Phase 2 gravity trunk sewer is 1,305m long with pipe sizes ranging from 375mm to 450mm diameter. The peak dry weather flow is 107.6 l/s and the peak wet weather flow is 138.6 l/s. These flows include an allowance for 29.1 l/s of LPS inflow representing 448 ha of development, of which approximately 48.9 ha (3.2 l/s) is existing. The depth of the trunk ranges from 5.4 to 7.3m. The trunk connects to a lift station at the north end. The lift station will convey flows from the trunk to the Phase 1 trunk. Ultimately, the force main will be 2,223m of 400mm HDPE with a pressure of 35 psi. Initial pumps should be sized for flow rate of 59 l/s at approximately 23 psi to achieve a velocity of 0.6m/s. The pumps running for 1 hour per day will turn over the volume in the pipe each day.

Phase 3

A conceptual design has been done for the phase 3 gravity trunk to provide construction cost estimates and determine the depth required at the Phase 1 manhole to allow the connection. The phase 3 gravity trunk is 2,200m long with pipe sizes ranging from 300mm to 450mm diameter. The peak dry weather flow is 36.5 l/s and the peak wet weather flow is 96.5 l/s. The flows result from portions of the Phase 2 basin connecting to

the south end of this trunk for efficient servicing. The stand-alone peak wet weather flow is 81.9 l/s. These flows do not include any allowance for LPS flows. The depth of the trunk ranges from 3.6m to 7.4m. The trunk connects to the Phase 1 gravity trunk at MH#613.

The servicing concept is shown on Figure 4.



NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 4
SERVICING CONCEPT

HAMLET BOUNDARY

COMMERCIAL/INDUSTRIAL

RESIDENTIAL

SCALE
1:25,000

0 0.25 0.5 1.0km

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6.0 CONSTRUCTION COST ESTIMATES

The construction cost for the servicing concept has been estimated based on the preliminary design of the system. This includes the gravity trunks, lift stations and the force mains as illustrated on Figures 5 to 8. The detailed cost estimates are included in Appendix B. Estimates include the following:

- Cost of the servicing study
- 10% for Engineering
- 20% for Contingencies (30% for Phase 3)
- Allowance for lining of three upper manholes to facilitate the LPS connection
- Trenchless construction of the force main

The construction costs are summarized in Table 3.

TABLE 3 - ESTIMATED COSTS

	Phase			Total*
	1	2	3*	
Gravity Trunk	2,753,000	1,057,000	1,254,000	5,064,000
Lift Station / Force Main	2,094,000	3,172,000	-	5,266,000
Subtotal	4,847,000	4,229,000	1,254,000	10,330,000
Contingencies 20%*	970,000	846,000	377,000	2,193,000
Engineering 10%	485,000	423,000	126,000	1,034,000
Subtotal	6,302,000	5,498,000	1,757,000	13,557,000
Trunk Sewer MH Lining	27,000	43,000	-	70,000
Design Report	60,000	60,000	40,000	160,000
Project Total	6,389,000	5,601,000	1,797,000	13,787,000

* Phase 3 Contingency is 30%

MH 608
RIM: 322.18
W INV: 316.44
E INV: 316.39

MH 609
RIM: 321.95
W INV: 316.03
E INV: 315.98

MH 610
RIM: 321.48
W INV: 315.73
E INV: 315.68

MH 611
RIM: 321.36
W INV: 315.41
E INV: 315.36

N.W.1/4 SEC.15
106-15-5

MH 612
RIM: 320.72
W INV: 315.09
E INV: 315.04

MH 613
RIM: 320.66
W INV: 314.77
E INV: 312.49

MH 614
RIM: 320.15
W INV: 312.29
E INV: 312.24

MH 615
RIM: 319.86
W INV: 312.03
S INV: 311.98

N.E.1/4 SEC.15
106-15-5

600mm @ 0.26%

600mm @ 0.27%

600mm @ 0.28%

600mm @ 0.29%

600mm @ 0.30%

675mm @ 0.24%

675mm @ 0.25%

MH 907
RIM: 320.66
N INV: 312.81

675mm @ 0.26%

MH 616
RIM: 320.20
N INV: 311.59
S INV: 311.54

EX. LAGOON

EX. LAGOON

675mm @ 0.27%

S.E.1/4 SEC.15
106-15-5

MH 617
RIM: 320.02
N INV: 311.13
S INV: 311.08

675mm @ 0.28%

SCALE
1:2500

50 25 0 25 50 100

MH 618
RIM: 320.03
N INV: 310.66
S INV: 310.61

675mm @ 0.30%

MH 619
RIM: 320.45
N INV: 310.36
E INV: 310.31

MH 620
RIM: 319.82
W INV: 309.89
E INV: 309.83

675mm @ 0.30%

675mm @ 0.40%

MH 621
RIM: 320.15
W INV: 309.64

S.W.1/4 SEC.15
106-15-5

N

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 5
PHASE 1-SHEET 1

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N.E.1/4 SEC.16
106-15-5

MH 603
RIM: 324.17
S INV: 318.88
E INV: 318.83

MH 604
RIM: 324.14
W INV: 318.24
E INV: 318.19

MH 605
RIM: 323.46
W INV: 317.59
E INV: 317.51

MH 606
RIM: 323.16
W INV: 317.20
E INV: 317.15

MH 607
RIM: 322.56
W INV: 316.83
E INV: 316.78

N.W.1/4 SEC.15
106-15-5

MH 608
RIM: 322.18
W INV: 316.44
E INV: 316.39

525mm @ 0.44%

525mm @ 0.45%

600mm @ 0.23%

600mm @ 0.24%

600mm @ 0.25%

525mm @ 0.27%

MH 600
RIM: 324.27
S INV: 319.30
N INV: 319.25

525mm @ 0.26%

MH 599
RIM: 323.88
S INV: 319.70
N INV: 319.65

S.E.1/4 SEC.16
106-15-5

S.W.1/4 SEC.15
106-15-5

525mm @ 0.25%

MH 598
RIM: 324.25
S INV: 320.11
N INV: 320.04

450mm @ 0.57%

MH 597
RIM: 324.51
W INV: 320.94
N INV: 320.89

MH 596
RIM: 324.71
W INV: 321.75
E INV: 321.70

MH 595
RIM: 325.55
E INV: 322.44

450mm @ 0.56%

450mm @ 0.56%

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 6
PHASE 1-SHEET 2

SCALE
1:2500

50 25 0 25 50 100

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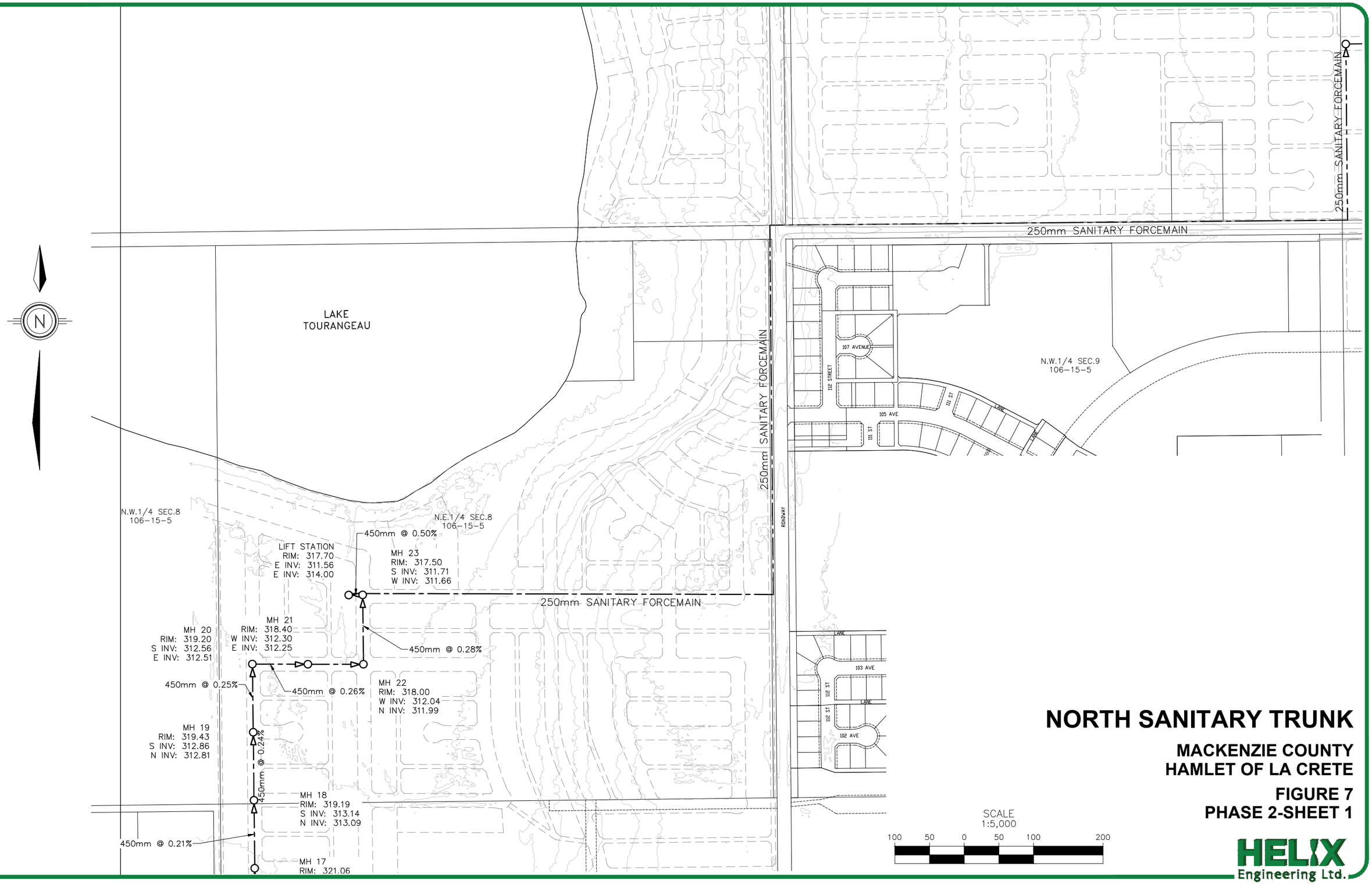

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 7
PHASE 2-SHEET 1

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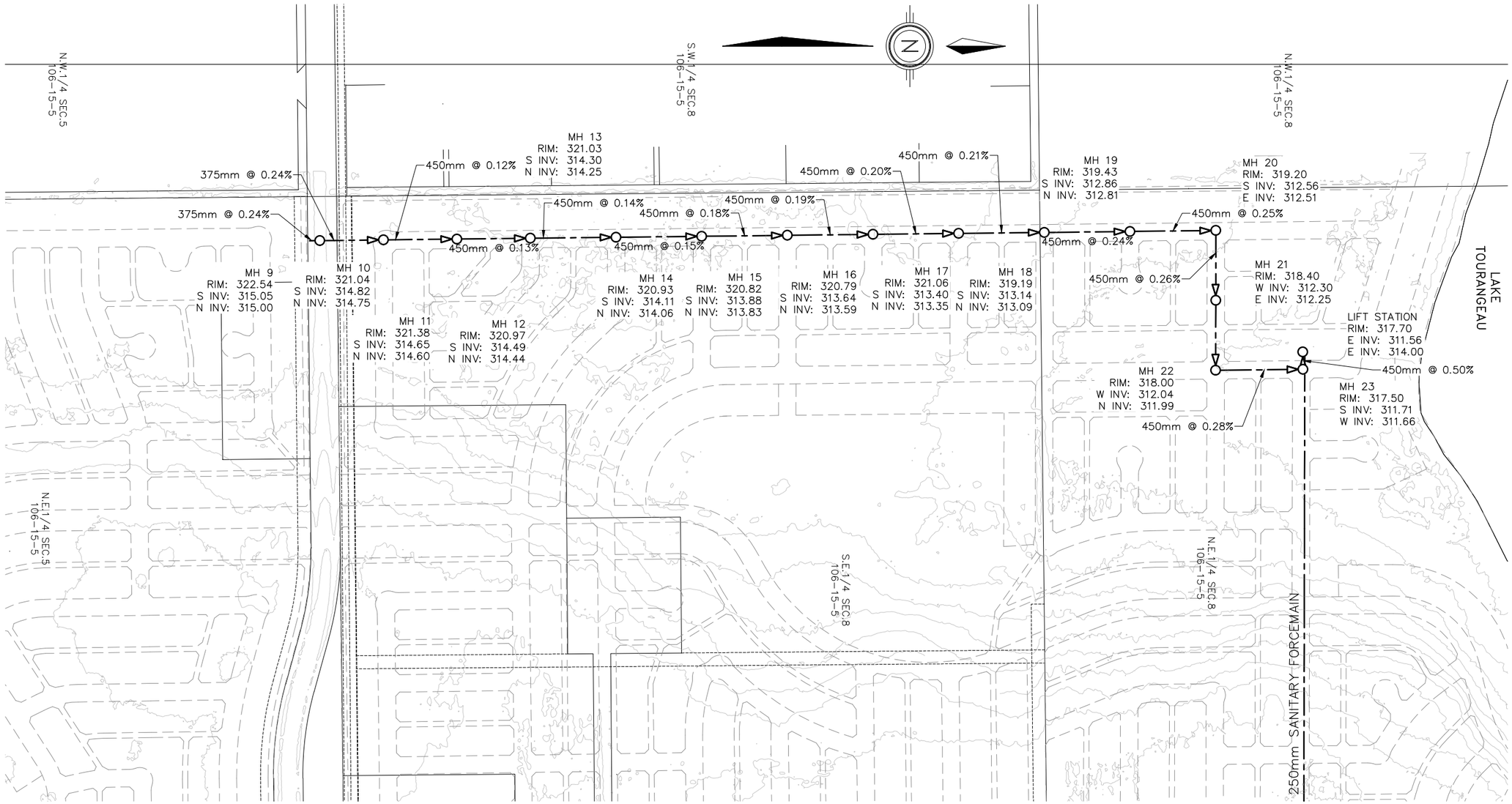

NORTH SANITARY TRUNK

MACKENZIE COUNTY
VILLAGE OF LA CRETE

FIGURE 8
PHASE 2-SHEET 2

SCALE
1:5,000

100 50 0 50 100 200

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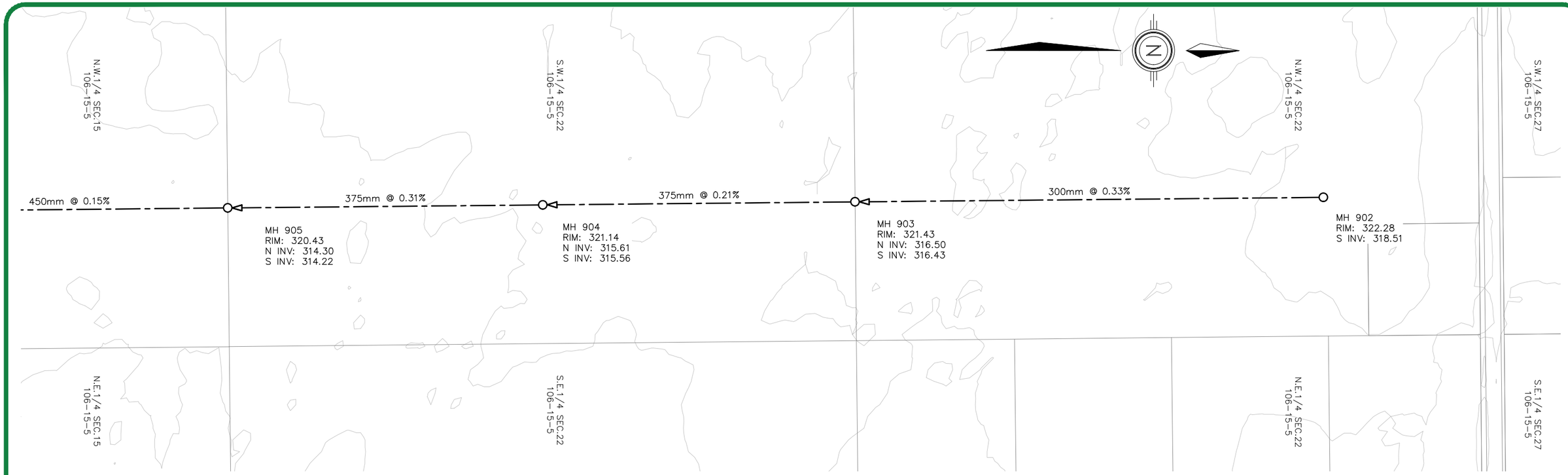

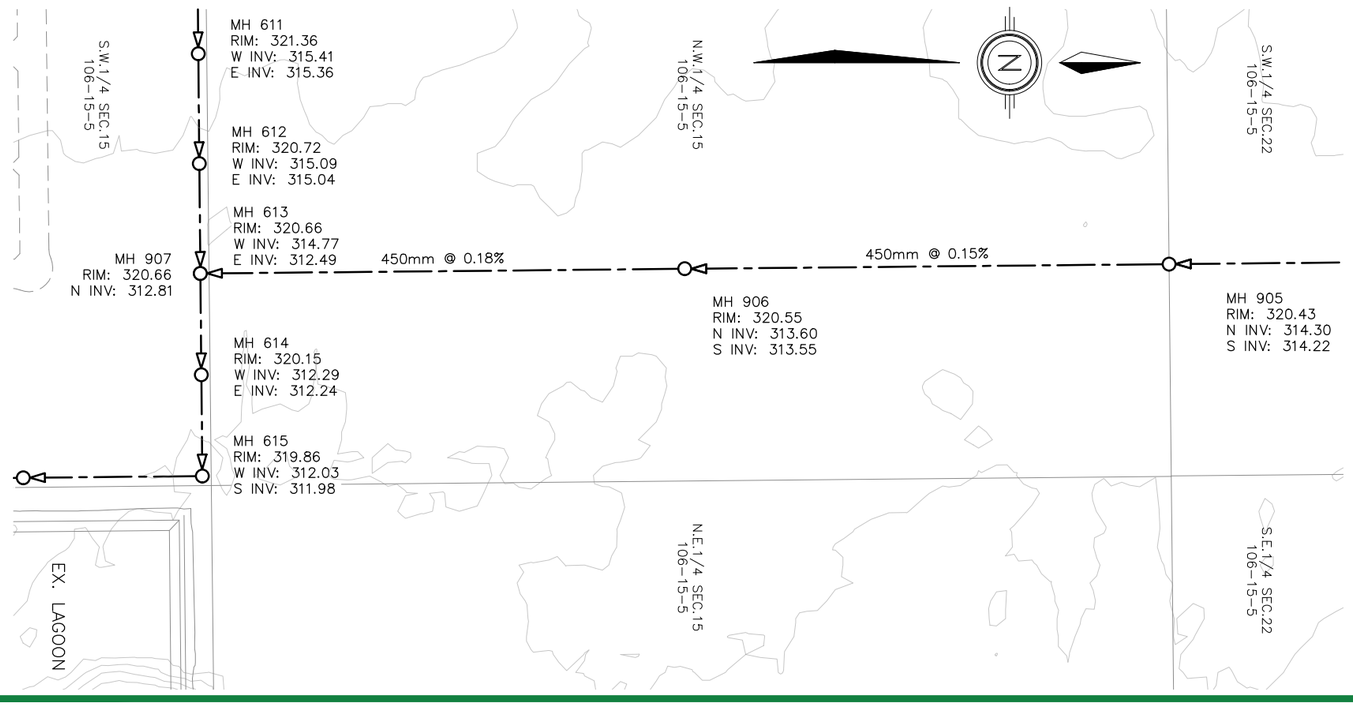

NORTH SANITARY TRUNK

MACKENZIE COUNTY
HAMLET OF LA CRETE

FIGURE 9
PHASE 3

SCALE
1:5,000

100 50 0 50 100 200

HELIX Engineering Ltd.

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7.0 BASIN LEVIES

The cost to service the basin will be charged back to the benefitting lands as a development levy. Separate levy rates are presented for the future LPS system and the gravity trunk servicing area. Costs have been apportioned based on the portion of the peak wet weather flow as shown in Table 3. The resulting cost allocations and development levies are shown Table 4.

TABLE 4 - DEVELOPMENT LEVIES

	Cost	Area (ha)	Levy
Residential	6,432,000	258.2	24,910
Com/Ind	5,604,000	499.0	11,240
Gravity Levy	**12,036,000**	**757.2**	**15,900**
LPS	1,681,000		
Extra Cost for MH Lining	70,000		
LPS Levy	**1,751,000**	**596.9**	**2,940**
Total	13,787,000		
Benefiting Area		1,354.1	

Cost amounts are rounded to nearest $1,000.
Levies are arounded to nearest $10.

Appendix A

Design Flow Calculations

xxxx

Mckenzie County

Sanitary Sewer Flows

LaCrete North Trunk Sewer

Phase 1

2320-002 Phase 2 and Phase 3 inflows included. Density: units per ha 10 350 l/p/d Res 3,000 l/ha/d Commercial I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
595	596	West		0	0 25.82	SF	25.82	35	904	0.00405 l/s/p		3.66																
					0.53	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					8.60	Com/Ind	8.60			0.03500 l/s/ha		0.3																
					-	School	0.00			0.20000 l/s/ha		-									320.8							
		Non-Residential					8.60				5.00	0.3	1.51	1.72	3.23	3.73				595 Ups MH			596 Dns MH					
		Direct Flow			138.6l/s From Phase 2 + 3 quarters of LPS							153.18			153.18	177.30												
		Total			34.95		34.95									204.27	213.24	450	0.0056	325.60	321.40	123	320.71	0.689	0.05	n	3.75	324.70	3.539
																		Min.	0.0012									
596	597	West		0	0 -	SF	25.82	35	904	0.00405 l/s/p		3.66																
					-	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					-	Com/Ind	8.60			0.03500 l/s/ha		0.3																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					8.60				5.00	0.3	1.51	1.72	3.23	3.73				596 Ups MH			597 Dns MH					
		Direct Flow										-			153.18	177.30												
		Total			-		34.95									204.27	213.24	450	0.0056	324.70	320.66	136	319.90	0.762	0.05	n	3.59	324.50	4.150
																		Min.	0.0012									
597	598			0	0 -	RG	25.82	35	904	0.00405 l/s/p		3.66																
					-	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					7.40	Com/Ind	16.00			0.03500 l/s/ha		0.6																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					16.00				5.00	0.6	2.80	3.20	6.00	6.94				597 Ups MH			598 Dns MH					
		Direct Flow	Add N half of SW 16 LPS									-			153.18	177.30												
		Total			7.40		42.35									207.48	215.14	450	0.0057	324.50	319.85	136	319.07	0.775	0.075	n	4.20	324.20	4.676
																		Min.	0.0012									
598	599			0	0 -	RG	25.82	35	904	0.00405 l/s/p		3.66																
					-	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					8.67	Com/Ind	24.67			0.03500 l/s/ha		0.9																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					24.67				5.00	0.9	4.32	4.93	9.25	10.71				598 Ups MH			599 Dns MH					
		Direct Flow	Add N half of SW 16 LPS												153.18	177.30												
		Total			8.67		51.02									211.24	214.92	525	0.0025	324.20	319.00	136	318.66	0.340	0.05	n	4.68	323.90	4.716
																		Min.	0.0010									
599	600			0	0 -	RG	25.82	35	904	0.00405 l/s/p		3.66																
					-	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					2.59	Com/Ind	27.26			0.03500 l/s/ha		1.0																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					27.26				5.00	1.0	4.77	5.45	10.22	11.83				599 Ups MH			600 Dns MH					
															153.18	177.30												
		Total			2.59		53.61									212.37	219.18	525	0.0026	323.90	318.61	136	318.26	0.354	0.05	n	4.77	324.30	5.519
																		Min.	0.0010									
600	603			0	0 -	RG	25.82	35	904	0.00405 l/s/p		3.66																
					-	MF	0.53	105	55	0.00405 l/s/p		0.22																
		Residential			0		26.35		959		3.81	3.89	14.81	5.27	20.08	23.24												
					-	Com/Ind	27.26			0.03500 l/s/ha		1.0																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					27.26				5.00	1.0	4.77	5.45	10.22	11.83				600 Ups MH			603 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		53.61									212.37	223.35	525	0.0027	324.30	318.21	136	317.84	0.367	0.05	n	5.57	324.17	5.806
																		Min.	0.0010									

Phase 1

2320-002

Phase 2 and Phase 3 inflows included.

Density: units per ha 10

350 l/p/d Res
3,000 l/ha/d Commercial

I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Population Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Flow Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data UPS Inv	Length	DNS Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	DNS Depth
603	604			0	0	54.00 RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						1.10 MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						64.69 Com/Ind	91.95			0.03500 l/s/ha		3.2																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					91.95				5.00	3.2	16.09	18.39	34.48	39.91				603 Ups MH		604 Dns MH							
		Direct Flow										-			153.18	177.30													
		Total			119.79		173.40									283.97	285.12	525	0.0044	324.17	317.79	133.5	317.20	0.587	0.05	n	5.86	324.14	6.414
																		Min.	0.0010										
604	605			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						- Com/Ind	91.95			0.03500 l/s/ha		3.2																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					91.95				5.00	3.2	16.09	18.39	34.48	39.91				604 Ups MH		605 Dns MH							
		Direct Flow										-			153.18	177.30													
		Total			-		173.40									283.97	288.35	525	0.0045	324.14	318.21	133.5	317.61	0.601	0.075	n	5.41	323.44	5.310
																		Min.	0.0010										
605	606			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						17.24 Com/Ind	109.19			0.03500 l/s/ha		3.8																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					109.19				5.00	3.8	19.11	21.84	40.95	47.39				605 Ups MH		606 Dns MH							
		Direct Flow													153.18	177.30													
		Total			17.24		190.64									291.45	294.32	600	0.0023	323.44	317.79	133.5	317.48	0.307	0.05	n	5.05	323.16	5.078
																		Min.	0.0010										
606	607			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
607 is the range road						- Com/Ind	109.19			0.03500 l/s/ha		3.8																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					109.19				5.00	3.8	19.11	21.84	40.95	47.39				606 Ups MH		607 Dns MH							
		Direct Flow													153.18	177.30													
		Total			-		190.64									291.45	300.65	600	0.0024	323.16	317.15	133.5	316.83	0.320	0.05	n	5.41	322.64	5.209
																		Min.	0.0010										
607	608			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						12.50 Com/Ind	121.69			0.03500 l/s/ha		4.3																	
607 is the range road						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					121.69				5.00	4.3	21.30	24.34	45.63	52.82				607 Ups MH		608 Dns MH							
		Direct Flow													153.18	177.30													
		Total			12.50		203.14									296.88	306.85	600	0.0025	322.64	316.78	137	316.44	0.343	0.05	n	5.26	322.09	5.052
																		Min.	0.0010										
608	609			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						- Com/Ind	121.69			0.03500 l/s/ha		4.3																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					121.69				5.00	4.3	21.30	24.34	45.63	52.82				608 Ups MH		609 Dns MH							
		Direct Flow													153.18	177.30													
		Total			-		203.14									296.88	312.92	600	0.0026	322.09	316.39	137	316.03	0.356	0.05	n	5.10	321.91	5.278
																		Min.	0.0010										
609	610			0	0	- RG	79.82	35	2,794	0.00405 l/s/p		11.32																	
						- MF	1.63	105	171	0.00405 l/s/p		0.69																	
		Residential			0		81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77													
						30.75 Com/Ind	152.44			0.03500 l/s/ha		5.3																	
						- School	0.00			0.20000 l/s/ha		-																	
		Non-Residential					152.44				4.71	5.3	25.12	30.49	55.60	64.36				609 Ups MH		610 Dns MH							
		Direct Flow													153.18	177.30													
		Total			30.75		233.89									308.42	318.89	600	0.0027	321.91	315.98	95	315.73	0.257	0.05	n	5.33	321.37	5.044
																		Min.	0.0010										

Phase 1

2320-002 Phase 2 and Phase 3 inflows included. Density: units per ha 10 350 l/p/d 3,000 l/ha/d Res Commercial I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry (l/s)	Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
610	611		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																		
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																		
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29		57.69	66.77													
					-	Com/Ind	152.44			0.03500 l/s/ha		5.3																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					152.44				4.71	5.3	25.12	30.49		55.60	64.36				610 Ups MH			611 Dns MH						
		Direct Flow														153.18	177.30														
		Total			-		233.89										308.42	324.74	600	0.0028	321.37	315.68	95	315.41	0.266	0.05	n	5.09	321.42	5.410
																			Min.	0.0010									
611	612		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																		
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																		
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29		57.69	66.77													
					-	Com/Ind	152.44			0.03500 l/s/ha		5.3																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					152.44				4.71	5.3	25.12	30.49		55.60	64.36				611 Ups MH			612 Dns MH						
		Direct Flow										-				153.18	177.30														
		Total			-		233.89										308.42	330.49	600	0.0029	321.42	315.36	92	315.09	0.267	0.05	n	5.46	320.71	5.017
																			Min.	0.0010									
612	613		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																		
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																		
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29		57.69	66.77													
					-	Com/Ind	152.44			0.03500 l/s/ha		5.3																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					152.44				4.71	5.3	25.12	30.49		55.60	64.36				612 Ups MH			613 Dns MH						
		Direct Flow														153.18	177.30														
		Total			-		233.89										308.42	336.14	600	0.0030	320.71	315.04	92	314.77	0.276	0.075	n	5.07	320.64	5.273
																			Min.	0.0010									
613	614		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																		
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																		
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29		57.69	66.77													
				307.48		Com/Ind	459.92			0.03500 l/s/ha		16.1																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					459.92				2.86	16.1	46.10	91.98		138.08	159.82				613 Ups MH			614 Dns MH						
		Direct Flow														153.18	177.30														
		Total		307.48			541.37										403.88	411.59	675	0.0024	320.64	312.50	85	312.30	0.204	0.05	n	7.46	320.11	7.139
																			Min.	0.0010									
614	615		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																		
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																		
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29		57.69	66.77													
					-	Com/Ind	459.92			0.03500 l/s/ha		16.1																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					459.92				2.86	16.1	46.10	91.98		138.08	159.82				614 Ups MH			615 Dns MH						
		Direct Flow														153.18	177.30														
		Total			-		541.37										403.88	420.08	675	0.0025	320.11	312.25	85	312.03	0.213	0.05	n	7.19	319.91	7.202
																			Min.	0.0010									

312.81 Inv of 450mm From phase 3
Calc 450 Gravity from North Expansion Area
312.585 max invert for MH 613 this trunk.

Phase 1

2320-002 — Phase 2 and Phase 3 inflows included. — Density: units per ha 10 — 350 l/p/d, 3,000 l/ha/d — Res, Commercial — I/I = 0.2 l/s/ha

Manhole Ups	Manhole Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Population Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Flow Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data UPS Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	DNS Depth
615	616		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
					-	Com/Ind	459.92			0.03500 l/s/ha		16.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					459.92				2.86	16.1	46.10	91.98	138.08	159.82				615 Ups MH			616 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		541.37									403.88	428.40	675	0.0026	319.91	311.98	150	311.59	0.390	0.05	n	7.25	320.25	7.981
																		Min.	0.0010									
616	617		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
					-	Com/Ind	459.92			0.03500 l/s/ha		16.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					459.92				2.86	16.1	46.10	91.98	138.08	159.82				616 Ups MH			617 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		541.37									403.88	436.56	675	0.0027	320.25	311.54	150	311.14	0.405	0.05	n	8.03	320.15	8.336
																		Min.	0.0010									
617	618		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
					-	Com/Ind	459.92			0.03500 l/s/ha		16.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					459.92				2.86	16.1	46.10	91.98	138.08	159.82				617 Ups MH			618 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		541.37									403.88	444.57	675	0.0028	320.15	311.09	150	310.67	0.420	0.05	n	8.39	320.06	8.717
																		Min.	0.0010									
618	619		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
					-	Com/Ind	459.92			0.03500 l/s/ha		16.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					459.92				2.86	16.1	46.10	91.98	138.08	159.82				618 Ups MH			619 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		541.37									403.88	452.44	675	0.0029	320.06	310.62	88	310.36	0.255	0.05	n	8.77	320.45	9.412
																		Min.	0.0010									
619	620		0	0	0.00	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					0.00	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
					29.76	Com/Ind	489.68			0.03500 l/s/ha		17.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					489.68				2.78	17.1	47.72	97.94	145.65	168.58				619 Ups MH			620 Dns MH					
		Direct Flow													153.18	177.30												
		Total			29.76		571.13									412.65	460.17	675	0.0030	320.45	310.31	140	309.89	0.420	0.05	n	9.46	319.86	9.292
																		Min.	0.0010									
620	621		0	0	-	RG	79.82	35	2,794	0.00405 l/s/p		11.32																
					-	MF	1.63	105	171	0.00405 l/s/p		0.69																
		Residential		0			81.45		2,965		3.45	12.01	41.40	16.29	57.69	66.77												
621 is the lift station					-	Com/Ind	489.68			0.03500 l/s/ha		17.1																
					-	School	0.00			0.20000 l/s/ha		-																
		Non-Residential					489.68				2.78	17.1	47.72	97.94	145.65	168.58				620 Ups MH			621 Dns MH					
		Direct Flow													153.18	177.30												
		Total			-		571.13							89.12		412.65	531.36	675	0.0040	319.86	309.84	50	309.64	0.200	0.05	n	9.34	320.15	9.832
																		Min.	0.0010									

		DWF		WWF						Depth	
		Flow	242.30 l/s		356.53 l/s				2883 m of Pipe		
Total Area:	571.13 ha	600 mm FM			0.220 sq.m				306.64 Approx. Min. Pump Elevation	3.59	min
LPS	14.56 l/s	17 DR			1.62 m/s					9.83	max

Mckenzie County
Sanitary Sewer Flows
LaCrete North Trunk Sewer
Phase 2
2320-002

Density: units per ha 10 pph

I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
9	10		0	0	52.45	RG	52.45	35	1,836	0.00405 l/s/p		7.44																
					1.06	MF	1.06	105	111	0.00405 l/s/p		0.45																
		Residential		0			53.51		1,947		3.59	7.89		28.35	10.70	39.06	45.20											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					4.51	School	4.51			0.20000 l/s/ha		0.9						375				12 Upstream Stub						
		Non-Residential					4.51				5.00	0.9		4.51	0.90	5.41	6.26				9 Ups MH		10 Dns MH					
		Direct Flow 7 Q LPS										29.12				29.12	33.70											
		CP			58.02		58.02					46.70		32.86	11.60	73.59	85.17	85.85	375	0.0024	322.54	315.00	72.66	314.83	0.174	0.075	n	7.17	321.04	5.839
																		Min.		0.0015		Includes 12m 375mm stub upstream							
10	11		0	0	3.54	RG	55.99	35	1,960	0.00405 l/s/p		7.94										Invert set based on lateral connection requirements.						
					1.23	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			58.28		2,200		3.55	8.91		31.67	11.66	43.32	50.14											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					2.00	School	6.51			0.20000 l/s/ha		1.3																
		Non-Residential					6.51				5.00	1.3		6.51	1.30	7.81	9.04				10 Ups MH		11 Dns MH					
		Direct Flow														29.12	33.70											
		Total			6.77		64.79					20.43		38.18	12.96	80.25	92.89	98.71	450	0.0012	321.04	314.75	84.07	314.65	0.101	0.05	n	5.84	321.38	6.280
																		Min.		0.0012									
11	12		0	0	-	RG	55.99	35	1,960	0.00405 l/s/p		7.94																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			58.28		2,200		3.55	8.91		31.67	11.66	43.32	50.14											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	6.51			0.20000 l/s/ha		1.3										6.78						
		Non-Residential					6.51				5.00	1.3		6.51	1.30	7.81	9.04				11 Ups MH		12 Dns MH					
		Direct Flow														29.12	33.70											
		Total			-		64.79					20.43		38.18	12.96	80.25	92.89	102.74	450	0.0013	321.38	314.60	84.07	314.49	0.109	0.05	n	6.33	320.97	6.030
																		Min.		0.0012									
12	13		0	0	-	RG	55.99	35	1,960	0.00405 l/s/p		7.94																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			58.28		2,200		3.55	8.91		31.67	11.66	43.32	50.14											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	6.51			0.20000 l/s/ha		1.3										6.53						
		Non-Residential					6.51				5.00	1.3		6.51	1.30	7.81	9.04				12 Ups MH		13 Dns MH					
		Direct Flow														29.12	33.70											
		Total			-		64.79					20.43		38.18	12.96	80.25	92.89	106.62	450	0.0014	320.97	314.44	98	314.30	0.137	0.05	n	6.08	321.03	6.277
																		Min.		0.0012									
13	14		0	0	12.97	RG	68.96	35	2,414	0.00405 l/s/p		9.78																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			71.25		2,654		3.49	10.75		37.49	14.25	51.74	59.88											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					2.51	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8		9.02	1.80	10.82	12.53				13 Ups MH		14 Dns MH					
		Direct Flow														29.12	33.70											
		Total			15.48		80.27					25.11		46.51	16.05	91.68	106.12	110.36	450	0.0015	321.03	314.25	98	314.11	0.147	0.05	n	6.33	320.93	6.374
																		Min.		0.0012									
14	15		0	0	16.94	RG	85.90	35	3,006	0.00405 l/s/p		12.18																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			88.19		3,247		3.41	13.15		44.89	17.64	62.53	72.37											
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8		9.02	1.80	10.82	12.53				14 Ups MH		15 Dns MH					
		Direct Flow														29.12	33.70											
		Total			16.94		97.21					29.91		53.91	19.44	102.47	118.60	120.90	450	0.0018	320.93	314.06	98	313.88	0.176	0.05	n	6.42	320.82	6.490
																		Min.		0.0012									

Mckenzie County
Sanitary Sewer Flows
LaCrete North Trunk Sewer
Phase 2
2320-002

Density: units per ha 10 pph

I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
15	16		0	0	3.89	RG	89.78	35	3,142	0.00405 l/s/p		12.73																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			92.07		3,383		3.40	13.70	46.56	18.41	64.97	75.20												
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					15 Ups MH			16 Dns MH					
		Direct Flow													29.12	33.70													
		Total			3.89		101.09					31.02	55.58	20.22	104.92	121.43	124.21	450	0.0019	320.82	313.83	98	313.64	0.186	0.05	n	6.54	320.79	6.696
																		Min.	0.0012										
16	17		0	0	-	RG	89.78	35	3,142	0.00405 l/s/p		12.73																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			92.07		3,383		3.40	13.70	46.56	18.41	64.97	75.20												
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					16 Ups MH			17 Dns MH					
		Direct Flow													29.12	33.70													
		Total			-		101.09					31.02	55.58	20.22	104.92	121.43	127.44	450	0.0020	320.79	313.59	98	313.40	0.196	0.05	n	6.75	321.06	7.212
																		Min.	0.0012										
17	18		0	0	10.56	RG	100.34	35	3,512	0.00405 l/s/p		14.23																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			102.63		3,752		3.36	15.20	51.04	20.53	71.57	82.84												
17 is at the quarter line					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					17 Ups MH			18 Dns MH					
		Direct Flow													29.12	33.70													
		Total			10.56		111.65					34.01	60.06	22.33	111.52	129.07	130.58	450	0.0021	321.06	313.35	98	313.14	0.206	0.05	n	7.26	319.19	5.598
																		Min.	0.0012										
18	19		0	0	11.03	RG	111.38	35	3,898	0.00405 l/s/p		15.79																
					-	MF	2.29	105	240	0.00405 l/s/p		0.97																
		Residential		0			113.67		4,139		3.32	16.77	55.66	22.73	78.39	90.73												
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					18 Ups MH			19 Dns MH					
		Direct Flow													29.12	33.70													
		Total			11.03		122.69					37.14	64.68	24.54	118.34	136.97	139.60	450	0.0024	319.19	313.09	98	312.86	0.235	0.05	n	5.65	319.43	6.123
																		Min.	0.0012										
19	20		0	0	3.85	RG	115.22	35	4,033	0.00405 l/s/p		16.34																
					0.19	MF	2.48	105	260	0.00405 l/s/p		1.05																
		Residential		0			117.70		4,293		3.31	17.39	57.49	23.54	81.03	93.78												
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					19 Ups MH			20 Dns MH					
		Direct Flow													29.12	33.70													
		Total			4.04		126.72					38.39	66.51	25.34	120.97	140.02	142.48	450	0.0025	319.43	312.81	98.2	312.56	0.246	0.05	n	6.17	319.20	6.189
																		Min.	0.0012										
20	21		0	0	-	RG	115.22	35	4,033	0.00405 l/s/p		16.34																
					-	MF	2.48	105	260	0.00405 l/s/p		1.05																
		Residential		0			117.70		4,293		3.31	17.39	57.49	23.54	81.03	93.78												
					-	Com/Ind	0.00			0.20000 l/s/ha		-																
					-	School	9.02			0.20000 l/s/ha		1.8																
		Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53					20 Ups MH			21 Dns MH					
		Direct Flow													29.12	33.70													
		Total			-		126.72					38.39	66.51	25.34	120.97	140.02	145.30	450	0.0026	319.20	312.51	80	312.30	0.208	0.05	n	6.24	318.40	5.647
																		Min.	0.0012										

Mckenzie County
Sanitary Sewer Flows
LaCrete North Trunk Sewer
Phase 2
2320-002

Density: units per ha 10 pph

I/I = 0.2 l/s/ha

Manhole / Basin Ups	Dns	Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
21	22	0	0	-	RG	115.22	35	4,033	0.00405 l/s/p		16.34																	
				-	MF	2.48	105	260	0.00405 l/s/p		1.05																	
	Residential		0			117.70		4,293		3.31	17.39	57.49	23.54	81.03	93.78													
				-	Com/Ind	0.00			0.20000 l/s/ha		-																	
				-	School	9.02			0.20000 l/s/ha		1.8																	
	Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53				21 Ups MH			22 Dns MH						
	Direct Flow													29.12	33.70													
	Total			-		126.72					38.39	66.51	25.34	120.97	140.02	148.07	450	0.0027	318.40	312.25	80	312.04	0.216	0.05	n	5.70	318.00	5.513
																Min.		0.0012										
22	23	0	0	5.16	RG	120.38	35	4,213	0.00405 l/s/p		17.07																	
				-	MF	2.48	105	260	0.00405 l/s/p		1.05																	
	Residential		0			122.86		4,474		3.29	18.12	59.61	24.57	84.18	97.44													
				-	Com/Ind	0.00			0.20000 l/s/ha		-																	
				-	School	9.02			0.20000 l/s/ha		1.8																	
	Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53				22 Ups MH			23 Dns MH						
	Direct Flow													29.12	33.70													
	Total			5.16		131.88					39.85	68.63	26.38	124.13	143.67	150.79	450	0.0028	318.00	311.99	100	311.71	0.280	0.05	n	5.56	317.50	5.343
																Min.		0.0012										
23	24	0	0	22.89	RG	143.27	35	5,014	0.00405 l/s/p		20.31																	
24 is Lift Station 2				0.47	MF	2.95	105	309	0.00405 l/s/p		1.25																	
	Residential		0			146.22		5,324		3.22	21.57	69.44	29.24	98.68	114.21													
				-	Com/Ind	0.00			0.20000 l/s/ha		-																	
				-	School	9.02			0.20000 l/s/ha		1.8																	
	Non-Residential					9.02				5.00	1.8	9.02	1.80	10.82	12.53				23 Ups MH			24 Dns MH						
	Direct Flow													29.12	33.70													
	Total			23.36		155.24					23.37	78.46	31.05	138.62	160.44	201.50	450	0.0050	317.50	311.66	20	311.56	0.100	0.05	n	5.39	317.70	5.693
																Min.		0.0012										

	DWF	WWF
Flow	107.58 l/s	138.62 l/s
400 mm FM		0.084 sq.m
11 DR		1.65 m/s

Total Area: 155.24 ha LPS Flow: 29.12 l/s

1317 m of Pipe in estimate (upstream stub)
1305 m of Trunk
308.56 Approx. Min. Pump Elevation

Depth
5.39 min
7.26 max

Mckenzie County
Sanitary Sewer Flows
LaCrete North Trunk Sewer

Phase 3 North Expansion

2320-002

Density: units per ha 10 | 350 l/p/d Res | 3,000 l/ha/d Commercial | I/I = 0.2 l/s/ha | l/s/sag

Manhole Ups	Basin Dns		Sag Manhole	Accum. Sags	Area (ha)	Zoning	Accum. Area	Population Density (people/ha)	Accum. (people)	Sewage Generation (rate)	PF	Flow Dry (l/s)	Weath (l/s)	Peak (l/s)	I/I -Area (l/s)	Total (l/s)	Design (l/s)	System Design Capacity (l/s)	Diameter (mm)	Slope (m/m)	UPS Rim	Pipe Data Ups Inv	Length	DNS Dns Inv	Pipe Drop	MH Drop	Curved	UPS Depth	DNS Rim	Depth
902	903	West		0	0	- SF	0.00	35	-	0.00405 l/s/p			0.00																	
						- MF	0.00	105	-	0.00405 l/s/p			0.00																	
		Residential		0			0.00		-		2.50	-		0.00	-	0.00	0.00													
					120.00	Com/Ind	120.00			0.03500 l/s/ha		4.2																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					120.00				5.00	4.2		21.00	24.00	45.00	52.08				902 Ups MH			903 Dns MH						
		Direct Flow														0.00	0.00													
		Total			120.00		120.00										52.08	53.81	300	0.0031	322.28	318.51	600	316.50	2.010	0.075	n	3.47	321.45	4.650
																			Min.	0.0022		Invert set based on lateral assessment.								
903	904			0	0	- RG	0.00	35	-	0.00405 l/s/p			0.00																	
						- MF	0.00	105	-	0.00405 l/s/p			0.00																	
		Residential		0			0.00		-		2.50	-		0.00	-	0.00	0.00													
					60.00	Com/Ind	180.00			0.03500 l/s/ha		6.3																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					180.00				4.37	6.3		27.52	36.00	63.52	73.52				903 Ups MH			904 Dns MH						
		Direct Flow										-				0.00	0.00													
		Total			60.00		180.00										73.52	74.35	375	0.0018	321.45	316.43	400	315.61	0.820	0.05	n	4.65	321.14	5.160
																			Min.	0.0015									
904	905			0	0	(0.00)	RG	0.00	35	(0)	0.00405 l/s/p			0.00																
						-	MF	0.00	105	-	0.00405 l/s/p			0.00																
		Residential		0			0.00		(0)		2.50	(0.00)		0.00	(0.00)	0.00	0.00													
					60.00	Com/Ind	240.00			0.03500 l/s/ha		8.4																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					240.00				3.84	8.4		32.24	48.00	80.24	92.87				904 Ups MH			905 Dns MH						
		Direct Flow										-				0.00	0.00													
		Total			60.00		240.00										92.87	94.37	375	0.0029	321.14	315.56	400	314.30	1.260	0.075	n	5.21	320.42	5.750
																			Min.	0.0015									
905	906			0	0	-	RG	0.00	35	(0)	0.00405 l/s/p			0.00																
						-	MF	0.00	105	-	0.00405 l/s/p			0.00																
		Residential		0			0.00		(0)		2.50	(0.00)		0.00	(0.00)	0.00	0.00													
					30.00	Com/Ind	270.00			0.03500 l/s/ha		9.5																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					270.00				3.64	9.5		34.39	54.00	88.39	102.31				905 Ups MH			906 Dns MH						
		Direct Flow										-				0.00	0.00													
		Total			30.00		270.00										102.31	102.74	450	0.0013	320.42	314.22	400	313.60	0.620	0.05	n	5.75	320.56	6.510
																			Min.	0.0012									
906	613			0	0	0.00	RG	0.00	35	0	0.00405 l/s/p			0.00																
						0.00	MF	0.00	105	0	0.00405 l/s/p			0.00																
		Residential		0			0.01		0		4.48	0.00		0.01	0.00	0.01	0.01													
					30.00	Com/Ind	300.00			0.03500 l/s/ha		10.5																		
					-	School	0.00			0.20000 l/s/ha		-																		
		Non-Residential					300.00				3.47	10.5		36.45	60.00	96.45	111.63				906 Ups MH			613 Dns MH						
		Direct Flow														0.00	0.00													
		Total			30.01		300.01									96.46	111.64	113.98	450	0.0016	320.56	313.55	400	312.81	0.740	0.05	n	6.56	320.66	7.400

Total Area: 300.01 ha
Note: When this trunk is stand-alone, the contributing area is 246ha and the peak wet weather flow is 84.1 l/s

Connect to Trunk 312.81

2200 m of Pipe

Min Depth 3.47 m
Max Depth 7.40 m

Appendix B

Detailed Cost Estimate

NORTH SANITARY SEWER EXPANSION

PHASE 1 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A1.	Safety flag persons, barricades, permits, eco plan	$10,000.00	l.s.	1	$10,000.00
	A.2	Crop damage reimbursement	$2.00	s.m	86,550	$173,100.00
	A3.	Hydrovac/locate existing shallow conflict utilities, gas mains	$10,000.00	l.s.	1	$10,000.00
	A4.	Clearing & grubbing	$7,500.00	ha.	1	$7,500.00
	A5.	Topsoil stripping of proposed construction limits & laydown areas (push to side of R/W)	$3.50	c.m.	14,425	$50,487.50
	A6.	Topsoil restoration of construction R.O.W. & laydown areas (restore to existing)	$3.50	c.m.	14,425	$50,487.50
	A7.	Restoration of existing gravel access road/road allowance c/w cloth/grid, 400mm GBC	$45.00	s.m.	250	$11,250.00
	A8.	Restoration of existing gravel access driveway c/w cloth/grid, 300mm GBC	$35.00	s.m.	0	$0.00
	A9.	Restoration of existing Pavement c/w cloth/grid, 600mm GBC, 120mm ACP	$100.00	s.m.	0	$0.00
	A10.	Supply/Install 15m -600mm CSP culvert c/w tapered ends	$5,000.00	ea	0	$0.00
	A11.	Supply/Install sanitary sewer main				
		a) 250	$90.00	l.m.	0	$0.00
		b) 300	$100.00	l.m.	0	$0.00
		c) 375	$125.00	l.m.	0	$0.00
		d) 450	$210.00	l.m.	395	$82,950.00
		e) 525	$235.00	l.m.	677	$159,095.00
		f) 600	$260.00	l.m.	915	$237,900.00
		g) 675	$340.00	l.m.	898	$305,320.00
		h) 750	$420.00	l.m.	0	$0.00
	A12.	Trenching/Backfilling				
		a) 0- 4 m depth of bury	$90.00	l.m.	259	$23,310.00
		b) 4- 5m depth of bury	$130.00	l.m.	272	$35,360.00
		c) 5- 6m depth of bury	$180.00	l.m.	1,321	$237,690.00
		d) 6- 7m depth of bury	$250.00	l.m.	134	$33,375.00
		e) 7- 8 m depth of bury	$390.00	l.m.	320	$124,800.00
		f) 8- 9m depth of bury	$640.00	l.m.	300	$192,000.00
		g) 9-10m depth of bury	$800.00	l.m.	278	$222,400.00
		h) 10-11m depth of bury	$900.00	l.m.	0	$0.00
		i) 11-12m depth of bury	$1,100.00	l.m.	0	$0.00
	A13.	Supply/Install SR concrete manholes c/w frame & covers for 19 units				
		a) 1200mm SR Precast base	$3,500.00	ea	11	$38,500.00
		b) 1500mm SR Precast base (>600 pipe)	$9,500.00	ea	16	$152,000.00
		c) Supply install 1200mm concrete barrels c/w rings & F.C	$2,200.00	v.m.	48.5	$106,630.81
		d) Supply install 1500mm concrete barrels c/w rings & F.C	$3,600.00	v.m.	110	$396,981.18
	A15.	Supply/Install aluminum safety platform	$1,850.00	ea.	0	$0.00
	A16.	Base stabilizing material (screened rock)	$70.00	c.m.	600	$42,000.00

NORTH SANITARY SEWER EXPANSION

PHASE 1 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A17.	Video Inspection	$17.00	l.m.	2,885	$49,045.00
	A18.	Lift station	$1,900,000.00	ea.	1.00	$1,900,000.00
	A19	Forcemain				
		200mm HDPE DR11 Forcemain	$325.00	l.m	0	$0.00
		300mm HDPE DR11 Forcemain	$390.00	l.m	0	$0.00
		400mm HDPE DR11 Forcemain	$500.00	l.m	0	$0.00
		450mm HDPE DR11 Forcemain	$550.00	l.m	0	$0.00
		500mm HDPE DR11 Forcemain	$655.00	l.m	0	$0.00
		550mm HDPE DR11 Forcemain	$710.00	l.m	0	$0.00
		600mm HDPE DR11 Forcemain	$750.00	l.m	50	$37,500.00
		850mm HDPE DR11 Forcemain	$1,000.00	l.m		$0.00
		Auger/Receiving Pits	$10,000.00	ea.	0	$0.00
		Trenching 4- 5m depth of bury	$130.00	l.m.	50	$6,500.00
		Replace ex. Inlet MH at Lagoon	$150,000.00	ea.	1	$150,000.00
		Air Relief Chambers	$30,000.00	ea.	0	$0.00
		TOTAL				$4,846,181.99

	Phase 1
Gravity	**$2,753,000.00**
LS/FM	**$2,094,000.00**
Subtotal	**$4,847,000.00**
Contingency	**$970,000.00**
Engineering	**$485,000.00**
Total	**$6,302,000.00**

Phase 1

Lined Manhole Costs

MH	Depth	Per/m	Amount
595	4.2	1,600	6,720
596	4.0	1,600	6,462
597	4.7	1,600	7,441
	12.9		

Subtotal	$21,000
Contingency (20%)	$4,000
Engineering (10%)	$2,000
Total	$27,000

NORTH SANITARY SEWER EXPANSION
PHASE 2 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A1.	Safety flag persons, barricades, permits, eco plan	$10,000.00	l.s.	1	$10,000.00
	A.2	Crop damage reimbursement	$2.00	s.m	26,580	$53,160.00
	A3.	Hydrovac/locate existing shallow conflict utilities, gas mains	$10,000.00	l.s.	1	$10,000.00
	A4.	Clearing & grubbing	$7,500.00	ha.	2.0	$15,000.00
	A5.	Topsoil stripping of proposed construction limits & laydown areas (push to side of R/W)	$3.50	c.m.	10,000	$35,000.00
	A6.	Topsoil restoration of construction R.O.W. & laydown areas (restore to existing)	$3.50	c.m.	10,000	$35,000.00
	A7.	Restoration of existing gravel access road/road allowance c/w cloth/grid, 400mm GBC	$45.00	s.m.	200	$9,000.00
	A8.	Restoration of existing gravel access driveway c/w cloth/grid, 300mm GBC	$35.00	s.m.	0	$0.00
	A9.	Restoration of existing Pavement c/w cloth/grid, 600mm GBC, 120mm ACP	$100.00	s.m.	200	$20,000.00
	A10.	Supply/Install 15m -600mm CSP culvert c/w tapered ends	$5,000.00	ea	0	$0.00
	A11.	Supply/Install sanitary sewer main				
		a) 250	$90.00	l.m.	0	$0.00
		b) 300	$100.00	l.m.	0	$0.00
		c) 375	$125.00	l.m.	97	$12,082.50
		d) 450	$210.00	l.m.	1,232	$258,791.40
		e) 525	$235.00	l.m.	0	$0.00
		f) 600	$260.00	l.m.	0	$0.00
		g) 675	$340.00	l.m.	0	$0.00
		h) 750	$420.00	l.m.	0	$0.00
	A12.	Trenching/Backfilling				
		a) 0- 4 m depth of bury	$90.00	l.m.	0	$0.00
		b) 4- 5m depth of bury	$130.00	l.m.	0	$0.00
		c) 5- 6m depth of bury	$180.00	l.m.	378	$68,040.00
		d) 6- 7m depth of bury	$250.00	l.m.	927	$231,750.00
		e) 7- 8 m depth of bury	$390.00	l.m.	12	$4,680.00
		f) 8- 9m depth of bury	$640.00	l.m.	0	$0.00
		g) 9-10m depth of bury	$800.00	l.m.	0	$0.00
		h) 10-11m depth of bury	$900.00	l.m.		
		i) 11-12m depth of bury	$1,100.00	l.m.		
	A13.	Supply/Install SR concrete manholes c/w frame & covers for 19 units				
		a) 1200mm SR Precast base	$3,500.00	ea	16.0	$56,000.00
		b) 1500mm SR Precast base (>600 pipe)	$9,500.00	ea	0.0	$0.00
		c) Supply install 1200mm concrete barrels c/w rings & F.C	$2,200.00	v.m.	78.9	$173,688.72
		d) Supply install 1500mm concrete barrels c/w rings & F.C	$3,600.00	v.m.	0.0	$0.00
	A15.	Supply/Install aluminum safety platform	$1,850.00	ea.	0.0	$0.00

NORTH SANITARY SEWER EXPANSION

PHASE 2 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A16.	Base stabilizing material (screened rock)	$70.00	c.m.	600	$42,000.00
	A17.	Video Inspection	$17.00	l.m.	1,329	$22,593.00
	A18.	Lift station	$1,700,000.00	ea.		$1,700,000.00
	A19	Forcemain				
		200mm HDPE DR11 Forcemain	$325.00	l.m	0	$0.00
		300mm HDPE DR11 Forcemain	$390.00	l.m	0	$0.00
		400mm HDPE DR11 Forcemain	$500.00	l.m	2223	$1,111,500.00
		450mm HDPE DR11 Forcemain	$550.00	l.m	0	$0.00
		500mm HDPE DR11 Forcemain	$655.00	l.m	0	$0.00
		550mm HDPE DR11 Forcemain	$710.00	l.m	0	$0.00
		600mm HDPE DR11 Forcemain	$750.00	l.m	0	$0.00
		850mm HDPE DR11 Forcemain	$1,000.00	l.m	0	$0.00
		Auger/Receiving Pits	$10,000.00	ea.	4	$40,000.00
		Trenching 4- 5m depth of bury	$130.00	l.m.	0	$0.00
		Modifications to Phase 1 Lift Station	$260,000.00	l.s.	1	$260,000.00
		Air Relief Chambers	$30,000.00	ea.	2	$60,000.00
		TOTAL				$4,228,285.62

	Phase 2
Gravity	**$1,057,000.00**
LS/FM	**$3,172,000.00**
Subtotal	**$4,229,000.00**
Contingency 20%	**$846,000.00**
Engineering 10%	**$423,000.00**
Total	**$5,498,000.00**

Phase 2

Lined Manhole Costs

MH	Depth	Per/m	Amount
9	7.5	1,600	12,064
10	6.3	1,600	10,063
11	6.8	1,600	10,848
	20.6		

Subtotal	$33,000
Contingency (20%)	$7,000
Engineering (10%)	$3,000
Total	$43,000

NORTH SANITARY SEWER EXPANSION
PHASE 3 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A1.	Safety flag persons, barricades, permits, eco plan	$10,000.00	l.s.	1	$10,000.00
	A.2	Crop damage reimbursement	$2.00	s.m	28600	$57,200.00
	A3.	Hydrovac/locate existing shallow conflict utilities, gas mains	$10,000.00	l.s.	1	$10,000.00
	A4.	Clearing & grubbing	$7,500.00	ha.	1.0	$7,500.00
	A5.	Topsoil stripping of proposed construction limits & laydown areas (push to side of R/W)	$3.50	c.m.	11,000	$38,500.00
	A6.	Topsoil restoration of construction R.O.W. & laydown areas (restore to existing)	$3.50	c.m.	11,000	$38,500.00
	A7.	Restoration of existing gravel access road/road allowance c/w cloth/grid, 400mm GBC	$45.00	s.m.	0	$0.00
	A8.	Restoration of existing gravel access driveway c/w cloth/grid, 300mm GBC	$35.00	s.m.	0	$0.00
	A9.	Restoration of existing Highway c/w cloth/grid, 600mm GBC, 120mm ACP	$100.00	s.m.	0	$0.00
	A10.	Supply/Install 15m -600mm CSP culvert c/w tapered ends	$5,000.00	ea	0	$0.00
	A11.	Supply/Install sanitary sewer main				
		a) 250	$90.00	l.m.	0	$0.00
		b) 300	$100.00	l.m.	600	$60,000.00
		c) 375	$125.00	l.m.	800	$100,000.00
		d) 450	$210.00	l.m.	800	$168,000.00
		e) 525	$235.00	l.m.	0	$0.00
		f) 600	$260.00	l.m.	0	$0.00
		g) 675	$340.00	l.m.	0	$0.00
		h) 750	$420.00	l.m.	0	$0.00
	A12.	Trenching/Backfilling				
		a) 0- 4 m depth of bury	$90.00	l.m.	0	$0.00
		b) 4- 5m depth of bury	$130.00	l.m.	1,000	$130,000.00
		c) 5- 6m depth of bury	$180.00	l.m.	400	$72,000.00
		d) 6- 7m depth of bury	$250.00	l.m.	800	$200,000.00
		e) 7- 8 m depth of bury	$390.00	l.m.	0	$0.00
		f) 8- 9m depth of bury	$640.00	l.m.	0	$0.00
		g) 9-10m depth of bury	$800.00	l.m.	0	$0.00
		h) 10-11m depth of bury	$900.00	l.m.	0	$0.00
		i) 11-12m depth of bury	$1,100.00	l.m.	0	$0.00
	A13.	Supply/Install SR concrete manholes c/w frame & covers for 19 units				
		a) 1200mm SR Precast base	$3,500.00	ea	1.0	$3,500.00
		b) 1500mm SR Precast base	$9,500.00	ea	5.0	$47,500.00
		c) Supply install 1200mm concrete barrels c/w rings & F.C	$2,200.00	v.m.	1.7	$3,784.00
		d) Supply install 1500mm concrete barrels c/w rings & F.C	$3,600.00	v.m.	30.0	$108,000.00
	A15.	Supply/Install aluminum safety platform	$1,850.00	ea.	0.0	$0.00
	A16.	Base stabilizing material (screened rock)	$70.00	c.m.	600	$42,000.00
	A17.	Video Inspection	$17.00	l.m.	2,200	$37,400.00

NORTH SANITARY SEWER EXPANSION
PHASE 3 - CONSTRUCTION COST ESTIMATES

	ITEM	DESCRIPTION	UNIT PRICE	UNIT	QUANTITY	AMOUNT
	A18.	Lift station	$2,000,000.00	ea.	0.00	$0.00
	A19	Forcemain				
		200mm HDPE DR11 Forcemain	$125.00	l.m	0	$0.00
		300mm HDPE DR11 Forcemain	$225.00	l.m	0	$0.00
		350mm HDPE DR11 Forcemain	$260.00	l.m	0	$0.00
		500mm HDPE DR11 Forcemain	$300.00	l.m	0	$0.00
		Auger/Receiving Pits	$10,000.00	ea.	0	$0.00
		Trenching 4- 5m depth of bury	$130.00	l.m.	0	$0.00
		Modifications at the Lagoon Lift Station	$120,000.00	l.s.	1	$120,000.00
		Air Relief Chambers	$30,000.00	ea.	0	$0.00
		TOTAL				$1,253,884.00

	Phase 3
Gravity	**$1,254,000.00**
Contingency 30%	**$377,000.00**
Engineering 10%	**$126,000.00**
Total	**$1,757,000.00**