THE CORPORATION OF THE MUNICIPALITY OF RED LAKE

ALTERNATIVE INFRASTRUCTURE STUDY

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1.0 INTRODUCTION

The Municipality of Red Lake is located at the end of Highway 105, approximately 170 kilometres north of the Trans Canada Highway at the Vermilion Bay turnoff. It is comprised of an area equivalent to 672 square kilometres. Five communities including Madsen, Red Lake, Balmertown, Cochenour and McKenzie Island are amalgamated to form the Municipality of Red Lake. The total population is approximately 4,600.

The Municipality of Red Lake is a progressive community strategically located on the major access route to a large part of Northwestern Ontario, a region with significant potential for sustainable development. As a community, the Municipality is characterized by northern hospitality and entrepreneurial spirit. The Municipality is the beneficiary of extensive, abundant natural resources, and the home of world class gold ore deposits.

The Municipality is experiencing a significant shortage of housing, and is working with the largest employer in the area, Goldcorp, to help make housing available for their ever growing workforce.

The Red Lake area is rugged terrain, and is predominately surficial bedrock, or bedrock overlain by shallow overburden. Sand and gravel deposits are uncommon in the area. As a result of the significant presence of bedrock, blasting and rock excavation to install water and sewer infrastructure has proven to be a financial barrier to the provision of land for housing development.

The Municipality has therefore initiated this study to investigate alternative infrastructure technologies that would be cost-effective methods of servicing residential lots.

2.0 BACKGROUND

The Municipality has recently completed a number of studies to identify land within the community that is available for development for both residential and employment uses. The Official Plan (OP) has recently been updated, and a consolidated OP containing comments from the review by Ministry of Municipal Affairs and Housing has been prepared. It is noted that Council has not yet formally adopted the consolidated OP, however for the purposes of this report it is being considered as the OP of record.

The Municipality has also recently completed a Sustainable Community Plan [1] and a Comprehensive Review [2].

The Sustainable Community Plan was prepared to *"be an overall framework that integrates other plans and initiatives of the Municipality"* [1]. The shortage of housing within the Municipality and recommendations on how to address this problem are addressed in the Plan.

The Comprehensive Review provided a review of current and projected land needs in the Municipality of Red Lake, and determined whether the land available will accommodate potential population and employment growth projections. The report concluded that "*there is a need to expand the settlement area boundaries of certain townsites within the Municipality of Red Lake to accommodate future residential and employment growth*"[2]. The Comprehensive Review also identified 11 potential areas for development, 7 of which were identified as suitable for future residential uses.

The Municipality and Goldcorp have also recently completed the design and tendering of several residential subdivision developments, but have not proceeded due to excessive costs.

The aforementioned documentation has provided valuable background information and has been utilized in the preparation of this study.

[1] Municipality of Red Lake Sustainable Community Plan, prepared by Meyers Norris Penny LLP, dated March 2011.
[2] Comprehensive Review – Final Draft Report, prepared by Fo Tenn Consultants Inc., dated July 2011.

3.0 SCOPE OF THE STUDY

The intent of the study is to focus on new technologies, installation methods and cost-benefit analysis for alternative servicing within defined developable areas within the Municipality.

The development of single family lots, with full sewer and water service (zoning designation of R1) is to be the main focus of the study.

The Municipality has identified 8 areas of potential residential development that will be assessed, as follows:

- Florin Lake
- Kelson Farm
- North of Cochenour
- Windy Point
- Blende Street
- North of Highway 125
- South-west of Pine Street (Block G - Old Baseball Diamond)
- Infill lots north of Goldshore Road

Recommendations on the type of infrastructure that would suit each development area are to be developed.

The servicing of lots with other utilities such as Bell Telephone, Hydro One, etc. is not included in the scope of this study.

4.0 SERVICING ALTERNATIVES

Water and sewer servicing in areas that are predominately bedrock is an extremely difficult and expensive undertaking. In addition, undulating terrain creates the need for additional pumping stations on the sanitary system.

Historically there were no alternatives to excavation and constructing watermains and sanitary sewers at depths sufficient to prevent freezing. In Red Lake servicing has to be generally in excess of 3.0 metres deep to be below the frost line. The majority of the older servicing in the Municipality would have been completed in this manner. With the development of pre-insulated pipe and heat tracing systems in the late 1970's, options to the deep burial mains became available.

Alternative methods of providing communal water and sanitary servicing have been assessed, and are discussed in the following sections. In all options, the watermain and sanitary sewer are assumed to be in a common trench. An evaluation summary of the various alternatives is presented in Table 2, following Section 5.0.

4.1 Type A – Roadway Deep Bury Servicing

This alternative involves servicing using uninsulated watermain and gravity sanitary sewers, buried below the frost depth under the roadway. Recognizing that the Municipality wants to explore alternatives other than this, it is included in the report to provide a baseline for comparison purposes.

Advantages

The advantages of this method of servicing include:

- The ability to service basements without the need for individual pumps in the homes;
- There are no ongoing energy costs associated with heat trace cable or grinder pumps;
- Lowest annual operating and maintenance costs of the alternatives assessed.

Disadvantages

The disadvantages of this method of servicing include:

- High initial capital cost due to bedrock blasting and removal, and due to the depth of the mains and service laterals;
- Undulating terrain can necessitate the need for pumping stations, which can contribute a significant cost to subdivision development.

An illustration of this type of servicing is shown on Figure 1.

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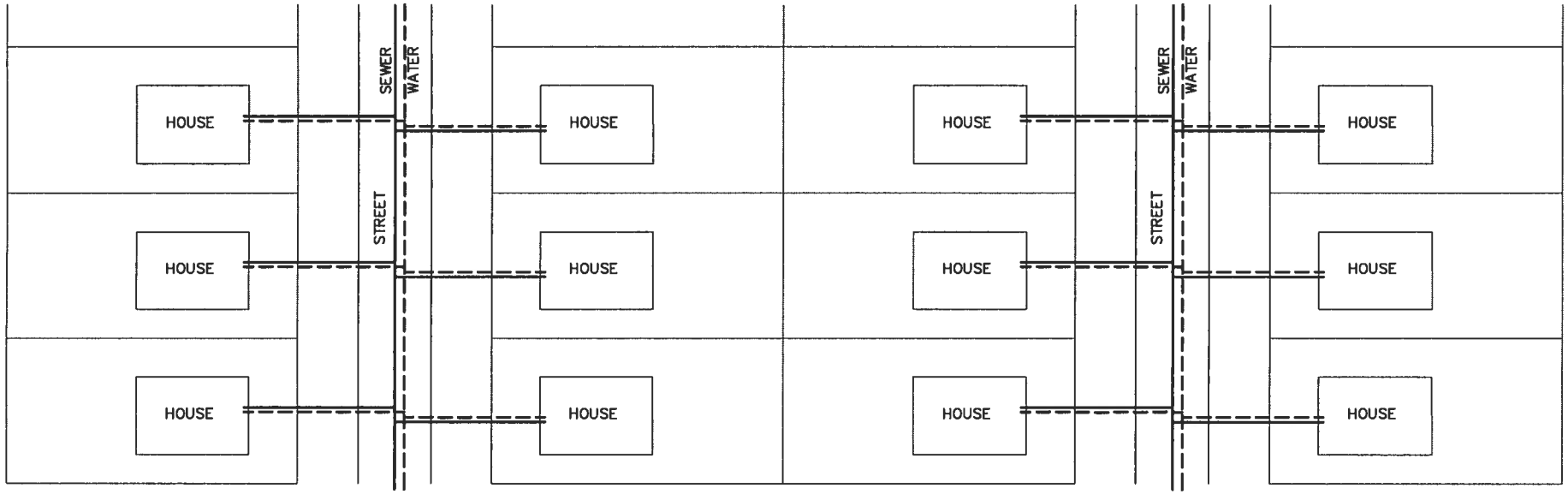
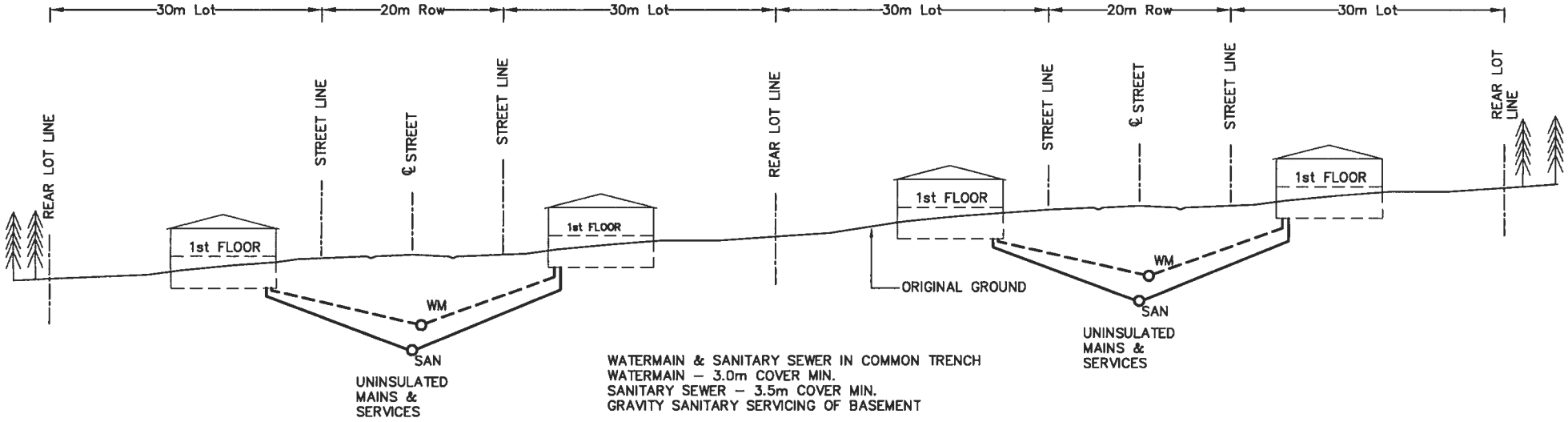


PLAN VIEW (NTS)



SECTION VIEW (NTS)

FIGURE 1 - TYPE "A" SERVICING ROADWAY DEEP BURY SERVICING

4.2 Type B – Roadway Shallow Bury Servicing

This servicing method utilizes gravity sewers; however the watermain and sanitary sewer are insulated such that they can be buried at a reduced depth under the roadway. The water service laterals are insulated and heat traced, and the sanitary laterals are insulated.

Advantages

The advantages of this method of servicing include:

- Lower initial cost for excavation and rock removal compared to deep bury servicing.

Disadvantages

The disadvantages of this method of servicing include:

- Ongoing energy costs associated with heat trace cable on the service laterals;
- Maintenance and eventual replacement of the heat trace cable and controllers;
- Power outages could cause freezing of service laterals;
- Basement servicing may require the use of pumps in the homes;
- Undulating terrain can necessitate the need for pumping stations, which can contribute a significant cost to subdivision development.

An illustration of this type of servicing is shown on Figure 2.

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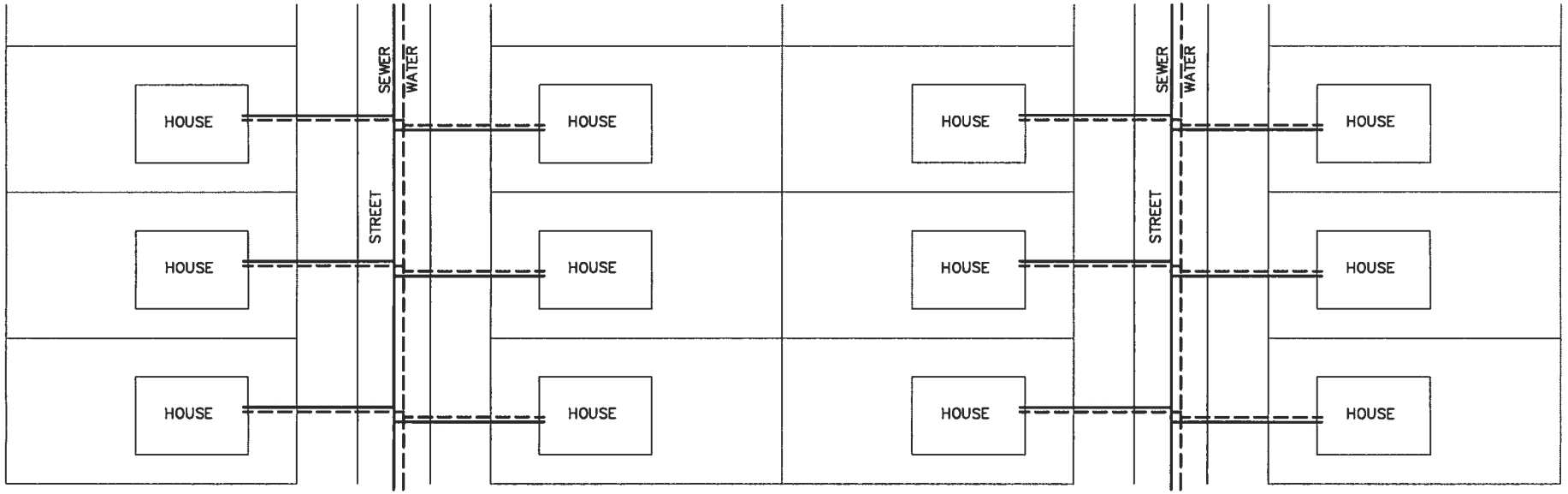

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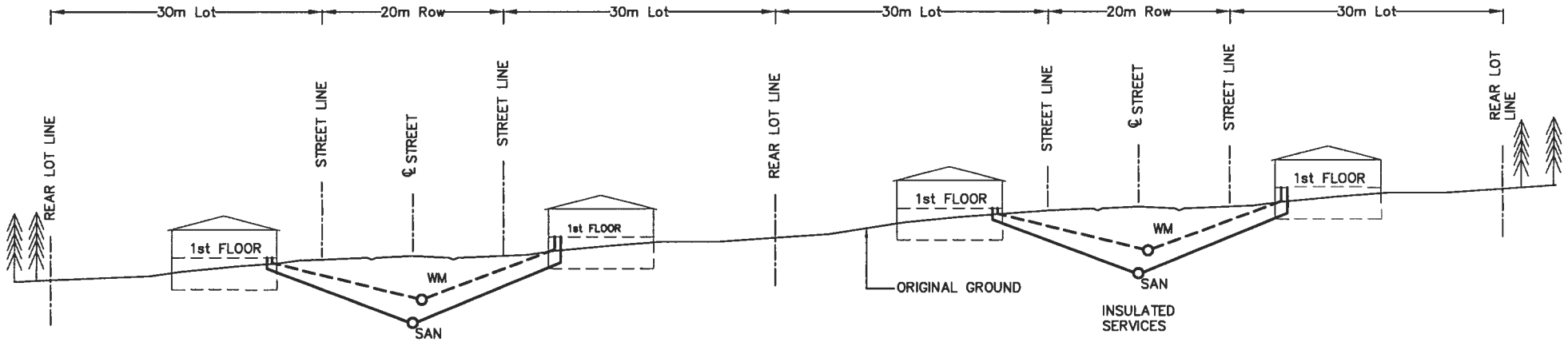

WATERMAIN & SANITARY SEWER IN COMMON TRENCH
WATERMAIN – 1.5m COVER MIN. – WATER SERVICES INSULATED + HEAT TRACED
SANITARY SEWER – 2.0m COVER MIN. – SANITARY SERVICES INSULATED
GRAVITY SANITARY SERVICING OF MAIN FLOOR

SECTION VIEW (NTS)

FIGURE 2 - TYPE "B" SERVICING ROADWAY SHALLOW BURY SERVICING - GRAVITY

4.3 Type C – Roadway Shallow Bury Servicing - Pumped

This alternative utilizes watermain and low pressure sewer (LPS) located beneath the roadway. Both the watermain and LPS are shallow buried, insulated and heat traced. Each home would have a grinder pump and pump chamber, and the water and sanitary laterals would be insulated and heat traced. The pump chamber can be located in the basement of the home, or outside beside the home.

Advantages

The advantages of this method of servicing include:

- Lower initial cost for excavation and rock removal compared to deep bury servicing;
- Laterals and mains are not subject to infiltration, therefore reduced pipe sizes can be utilized, and a resultant impact of reduced flows on the WPCP;
- Undulating terrain can normally be serviced without sewage pumping stations;
- Network layout is not as dependent on ground contours.

Disadvantages

The disadvantages of this method of servicing include:

- Ongoing energy costs associated with heat trace cable on the mains and service laterals, and the grinder pump operation;
- Maintenance and eventual replacement of the heat trace cable and controllers and the grinder pumps;
- Power outages could cause freezing of the mains and service laterals, and backup of sewage from the pump chamber into the homes;
- Basement servicing can be achieved if the pump chamber is outside and lower than the basement;
- Education is necessary for users with respect to the pump, heat trace and heat trace controller operations.

Figure 3 illustrates the Type C servicing.

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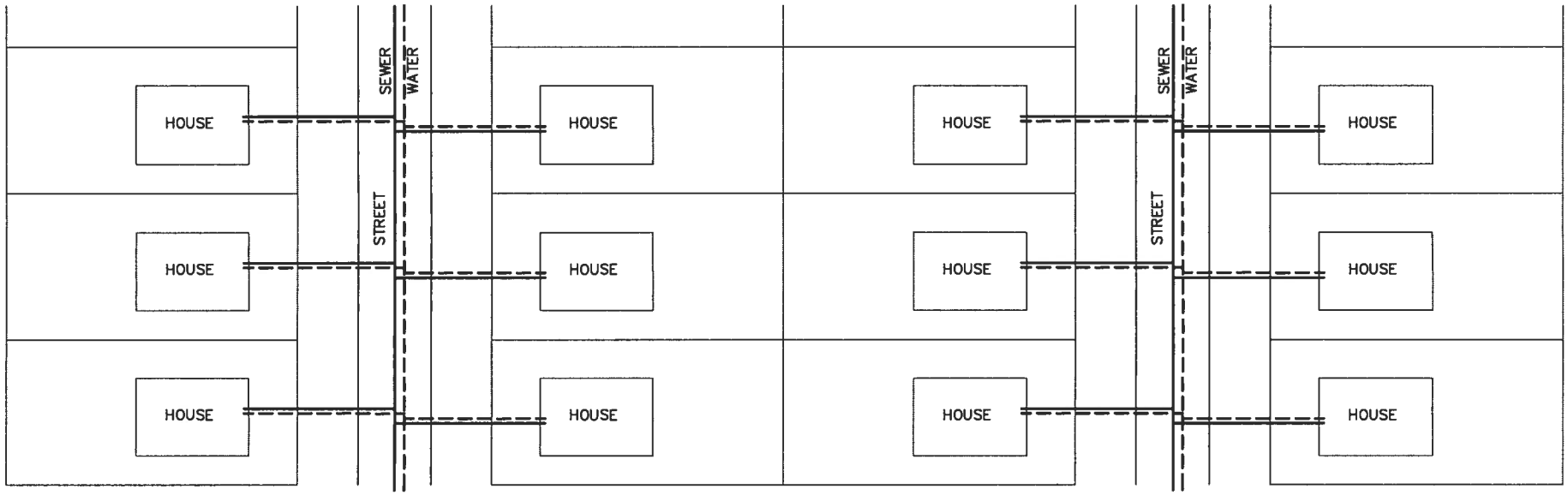

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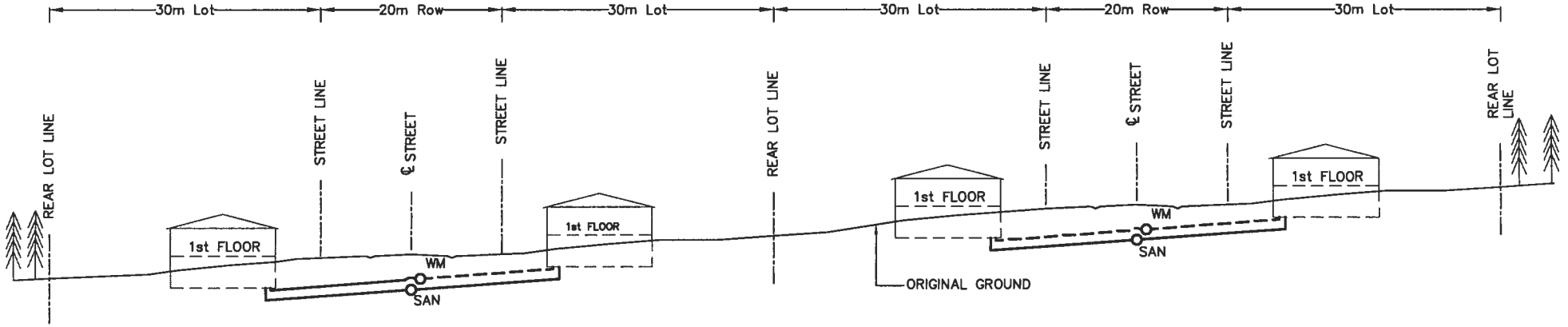

WATERMAIN & LOW PRESSURE SEWER IN COMMON TRENCH
WATERMAIN - 1.2m COVER MIN. - WATER SERVICES INSULATED + HEAT TRACED
L.P.S. - 1.5m COVER MIN. - SANITARY SERVICES INSULATED + HEAT TRACED
PUMPED SANITARY SERVICING OF MAIN FLOOR - PUMPS LOCATED IN BASEMENT OR OUTSIDE

SECTION VIEW (NTS)

FIGURE 3 - TYPE "C" SERVICING ROADWAY SHALLOW BURY SERVICING - PUMPED

4.4 Type D – Roadway Above Grade Servicing - Bermed

An alternative method to shallow or deep bury mains and service laterals is to place the services on or close to the original ground, and place fill material above the pipes to achieve the required frost protection.

This alternative is based on water and low pressure sewer (LPS) servicing being located in the road allowance, and the roadway and lots being filled to provide the required cover.

Both the watermain and LPS are shallow buried, insulated and heat traced. Each home would have a grinder pump and pump chamber, and the water and sanitary laterals would be insulated and heat traced. The pump chamber can be located in the basement of the home, or outside beside the home.

Advantages

The advantages of this method of servicing include:

- No bedrock blasting or excavation required;
- Laterals and mains are not subject to infiltration, therefore reduced pipe sizes can be utilized, and a resultant impact of reduced flows on the WPCP;
- Undulating terrain can be serviced without sewage pumping stations;
- Network layout is not as dependent on ground contours.

Disadvantages

The disadvantages of this method of servicing include:

- Large volume of fill is required;
- Drainage can be impacted by the extent of the fill area;
- Ongoing energy costs associated with heat trace cable on the mains and service laterals, and the grinder pump operation;
- Maintenance and eventual replacement of the heat trace cable and controllers and the grinder pumps;
- Power outages could cause freezing of the mains and service laterals, and backup of sewage from the pump chamber into the homes;
- Basement servicing can be achieved if the pump chamber is outside and lower than the basement;
- Education is necessary for users with respect to the pump, heat trace and heat trace controller operations.

Figure 4 illustrates the Type D servicing.

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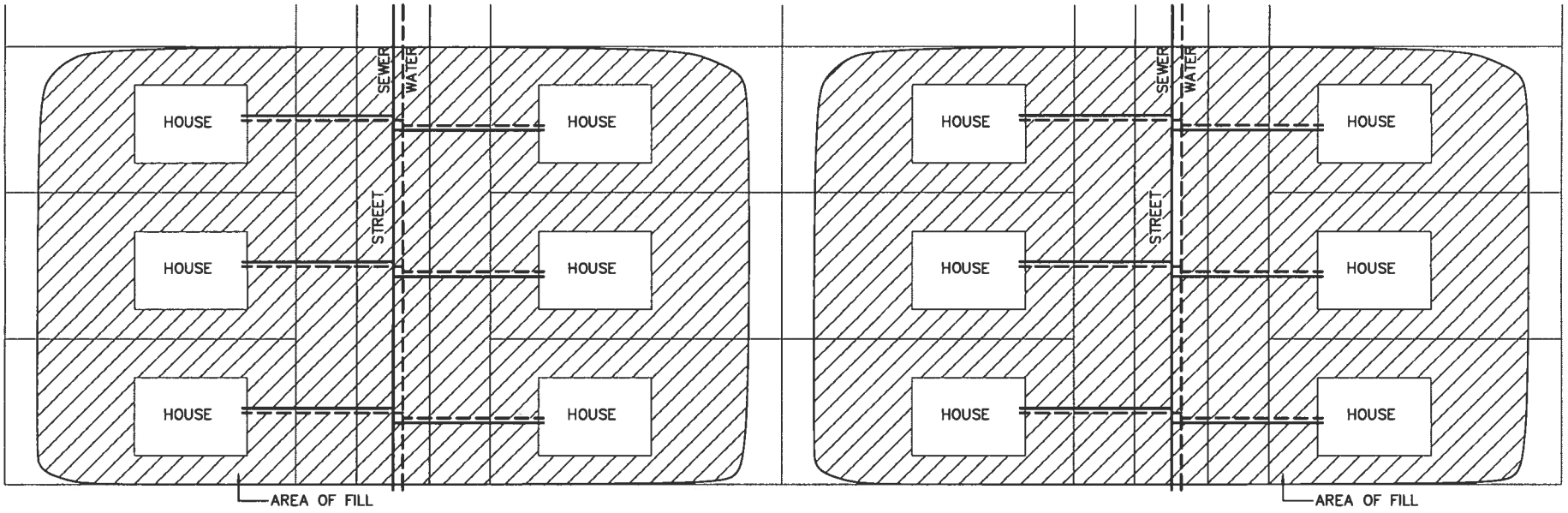

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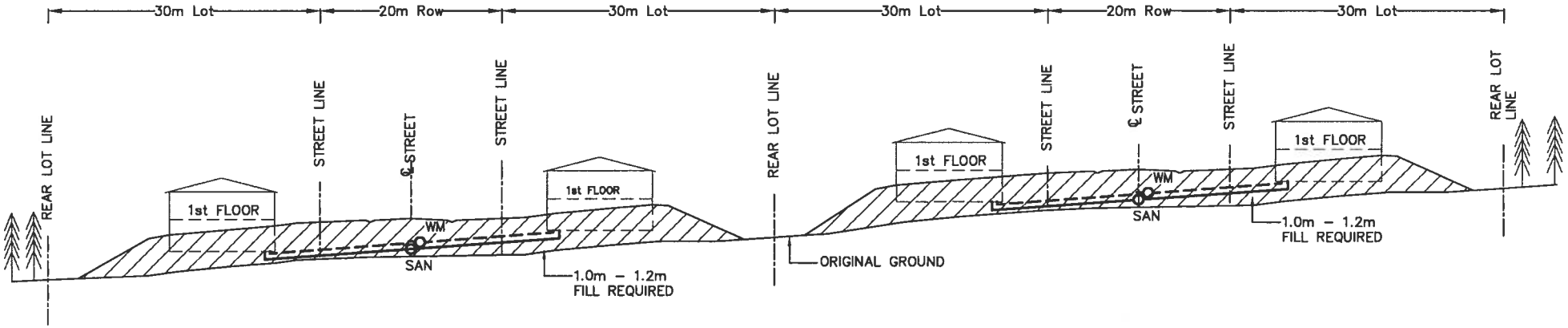

ROADS & HOUSES BUILT ABOVE ORIGINAL GROUND
WATER & LOW PRESSURE SEWER IN COMMON TRENCH
WATERMAIN - 1.2m COVER MIN. - WATER SERVICES INSULATED + HEAT TRACED
L.P.S. - 1.5m COVER MIN. - SANITARY SERVICES INSULATED + HEAT TRACED
PUMPED SANITARY SERVICING OF MAIN FLOOR - PUMPS LOCATED IN BASEMENT OR OUTSIDE HOUSE

SECTION VIEW (NTS)

FIGURE 4 - TYPE "D" SERVICING ROADWAY ABOVE GRADE SERVICING - BERMED

4.5 Type E – Rear Yard Above Grade Servicing - Bermed

Similar to Type D servicing, this alternative uses fill material to achieve the required frost protection for the mains and service laterals. To reduce the amount of fill required, the mains are located on a rear yard easement, and the houses located closer to the rear lot line. To further reduce the amount of fill and to lessen the impacts of the berms, the services could be located along the side yards.

The layout of a subdivision and/or lots to optimize this type of servicing would have to take into account the location of the servicing, to economize on two sided servicing where possible. The savings realized on servicing may be offset by additional road construction. In addition, as the lot sizes would be different than the standard single family lot to accommodate the rear yard easement, there may be a reduced lot density in certain areas.

Fill material would be placed above the pipes to achieve the required frost protection. Both the watermain and LPS are shallow buried in the berm and are insulated and heat traced. Each home would have a grinder pump and pump chamber, and the water and sanitary laterals would be insulated and heat traced. The pump chamber can be located in the basement of the home, or outside beside the home.

Advantages

The advantages of this method of servicing include:

- No bedrock blasting or excavation required;
- Reduced amount of fill compared to Type D servicing;
- Laterals and mains are not subject to infiltration, therefore reduced pipe sizes can be utilized, and a resultant impact of reduced flows on the WPCP;
- Undulating terrain can be serviced without sewage pumping stations;
- Network layout is not as dependent on ground contours.

Disadvantages

The disadvantages of this method of servicing include:

- Drainage will be impacted by the berms;
- Negative visual impact due to the berms;
- Reduced rear yard usage due to the berm construction;
- Ongoing energy costs associated with heat trace cable on the mains and service laterals, and the grinder pump operation;
- Maintenance and eventual replacement of the heat trace cable and controllers and the grinder pumps;
- Power outages could cause freezing of the mains and service laterals, and backup of sewage from the pump chamber into the homes;
- Basement servicing can be achieved if the pump chamber is outside and lower than the basement;
- Education is necessary for users with respect to the pump, heat trace and heat trace controller operations;
- The configuration of the lot and road layout requires careful planning to avoid additional road construction costs.

An illustration of this type of servicing is shown on Figure 5.

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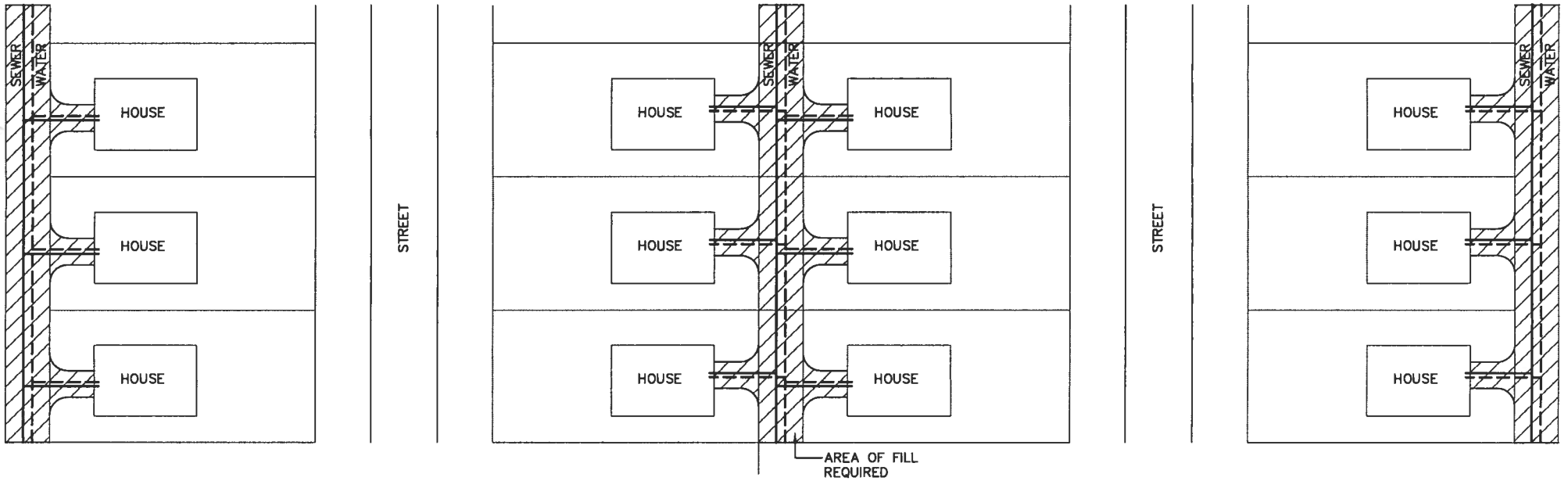

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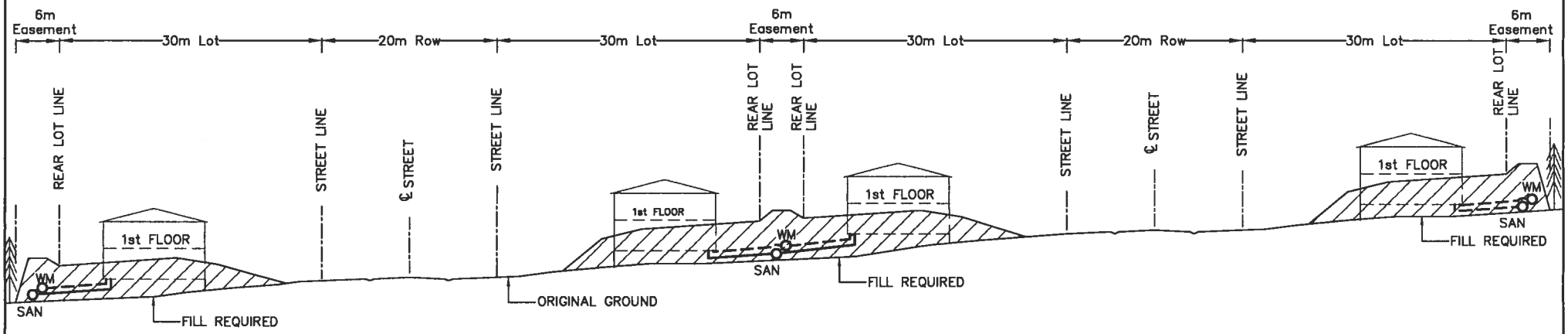

HOUSES ABOVE ORIGINAL GROUND
WATERMAIN & L.P.S. IN BERM ON REAR YARD EASEMENT
SERVICES IN BERM ON REAR YARDS
WATERMAIN - 1.2m COVER MIN. - WATER SERVICES INSULATED + HEAT TRACED
L.P.S. - 1.5m COVER MIN. - SANITARY SERVICES INSULATED + HEAT TRACED
PUMPED SANITARY SERVICING OF MAIN FLOOR - PUMPS LOCATED IN BASEMENT OR OUTSIDE HOUSE

SECTION VIEW (NTS)

FIGURE 5 - TYPE "E" SERVICING REAR YARD ABOVE GRADE SERVICING - BERMED

4.6 Type F – Rear Yard Above Grade Servicing – "Utilidor"

Above grade servicing can also be achieved using a "utilidor" type system. The mains and service laterals would be installed in above grade protective enclosures, supported on posts/legs that are secured into the ground. Alternately the mains and service laterals would be open to the environment, and secured in place by a support framework. This type of system is commonly used in the far north where the presence of permafrost prevents excavation for pipe burial. To lessen the impacts of the above ground services, the services could be located along the side yards

Similar to Type E servicing, the mains are located on a rear yard easement, and the houses located closer to the rear lot line. The layout of a subdivision and/or lots to optimize this type of servicing would have to take into account the location of the servicing, to economize on two sided servicing where possible. The savings realized on servicing may be offset by additional road construction. In addition, as the lot sizes would be different than the standard single family lot to accommodate the rear yard easement, there may be a reduced lot density in certain areas.

Typical rear yard installations of similar systems are shown on Figure 6.

All mains and service laterals would be insulated and heat traced. The water and sanitary laterals would be insulated and heat traced. Depending on the terrain, either a gravity sewer or a low pressure sewer could be utilized. If a LPS is used, the pump chamber can be located in the basement of the home, or outside beside the home.

Service tunnels large enough for a person to walk through were not assessed as an alternative type of servicing.

Advantages

The advantages of this method of servicing include:

- No bedrock blasting or excavation required;
- No fill required;
- Laterals and mains are not subject to infiltration, therefore reduced pipe sizes can be utilized, and a resultant impact of reduced flows on the WPCP;
- Potential use of the enclosure by other utilities such as telephone, cable TV, hydro, etc.;
- Network layout is not as dependent on ground contours.

Disadvantages

The disadvantages of this method of servicing include:

- Negative visual impact due to the utilidor;
- Reduced rear yard usage due to the utilidor construction;
- Ongoing energy costs associated with heat trace cable on the mains and service laterals, and the grinder pump operation will be the highest of all the alternatives;
- Maintenance and eventual replacement of the heat trace cable and controllers and the grinder pumps;

- Power outages could cause freezing of the mains and service laterals, and backup of sewage from the pump chamber into the homes;
- Basement servicing can be achieved if the pump chamber is outside and lower than the basement;
- Education is necessary for users with respect to the pump, heat trace and heat trace controller operations;
- The configuration of the lot and road layout requires careful planning to avoid additional road construction costs;
- Utilidor connected to adjacent buildings present the potential for one to travel from one building to the other (protective enclosures).

Figure 7 provides a schematic of this servicing alternative.

Examples of Rear Yard Utilidor Construction

FIGURE 6

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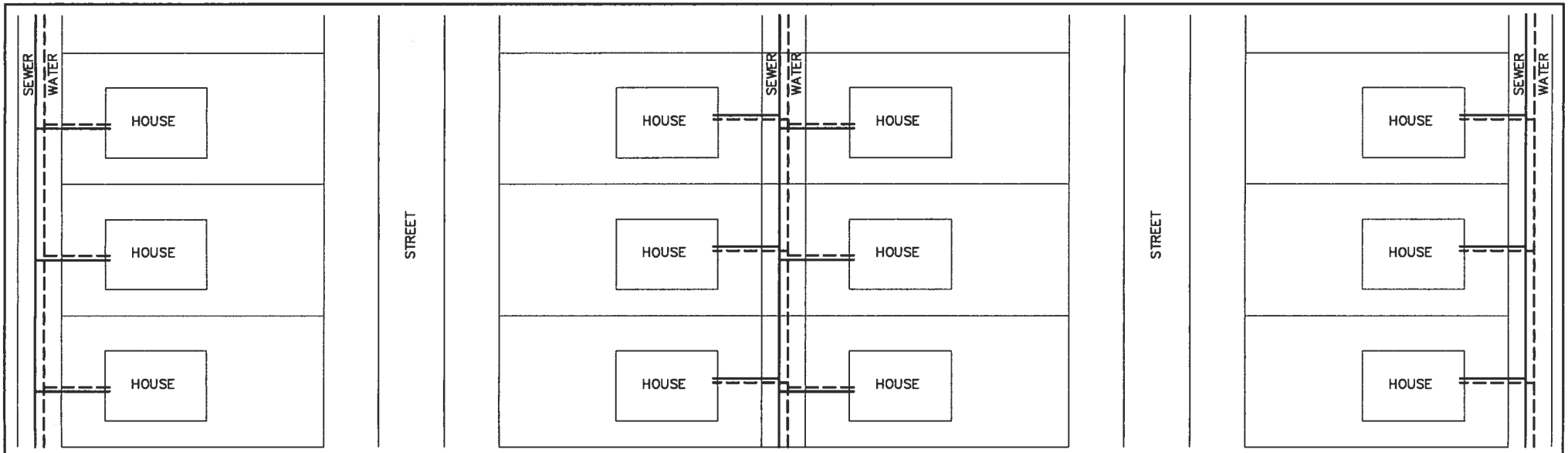
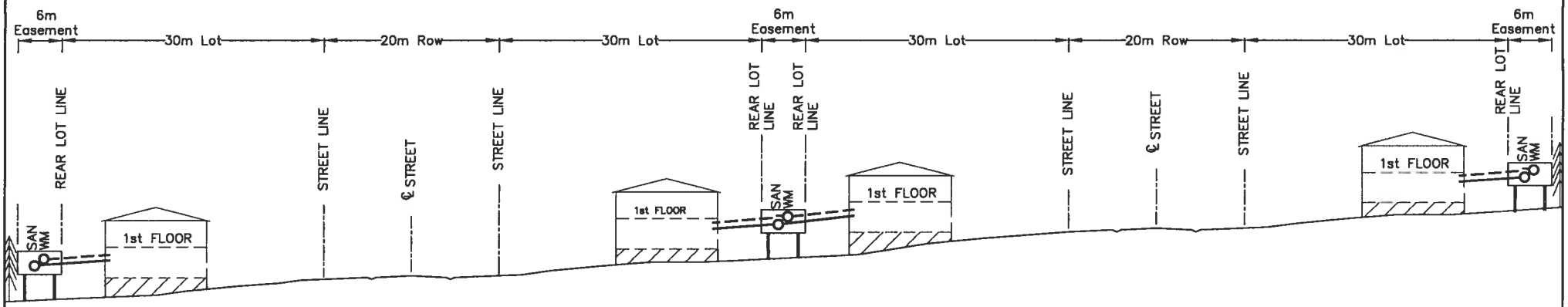


PLAN VIEW (NTS)



WATERMAIN AND SANITARY (GRAVITY OR L.P.S.) IN UTILIDOR ON REAR YARD EASEMENT
SERVICES IN UTILIDOR ON REAR YARD
MAINS + SERVICES INSULATED + HEAT TRACED
HOUSES ABOVE ORIGINAL GROUND + SKIRTED IN AROUND BASE
HEIGHT OF UTILIDOR DEPENDENT ON GRADE OF SANITARY

SECTION VIEW (NTS)

FIGURE 7 - TYPE "F" SERVICING REAR YARD ABOVE GRADE SERVICING - UTILIDOR

5.0 COST ESTIMATES

Cost estimates of the capital, annual operating and maintenance, and life cycle costs of the above six alternative servicing types have been prepared. The costs are summarized on Table 1 and are intended to provide a comparative evaluation of each servicing alternative. The costs are based on 15 m wide single family lots. The costs for Type E and F servicing, are based on the same layouts as the other servicing types. Actual subdivision and lot layouts will likely vary from the typical layouts and costs provided, however they are intended to provide a comparative cost analysis.

Capital costs were estimated utilizing materials quotations obtained from various piping and pump suppliers. Breakdowns of the capital and annual operating maintenance costs are enclosed in Appendix A. Copies of the quotations received are enclosed in Appendix B.

Annual operating costs were estimated using current electricity rates, and estimates of annual maintenance activity requirements.

The life cycle costs are based on the addition of the capital costs plus the annual operating and maintenance costs over a 20 year period, shown as the Present Value capitalized over 20 years with interest at 6% and inflation at 3%.

It should be noted that the costs have been estimated for water and sewer servicing only. Other costs associated with developing lots including hydro, telephone, television, roads, sidewalks, street lighting and storm sewers have not been included. These costs can increase the total servicing costs per lot considerably. It should also be noted that the layout of a given area will also have an impact on the overall cost per lot.

The gravity sewer servicing options Type A and B do not include costs for any sewage pumping stations, which could be significant depending on the layout, area serviced, etc. External services such as marine, water and sewer mains, booster pumping stations, rechlorination facilities are also not included in the costs per lot.

TABLE 1

Life Cycle Cost Breakdown of the Servicing Types

Item	**Type A** Roadway Deep Bury	**Type B** Roadway Shallow Bury	**Type C** Roadway Shallow Bury Pumped	**Type D** Roadway Above Grade Bermed	**Type E** Rear Yard Above Grade Bermed	**Type F** Rear Yard Above Grade Utililidor
Capital Cost per Lot	**42,629**	**38,624**	**46,197**	**69,079**	**34,192**	**50,898**
Annual Average Operating Costs per Lot	0	112	770	770	770	994
Capitilized Operating Costs - over a 20 year period	**0**	**1,443**	**9,892**	**9,892**	**9,892**	**12,768**
Total Life Cycle Cost per Lot - 20 year period	**42,629**	**40,067**	**56,089**	**78,971**	**44,084**	**63,666**

Notes:

1. Capital cost per lot is shown on Table A1 located in Appendix A
2. Annual operating costs per lot are shown on Table A2 located in Appendix A
3. Capitalized O & M costs are shown as a present value, capitalized for a 20 year period at 6% interest and an inflation rate of 3%

Table 2 - Servicing Alternative Evaluation Matrix

Evaluation Criteria	Servicing Type and Description					
	Type A **Roadway Deep Bury**	**Type B** **Roadway Shallow Bury**	**Type C** **Roadway Shallow Bury Pumped**	**Type D** **Roadway Above Grade Bermed**	**Type E** **Rear Yard Above Grade Bermed**	**Type F** **Rear Yard Above Grade Utilidor**
Technical						
Watermain Type and Depth	Uninsulated pipe, min. 3.0m cover, min 150mm dia	Insulated pipe, min. 1.5m cover, min 150mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 150mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 150mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 150mm dia	Insulated and heat traced pipe, min 150 mm dia
Water Service Lateral Type and Depth	Uninsulated pipe, min. 2.0m cover	Insulated and heat traced pipe, min. 1.0m cover	Insulated and heat traced pipe, min. 1.0m cover	Insulated and heat traced pipe, min. 1.0m cover	Insulated and heat traced pipe, min. 1.0m cover	Insulated and heat traced pipe,
Sanitary Sewer Type and Depth	Uninsulated pipe, min. 3.5m cover, min 200mm dia	Insulated pipe, min. 2.0m cover, min 200mm dia	Insulated LPS, min. 1.5m cover, min 50mm dia	Insulated LPS, min. 1.5m cover, min 50mm dia	Insulated pipe, min. 1.5m cover, min 50mm dia	Insulated and heat traced pipe, min 50mm dia (LPS) or 200mm dia (gravity)
Sanitary Service Lateral Type and Depth	Uninsulated pipe, min. 2.5m cover, min 125mm dia	Insulated pipe, min. 1.5m cover, min 125mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 32 mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 32mm dia	Insulated and heat traced pipe, min. 1.2m cover, min 32m dia	Insulated and heat traced pipe, min 32m dia (LPS) or 125mm dia (gravity)
Lot Yield per ha	Per Zoning By-Law	Per Zoning By-Law	Per Zoning By-Law	Per Zoning By-Law	Reduced due to rear yard easement req'ts	Reduced due to rear yard easement req'ts
Drainage	No impact	No impact	No impact	Impacted by fill area	Impacted by berm	Impacted by utilidor
Future Growth	Trench would have to be extended	Trench would have to be extended	Trench would have to be extended	Fill area would have to be extended – easy to extend	Fill area would have to be extended - easy to extend	Utilidor would have to be extended - easy to extend

	Servicing Type and Description					
Evaluation Criteria	**Type A** **Roadway** **Deep Bury**	**Type B** **Roadway** **Shallow Bury**	**Type C** **Roadway** **Shallow Bury** **Pumped**	**Type D** **Roadway** **Above Grade** **Bermed**	**Type E** **Rear Yard** **Above Grade** **Bermed**	**Type F** **Rear Yard** **Above Grade** **Utilidor**
Energy Consumption	None	Energy consumed by heat trace cable	Energy consumed by heat trace cable and grinder pumps	Energy consumed by heat trace cable and grinder pumps	Energy consumed by heat trace cable and grinder pumps	Energy consumed by heat trace cable and grinder pumps
Basement Servicing	Yes - gravity	Yes – require pump	Yes – if pump chamber outside	Yes – if pump chamber outside	Yes – if pump chamber outside	Possible
Environmental						
Impact on Groundwater/WWTP	Potential infiltration into sewer	Potential infiltration into sewer	No infiltration into sewer	No infiltration into sewer	No infiltration into sewer	No infiltration into sewer
Social						
Visual Aesthetic	No impact	No impact	No impact	No impact	Negative Impact due to berm	Negative Impact due to utilidor
Recreational Resources	No impact	No impact	No impact	No impact	Impact due to berm	Impact due to utilidor
Heritage Resources	Potential for archaeological resources	Potential for archaeological resources	Potential for archaeological resources	No impact	No impact	No impact
Operational						
Access for repairs	Excavation req'd	Excavation req'd	Excavation req'd	Excavation req'd	Excavation req'd	No excavation req'd
Pump and heat trace maintenance	None req'd	O&M of heat trace and controller, and pump if provided	O&M of heat trace and controller, and grinder pump	O&M of heat trace and controller, and grinder pump	O&M of heat trace and controller, and grinder pump	O&M of heat trace and controller, and grinder pump
Power Outages	No impact	Potential freezing of service laterals	Potential freezing of mains and service laterals	Potential freezing of mains and service laterals	Potential freezing of mains and service laterals	Potential freezing of mains and service laterals

	Servicing Type and Description					
Evaluation Criteria	**Type A** **Roadway Deep Bury**	**Type B** **Roadway Shallow Bury**	**Type C** **Roadway Shallow Bury Pumped**	**Type D** **Roadway Above Grade Bermed**	**Type E** **Rear Yard Above Grade Bermed**	**Type F** **Rear Yard Above Grade Utilidor**
Ease of Obtaining Spare Parts	No impact	Easy to obtain	Easy to obtain	Easy to obtain	Easy to obtain	Easy to obtain
Expected Life	50 years	50 years	25 years for pump and heat trace equipment	25 years for pump and heat trace equipment	25 years for pump and heat trace equipment	25 years for pump and heat trace equipment
Complexity	Low complexity	Low complexity	More complex	More complex	More complex	More complex
Economic						
Capital costs	42,629	38,624	46,197	69,079	34,192	50,898
Annual O&M costs	0	112	770	770	770	994
Life Cycle	42,629	40,067	56,089	78,971	44,084	63,666
Construction						
Geotechnical conditions	Presence of bedrock affects schedule and cost	Presence of bedrock affects schedule and cost	Presence of bedrock affects schedule and cost	No impact	No impact	No impact
Community impacts during construction	Noise, dust and vibration due to rock blasting and general construction activity	Noise, dust and vibration due to rock blasting and general construction activity	Noise, dust and vibration due to rock blasting and general construction activity	Noise and dust due to general construction activity	Noise and dust due to general construction activity	Noise and dust due to general construction activity

6.0 POTENTIAL AREAS FOR DEVELOPMENT

The Municipality has identified 8 areas of potential residential development. These areas were reviewed to determine the type of infrastructure that may suit each development area. The 8 areas of potential development are summarized on Table 3, and discussed in the following sections. It should be noted that 7 of the areas are considered to be in areas of High Mineral Potential. Figures 8 and 9 indicate the location of these areas.

Table 3 - Areas of Potential Residential Development

Description	Owner	Size (ha)	OP Designation	Zoning Designation	Limitations	Servicing Proximity
1. Florin Lake	GoldCorp	70	NR [1]	NR	High Mineral Potential, some undulating terrain and rocky outcrops	150mm WM and 200mm SAN available at site boundary
2. Kelson Farm	GoldCorp	57	TR	R1 & Special Zone	High Mineral Potential, some undulating terrain and rocky outcrops	250mm WM and 200mm SAN available at site boundary
3. North Cochenour	MNR and GoldCorp	191	NR, EP & RR [1]	NR & EP	High Mineral Potential, sandy terrain	WM and SAN extensions needed – approx. 1000m
4. Windy Point	GoldCorp	90	NR [1]	R5 & NR	High Mineral Potential, sloping to lake, some sandy areas	200mm WM and 200mm SAN available at north property boundary, extension of
5. Blende Street	MRL	4.6	TR	R1	High Mineral Potential, steep slopes, rocky outcrops	150mm WM and 200mm SAN available at north and south site boundary
6. North of Hwy 125	Mixed	145	NR & EP [1]	NR, R5 & EP	some undulating terrain and rocky outcrops, environmental protection areas	WM and SAN extensions needed – approx. 1000m
7. Baseball Diamond	Mennonite Church	1.9	OS	OS	High Mineral Potential, site is level	150mm WM and 200mm SAN available approx. 150 m from site
8. Infill north of Goldshore Road	MRL	26	TR	R1	High Mineral Potential, steep slopes, rocky outcrops	WM and SAN connections available in several areas

Notes:
1. Outside OP settlement area

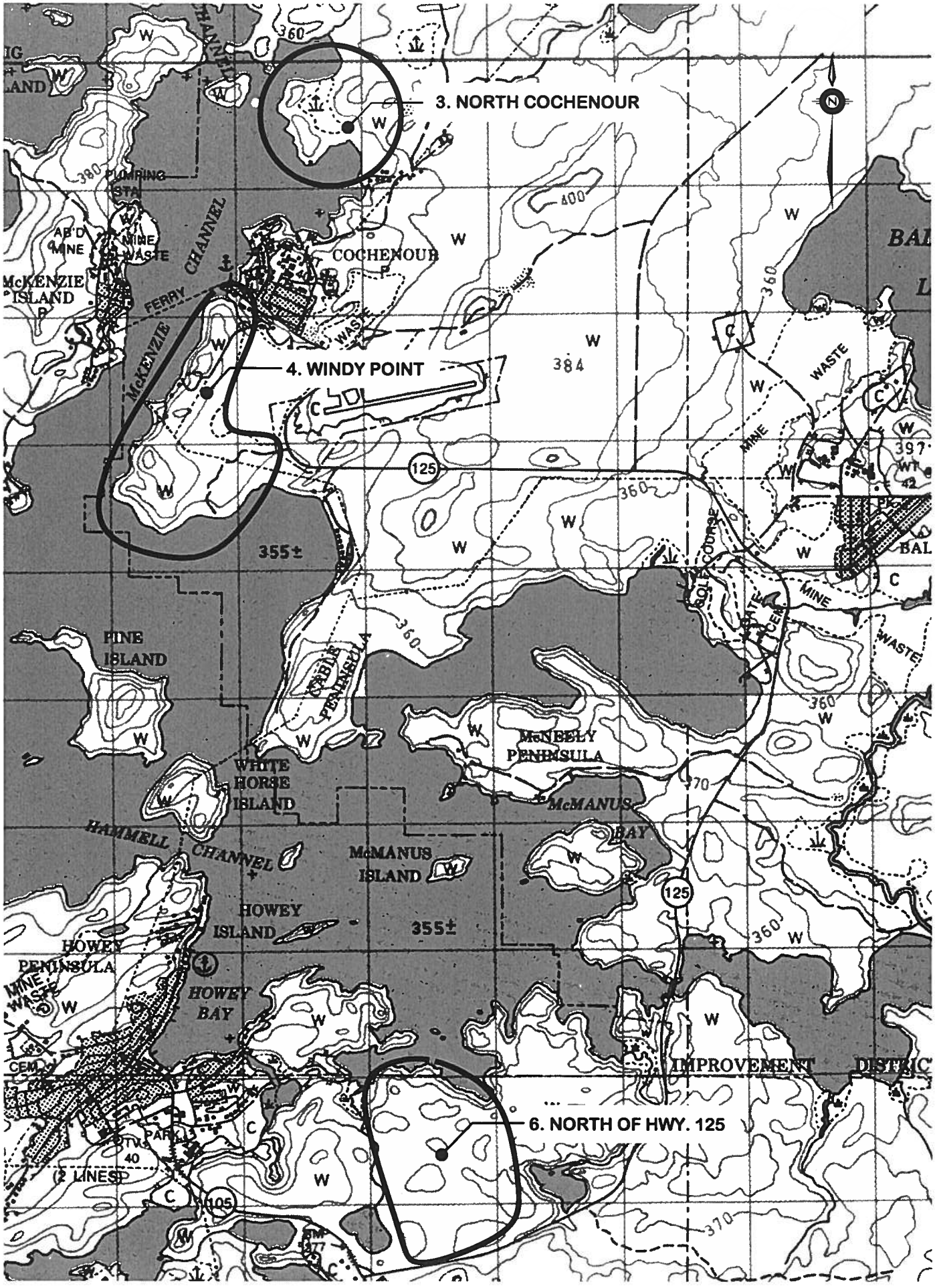


FIGURE 8 – AREAS OF FUTURE DEVELOPMENT
OVERALL KEY PLAN NTS

Drawing file: E:\ENL\PN11071\dwg\FIG 8 .DWG
Plotted: Nov 28' 2011 – 12:22pm

Created: Mar 30' 1995 – 2:18pm
Last Saved: Nov 28' 2011 – 12:21pm

Drawing file: E:\ENL\PN11071\dwg\FIG 9.0WG
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Created: Mar 30' 1995 – 2:18pm
Last Saved: Nov 28' 2011 – 11:21am

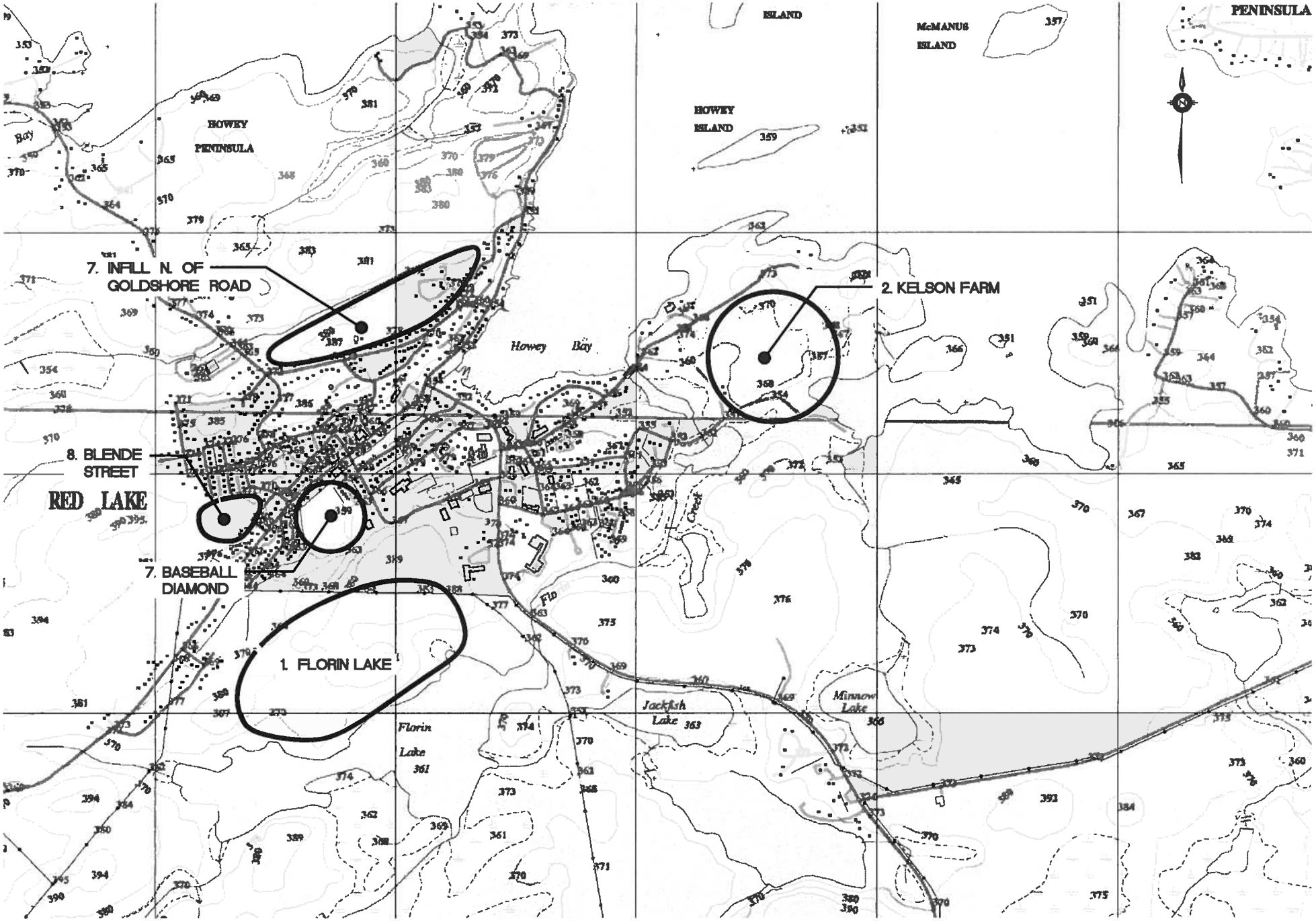

FIGURE 9 – AREAS OF PROPOSED DEVELOPMENT RED LAKE AREA-KEY PLAN NTS

6.1 Florin Lake

The Comprehensive Review identified approximately 70 ha of property north of Florin Lake as a potential residential development area. The property is presently outside the Official Plan settlement area, and is zoned as Natural Resources.

The area is characterized by some fairly steep slopes, some undulating terrain, and rocky outcrops.

A proposed lot layout for this area was provided by the Municipality, prepared by Meridian Planning Consultants Inc. (enclosed as Figure 10). The proposed layout yields approximately 200 single family lots. We note that there is a fair extent of undeveloped road frontage which will increase servicing costs per lot.

The type of servicing most suited to this area is difficult to determine without the benefit of original ground profiles and cross-sections in the proposed areas of development, and geotechnical information.

Based on a review of the available topographic mapping for this area, the majority of the proposed lots appear to be at elevations higher than the areas of proposed connections to roadways and services.

It may be possible to service a good portion of the area by gravity sewers. Small areas of low pressure sewers may be needed to avoid the construction of a sewage pumping station. Depending on the location of the bedrock, Type A, B and C servicing would be appropriate for this subdivision, based on the current layout.

6.2 Kelson Farm

The Kelson Farm area is located east of Dupont Drive, and preliminary plans for a 60± lot subdivision have been prepared by Keewatin-Aski Ltd. (enclosed as Figure 11). A possible extension of Street 'D' to the east is suggested enabling additional lots to be developed in future stages.

Existing watermains and sanitary sewers are available for connection at the subdivision limits.

Design of servicing for Phase 1 of the subdivision was previously completed by Keewatin-Aski Ltd., which was based on shallow bury watermain and low pressure sewer (LPS), referred to as Type C servicing in this report. Pricing for this type of servicing has been obtained, however it is understood that construction has not proceeded due to the high costs.

The topographic mapping for this area indicates areas of significant slopes and may provide an opportunity for gravity servicing rather than relying on a pumped system. Assuming bedrock is near or at the surface, Type B servicing may be an economical alternative.

Drawing file: E:\ENL\PN11071\dwg\FIG 10.DWG
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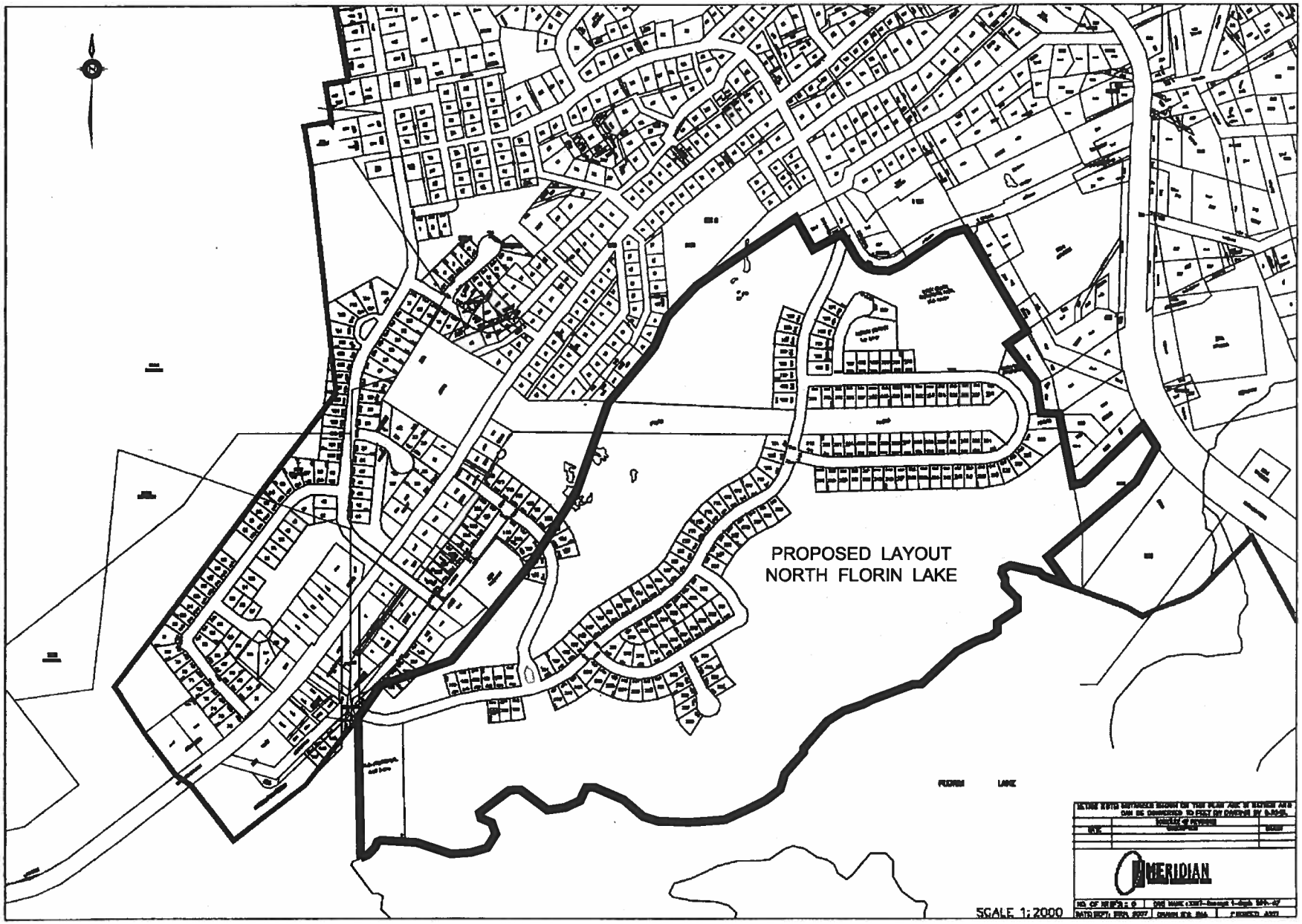

FIGURE 10 - FLORIN LAKE AREA NTS

Drawing file: L:\ENL\PN110/1\dwg\FIG 11.DWG
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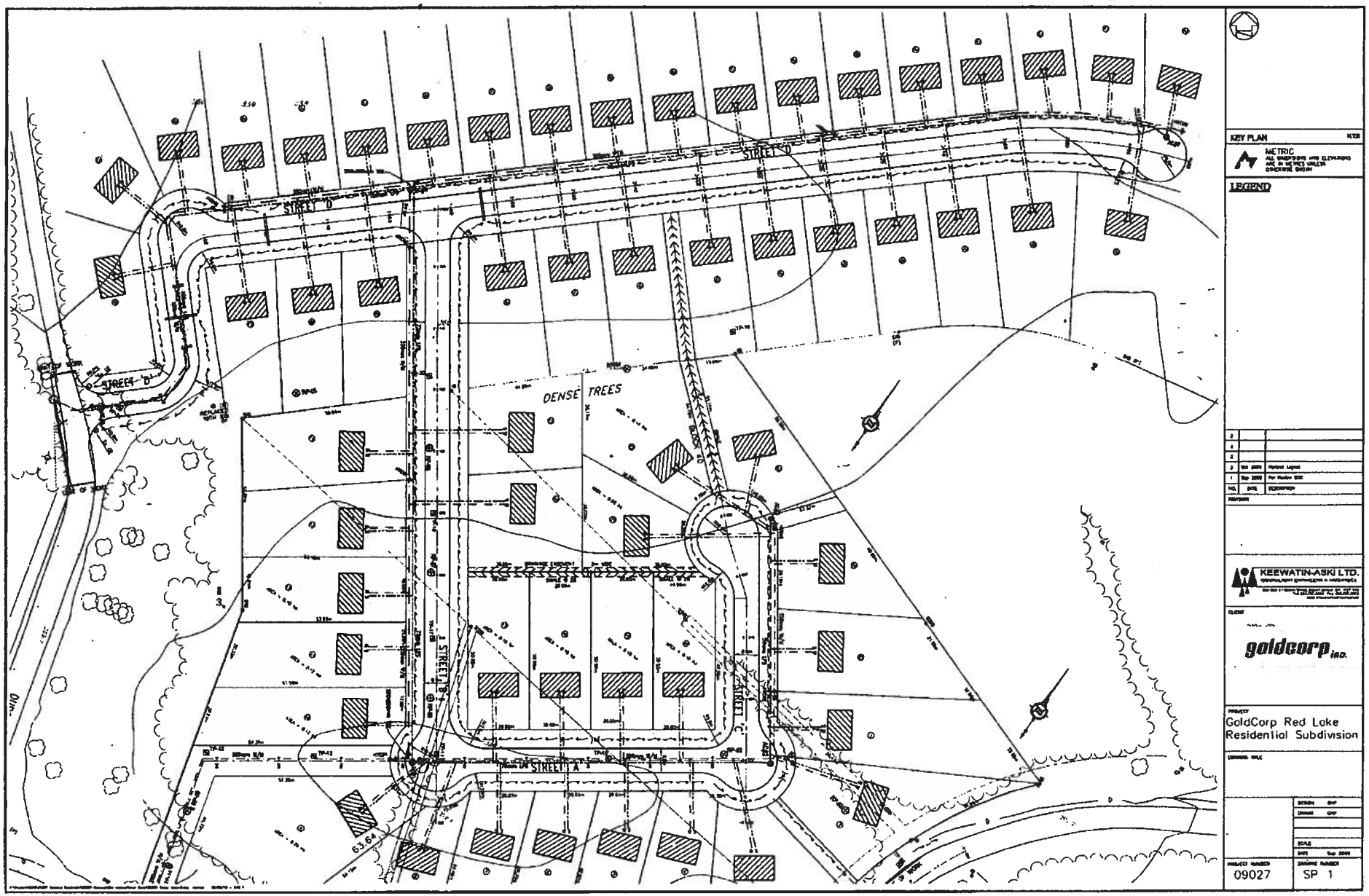

FIGURE 11 – KELSON FARM AREA NTS

6.3 North Cochenour

A large parcel of undeveloped land, approximately 190 ha, is located to the north of the McMarmac settlement area. This property was identified as potential residential development in the Comprehensive Review. The property is outside the OP settlement area, and is zoned as Natural Resources and Environmental Protection.

The soils are reportedly sandy, and the terrain appears to be gently sloping.

Type A servicing would be optimal for this area, assuming bedrock depths are greater than 3 m. Extensions of water and sanitary service would be required from Cochenour to service this area.

A watermain extension from the existing 150 mm main on Cochenour Crescent across the bay would be required to service the area. An analysis would have to be completed in order to determine whether or not sufficient flow and pressure is available to reach the North Cochenour area. It is possible that an in-line pressure booster station, and re-chlorination facility would be needed to ensure sufficient pressure and chlorine residual can be made available. It is unlikely that sufficient flow to provide fire protection will be available due to the configuration of the existing water distribution system.

A connection to the existing sanitary system on Cochenour Crescent may not be feasible, as the existing sewer is only 50 mm diameter. Alternatives include extending a marine forcemain further south to connect to the existing sanitary system at Lakeview Crescent, or providing individual septic systems for the lots. Individual septic systems will significantly reduce the lot yield.

A schematic of the north Cochenour area is enclosed as Figure 12.

Drawing file: E:\ENL\PN11071\DWG\FIG 12.DWG
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Created: Mar 30' 1995 – 2:18pm
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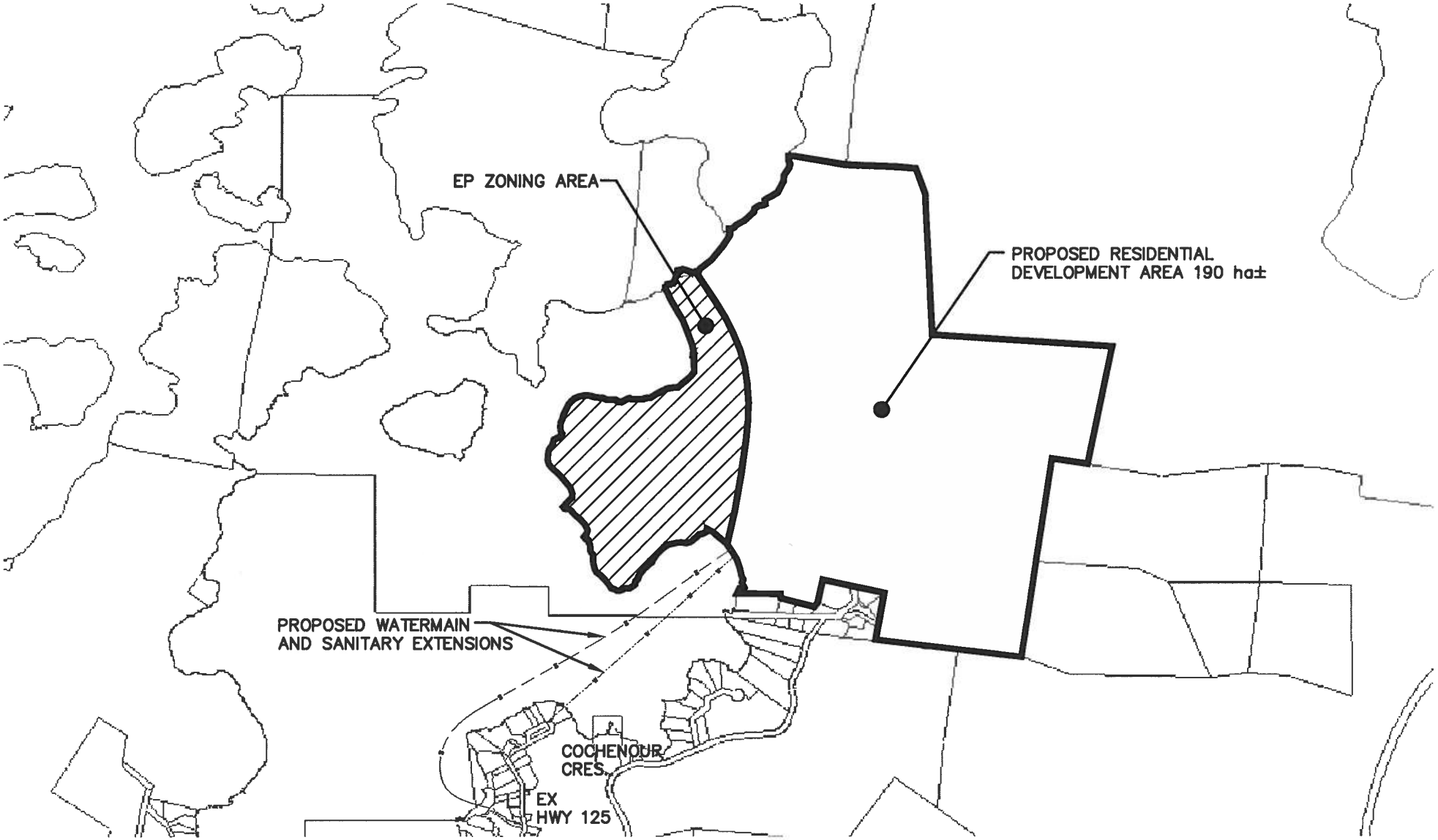

FIGURE 12 – NORTH COCHENOUR AREA NTS

6.4 Windy Point

The Windy Point area is located southwest of Cochenour, and is approximately 90 ha in size. It is outside of the OP settlement area, and is zoned as Natural Resources. Portions of the site are gently sloping and appear to be sandy, although areas of surficial bedrock are also present. The southwest shoreline area is steeply sloped.

Extensions of servicing southerly from the mains on Highway 125 would be required, and could be in excess of 1,500 m in length.

Based on the available information, Type A servicing could be utilized for a portion of the site where the bedrock is located at depths greater than 3 m and Type B utilized where bedrock is shallower. Pumping to connect to the existing sanitary sewer may not be required, as it appears that the majority of the area is elevated compared to the Highway.

Depending on the available water pressure at the Highway, an in-line booster station may be needed to ensure sufficient pressure throughout the development. Re-chlorination facilities would also likely be needed to ensure adequate chlorine residuals are present at the extremities of the system.

The Windy Point area is shown on Figure 13.

6.5 Blende Street

The Municipality has prepared a subdivision plan for an area south of Blende Street, which extends to Dynes Street at the southern terminus, and provides for 18 single family lots. Costing has been obtained for the servicing and road construction, however the work has not proceeded due to excessive costs. The layout provided by the Municipality is enclosed as Figure 14.

We note that the layout includes a considerable extent of road frontage that is either developed on one side only or not at all, which will increase the servicing costs per lot. Areas of steep slopes, and low lying swampy areas appear to be outside the proposed development areas.

Portions of this area may be suitable for Type E rear yard servicing which, with a minor revision to the proposed road layout, may prove more economical.

Drawing file: E:\ENL\PN11071\dwg\FIG 13.DWG
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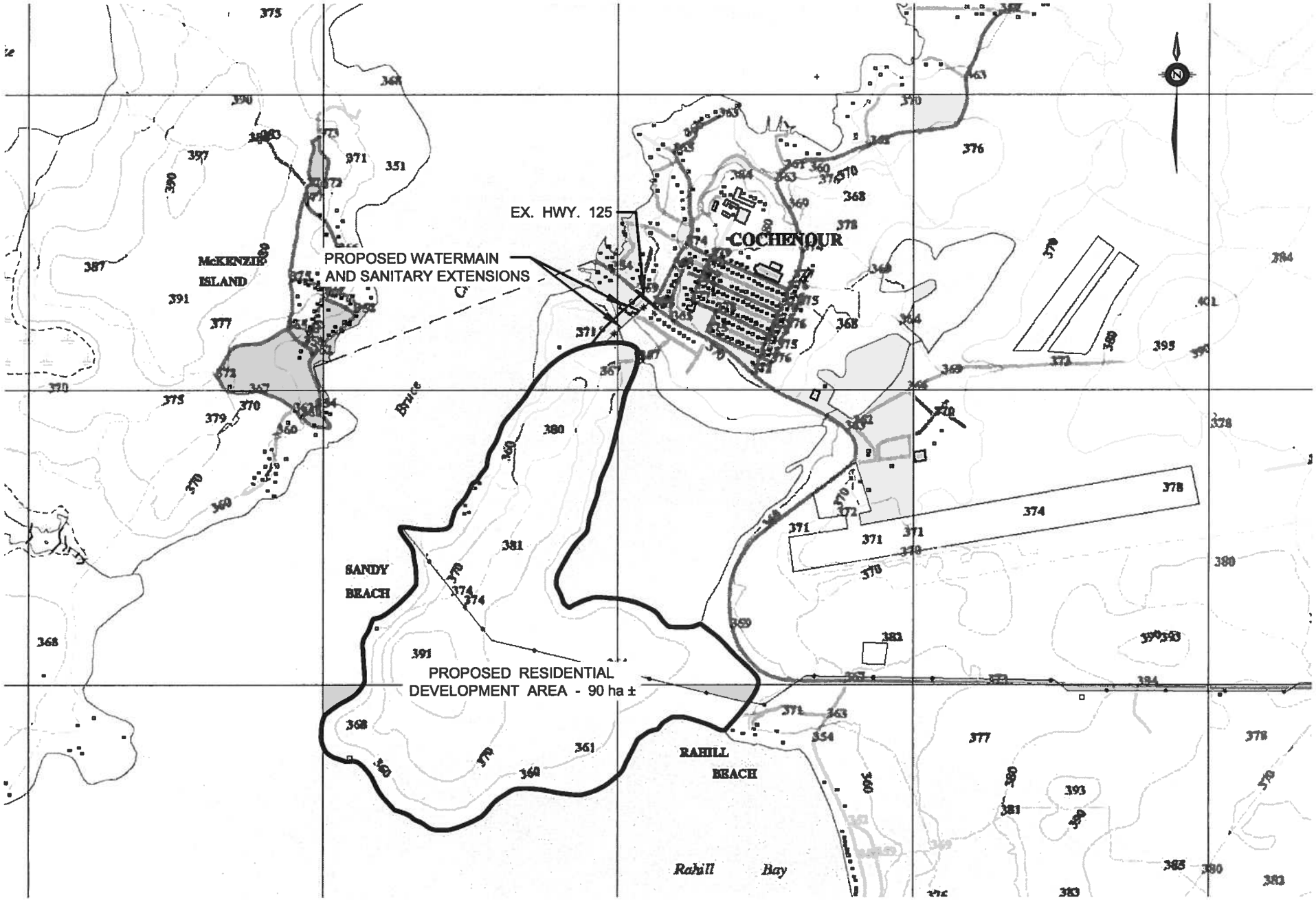

FIGURE 13 – WINDY POINT AREA NTS

Drawing file: E:\ENL\PN110/1\dwg\FIG 14.DWG
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Created: Mar 30' 1995 – 2:18pm
Last Saved: Nov 24' 2011 – 8:25am

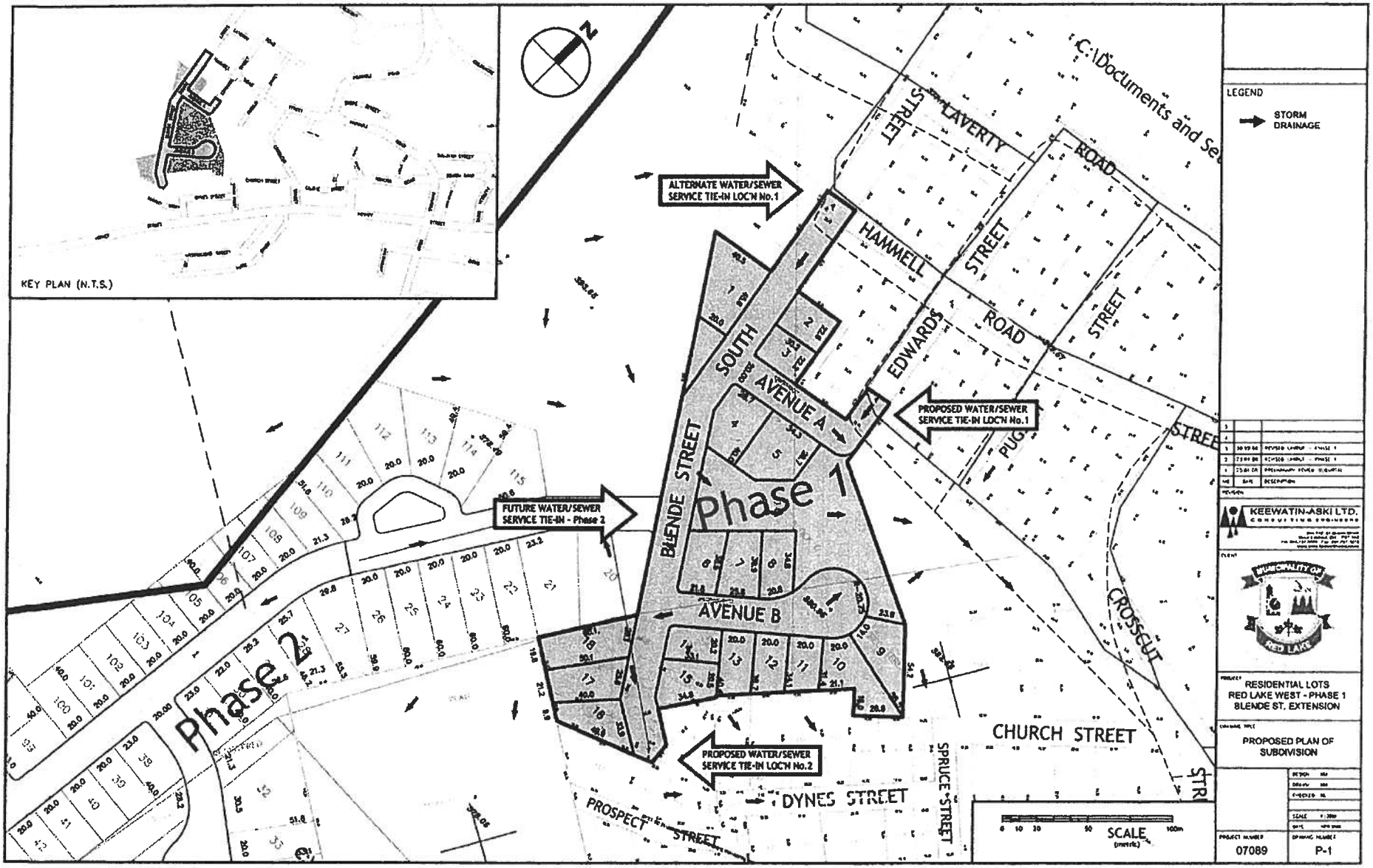

FIGURE 14 – BLENDE STREET AREA NTS

6.6 North of Highway 125

Property north of Highway 125, and east of the area referred to as East Kelson Farm, has been identified for potential residential development. This area is approximately 145 ha in size, and is outside the OP settlement area. The site is zoned Natural Resources and Environmental Protection. The property immediately north of Highway 125 has been identified as potential future commercial development.

There are lakes on the east, west and north sides of the site, and a significant creek traversing the site from the south to the northwest. A street and lot layout would have to be developed considering the natural features that require protection. In addition there is an area of Environmental Protection near the southeast portion of the site that has to be carefully considered in any proposed development.

Watermain and sanitary sewer services would have to extend easterly from Young Street, a distance of approximately 1,000 m from the west site boundary. Roadway connections would also be required, likely north from Highway 125, and east from the Young Street area. Development of the residential property east of Young Street before this area would help to reduce the costs of extending service and road connections to this area. The available topographic mapping for the area indicates the site is generally sloping to the north and east, with the highest elevations toward the southwest portion of the site. Geotechnical information is not available for the site.

It may be possible to service a significant portion of the area by gravity sewers, although pumping will likely be required to connect to the existing sewers to the west.

Figure 15 illustrates this proposed development area.

6.7 Block G - Baseball Diamond

The Municipality identified a site formally used as a baseball diamond west of Pine Crescent that may be suitable for residential development. The site is 1.9 ha, and is currently designated as Open Space in the OP, and is also zoned as Open Space.

The site is fairly level, and would be readily serviced from connections to the existing watermain and sanitary sewers on Pine Crescent. From review of the topographic mapping, the site is sloping to the southwest, i.e. away from Pine Crescent, such that pumped servicing is likely to be required. Type C or D servicing would be preferred for this area to avoid the expense of a sewage pumping station.

There is a low swampy area, and drainage course that traverses the site that may reduce the amount of property available to develop. Maintaining a buffer around this area may be possible, and in which case approximately 10 – 15 residential lots could be developed on the site. The property proposed for development is presented on Figure 16.

Drawing file: E:\ENL\PN11071\dwg\FIG 15.DWG
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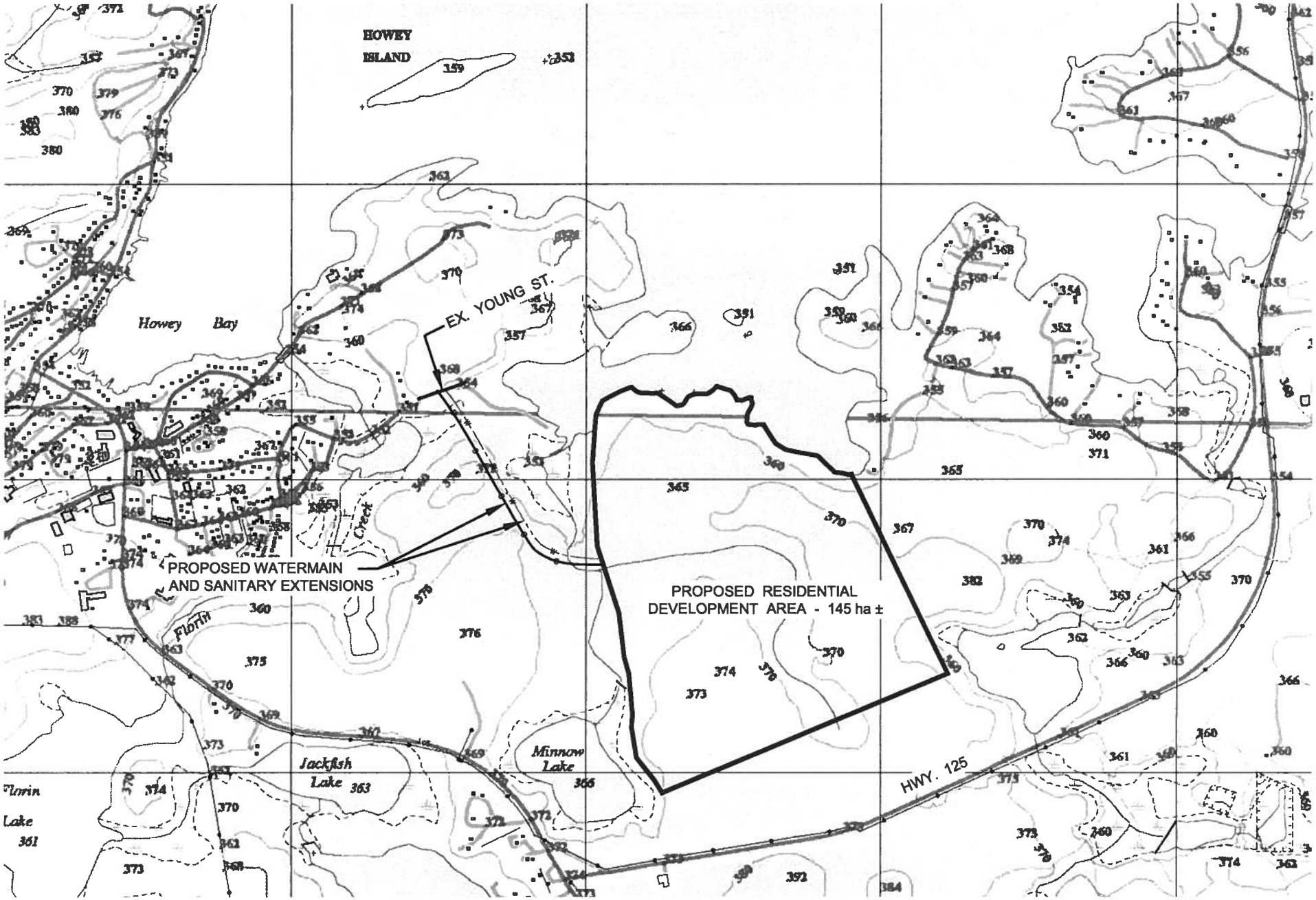

FIGURE 15 – NORTH HIGHWAY 125 AREA NTS

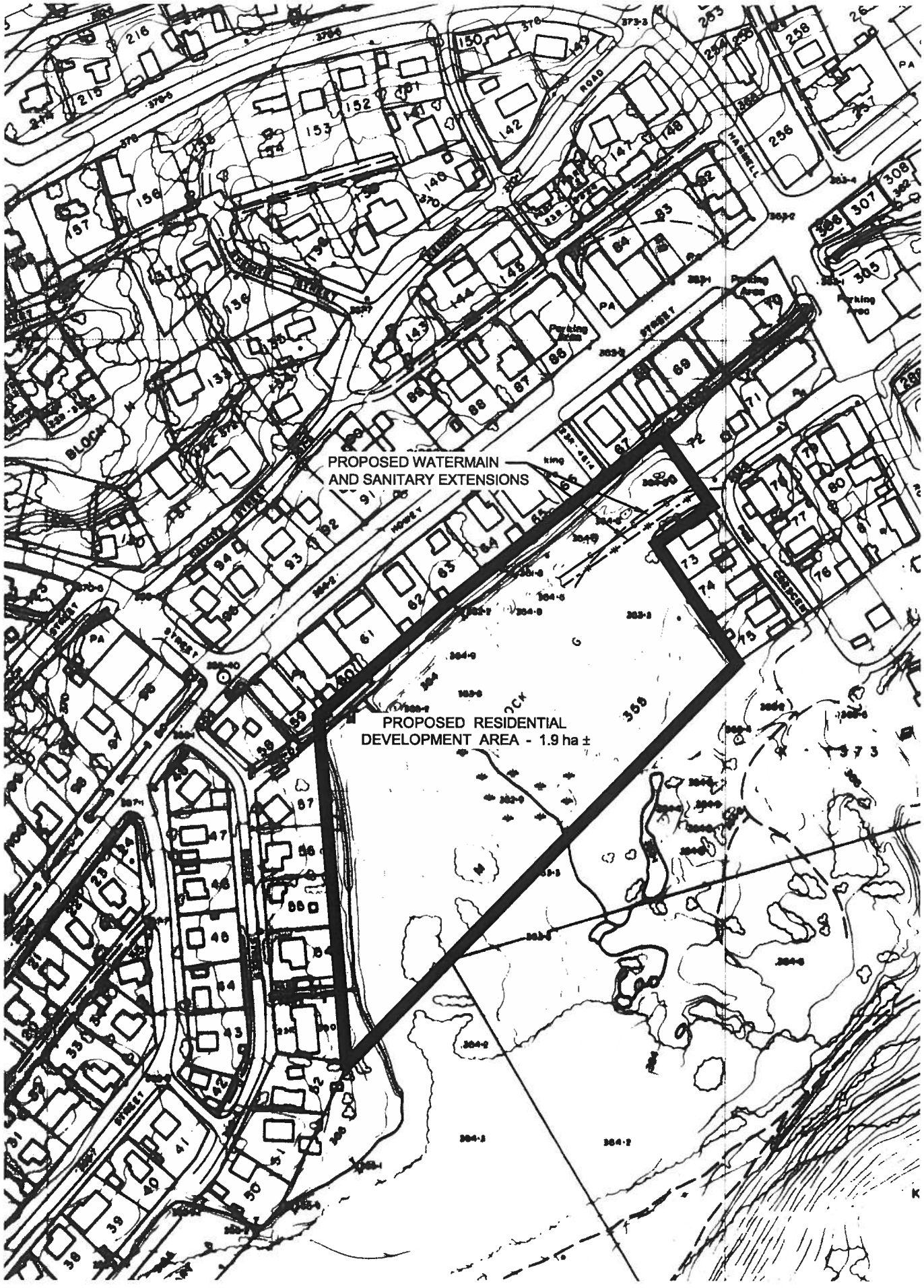

FIGURE 16 - BLOCK G BASEBALL DIAMOND AREA NTS

Drawing file: E:\ENL\PN11071\dwg\FIG 16.DWG
Plotted: Mar 01' 2012 - 2:55pm

Created: Mar 30' 1995 - 2:18pm
Last Saved: Mar 01' 2012 - 2:55pm

6.8 Infill North of Goldshore Road

There is property designated in the OP as Townsite Residential and which is zoned for residential use north of Goldshore Road. Access to the property is limited due to the presence of existing homes and private property ownership. The terrain is predominately surficial bedrock in this area.

Roadway connections to Quartz Street and Keetch/Birch Street would enable access to a 2.0 ha ± portion of the property. This area could yield approximately 10 single family lots.

Watermain and sanitary sewer connections could be made to the existing services on Quartz Street, and extended westerly. Water pressure and the ability to deliver fire flow may be of concern as the existing watermain on Quartz Street is only 150 mm.

This appears to be a good candidate for Type D servicing, due to the presence of bedrock and the locations of the existing services.

Figure 17 illustrates this proposed development area.

There may be opportunities to develop individual lots in other areas along Goldshore Road, which could utilize Type D servicing due to the presence of bedrock.

6.9 Water & Wastewater Pollution Control Plant Reserve Capacities

The Official Plan does not speak to reserve capacity of the existing municipal water treatment plants (WTP's) and wastewater pollution control plants (WPCP's) with respect to future development.

A review of the recent annual reports for the existing WTP's and WPCP's was conducted, and rated capacities and recent flow data summarized in Table 4.

Table 4 - Water Treatment and Wastewater Pollution Control Plant Capacities

Facility	Rated Capacity (m^3/d)	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
Red Lake WTP	6048		
2010 flows		1,013	2,465
2011 flows (up to September)		839	2,112
Red Lake WPCP	2,460		
2010 flows		1,385	3,744
2011 flows (up to September)		1,168	3,728
Cochenour WTP ([1])	6,368		
2010 flows		1,162	2,232
2011 flows (up to September)		1,163	not available

Facility	Rated Capacity (m^3/d)	Average Daily Flow (m^3/d)	Maximum Daily Flow (m^3/d)
Cochenour Sewage Lagoon ([2])	253		
2010 flows		125	321
2011 flows (up to September)		146	not available
Balmertown WPCP	1,124		
2010 flows		805	2,253
2011 flows (up to September)		662	2,355

Notes:

1. The Cochenour WTP provides potable water to the communities of Balmertown, Cochenour and McKenzie Island.
2. The Cochenour Sewage Lagoon accepts wastewater from the communities of Cochenour and McKenzie Island. The lagoon has 2 cells, with a storage capacity of 92,333 m^3, which equates to 253 m^3/d.

The proposed areas of interest would be serviced by the Red Lake WTP and WPCP, the Cochenour WTP, and the Cochenour sewage lagoon. Both the Red Lake and Cochenour WTP's have significant excess capacity as compared to the recent average and maximum daily flows.

The expansion of municipal water services to service the proposed areas of interest should not be restricted by the existing WTP capacities.

The Red Lake WPCP has sufficient capacity for the recent average daily flows, however it is noted that maximum daily effluent flow in excess of the rated capacity has been experienced in 2010 and 2011.

A more detailed analysis may be required to confirm the extent of development that can occur utilizing the Red Lake WPCP for wastewater treatment, as indicated by the following statement included in the recent reports provided by the Municipality.

> *"As the facility approaches capacity (greater than 80%) effluent water quality deteriorates and the Ministry may impose restrictions on new development in town".* [1]

[1] "Red Lake WPCP, 2010 Annual Report", prepared by Northern Waterworks Inc.

Drawing file: E:\ENL\PN11071\dwg\FIG 17.DWG
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Created: Mar 30' 1995 – 2:18pm
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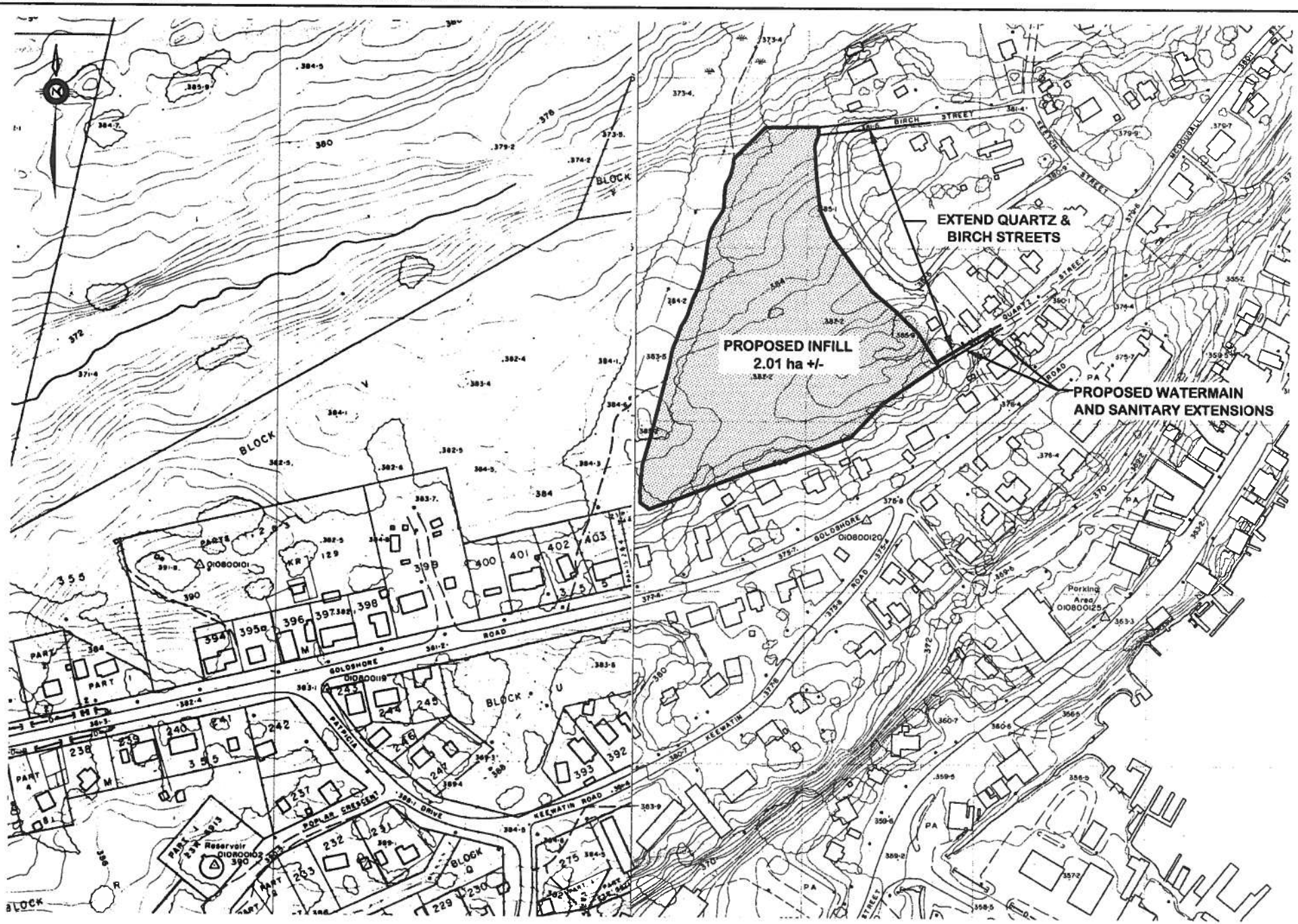

FIGURE 17 – INFILL NORTH OF GOLDSHORE ROAD AREA NTS

7.0 ACTION PLAN

The Municipality is seeking a methodology to be used when considering new development areas within the next 20 years. In reviewing both the Sustainable Community Plan and Comprehensive Review, several recommendations were made to assist the Municipality with planning and development. Several of these recommendations, together with additional ones are summarized below:

- obtain current topographic mapping (at a scale of 1:2,000 or larger) of the potential selected expansion areas, where existing mapping is not available;

- conduct a preliminary geotechnical investigation of the proposed expansion areas to supplement existing information;

- prepare Water and Sewage Servicing Master Plans, to identify infrastructure upgrades needed to ensure the ability to provide municipal servicing to the proposed development areas. The provision of sufficient flow and pressures to satisfy population growth and anticipated water demands (domestic and fire) may require additional trunk watermains from the existing WTP's, oversizing of some watermains, additional storage facilities, booster pumping stations, rechlorination facilities, etc. These potential upgrades should be identified and included in the Municipal Financial Plan to allow the Municipality to ensure servicing expansions and capital projects take into account the future needs.

  The ability to collect and distribute the future sewage flows to the existing collection and treatment systems also needs to be reviewed, to ensure capacity exists to accommodate the additional flows. Upgrades including oversizing of sewers, additional or expanded sewage pumping stations, etc. may be required.

- Prepare a Transportation Master Plan. This plan would identify roadway improvements, new roads, active transportation facilities, etc. to incorporate the proposed development areas with the existing road and active transportation network.

- Establish development areas that utilize smaller and more compact units, such as duplexes, and townhomes, to reduce the costs per unit and to suit existing neighbourhoods.

- Establish servicing systems that reduce long-term operating costs.

- Investigate alternative housing construction to reduce the need for basements.

- Review the WTP and WPCP every 5 years to ensure capacity is available for future developments.

APPENDIX A

COST ESTIMATIONS

Municipality of Red Lake
Alternative Infrastructure Study
TABLE A-1
Capital Cost Estimate

Servicing Type	Servicing Description	Item	Unit	Estimated Quantity	Unit Estimated Cost	Cost
A	Roadway Deep Bury	*Watermain PVC uninsulated (200mm)*	m	7.5	$250	$1,875
		Service HDPE uninsulated (25mm)	m	16	$100	$1,600
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary PVC uninsulated (200mm)	m	7.5	$150	$1,125
		Service PVC uninsulated (100mm)	m	16	$115	$1,840
		Rock Trenching (4.1m x 1.2m x 23.5m)	m3	116	$275	$31,900
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$2,789	$2,789
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE A				***$42,629***
B	Roadway Shallow Bury	*Watermain (200mm) c/w 50mm insulation*	m	7.5	$300	$2,250
		Service (25mm) c/w 50mm insulation	m	16	$200	$3,200
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary (200mm) c/w 50mm insulation	m	7.5	$250	$1,875
		Service (100mm) c/w 50mm insulation	m	16	$220	$3,520
		Heat tracing components for water service only				
		a) Electronic thermostat	each	1	$1,500	$1,500
		b) Thermocable	m	16	$42	$672
		c) Temperature sensors	each	3	$160	$480
		d) Power feed kit	each	1	$750	$750
		Rock Excavation (2.6m x 1.2m x 23.5m)	m3	74	$275	$20,350
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$2,527	$2,527
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE B				***$38,624***
C	Roadway Shallow Bury - Pump	*Watermain (200mm) c/w 50mm insulation*	m	7.5	$265	$1,988
		Service (25mm) c/w 50mm insulation	m	16	$180	$2,880
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary (75mm) c/w 50mm insulation	m	7.5	$210	$1,575
		Service (50mm) c/w 50mm insulation	m	16	$210	$3,360
		Heat tracing components for water and sanitary services				
		a) Electronic thermostat	each	2	$1,500	$3,000
		b) Thermocable	m	32	$42	$1,344
		c) Temperature sensors	each	6	$160	$960
		d) Power feed kit	each	2	$750	$1,500
		Heat tracing components for water and sanitary mains				
		a) Electronic thermostat	each	0.05	$1,500	$75
		b) Thermocable	m	15	$38	$570
		c) Temperature sensors	each	0.3	$160	$48
		d) Power feed kit	each	0.1	$750	$75
		Low pressure pump c/w 93" deep chamber & control panel	each	1	$10,000	$10,000
		Rock Excavation for services (1.8m x 1.2m x 23.5m)	m3	50	$275	$13,750
		Rock Excavation for pump chamber (1m dia. X 2.36m height)	m3	2	$275	$550
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$3,022	$3,022
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE C				***$46,197***

Municipality of Red Lake
Alternative Infrastructure Study
TABLE A-1
Capital Cost Estimate

Servicing Type	Servicing Description	Item	Unit	Estimated Quantity	Unit Estimated Cost	Cost
D	Roadway Above Grade Servicing - Bermed	*Watermain (200mm) c/w 50mm insulation*	m	7.5	$245	$1,838
		Service (25mm) c/w 50mm insulation	m	16	$150	$2,400
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary (75mm) c/w 50mm insulation	m	7.5	$200	$1,500
		Service (50mm) c/w 50mm insulation	m	16	$200	$3,200
		Heat tracing components for water and sanitary services				
		a) Electronic thermostat	each	2	$1,500	$3,000
		b) Thermocable	m	32	$42	$1,344
		c) Temperature sensors	each	6	$160	$960
		d) Power feed kit	each	2	$750	$1,500
		Heat tracing components for water and sanitary mains				
		a) Electronic thermostat	each	0.05	$1,500	$75
		b) Thermocable	m	15	$38	$570
		c) Temperature sensors	each	0.3	$160	$48
		d) Power feed kit	each	0.1	$750	$75
		Low pressure pump c/w 93" deep chamber & control panel	each	1	$10,000	$10,000
		Rock Excavation for pump chamber (1m dia. X 2.36m height)	m3	2	$275	$550
		Fill for berm	m3	900	$40	$36,000
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$4,519	$4,519
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE D				***$69,079***
E	Rear Yard Above Grade Servicing - Bermed	*Watermain insulated (200mm)*	m	7.5	$245	$1,838
		Service insulated (25mm)	m	10	$150	$1,500
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary insulated (75mm)	m	7.5	$200	$1,500
		Service insulated (50mm)	m	10	$200	$2,000
		Heat tracing components for water and sanitary services				
		a) Electronic thermostat	each	2	$1,500	$3,000
		b) Thermocable	m	20	$42	$840
		c) Temperature sensors	each	6	$160	$960
		d) Power feed kit	each	2	$750	$1,500
		Heat tracing components for water and sanitary mains				
		a) Electronic thermostat	each	0.05	$1,500	$75
		b) Thermocable	m	15	$38	$570
		c) Temperature sensors	each	0.3	$160	$48
		d) Power feed kit	each	0.1	$750	$75
		Low pressure pump c/w 93" deep chamber & control panel	each	1	$10,000	$10,000
		Rock Excavation for pump chamber (1m dia. X 2.36m height)	m3	2	$275	$550
		Fill for bermed services	m3	150	$40	$6,000
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$2,237	$2,237
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE E				***$34,192***

Municipality of Red Lake
Alternative Infrastructure Study
TABLE A-1
Capital Cost Estimate

Servicing Type	Servicing Description	Item	Unit	Estimated Quantity	Unit Estimated Cost	Cost
F	Rear Yard Above Grade Servicing - "Utilidor"	*Watermain insulated (200mm)*	m	7.5	$325	$2,438
		Service insulated (25mm)	m	10	$200	$2,000
		Curb Stop & Box	each	1	$1,500	$1,500
		Sanitary insulated (75mm)	m	7.5	$275	$2,063
		Service insulated (50mm)	m	10	$250	$2,500
		Heat tracing components for water and sanitary services				
		a) Electronic thermostat	each	2	$1,500	$3,000
		b) Thermocable	m	20	$42	$840
		c) Temperature sensors	each	6	$160	$960
		d) Power feed kit	each	2	$750	$1,500
		Heat tracing components for water and sanitary mains				
		a) Electronic thermostat	each	0.05	$1,500	$75
		b) Thermocable	m	15	$38	$570
		c) Temperature sensors	each	0.3	$160	$48
		d) Power feed kit	each	0.1	$750	$75
		Pre-fabricated pipe support structures (one every 1.5m)	each	10	$3,000	$30,000
		General Items (bonds, insurance, mobilization, demobilization,	l.s	1	$3,330	$3,330
		TOTAL ESTIMATED COST/PROPERTY FOR SERVICE TYPE F				***$50,898***

Assumptions for all Servicing Types:

1. *Minimum Lot Frontage = 15m (49.21 ft) – (Municipality of Red Lake Zoning By-Low).*
2. *Minimum Lot Area = 460 m2 (Municipality of Red Lake Zoning By-Law).*
3. *Minimum Lot Depth = 30.67m (100.62 ft.).*
4. *Services estimated to house.*
5. *Low pressure sanitary pump and chamber assumed on exterior of property.*
6. *General Items ossumed to be a total of 7% construction costs.*
7. *Labour and equipment rotes have been included in the unit price.*
8. *Freight costs hove been estimated based on quantities and estimoted weights. Freight costs have been included in the unit price.*
9. *Costs ore based on 15 m wide lots.*
10. *Bedrock assumed to be 0.3 m below grade.*

Municipality of Red Lake
Alternative Infrastructure Study

TABLE A2
Operating & Maintenance Cost Breakdown of the Servicing Types

Item	**Type A** Roadway Deep Bury	**Type B** Roadway Shallow Bury	**Type C** Roadway Shallow Bury Pumped	**Type D** Roadway Above Grade Bermed	**Type E** Rear Yard Above Grade Bermed	**Type F** Rear Yard Above Grade Utililidor
Annual Operating Costs						
Hydro [2]	$ -	$ 37.32	$ 243.80	$ 243.80	$ 243.80	$ 467.75
Maintenance and replacement of grinder pumps	$ -	$ -	$ 297.60	$ 297.60	$ 297.60	$ 297.60
Maintenance and replacement of heat trace and controllers	$ -	$ 75.00	$ 228.75	$ 228.75	$ 228.75	$ 228.75
Total O & M	$ -	$ 112	$ 770	$ 770	$ 770	$ 994
Capitalized over 20 years [1]	$ -	$ 1,443	$ 9,892	$ 9,892	$ 9,892	$ 12,768

Notes:
1. Capitalized O & M costs are shown as a present value, capitalized for a 20 year period at 6% interest and an inflation rate of 3%
2. Costs are for heat trace on the mains and on the services up to the houses, and grinder pumps at the houses
3. Costs do not differentiate between municipal and private
4. Costs do not include maintenance activities such as flushing

Operating & Maintenance Cost Breakdowns

hydro rate per kwh 0.12

heat trace costs per service - in ground

days in service	240	
hours per day	24	
kwh per service	0.054	assume 18m long heat trace cable, i.e. to the house
kwh per year	311.04	

heat trace costs per service - above ground

days in service	240	
hours per day	24	
kwh per service	0.126	
kwh per year	725.76	

grinder pump costs

days in service	365
hours per day	0.5
kw of pump	0.75
kwh per year	200

heat trace costs per main per lot - in ground

days in service	240	
hours per day	24	
kwh per main	0.105	assume 15m long heat trace cable
kwh per year	604.8	

heat trace costs per main per lot - above ground

days in service	240	
hours per day	24	
kwh per main	0.195	assume 15m long heat trace cable
kwh per year	1123.2	

maintenance of grinder pumps

normal servicing is every 10 years, cost is approx. $1000, say $100 per year
replacement cost of pumps in todays costs are $3800 plus 4%, lifespan 20 years
so cost per year, use $3800/20

maintenance of heat trace cable and controllers on san and water

replacement cost of controllers and power feed kits in todays costs are $1500, lifespan 20 years
so cost per year, use $1500/20 per lot

for the mains, have controllers spaced at max 490m
so for each lot, say 20 lots per controller

replacement cost of controllers and power feed kits in todays costs are $1500, lifespan 20 years
so cost per year, use $1500/20 per lot

heat trace cable lifespan estimated in excess of 25 years, therefore no costs included

APPENDIX B

SUPPLIER QUOTATIONS

URECON
PRE-INSULATED PIPE
1800, avenue Bédard
Saint-Lazare, Québec, Canada J7T 2G4
Tél. : (450) 455-0961 • Fax : (450) 455-0350
sales.east@urecon.com • www.urecon.com

Date:	*November 21st, 2011*	**Quote #**	
From:	*Christian St-Maurice*	**Pages:**	*2 (including this page)*
Email:	*c.st-maurice@urecon.com*	**Email:**	
To:		**Phone:**	
Attn:		**Fax:**	
Ref:	*Municipality Of Red Lake*	**Closing Date:**	

Further to your request we are pleased to quote the following:
PRICES ARE NET. ALL DISCOUNTS HAVE ALREADY BEEN DEDUCTED.

Item	Quantity	Description	Unit Price
		Above Ground Portion	
1.	1000.4 m	50 mm thick U.I.P.® factory applied urethane insulation c/w 22 Ga. Galvanized steel SPIWRAP outer jacket (13" Outside diameter), one (1) integral heat trace channel and one (1) joint insulation kit per 12.2m (40ft) length on **customer supplied** 200 mmø (8") HDPE pipes.	175.75$/ea.
		Buried Portion	
2.	1000.4 m	50 mm thick U.I.P.® factory applied urethane insulation c/w 1,27 mm thick black polyethylene outer jacket, one (1) integral heat trace channel and one (1) joint insulation kit per 12.2m length on **customer supplied** 200 mmø (8") HDPE pipes.	95.49$/ea.
		Electrical Option: Electrical components required based on 120V a.c and ambient temperature of -25°C (Above/Buried application) Quantities of thermostats, sensors and other electrical components to be confirmed at time of the order	
3.	As required	Electronic thermostat model # **UTC-2030-01** with ground fault detection circuitry, 120-240 Vac, 30 A, 2 poles in a Nema 4 painted steel enclosure. Factory set @; control: 3°C, high limit: 65°C for protection of plastic piping.	850.81$/ea.
4.	As required	THERMOCABLE® **C13-240-COJ** heating cable with an output of 13 watts/meter @ 240 volts and a maximum circuit length of 245 meters.	23.51$/m
5.	As required	100 ohms RTD temperature sensor # **URTD-06-R** with 6 meters of red PVC lead wire	77.72$/ea.
6.	As required	100 ohms RTD temperature sensor # **URTD-15-G** with 15 meters of grey PVC lead wire	126.29$/ea.
7.	As required	Urecon power feed kit model **PFK-1**.	408.66$/ea.

NOTES & CONDITIONS

Terms:	*All prices are net 30 days, subject to credit approval.*
Taxes:	*All taxes are extra if applicable.*
Freight:	*EX works, St-Lazare-de-Vaudreuil (Québec)*
Validity:	*Prices are valid for 30 days and upon receipt of entire order.*
Delivery:	*4 weeks after receipt of pipe and casing.*
	To be reconfirmed at time of order.
Dimensions:	*All dimensions are nominal, outside diameters may vary.*
Returns:	*No return of merchandise will be accepted.*
Quality:	*Urecon is certified to ISO 9001.*
Quantities:	*This quote is based on unit prices. Urecon is not responsible for final takeoff quantities required for this project.*
Design:	*Urecon is not responsible for system design.*
THERMOCABLE®:	*We reserve the right to ship and bill for, up to 105% of the required length.*

Thank you once again for this opportunity to quote. We look forward to working with you on this project.

Regards,

Christian St-Maurice

WARRANTY

Urecon Ltd. warrants it's U.I.P.® insulation, outer jacket, heat tracing cable and associated accessories to be free of defects in material and workmanship, provided the product is properly handled and installed, for a period of one (1) year from the date of shipment from our plant. Urecon Ltd. shall repair or replace at it's election any portion thereof if it fails to meet the foregoing warranty, provided that installation and application of the product have been properly accomplished and that Urecon Ltd. has been notified of the defect within five (5) days of discovery. The express warranty set forth is exclusive and no other warranties of any kind, whether statutory, oral, written, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose shall apply.

LIMITATION OF RESPONSIBILITY

Urecon Ltd.'s responsibility is limited to the price of the defective merchandise and Urecon Ltd. shall not be responsible for any consequential or other damages, loss of profits or revenue or loss of use.

URECON
PRE-INSULATED PIPE
1800, avenue Bédard
Saint-Lazare, Québec, Canada J7T 2G4
Tél. : (450) 455-0961 • Fax : (450) 455-0350
sales.east@urecon.com • www.urecon.com

Date:	*November 29, 2011*	**Quote #**	
From:	*Christian St-Maurice*	**Pages:**	*2 (including this page)*
Email:	*c.st-maurice@urecon.com*	**Email:**	*kbemben@enl-tbay.com*
To:		**Phone:**	
Attn:	*Kathy Bemben*	**Fax:**	
Ref:	*Municipality Of Red Lake*	**Closing Date:**	

Further to your request we are pleased to quote the following:
PRICES ARE NET. ALL DISCOUNTS HAVE ALREADY BEEN DEDUCTED.

Item	**Quantity**	**Description**	**Unit Price**
		Above Ground Portion	
		50 mm thick U.I.P.® factory applied urethane insulation c/w 22 Ga. Galvanized steel SPIWRAP outer jacket, one (1) integral heat trace channel and one (1) joint insulation kit per 12.2m (40ft) length on ***customer supplied*** *following HDPE pipes:*	
1.	*As required*	*25 mmø (Outside diameter 6")*	*103.94$/m*
2.	*As required*	*50 mmø (Outside diameter 7")*	*153.65$/m*
3.	*As required*	*75 mmø (Outside diameter 8")*	*170.02$/m*
		Buried Portion	
		50 mm thick U.I.P.® factory applied urethane insulation c/w 1,27 mm thick black polyethylene outer jacket, one (1) integral heat trace channel and one (1) joint insulation kit per 12.2m (40ft) length on ***customer supplied*** *following HDPE pipes:*	
4.	*As required*	*25 mmø*	*48.07$/m*
5.	*As required*	*50 mmø*	*57.12$/m*
6.	*As required*	*75 mmø*	*66.70$/m*
		Electrical Option: *Electrical components required based on 120V a.c and ambient temperature of -25°C (Above/Buried application)* *Quantities of thermostats, sensors and other electrical components to be confirmed at time of the order*	
7.	*As required*	*Electronic thermostat model #* ***UTC-2030-01*** *with ground fault detection circuitry, 120-240 Vac, 30 A, 2 poles in a Nema 4 painted steel enclosure. Factory set @; control: 3°C, high limit: 65°C for protection of plastic piping.*	*1000.95$/ea.*
8.	*As required*	*THERMOCABLE®* ***C7-120-COJ*** *heating cable with an output of 7 watts/meter @ 120 volts and a maximum circuit length of 140 meters.*	*27.66$/m*
9.	*As required*	*100 ohms RTD temperature sensor #* ***URTD-06-R*** *with 6 meters of red PVC lead wire*	*91.43$/ea.*

Item	Quantity	Description	Unit Price
10.	As required	100 ohms RTD temperature sensor # **URTD-15-G** with 15 meters of grey PVC lead wire	148.58$/ea.
11.	As required	Urecon power feed kit model **PFK-1**.	480.78$/ea.

NOTES & CONDITIONS

Terms:	All prices are net 30 days, subject to credit approval.
Taxes:	All taxes are extra if applicable.
Freight:	EX works, St-Lazare-de-Vaudreuil (Québec)
Validity:	Prices are valid for 30 days and upon receipt of entire order.
Delivery:	4 weeks after receipt of pipe and casing. To be reconfirmed at time of order.
Dimensions:	All dimensions are nominal, outside diameters may vary.
Returns:	No return of merchandise will be accepted.
Quality:	Urecon is certified to ISO 9001.
Quantities:	This quote is based on unit prices. Urecon is not responsible for final takeoff quantities required for this project.
Design:	Urecon is not responsible for system design.
THERMOCABLE®:	We reserve the right to ship and bill for, up to 105% of the required length.

Thank you once again for this opportunity to quote. We look forward to working with you on this project.

Regards,

Christian St-Maurice

WARRANTY

Urecon Ltd. warrants it's U.I.P.® insulation, outer jacket, heat tracing cable and associated accessories to be free of defects in material and workmanship, provided the product is properly handled and installed, for a period of one (1) year from the date of shipment from our plant. Urecon Ltd. shall repair or replace at it's election any portion thereof if it fails to meet the foregoing warranty, provided that installation and application of the product have been properly accomplished and that Urecon Ltd. has been notified of the defect within five (5) days of discovery. The express warranty set forth is exclusive and no other warranties of any kind, whether statutory, oral, written, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose shall apply.

LIMITATION OF RESPONSIBILITY

Urecon Ltd.'s responsibility is limited to the price of the defective merchandise and Urecon Ltd. shall not be responsible for any consequential or other damages, loss of profits or revenue or loss of use.

QUOTATION

WESTERN SUPPLIES
A DIVISION OF EMCO LIMITED
P.O. BOX 2327
933 TUNGSTEN STREET
THUNDER BAY, ONTARIO P7B 5E8
TELEPHONE 1-807-345-6543 FAX 1-807-345-0090

PLEASE REFER TO THIS QUOTATION NUMBER 103111

OR PROJECT NAME WHEN ORDERING MATERAL

DATE Nov/01/11

Page 1 of 1

TO: ENI

To the Attention of: JOE DELUCA

Project: RED LAKE SUBDIVISION

F.O.B. PIPE THUNDER BAY, WEIGHTS FOB WPG.

G.S.T. EXTRA Prov. Sales Tax EXTRA

Delivery PIPE 3-4 WKS, , WEIGHTS APROX 12 WKS

TERMS and CONDITIONS

1. Terms are USUAL
2. Prices cover only quantities, types and sizes shown on this quotation and are subject to change without notice.
3. Quotations are based on present tariffs, Sales Taxes, Foreign Exchange and present manufacturers' prices and are for immediate acceptance and change without notice.
4. All goods are guaranteed in so far as warranted by the manufacturer.
5. *Indicates non stock (special) items. If returned are subject to manufacturer's restocking and all freight charges.

Signature of person issuing quotation

QUANTITY	DESCRIPTION	NET PRICE	UNIT
3000 FT	16" X 50' DR11 IPS MARWE PIPE	37.12	Foot Net
	CONCRETE WEIGHTS	252.00	EA
1000	MTR 150 MM C900 DR18 PVC WTRMN PIPE	31.10	MTR Net
	200MM	52.80	
	250MM	82.60	
	OR		
3300	FT 6 X 50' DR11 IPS HDPE WTRMN PIPE	14.00	Foot Net
	8 X 50'	16.00	
	10 X 50'	18.00	
	2" X 100' CTS HDPE SERVICE LINE PIPE	2.80	FT Net
1000	MTR 200MM DR35 PVC SANITARY PIPE	23.50	MTR Net
	150MM DR28 PVC SERVICE PIPE	18.00	
	100MM DR28 PVC SERVICE PIPE	8.63	

QUOTATION

WESTERN SUPPLIES
A DIVISION OF EMCO LIMITED
P.O. BOX 2327
933 TUNGSTEN STREET
THUNDER BAY, ONTARIO P7B 5E8
TELEPHONE 1-807-345-6543 FAX 1-807-345-0090

PLEASE REFER TO THIS QUOTATION NUMBER

019773

OR PROJECT NAME WHEN ORDERING MATERAL

DATE Nov/23/11

Page 1 of 1

TO: ENL

To the Attention of: JOE . D.

Project:

F.O.B. THUNDER BAY

G.S.T. EXTRA Prov. Sales Tax EXTRA

Delivery ABOX 4 WKS

TERMS and CONDITIONS

1. Terms are Net 30 DAY'S
2. Prices cover only quantities, types and sizes shown on this quotation and are subject to change without notice.
3. Quotations are based on present tariffs, Sales Taxes, Foreign Exchange and present manufacturers' prices and are for immediate acceptance and change without notice.
4. All goods are guaranteed in so far as warranted by the manufacturer.
5. *Indicates non stock (special) items. If returned are subject to manufacturer's restocking and all freight charges.

Signature of person issuing quotation R Lemay

QUANTITY	DESCRIPTION	NET PRICE		UNIT
1000	MTR 150mm X 6.1MTR C900 DR18 PVC PIPE C/W 50mm UP INSULATION + SINGLE H.T. CHANNEL, NO CABLE C/W JOINT KIT FOR EACH LENGTH	118.	52	MTR NET
	OR			
1000	MTR 200MM X 6.1MTR C900 DR18 PVC PIPE C/W 50mm UP INSULATION + SINGLE Channel, NO CABLE, C/W JOINT KIT FOR EACH LENGTH	152.	09	MTR NET
	Thank You Lyle Lemay			