Water

Parkland County

WILD Water Line Servicing Study

Prepared by:

AECOM
101 – 18817 Stony Plain Road NW
Edmonton, AB, Canada T5S 0C2
www.aecom.com

780 486 7000 tel
780 486 7070 fax

Project Number:

60313882

Date:

January 2015

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AECOM: 2012-01-06

AECOM
101 – 18817 Stony Plain Road NW
Edmonton, AB, Canada T5S 0C2
www.aecom.com

780 486 7000 tel
780 486 7070 fax

January 9, 2014

Chantal McKenzie, P. Eng.
Engineering Coordinator
Parkland County
53109A HWY 779
Parkland County, AB T7Z 1R1

Dear Ms. McKenzie:

Project No: 60313882

Regarding: WILD Water Line Servicing Study – FINAL

We are pleased to submit our final report for the WILD Water Line Servicing Study. We have incorporated the comments received through review of the draft report.

If you have any questions or require any further information please call.

Sincerely,
AECOM Canada Ltd.

Ahtesham Shirazi, M.Eng., P. Eng.
Manager, Water Resources, Northern Alberta
ahtesham.shirazi@aecom.com

KS:sw
Encl.

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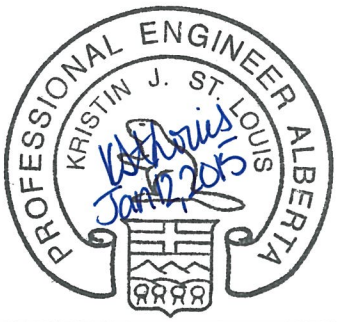

Report Prepared By:

Kristin St. Louis, P.Eng.
Water Resources Engineer

JAN 12, 2015

Report Reviewed By:

Ahtesham Shirazi, P.Eng.
Manager, Water Resources, Northern Alberta

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Executive Summary

The West Inter Lake District (WILD) Regional Water Services Commission was created to provide water to a number of communities within the region. Parkland County, as one of the members of the WILD Commission, has been allocated to withdraw a predetermined amount of water from the transmission line. Parkland County is interested in examining opportunities to provide water servicing to areas in the vicinity of the WILD water line including Duffield, Carvel, Fallis and other country residential developments as well as the Hamlet of Entwistle which is outside the vicinity of the WILD line. They would also like to service the 5th Meridian industrial area. The scope of the project includes data collection and review, water and wastewater servicing, environmental overview and evaluation of alternatives to service local communities based on the allocation as well as service Entwistle as it has its own separate allocation.

Water Servicing

For water servicing, it was assumed that the water demand for urban areas is 300 L/p/d and for rural areas 120 L/p/d. The Maximum Day Demand is assumed as 1.8 times the Average Day Demand (ADD) and the Peak Hour Demand (PHD) is 3 times the Average Day Demand (ADD). Fire storage was based on the fire flow requirements indicated in Parkland County's Engineering Design Standards and the fire duration indicated in the Fire Underwriter's Survey publication entitled "Water Supply for Public Fire Protection – a Guide to Recommended Practice". Four levels of service were examined for each community. These services include – reservoir with fire flow and distribution system, reservoir and distribution system without fire flow, trickle fill system and truck fill. All the servicing alternatives were evaluated as part of this study.

For country residential, a trickle fill system is likely the most appropriate. The country residential subdivisions selected for servicing are: Hycrest Place, Willow Peak Estates, Cherlyn Heights, Glory Lake Park, Silver Sands Estates, North Ridge Meadows, Bridge Water Properties, Chateau Heights, Winfield Heights, Sorensens and Park, Aspen Hills. These subdivisions are located north of Highway 16, between Highways 43 and 779, and include 453 lots which also allows for some country residential growth (up to 488 lots). To service Entwistle through WILD, a 35 km long 150 mm diameter line extended from Wabamun along Highway 16 will be required. A booster station will also be required at the branch that leads to Wabamun. The service alternatives for the Hamlet of Duffield include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand (without fire flow), and a local truckfill station. Approximately 12 km of 150 mm diameter line extended from Wabamun would be required to service Fallis through WILD as well as a booster station. A portion of the line and booster station could be shared with Entwistle. The service alternatives for the Hamlet of Fallis include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand, and a local truckfill station. Approximately 9 km of 100 mm diameter line extended from Duffield would be required to service Carvel through WILD. The service alternatives for the Hamlet of Carvel include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand, and a local truckfill station.

The cost per lot and per person was calculated for each potential service area for comparison and provided in a summary table below. From the study, it is recommended that Parkland County consider utilizing their WILD allocation to service Country Residential in the vicinity of the WILD alignment with a trickle fill system.

Table ES-1: Cost Estimation Summary

Location	Total Cost	Cost per Lot	Cost per Person
Country Residential	$18,225,000	$40,300	$13,500
Duffield	$2,506,000	$82,700	$27,600
Carvel	$3,164,000	$379,700	$126,600
Fallis	$4,186,000	$176,900	$59,000
Entwistle	$15,134,000	-	$21,900

Servicing of the 5th Meridian Area was examined in detail as part of the Parkland County 5th Meridian Servicing (Associated Engineering, July 2010). Parkland County has requested that the WILD Commission increase the capacity in the WILD water line to 11,467 m^3/day to accommodate 4,286 m^3/day for the future servicing of the 5th Meridian Area (West Inter Lake District Regional Water Services Commission Water Transmission – Stony Plain to Wabamum Parkland County Request for Line Upsizing - April 22, 2013, DCL Siemens).

Wastewater Servicing

The same design criteria were used for the wastewater servicing. The Alberta Capital Region Wastewater Commission (ACRWC) currently provides sanitary sewer servicing to some areas of the County west of Stony Plain. The ACRWC Parkland Sewage Transmission System (PSTS) gravity line terminates in Stony Plain. We believe that most of the residential areas in the WILD service area are currently serviced by septic fields and storage tanks. Duffield and Entwistle also have existing lagoons that treat wastewater. It is very unlikely, due to the long distance between the service areas and PSTS, that gravity servicing will be cost effective, and therefore a low pressure system was investigated. To service Country Residential, a low pressure system can be developed by putting grinder pumps at every lot. The wastewater will go to a 150 mm force main through a 50-75 mm collection system. The 15 km long force main will then tie to the ACRWC Parkland Sewage Transmission Line. The Duffield lagoon could potentially be connected to the ACRWC system through a 150 mm force main, and Carvel and Fallis may also be serviced through this line with a low pressure system. To service Entwistle by connecting to the ACRWC system, an approximate 85 km long 150 mm force main will be required. However, this is a very long force main and needs multiple lift stations along the way due to the change of elevations. It is very unlikely that this would be feasible unless there are major issues with the existing lagoon in Entwistle. Based on the evaluation of different servicing alternatives, residents with functioning private septic fields may not desire wastewater servicing. However, new country residential subdivisions in the vicinity of the ACRWC line would be good candidates for wastewater servicing and low pressure systems are often the most cost effective. The cost of wastewater servicing for country residential is $13,500 per person and $40,300 per lot.

Environmental Overview

AECOM also completed a desktop environmental overview regarding the environmental impact affiliated with expanding the West Inter Lake District (WILD) regional water system to service the Hamlets of Entwistle, Duffield, Carvel, Fallis, and other country residential developments. The environmental overview has been discussed in Section 5 of the main report.

Grant Funding

The Alberta Municipal Water/Wastewater Partnership (AMWWP) provides cost-shared funding to eligible municipalities to assist in the construction of municipal water supply and treatment and wastewater treatment and disposal facilities. The program ensures that Albertans have access to safe water supplies and adequate wastewater treatment. Parkland County is an active member of West Inter Lake District (WILD) Regional Water Services Commission and Alberta Capital Region Wastewater Commission (ACRWC).

Therefore, the water main line from Wabamun to Entwistle will be treated as part of regional system and will be eligible for 90% funding. The wastewater forcemain from country residential tie to the ACRWC Parkland Sewage Transmission System (PSTS) line will also be eligible for 90% funding. For pumps and reservoirs under the WILD project, 59.5% of project costs will be available for funding. Details about the grant findings are provided in Section 6.

Table of Contents

List of Figures

List of Tables

Appendices

Appendix A. Low Pressure Sewer System Design Guide
Appendix B. Environmental Overview Report
Appendix C AMWWP Funding Guidelines

1. Introduction

1.1 Background

The West Inter Lake District (WILD) Regional Water Services Commission was created to provide water to a number of communities within the region. The project will be completed in three phases with Phase 1, from Stony Plain to Wabamun, scheduled to be completed in 2014. Parkland County, as one of the members of the WILD Commission, has been allocated to withdraw a predetermined amount of water from the transmission line. Parkland County is interested in examining opportunities to provide water servicing to areas in the vicinity of the WILD water line including Duffield, Carvel, Fallis and other country residential developments as well as the Hamlet of Entwistle which is outside the vicinity of the WILD line. They would also like to service the 5th Meridian industrial area. Water supply to a number of existing developments is either trucked in or provided from private wells. A water servicing strategy needs to be developed along with the possibility of establishing sewer servicing for the areas that are to receive water.

1.2 Scope of Work

Key elements of the scope of work for this project are summarized below:

Data Collection and Review
- Review of existing reports, supporting documents, mapping, photography and land use data
- Review population information and 2037 targets

Water Servicing
- Confirm water allocation
- Identify servicing areas
- Establish design criteria for various levels of service
- Calculate water requirements
- Identify servicing alternatives as required
- Prepare cost estimates

Wastewater Servicing
- Align potential areas for wastewater servicing with water servicing areas
- Establish design criteria for various levels of service
- Calculate wastewater generation services areas
- Determine servicing alternatives as required
- Prepare cost estimates

Environmental Overview
- Assess project effects on ecosystem
- Historical resources overview

Evaluate Alternatives Based On
- Feasibility
- Environmental Impact
- Operation and Maintenance
- Implementation and staging
- Cost benefit and life cycle costs
- Funding opportunities

Prepare a report summarizing the findings of the study with conclusions and recommendations.

2. Information Review

2.1 Existing Reports

The following reports and documents were reviewed and are summarized as follows:

Water Transmission – Stony Plain to Wabamun – Final Report, DCL Siemens Engineering Ltd. November 2011

This is a pre-design report providing recommendations on the most feasible and cost effective options for the construction of the WILD regional water system. Water modelling was undertaken to size the piping and estimate pressures and booster station requirements. Options for the connection to the Capital Region Parkland Water Services Commission (CRPWSC) in Stony Plan were investigated and a preferred option selected. Several pipeline alignments from Stony Plain to Wabamun were examined and a preferred option selected based on environmental, land, constructability, expansion, cost and serviceability factors. Operation and maintenance costs were estimated and critical steps to move the project forward were identified.

Water Transmission – Stony Plain to Wabamun – Supplement to Final Report, DCL Siemens Engineering Ltd. January 2012

In this supplemental report, the selected alignment of the water line was refined to avoid the Highway 779 right of way. Golf Course Road was chosen for the alignment instead.

WILD Regional Water Services Commission System Business Plan Draft 5.2, April 23, 2012

The business plan sets out the nature of the WILD System to be developed, the timing of construction, the manner of operation, the expected capital costs and funding and the projected operating costs and rates required. The staging of the proposed system is laid out. Details on capital costs, financing, operating costs, revenues and rates are discussed. The plan also provides details on the projected population and water demands for each member for a 25 year growth horizon.

WILD Regional Water Services Commission Water Transmission – Stony Plain to Wabamun Technical Memorandum, DCL Siemens Engineering Ltd, July 9, 2012

This technical memorandum further adjusts the alignment to avoid a major creek crossing. The water modeling was refined to reflect better elevation information obtained from survey as well as the new alignment. Unit costs were updated and cost estimates re-done based on the new alignment, sizing, refined quantities and unit costs. In addition, directional drilling was recommended throughout. A reservoir for the system was examined as well as four truckfill locations.

Parkland County 5th Meridian Servicing Study, Associated Engineering, July 2010

In this study, various water and sanitary sewer servicing options were analysed for the 5th Meridian Area which is comprised of business industrial and estate residential land use as well as the county office located on Highway 779. It was indicated that the County would prefer to provide full municipal services to this area rather than a trickle fill system even though the initial costs would be higher as a reservoir would be required. It was recommended that water for the area be supplied either through the Town of Stony Plain distribution system or through cost sharing of a supply line from the CRPWSC to the WILD commission.

The Town of Stony Plain agreed to provide temporary water servicing to the County office but was not interested in supplying the entire development and therefore a connection to CRPWSC was selected. For sanitary servicing a gravity system, a low pressure system, and a combination of the two were presented. The system would tie into the Alberta Capital Region Wastewater Commission Trunk located just south of the study area.

2.2 Population and Land Use

The population projections utilized for Parkland County in the design of the WILD system are shown in Table 2.1.

Table 2.1: Parkland County Population Projections

Area	2012	2017	2022	2027	2032	2037
Carvel	19	20	21	22	23	25
Duffield	71	75	79	83	87	91
Entwistle*	534	566	597	628	659	693
Fallis	55	58	61	64	67	71
Non-hamlet urban	369	388	408	429	451	474
Rural	1568	1648	1732	1820	1913	2011
Total	2616	2755	2898	3046	3200	3365

**all projections are taken from the WILD Regional Water System Business Plan Draft 5.2, April 2012 with the exception of Entwistle*

The Hamlet of Entwistle was added in 2013 at the request of Parkland County. It is our understanding through discussions with the commission that Entwistle will be included in the next draft of the WILD business plan. Currently there are no official documents which include Entwistle. The total population to be serviced is 693.

The distinction between non-hamlet urban and rural is not well defined in the previous studies. It was assumed that non-hamlet urban includes subdivisions while rural includes farms and homes not located in subdivisions. Specific locations were not identified in previous studies.

3. Water Servicing

3.1 Design Criteria

The design criteria utilized in the design of the WILD water line is as follows:

- 300 L/p/d for urban areas
- 120 L/p/d for rural areas
- Maximum day demand (MDD) factor of 1.8 times the Average Day Demand (ADD)
- Peak hour demand (PHD) factor of 3.0 times the Average Day Demand (ADD)

Fire storage was based on the fire flow requirements indicated in Parkland County's Engineering Design Standards and the fire duration was specified in the Fire Underwriter's Survey publication entitled "Water Supply for Public Fire Protection – a Guide to Recommended Practice". Fire storage was based on the highest fire flow requirement within each community and is summarized in 3.1.

Table 3.1: Required Storage for Fire Protection

Location	Required Fire Flow (L/s)	Duration (hours)	Fire Storage (m^3)
Carvel	60	1.5	324
Duffield	230	3	2484
Entwistle	230	3	2484
Fallis	60	1.5	324
Country Residential	60	1.5	324

Four levels of service will be examined for most of the communities:

- Reservoir with fire flow and distribution system
- Reservoir and distribution system without fire flow
- Trickle fill system
- Truck fill

Illustrations depicting each level of service are provided in Figure 3.1.

Reservoir and Distribution System (With Fire Flow)

EPCOR supplies treated water from the E.L. Smith Water Treatment Plant to the Regional Water Customers Group (including the CRPWSC and WILD) subject to regional demand management. The maximum draw rate from the regional system has been set at the rolling five day average of EPCOR water production. The goal is to control the overall regional draw rate to mirror the previous day's production at the EPCOR water treatment plants. As per the supply contract, EPCOR has established a maximum draw rate of 1.8 times the ADD for the Regional Water Customers Group. The penalties for exceeding this are quite high and therefore, it is generally recommended that reservoirs be sized for 2 times ADD to avoid any additional charges.

For the purposes of this study the municipal water system will consist of a reservoir sized for 2 times ADD plus fire flow, and a pump station. The pump station would be equipped with a lead pump, lag pump and back up pump with generator. Distribution pumps would be designed for peak hour demand. As an alternative, a genset can provide power during emergency scenarios and the distribution pumps can be sized for the critical of PHD or MDD plus fire flow. The distribution system would be sized for the critical of PHD or MDD plus fire flow. Distribution pipe sizes are a minimum of 200 mm for residential areas and 300 mm for non-residential. Hydrants would be spaced approximately every 150 m. Each home would have a direct connection to the system and would not require storage or pumping.

The cost to provide a full distribution system as described above for smaller communities such as Duffield, Fallis and Carvel are likely not feasible and were considered for cost comparison purposes only.

A distribution reservoir with storage for fire flow would be very difficult to operate. The water turn-over rate would be very low and re-chlorination systems would be required.

Reservoir and Distribution System (Without Fire Flow)

For the purposes of this study the municipal water system will consist of a reservoir sized for double the average day demand. Distribution pumps would be sized to provide PHD to the residents with suitable pressure negating the need for local cisterns. The pump station would be equipped with a lead pump, lag pump and back up pump with a small natural gas generator. A piped distribution system would be designed for peak hour demand.

Trickle Fill System

A trickle fill system consists of a piped distribution system sized for maximum day demand (1.8 times ADD). Each home would have a storage tank (cistern) with a pump. The storage tank would fill from the system with a flow control valve. A small pump would be required to circulate the water through the distribution system. A small reservoir would be located at the pumphouse to provide an air-break. This reservoir would not be required to provide storage for the system, but rather to aid in the operation of the pumps. Fire flows would not be provided.

Trickle fill systems will be designed to supply MDD to existing cisterns. The system loop pressure would be controlled at approximately 140 kPa pressure. Each cistern fill valve would be fitted with a float assembly and backpressure control to limit the loop pressure from dropping to below 60 kPa.

Truck fill

Truck fills were assumed to service approximately twenty 3000 USgal (11,360 L) trucks per day. It was assumed that the size of the truck fill would not depend on the location as the truck fill station would service a wider number of people than the area that they are located within. They would include a small reservoir and pump station / filling station.

For the distribution and trickle fill systems, a meter would be provided for each home. The truck fill would also be equipped with a flow meter.

3.2 Allocation

The 2037 (25 Year horizon) allocation for Parkland County used in the design of the WILD Water system is summarized in Table 3.2.

Table 3.2: Parkland County Allocation

Location	2037 Population	Average Daily Water Demand (m^3)	Annual Average Water Volume (m^3)	Maximum Daily Volume (m^3)
Carvel	25	7	2,683	13
Duffield	91	27	9,987	49
Entwistle*	693	208	75,891	374
Fallis	71	21	7,751	38
Non-hamlet urban	474	142	51,875	256
Rural	2,011	241	88,068	434
Total	3,365	646	236,255	1,164

**Entwistle values were calculated based on the max day volume of 374 provided by DCL Siemens. The other values are from the WILD Regional Water System Business Plan Draft 5.2 (April 2012).*

The projected daily volumes of treated water required by the population were based on a demand of 300 L/p/d for urban density developments, and 120 L/p/d for rural development. Maximum day demands are based on a peaking factor of 1.8 times the average daily flow. These values are set out in the WILD Regional Water System Business Plan Draft 5.2 (April 2012). Specific locations for non-hamlet urban and rural were not identified.

The 2037 allocation for Parkland County is 1164 m^3/d. Excluding Entwistle the total allocation is 790 m^3/d. Based on 300 L/p/d, a peaking factor of 1.8, and a density of 3 people per lot, the total number of homes that can be serviced outside of Entwistle with the allocation is 488.

It is our understanding through discussions with Parkland County that the intention of the allocations provided was to come up with reasonable demands for the County, not that each hamlet identified would necessarily be serviced by WILD. Servicing the different locations will be investigated for cost effectiveness with the intention of prioritizing the most cost effective alternative.

3.3 Servicing Alternatives

3.3.1 Country Residential

A trickle fill system is likely the most appropriate for country residential developments. The system would consist of a small reservoir and pumphouse connecting to the WILD water line to provide an air-break. The pumphouse would then feed a distribution loop throughout the subdivision. Many existing country residential subdivisions have private cisterns to store drinking water for each lot. The distribution system would fill these cisterns. The reservoir / pumphouse would be fitted with a flow meter and a chlorine meter to track water usage and chlorine residual. Each service would have a meter as well. Unfortunately there is no information on which country residential subdivisions are serviced by cisterns versus wells. If subdivisions with wells were to be serviced by trickle fill, a cistern would have to be installed. It was assumed that homes currently on a well system would convert to a cistern system as it is anticipated that the water quality would be improved with a trickle fill system.

The average private cistern has approximately 3000 USgal (11,356 L) of storage. At 300 L/p/d and 3 people per lot, this is equivalent to between 12 and 13 days of storage. With this amount of storage provided, a peaking factor less than 1.8 may be experienced. Once the system is in place, water use can be monitored and it may be possible to service a greater number of lots with the same allocation.

The highest density of country residential within the vicinity of the WILD water line is along Township Road 534. To stay within the current Parkland County allocation the following country residential subdivisions were selected for servicing:

- Hycrest Place
- Willow Peak Estates
- Cherlyn Heights
- Glory Lake Park
- Silver Sands Estates
- North Ridge Meadows
- Bridge Water Properties
- Chateau Heights
- Winfield Heights
- Sorensens Park
- Aspen Hills

The proposed country residential subdivisions that may be serviced is shown on Figure 3.2. These subdivisions include 453 lots which allows for some country residential growth (up to 488 lots).

This is assuming that only country residential area would be serviced as opposed to hamlets. The benefit of higher density is that the required reservoir and pumphouse can be shared therefore reducing the overall cost. These subdivisions are also directly beside the WILD alignment therefore reducing connection costs and are connected to each other allowing for looping. The actual subdivision chosen for servicing will depend on whether the homeowners desire servicing and are willing to cost share. The County was not able to provide information on which subdivisions have wells and which have storage tanks. It may be the case that subdivisions with storage tanks and currently truck in water will be more likely to desire servicing than those with wells.

If it is the case that most country residential areas do not have existing cisterns, it may be cost effect to provide a pressurized distribution system without fire flow. For the purposes of this study, a reservoir sized for 2 times the average day demand and distribution pumps sized to provide peak hour demand to the residents with suitable pressure would eliminate the need for local cisterns. The pump station would be equipped with a lead pump, lag pump and back up pump with a small natural gas generator. Distribution pumps and piped distribution system would be designed for the peak hour demand.

Costs are presented in Section 3.4. Costs for traditional distribution system and truck fill options were also estimated for comparison.

3.3.2 Hamlets

Entwistle

Entwistle has an existing reservoir and distribution system with fire flow that is currently supplied by a well. To service Entwistle through WILD, a 35 km long 150 mm diameter line extended from Wabamun along Highway 16 will be required. A booster station will also be required at the branch that leads to Wabamun. Costs are shown in Section 3.4. Other level of service options were not investigated as existing infrastructure will be utilized.

Duffield

Duffield has an ultimate (2037) population of 91 people as well as a school with approximately 274 students. There is currently sanitary sewer servicing but no water servicing. Residents have wells or cisterns for potable water. The service levels for the Hamlet of Duffield as part of this assessment include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand (without fire flow), and a local truckfill station.

The ADD for the Hamlet of Duffield was based on a residential average day per capita demand of 300 L/p/d plus an allowance of 20 L/p/d for the school. Thus the design ADD for Duffield is 32,800 L/d.

With the water supply being from cisterns, the school would require a cistern of approximately 10,000 L. The trickle fill distribution loop would be sized for a MDD demand of 59,000 L (1.8 times the ADD) or a continuous flow rate of approximately 0.7 L/s.

A pressure distribution system (without fire flow) would require a small reservoir sized to store one maximum day demand of 59,000 L. The distribution loop would be sized for a peak hour demand of 98,400 L (3 times the ADD) or a continuous flow rate of approximately 1.1 L/s.

Fallis

Fallis has an ultimate (2037) population of 71 people. Approximately 12 km of 150 mm diameter line extended from Wabamun would be required to service Fallis through WILD as well as a booster station. A portion of the line and booster station could be shared with Entwistle. The service levels considered for the Hamlet of Fallis as part of this assessment include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand, and a local truckfill station.

The ADD for the Hamlet of Fallis was based on a residential average day per capita demand of 300 L/p/d. Thus the design ADD for Fallis is 21,300 L/d.

The trickle fill distribution loop would be sized for a MDD demand of 38,300 L (1.8 times the ADD) or a continuous flow rate of approximately 0.44 L/s.

A pressure distribution system (without fire flow) would require a small reservoir sized to store one maximum day demand of 38,300 L. The distribution loop would be sized for a peak hour demand of 64,000 L (3 times the ADD) or a continuous flow rate of approximately 0.74 L/s.

Carvel

Carvel has an ultimate (2037) population of 25 people. Approximately 9 km of 100 mm diameter line extended from Duffield would be required to service Carvel through WILD. The service levels considered for the Hamlet of Carvel include a trickle feed system to existing cisterns (residents without a cistern will be required to have one installed), a pressured distribution system sized for peak hour demand, and a local truckfill station.

The ADD for the Hamlet of Carvel was based on a residential average day per capita demand of 300 L/p/d. Thus the design ADD for Carvel is 7,500 L/d.

The trickle fill distribution loop would be sized for a MDD demand of 13,500 L (1.8 times the ADD) or a continuous flow rate of approximately 0.16 L/s.

With a pressure distribution system (without fire flow) would require a small reservoir sized to store one maximum day demand of 13,500 L. The distribution loop would be sized for a PHD of 22,500 L (3 times the ADD) or a continuous flow rate of approximately 0.26 L/s.

3.3.3 Other

5th Meridian Area

Servicing of the 5th Meridian Area was examined in detail in the Parkland County 5th Meridian Servicing Study by Associated Engineering. Parkland County has requested that the WILD Commission increase the capacity in the WILD water line to 11,467 m^3/day to accommodate 4,286 m^3/day for the future servicing of the 5th Meridian Area (West Inter Lake District Regional Water Services Commission Water Transmission – Stony Plain to Wabamum Parkland County Request for Line Upsizing - April 22, 2013, DCL Siemens).

Potential service areas and connections to WILD are shown on Figure 3.2.

3.4 Cost Estimates

Cost estimates for each service area and for each level of service considered are provided. Generally the costs are highest for the reservoir and distribution system followed by a trickle fill system followed by a truck fill.

3.4.1 Country Residential

Costs to provide servicing to the Country Residential areas identified under the various levels of service are provided in Tables 3.3 to 3.6.

Table 3.3: Country Residential Cost Estimates – Distribution System with Fire Flow

	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	-		-	$ 100,000
Distribution Pipe	200	30,000	300	$ 9,000,000
Service Connections	-	453 (units)	7,500	$ 3,397,500
Hydrants		200 (units)	10,000	$ 2,000,000
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pump, Reservoir (2ADD + FF)	1139	68.5 (MDD+FF)	LS	$ 1,033,400
			Subtotal	**$ 15,530,900**
			Engineering and Contingency (40%)	$ 6,212,360
			Total	**$ 21,744,000**
			Total Cost Per Person	$ 16,000
			Total Cost Per Lot	$ 48,000

Table 3.4: Country Residential Cost Estimates – Distribution System without Fire Flow

	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	-	0	-	$ 100,000
Distribution Pipe	200	30,000	300	$ 9,000,000
Service Connections	-	453 (units)	7,500	$ 3,397,500
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir and Building	815	14.2 (PHD)	LS	$ 730,000
			Subtotal	**$ 13,227,500**
			Engineering and Contingency (40%)	$ 5,291,000
			Total	**$ 18,519,000**
			Total Cost Per Person	$ 13,700
			Total Cost Per Lot	$ 40,900

Table 3.5: Country Residential Cost Estimates – Trickle Fill System

	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	-	0	-	$ 100,000
Distribution Pipe	75	30,000	150	$ 4,500,000
Cisterns (3000 USgal)	11,350	453 (units)	10,000	$ 4,530,000
Service Connections	-	453 (units)	7,500	$ 3,397,500
		Flow (L/s)		
Small Pump station / Reservoir		8.5 (MDD)	LS	$ 490,000
			Subtotal	**$ 13,017,500**
			Engineering and Contingency (40%)	$ 5,207,000
			Total	**$ 18,225,000**
			Total Cost Per Person	$ 13,500
			Total Cost Per Lot	$ 40,300

Table 3.6: Country Residential Cost Estimates - Truck Fill

	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	-	0	-	$ 100,000
	Reservoir Volume (m^3)			
Small Pump station / Reservoir	227	-	LS	$ 490,000
			Subtotal	**$ 590,000**
			Engineering and Contingency (40%)	$ 236,000
			Total	**$ 826,000**
			Total Cost Per Person	$ 700
			Total Cost Per Lot	$ 1900

3.4.2 Entwistle

Cost estimates to service Entwistle through WILD are provided in Table 3.7. Entwistle has an existing reservoir and distribution system. The costs shown for the distribution system and reservoir are required to expand the system to service the 2037 population. Any upgrades to the existing system are not shown as these upgrades would be required regardless of whether Entwistle receives water from WILD. Costs for upgrades and extensions for the ultimate build-out of Entwistle can be found in the Hamlet of Entwistle Infrastructure Assessment (Draft), AECOM, 2014.

Table 3.7: Entwistle Cost Estimates - Distribution System with Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	150	35,000	250	$ 8,750,000
Distribution Pipe	300	500	500	$ 250,000
Booster Station	-	-	LS	$ 450,000
Hydrants		3 (units)	10,000	$ 30,000
	Volume (m^3)	**Flow (L/s)**		
Upgrade Pump, Reservoir (2ADD + FF) *	2260	234 (MDD+FF)	LS	$ 1,330,000
			Subtotal	**$ 10,810,000**
			Engineering and Contingency (40%)	$ 4,324,800
			Total	**$ 15,134,000**
			Total Cost Per Person	$ 21,900

**Entwistle has an existing storage volume of 640 m^3, as such 2,260 m^3 is the additional storage required.*

*** Booster station costs will be shared with Fallis and cost has been apportioned based on the MDD flow rates.*

3.4.3 Duffield

Costs to provide water servicing to Duffield from WILD under the various levels of service are provided in Tables 3.8 to 3.11.

Table 3.8: Duffield Cost Estimates - Distribution System with Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	6,500	200	$ 1,300,000
Distribution Pipe	300	4,836	500	$ 2,418,000
Service Connections	-	30 (units)	7,500	$ 227,500
Hydrants	-	30 (units)	10,000	$ 300,000
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumphouse, Reservoir (2ADD + FF)	2538	230.7 (MDD+FF)	LS	$ 1,619,000
			Subtotal	**$ 5,864,500**
			Engineering and Contingency (40%)	$ 2,345,800
			Total	**$ 8,211,000**
			Total Cost Per Person	$ 90,300
			Total Cost Per Lot	$ 270,700

Table 3.9: Duffield Cost Estimates - Distribution System without Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	6,500	200	$ 1,300,000
Distribution Pipe	75	4,836	150	$ 725,400
Service Connections	-	30 (units)	5,000	$ 150,000
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir and Building	54	1.1 (PHD)	LS	$ 490,000
			Subtotal	**$ 2,665,400**
			Engineering and Contingency (40%)	$ 1,066,160
			Total	**$ 3,732,000**
			Total Cost Per Person	$ 41,100
			Total Cost Per Lot	$ 123,100

Table 3.10: Duffield Cost Estimates - Trickle Fill System

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	6,500	200	$ 1,300,000
Distribution Pipe	75	4,836	150	$ 725,400
Cisterns (3000 usgal)	11,350	30 (units)	10,000	$ 300,000
Service Connections	-	30 (units)	7,500	$ 225,000
	Flow (L/s)			
Pumphouse	0.7 (MDD)		LS	$ 490,000
			Subtotal	**$ 3,040,400**
			Engineering and Contingency (40%)	$ 1,216,160
			Total	**$ 4,257,000**
			Total Cost Per Person	$ 46,800
			Total Cost Per Lot	$ 140,400

Table 3.11: Duffield Cost Estimates - Truck Fill

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	6,500	200	$ 1,300,000
	Reservoir Volume (m^3)			
Small Pump station / reservoir	227		LS	$ 490,000
			Subtotal	**$ 1,790,000**
			Engineering and Contingency (40%)	$ 716,000
			Total	**$ 2,506,000**
			Total Cost Per Person	$ 27,600
			Total Cost Per Lot	$ 82,700

3.4.4 Carvel

Cost estimates to provide water servicing to Carvel from WILD under the various levels of service are provided in Tables 3.12 to 3.15.

Table 3.12: Carvel Cost Estimates - Distribution System with Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	8,850	200	$ 1,770,000
Distribution Pipe	200	705	300	$ 211,500
Service Connections	-	8 (units)	7,500	$ 60,000
Hydrants		5 (units)	10,000	$ 50,000
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir (2ADD + FF)	338	60.2 (MDD + FF)	LS	$ 603,000
			Subtotal	**$ 2,695,000**
			Engineering and Contingency (40%)	$ 1,078,000
			Total	**$ 3,773,000**
			Total Cost Per Person	$ 151,000
			Total Cost Per Lot	$ 452,800

Table 3.13: Carvel Cost Estimates - Distribution System without Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	8,850	200	$ 1, 770,000
Distribution Pipe	75	705	150	$ 105,750
Service Connections	-	8 (units)	7,500	$ 60,000
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir and Building	14	0.3 (PHD)	LS	$ 490,000
			Subtotal	**$ 2,425,750**
			Engineering and Contingency (40%)	$ 970,300
			Total	**$ 3,397,000**
			Total Cost Per Person	$ 135,900
			Total Cost Per Lot	$ 407,600

Table 3.14: Carvel Cost Estimates - Trickle Fill System

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	8,850	200	$ 1,770,000
Distribution Pipe	75	705	150	$ 105,750
Cisterns (3000 usgal)	11,350	8	10,000	$ 80,000
Service Connections	-	8 (units)	7,500	$ 60,000
		Flow (L/s)		
Small Pump station / reservoir		0.2	LS	$ 490,000
			Subtotal	**$ 2,505,750**
			Engineering and Contingency (40%)	$ 1,002,300
			Total	**$ 3,509,000**
			Total Cost Per Person	$ 140,400
			Total Cost Per Lot	$ 421,000

Table 3.15: Carvel Cost Estimates - Truck Fill

	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	8,850	200	$ 1,770,000
	Reservoir Volume (m^3)			
Small Pump station / reservoir	227		LS	$ 490,000
			Subtotal	**$ 2,260,000**
			Engineering and Contingency (40%)	$ 904,000
			Total	**$ 3,164,000**
			Total Cost Per Person	$ 126,600
			Total Cost Per Lot	$ 379,700

3.4.5 Fallis

Cost estimates to provide water servicing to Fallis from WILD under the various levels of service are provided in Tables 3.16 to 3.19.

Table 3.16: Fallis Cost Estimates - Distribution System with Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	12,500	200	$ 2,500,000
Distribution Pipe	200	4,000	300	$ 1,200,000
Service Connections	-	24 (units)	7,500	$ 180,000
Hydrants		13 (units)	10,000	$ 130,000
Booster Station	-	-	LS	$ 50,000*
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir (2ADD + FF)	366	60.44 (MDD+FF)	LS	$ 625,000
			Subtotal	**$ 4,685,000**
			Engineering and Contingency (40%)	$ 1,874,000
			Total	**$ 6,559,000**
			Total Cost Per Person	$ 92,400
			Total Cost Per Lot	$ 277,200

** Booster station costs will be shared with Entwistle and cost has been apportioned based on the MDD flow rates.*

Table 3.17: Fallis Cost Estimates - Distribution System without Fire Flow

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	12,500	200	$ 2,500,000
Distribution Pipe	200	4,000	300	$ 1,200,000
Service Connections	-	24 (units)	7,500	$ 180,000
Booster Station	-	-	-	$ 50,000*
	Reservoir Volume (m^3)	**Flow (L/s)**		
Pumps, Reservoir and Building	42	0.73	LS	$ 490,000
			Subtotal	**$ 4,420,000**
			Engineering and Contingency (40%)	$ 1,768,000
			Total	**$ 6,188,000**
			Total Cost Per Person	$ 87,200
			Total Cost Per Lot	$ 261,500

** Booster station costs will be shared with Entwistle and cost has been apportioned based on the MDD flow rates.*

Table 3.18: Fallis Cost Estimates - Trickle Fill System

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	12,500	200	$ 2,500,000
Distribution Pipe	200	4,000	300	$ 1,200,000
Cisterns (3000 USgal)	11,350	24	10,000	$ 240,000
Service Connections	-	24 (units)	7,500	$ 180,000
		Flow (L/s)		
Small Pump Station/ Reservoir		0.4 (MDD)	LS	$ 490,000
			Subtotal	**$ 4,610,000**
			Engineering and Contingency (40%)	$ 1,844,000
			Total	**$ 6,454,000**
			Total Cost Per Person	$ 91,000
			Total Cost Per Lot	$ 272,800

Table 3.19: Fallis Cost Estimates - Truck Fill

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to WILD	100	12,500	200	$ 2,500,000
	Reservoir Volume (m^3)			
Small Pump Station/ Reservoir	227		LS	$ 490,000
			Subtotal	**$ 2,990,000**
			Engineering and Contingency (40%)	$ 1,196,000
			Total	**$ 4,186,000**
			Total Cost Per Person	$ 59,000
			Total Cost Per Lot	$ 176,900

3.5 Cost Estimate Summary

The cost per home and per person was calculated for each potential service area for comparison. A summary is provided in Table 3.20. The distance to WILD is a major factor in the cost as well as the population density and level of service. Grant funding opportunities may be available and are summarized in Section 6.

Table 3.20: Cost Estimate Summary

Location	Total Cost	Cost per Lot	Cost per Person
Country Residential	$18,225,000	$40,300	$13,500
Duffield	$2,506,000	$82,700	$27,600
Carvel	$3,164,000	$379,700	$126,600
Fallis	$4,186,000	$176,900	$59,000
Entwistle	$15,134,000	-	$21,900

3.6 Water Servicing Recommendations

It is recommended that Parkland County consider utilizing their WILD allocation to service Country Residential in the vicinity of the WILD alignment with a trickle fill system. The servicing concept is illustrated in Figure 3.3. However, the precise areas serviced will depend on the property owners' desire for servicing within each subdivision.

Trucked-In Water

Trickle Fill Water Distribution

Full-Pressure Piped Water Distribution

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Figure 3.1

Parkland County

Wild Water Line Servicing Study
Water Servicing Levels of Service

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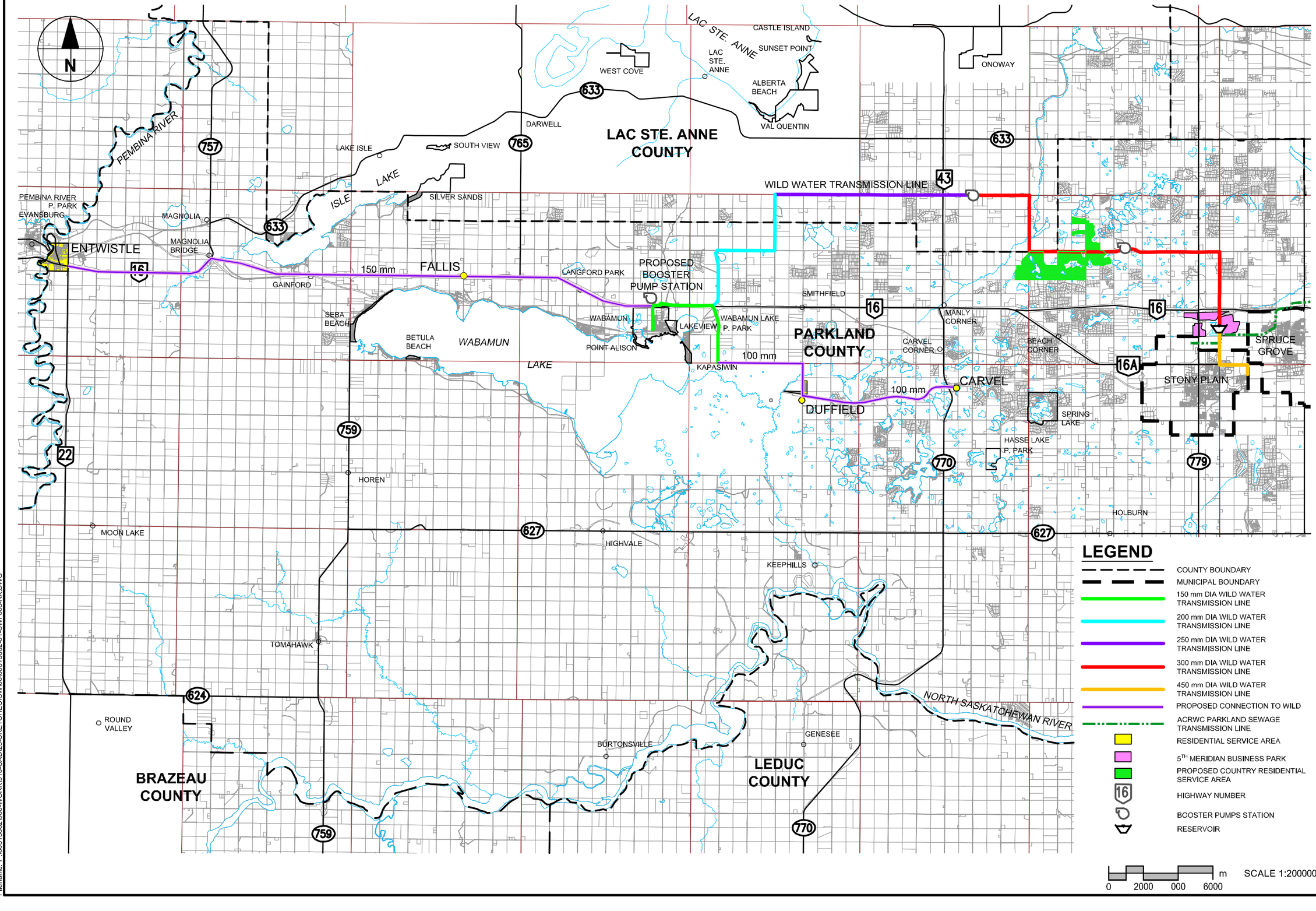
Figure 3.2



Parkland County

Wild Water Line Servicing Study
Potential Water Service Areas and Connections

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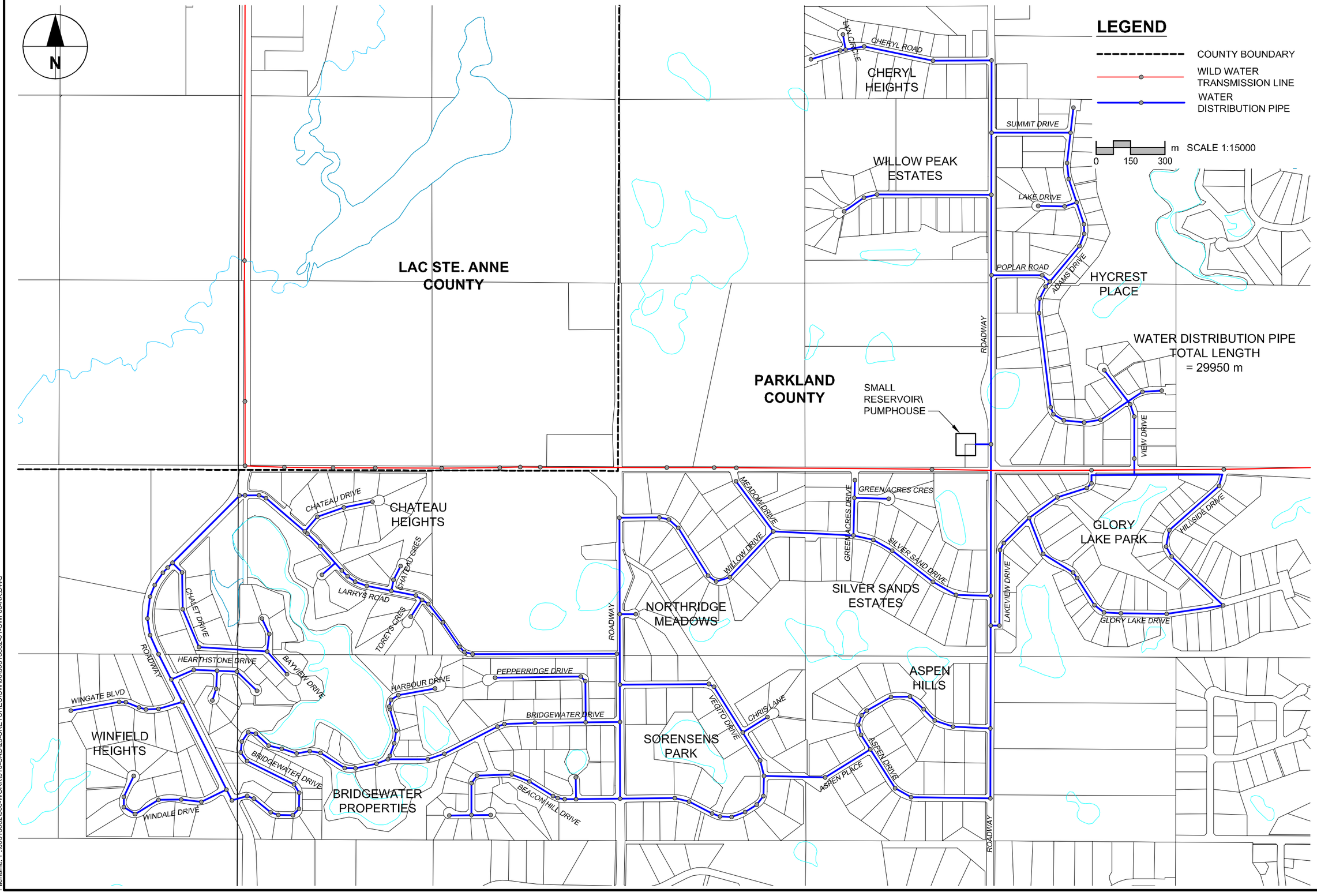

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Figure 3.3

Parkland County

Wild Water Line Servicing Study
Country Residential Servicing Concept

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4. Wastewater Servicing

4.1 Design Criteria

The same design criteria utilized in the design of the WILD water line will be applied to wastewater servicing as follows:

- 300 L/p/d for urban areas
- 120 L/p/d for rural areas

ACRWC currently provides sanitary sewer servicing to some areas of the County west of Stony Plain. The ACRWC Parkland Sewage Transmission System (PSTS) gravity line terminates in Stony Plain. We believe that most of the residential areas in the WILD service area are currently serviced by septic fields. There may also be storage tanks. Duffield, however has municipal sewage that is treated in a lagoon and the lagoon is currently at or above capacity. Entwistle also has existing lagoons that treat wastewater. Where communities have existing lagoons it can often work to maintain the existing lagoons and provide a pumped connection to the regional system. The lagoons can be maintained for storage during wet weather conditions and a lift station and force main can convey the flow to ACRWC when there is capacity available. This is beneficial to both the community as there are minimal changes to the operation of the existing system and to ACRWC as they do not necessarily have additional capacity during wet weather flows. This will also help minimize the size of the force main and pumping stations.

It is very unlikely, due to the long distance between the service areas and PSTS, that gravity servicing will be cost effective, and therefore a low pressure system was investigated. The 5th Meridian area, however, is very close to the PSTS and can easily connect by gravity as discussed in the 5th Meridian Servicing Study (AE, 2010).

The different levels of service are illustrated in Figure 4.1 while the pipeline alignment concepts are shown on Figure 4.2.

4.2 Servicing Alternatives

4.2.1 Country Residential

Existing Country Residential areas are serviced by private septic fields. These require very little maintenance but may have a negative environmental impact if close to groundwater or surface water. If municipal sewer servicing is to be provided to country residential areas then a low pressure system is likely the most appropriate and cost effective. The existing septic field systems can be retrofitted to pump to a municipal system.

To develop the low pressure system, every lot needs to have a Grinder pump and all the sewer will directly go to the force main through the collection system. A WaterCAD model was developed and the simulation results indicate that the grinder pumps can generate sufficient head; therefore no lift station is needed. A total length of 30,000 m of force main pipe will be required for the collection system. Based on 3 persons per lot, one grinder pump will be required for each lot with a pumping capacity of 0.031 L/s. It was assumed that during maximum daily flows approximately 20 grinder pumps will operate simultaneously, for a number of 477-509 pumps in the system. The pumps can operate within a pressure head of 350-500 kPa. Details about the grinder pump curve and operations are provided on Appendix A. It is recommended to use 50-75 mm pipe in the collection system and 150 mm pipe for the force main.

4.2.2 Duffield and Carvel

The Duffield lagoon could potentially be connected to the ACRWC system through a 150 mm force main on the alignment shown on Figure 4.2. This would alleviate the capacity issues at the lagoon; however, it is quite a long distance to the ACRWC connection point. Carvel may also be serviced through this line with a low pressure system.

4.2.3 Entwistle and Fallis

The Entwistle lagoon could potentially be connected to the ACRWC system through an approximately 85,000 m long 150 mm force main on the alignment shown on Figure 4.2. However, this is a very long force main and needs multiple lift stations along the way due to the change of elevations. It is very unlikely that this would be feasible unless there are major issues with the existing lagoon in Entwistle. Fallis may also be serviced through this line with a low pressure system.

4.3 Cost Estimates

Cost estimates to provide wastewater servicing to the county residential areas are provided in Table 4.1.

Table 4.1: Country Residential Wastewater Cost Estimates

Item	Diameter (mm)	Length (m)	Unit Cost ($)	Cost
Connection to ACRWC	150	15,000	250	$ 3,750,000
On-lot pump systems (pump +Septic Tank+Alarm)		453 Units	10,000	$ 4,530,000
Collection system (Primary)	75	7,000	150	$ 1,050,000
Collection System (Secondary)	50	21,000	100	$ 2,100,000
Service Connections		453 units	7,500	$ 3,398,000
			Subtotal	**$ 14,828,000**
			Engineering and Contingency (40%)	$ 5,932,000
			Total	**$ 20,760,000**
			Total Cost Per Person	$ 15,500
			Total Cost Per Lot	$ 46,000

4.4 Recommendations

It may be unlikely that residents with functioning private septic fields would desire wastewater servicing. However, new country residential subdivisions in the vicinity of the ACRWC line would be good candidates for wastewater servicing and low pressure systems are often the most cost effective.

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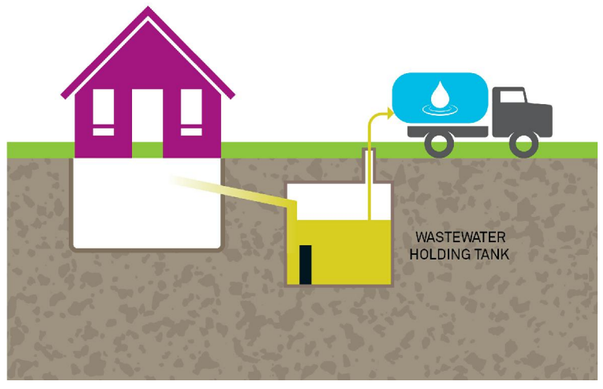
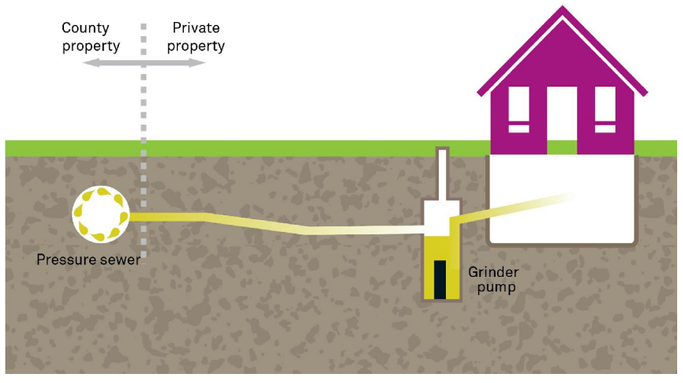
Figure 4.1

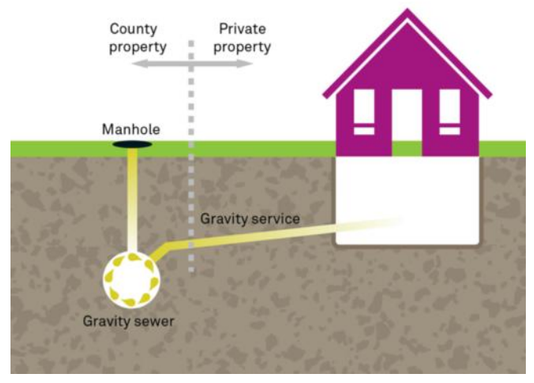
Trucked-Out Sewage



Low-Pressure System



Gravity Pipe System



Parkland County

Wild Water Line Servicing Study
Wastwater Servicing Levels of Service

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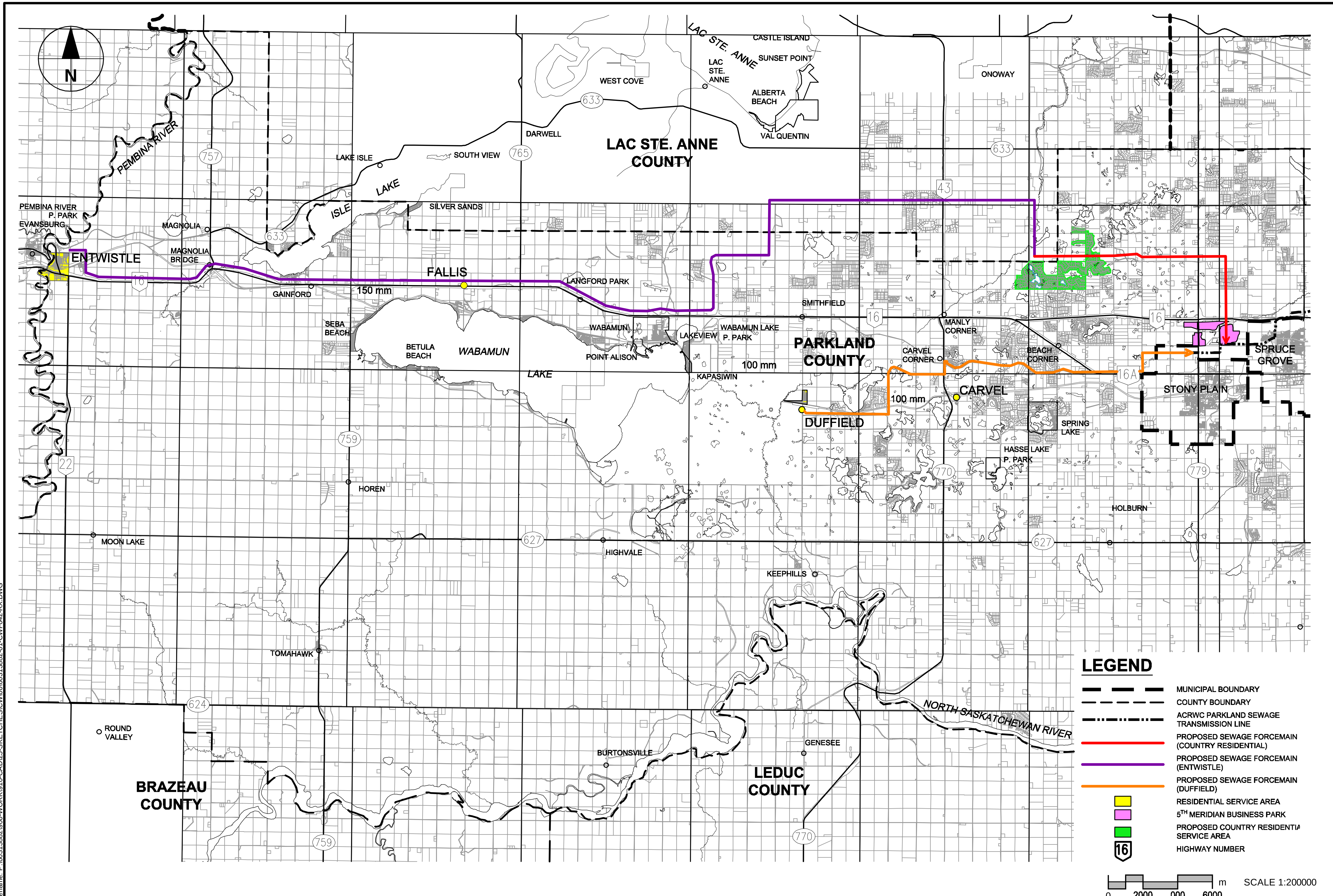
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LAC STE. ANNE COUNTY
PARKLAND COUNTY
BRAZEAU COUNTY
LEDUC COUNTY
ENTWISTLE
FALLIS
DUFFIELD
CARVEL
STONY PLAIN
SPRUCE GROVE
PEMBINA RIVER
PEMBINA RIVER P. PARK
EVANSBURG
MAGNOLIA
MAGNOLIA BRIDGE
GAINFORD
LAKE ISLE
ISLE LAKE
SOUTH VIEW
SILVER SANDS
DARWELL
WEST COVE
LAC STE. ANNE
CASTLE ISLAND
SUNSET POINT
ALBERTA BEACH
VAL QUENTIN
ONOWAY
LANGFORD PARK
SEBA BEACH
BETULA BEACH
WABAMUN LAKE
WABAMUN
POINT ALISON
LAKEVIEW
WABAMUN LAKE P. PARK
KAPASIWIN
SMITHFIELD
MANLY CORNER
CARVEL CORNER
BEACH CORNER
SPRING LAKE
HASSE LAKE P. PARK
HOLBURN
HOREN
MOON LAKE
HIGHVALE
KEEPHILLS
TOMAHAWK
ROUND VALLEY
BURTONSVILLE
GENESEE
NORTH SASKATCHEWAN RIVER
150 mm
100 mm
100 mm
LEGEND
MUNICIPAL BOUNDARY
COUNTY BOUNDARY
ACRWC PARKLAND SEWAGE TRANSMISSION LINE
PROPOSED SEWAGE FORCEMAIN (COUNTRY RESIDENTIAL)
PROPOSED SEWAGE FORCEMAIN (ENTWISTLE)
PROPOSED SEWAGE FORCEMAIN (DUFFIELD)
RESIDENTIAL SERVICE AREA
5TH MERIDIAN BUSINESS PARK
PROPOSED COUNTRY RESIDENTIA SERVICE AREA
HIGHWAY NUMBER
m
SCALE 1:200000
0 2000 000 6000

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Figure 4.2

Parkland County

Wild Water Line Servicing Study
Potential Wastewater Service Areas and Connections

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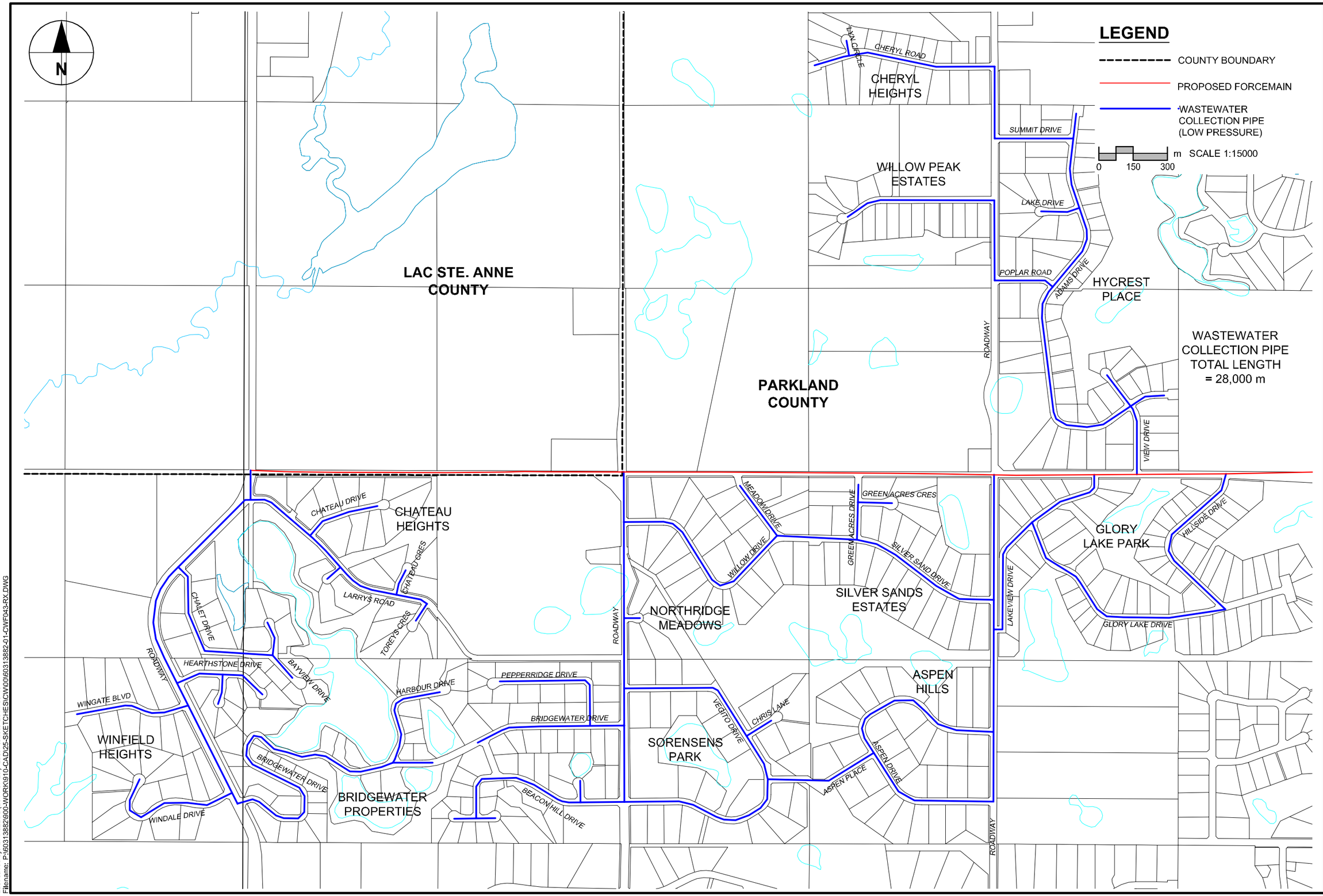

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Figure 4.3

Parkland County

Wild Water Line Servicing Study
Country Residential Wastewater Servicing Concept

5. Environmental Overview

AECOM completed an environmental overview regarding the environmental impact affiliated with expanding the West Inter Lake District (WILD) regional water system to service the hamlets of Entwistle, Duffield, Carvel, Fallis, and other country residential developments. This environmental overview report provides a broad desktop review of all applicable legislation, protected areas, and environmental conditions within the project area. For the purpose of this environmental overview, the project has been divided into three search areas: Search Area A includes Sewage Line 1 and Water Line 1 from Entwistle to Wabamun. Search Area B includes Water Line 2 from Wabamun to Carvel, and Search Area 3 includes Sewage Line 2 from Duffield to the Alberta Capital Regional Wastewater Commission (ACRWC) connection in Stony Plain.

This project lies within the Dry Mixedwood Natural Subregion of the Boreal Forest Region of Alberta. This subregion is characterized by aspen forests, cultivated lands, and fens in low lying areas. Topography is gently rolling. Luvisolic soils occur on imperfectly drained forest sites, Brunisols are common on well drained fluvial or eolian sediments, and gleysols and organic soils are associated with wetlands or poorly drained soils. The Alberta Conservation Information Management System (ACIMS) identified 10 occurrences of rare plants within Search Area A and two within Search Area B.

The desktop assessment identified numerous protected areas within the three search areas. The Colonial Nesting Bird Key Wildlife Layer for the Great Blue Heron (*Ardea herodias)* was found within all search areas. Portions of Search Area C fall within the Sharp-tailed Grouse Key Range Layer. Work should be limited between March 15th and June 15th due to the Sharp-tailed Grouse *(Tympanuchus phasianellus*) lekking (breeding) season. Search Area A contains three Environmentally Significant Areas (ESAs), Search Area B contains one ESA, and Search Area C does not contain any ESAs. Search Area A includes areas of the Pembina River Provincial Park. Search Area B borders the Wabamun Lake Provincial Park, but the actual sewage and water lines do not cross into these two parks. Regulatory bodies have established these ranges for the protection of critical areas and to preserve them from development.

A total of 30 Species at Risk, designated by federal and provincial legislation, have the potential to occur in the project area. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists eight species as “Special Concern”, seven species as “Threatened”, and two species as “Endangered”. Alberta Environment and Sustainable Resource Development (AESRD) lists 19 as “Sensitive”, five as “May Be At Risk”, three as “At Risk”, and one as “Extirpated/Extinct”.

There are a total of 28 water crossings on the proposed route of the WILD lines. Three of these crossings are mapped Class C water bodies and 13 are unmapped Class C water bodies, all with Restricted Activity periods of April 16th to June 30th. No records for Species at Risk were noted in the water bodies crossed by the proposed project routes. Various wetland types occur throughout the project area as well. Search Area A includes areas of marsh, open water, fens, and swamps for a total of 353.6 hectares (ha). Search Area B and Search Area C include areas of marsh, open water, bogs, and fens for a total of 1045.2 ha and 866.5 ha, respectively.

The major type of land use in the area is agriculture, with several Country Residential Districts along the proposed line. All projects on Public Lands must undergo a First Nations Consultation assessment request through AESRD prior to construction activities to determine consultation needs and requirements. Search Areas B and C travel along the east border of Wabamun 133A, but the actual lines do not enter the First Nations lands.

Energy Resources Conservation Board (ERCB) records were searched for spills and complaints within the project search areas and indicated a total of 12 spills and 4 complaints. On August 3, 2005, 43 Canadian National (CN) rail cars derailed, releasing petroleum hydrocarbons into Wabamun Lake.

Water quality testing was immediately started following the spill, and a long-term monitoring program was put in place. Ongoing monitoring has showed that the initial effects of the oil spill on fish in the area have diminished and the condition of the lake has improved.

A review of the proposed project area concluded that most of the area was previously disturbed by other activities suggesting there is little potential for finding undisturbed historical resource sites. The only areas that remain undisturbed fall within Search Area B (Carvel to Duffield), which would require further historical assessment should this alignment be chosen.

Pipeline construction must adhere to the *Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body* under the *Water Act*, with a notification sent to the regional Natural Resources Service office of AESRD. Multiple environmental and historical resources assessments would need to be completed prior to development. A Conservation and Reclamation Report will need to be prepared for this project as Class 1 pipelines are included in the proposed project plans. Both federal and provincial legislation, as well as land use guidelines, must be included during the planning stages of any project and adhered to prior to development. Mitigation strategies will have to be followed in areas identified as sensitive within the project area.

A detailed report on the findings of the environmental review is provided in Appendix B.

6. Grant Funding

The Alberta Municipal Water/Wastewater Partnership (AMWWP) provides cost-shared funding to eligible municipalities to assist in the construction of municipal water supply and treatment and wastewater treatment and disposal facilities. The program ensures that Albertans have access to safe water supplies and adequate wastewater treatment.

The detailed guidelines are appended in Appendix “C”. The provisions in AMWWP are briefly described as:

6.1 Funding Criteria under AMWWP

1. Funding is provided to cities (under 45,000 population), towns, villages, summer villages, regional commissions and eligible hamlets within rural municipalities for the construction of high-priority water supply and treatment and wastewater treatment and disposal facilities.
2. Water distribution and/or wastewater collection systems are not eligible for assistance.
3. Funding is provided as a percentage of eligible approved project costs. For those municipalities under 1,000 populations, projects are cost-shared on a 75 percent Government/25 percent municipality basis. For communities over 1,000 population (to a maximum of 45,000 population), grant percentage ratios are calculated by a formula. The percentage ratio declines as the population increases.
4. The program also encourages water conservation and consumption-based rate structures. Under this initiative, municipalities could be subject to a 10 percent reduction in grants if they have no metering in place and the average annual consumption exceeds the norm for the area. This applies to both water and wastewater projects.
5. Regional commissions are eligible to receive funding for multi-municipal commission-owned facilities related to water supply and treatment and wastewater treatment as outlined in the project eligibility criteria.
6. Municipalities which are part of a regional commission but require their own facilities may apply on an individual basis for program funding.

6.1.1 AMWWP Regional Systems Initiative and Water Strategy Initiative (Water for Life)

To support the development of new regional water and wastewater systems under the Alberta Municipal Water/Wastewater Partnership which are more cost-effective and/or environmentally desirable than independent systems.

The water strategy initiative is only available for NEW regional water or wastewater systems or NEW EXTENSIONS to existing regional water or wastewater systems. Funding under these initiatives is available to all regional commissions or groups of two or more municipalities (or eligible hamlets) that are eligible for funding under the AMWWP. Eligible municipalities include groups of Cities, Towns, Villages, Summer Villages, Rural Municipalities, or Metis Settlements.

The capital costs of installing the initial monitoring and control equipment needed for operational consortia is eligible for Water for Life funding at 90 percent as of June 2009. Stand-alone systems eligible for funding under the regular AMWWP qualify if two or more systems are linked.

Regional Systems initiative will be feasible due to existence of commissions for water and wastewater and Parkland County is an active member of WILD and ACRWC respectively.

a) New Extension to existing WILD Regional Water System

Parkland County is an active member of West Inter Lake District (WILD) Regional Water Services Commission since 2008. The proposed 150 mm diameter and 35 km long water supply line to provide treated water from Wabamun to the Hamlet of Entwistle is recommended to tie-in to the WILD regional water line at Wabamun as per this report. This water supply line may provide water to adjacent rural communities such as Fallis, Gainford, Seba Beach, and Magnolia Bridge. If the County wants to proceed with an ultimate connection to the WILD line, it is recommended the County enter into negotiations with the WILD Commission for possible cost sharing of a supply line that would benefit both parties. This would decrease the initial costs for the Wild West connection line. This line from Wabamun to Entwistle will be treated as part of regional system and will be eligible for 90% funding.

b) New Extension to existing ACRWC Regional Wastewater System

Parkland County is a member of Alberta Capital Region Wastewater Commission (ACRWC). ACRWC will accept sewage flow from the Parkland County.

ACRWC currently provides sanitary sewer servicing to some areas of the County west of Stony Plain. The ACRWC Parkland Sewage Transmission System (PSTS) gravity line terminates in Stony Plain. We believe that most of the residential areas in the WILD service area are currently serviced by septic fields and storage tanks. The 15 km long forcemain from Country residential will then tie to the ACRWC Parkland Sewage Transmission Line NE of Stony Plain.

If the County wants to proceed with an ultimate connection to PSTS which is part of ACRWC, it is recommended the County may enter into negotiations with the ACRWC for possible cost sharing of a forcemain that would benefit both parties. This would decrease the initial costs for the Duffield forcemain. At this point, Duffield has not been considered for servicing but it can be considered in near future based on the available funding. This forcemain from Duffield through Carvel will be treated as part of regional system and will be eligible for 90% funding.

Funding summary for both water and sanitary regional system initiatives are provided on Table 6.1.

Table 6.1: Funding Summary for Regional System Initiatives

Description	Project Category	Cost Estimate ($)	Cost + 40 % Contingency	Funding Amount ($)
REGIONAL WATER SYSTEM				
Wabamun to Entwistle Regional Water Line (150 mm - 35 km long)	Regional Waterline	$8,750,000	$12,250,000	$11,025,000
REGIONAL SANITARY SYSTEM				
Country Residential to PSTS (150 mm – 15 km Forcemain)	Connection to ACRWC	$3,750,000	$5,250.000	$4,725,000

6.2 Eligible Projects

All services, material and equipment engaged on projects eligible for funding must be from the private sector. Municipalities are encouraged to support Alberta companies supplying goods and services to the waterworks and wastewater industry.

Funding may be available for the following projects, subject to a detailed assessment of eligibility by the department:

- Planning and/or design studies directly related to an eligible project.
- Treated-water supply line from the treatment plant to the first connection point on the distribution system.
- Treated-water storage facilities and related works.

6.3 Eligible Associated Costs

Funding may be available for associated project costs which can include:

- Right-of-way acquisition and/or land costs, including expropriation costs.
- Relocation and adjustment of associated utilities.
- Engineering costs.
- Survey fees.
- Legal fees.
- Advertising for tenders.
- Other costs (such as audit fees).

Municipal officials should contact the department regarding the eligibility of any other related costs.

The following will not be considered eligible for funding:

- Municipal labour and equipment.
- Administration costs (i.e. all municipal employee salaries or council member salaries, office administration costs, etc.).
- Goods and Services Tax.
- Water license costs.

6.4 Application Procedures

There is no formal application form however, to access funding municipalities must apply directly to the Department and follow the procedures as outlined herein. The municipality is responsible for selecting a project suitable for AMWWP funding.

Municipalities should contact department officials at an early date to discuss the eligibility of proposed projects. Formal applications for assistance should be submitted to the department by November 30 to ensure consideration for the next fiscal year budget.

Parkland County may be eligible to get funding under AMWWP. The amount of funding can be calculated by considering few points mentioned below.

1. Present population is 2,616 in year 2012 to be served by WILD. The projected population will be 3,365 for a 25-year design life in 2037.
2. Water distribution and/or sewage collection systems are not eligible for assistance.
3. Funding will be available in percentage based on the present population to be served by the project and formula is:

$$\text{Percentage} = \frac{0.5 \times \text{Population} + 250}{\text{Population}} \times 100$$

For the WILD Project, 59.5% of project costs may be available for funding under AMWWP.

The funding will be available for:

- Treated-water supply line from the treatment plant to the first connection point on the distribution system.
- Treated-water storage facilities and related works.
- Outfall sewer from last connection point on the collection system to the wastewater treatment facilities.
- Wastewater treatment facilities.
- Outfall sewers from the wastewater treatment facilities to the point of discharge or disposal and related works.
- Planning and/or design studies directly related to WILD project.
- General municipal infrastructure planning studies for eligible municipalities under 10,000 population.

Based on cost estimates developed in Section 3 funding amounts have been calculated and are summarized in Table 6.2.

Table 6.2: Funding Summary for Water

Description	Project Category	Cost Estimate ($)	Cost + 40 % Contingency	Funding Amount ($)
WATER				
Country Residential				
Traditional Distribution System with Fire Flow	Reservoir	$1,033,400	$1,446,800	$860,800
Traditional Distribution System without Fire Flow	Pumps, Reservoir and Building	$730,000	$1,022,000	$608,100
Trickle System	Small Pump Station and Reservoir	$490,000	$686,000	$408,200
Truck Fill Station	Small Pump Station and Reservoir	$490,000	$686,000	$408,200
Hamlet of Duffield				
Traditional Distribution System with Fire Flow	Pumphouse and Reservoir	$1,619,000	$2,266,600	$1,348,600
Traditional Distribution System without Fire Flow	Pumps, Reservoir and Building	$490,000	$686,000	$408,200
Trickle System	Pumphouse	$490,000	$686,000	$408,200
Truck Fill Station	Truck Fill	$490,000	$686,000	$408,200
Hamlet of Carvel				
Traditional Distribution System with Fire Flow	Reservoir	$603,500	$844,900	$502,700
Traditional Distribution System without Fire Flow	Pumps, Reservoir and Building	$490,000	$686,000	$408,200
Trickle System	pumphouse	$490,000	$686,000	$408,200
Truck Fill Station	Truck Fill	$490,000	$686,000	$408,200
Hamlet of Fallis				
Traditional Distribution System with Fire Flow	Pumps, Reservoir & Booster Station	$675,000	$945,000	$562,300
Traditional Distribution System without Fire Flow	Pumps, Reservoir and Building	$540,000	$756,000	$449,800
Trickle System	Pumphouse	$490,000	$686,000	$408,200
Truck Fill Station	Truck Fill	$490,000	$686,000	$408,200
		Total Water Funding		**$8,414,300**

The Hamlet of Entwistle will not get funding as they already have pumps and reservoirs which need to be upgraded.

7. Conclusions and Recommendations

7.1 Water Servicing

Conclusions

- Parkland County, as one of the members of the WILD Commission, has been allocated to withdraw a predetermined amount of water from the transmission line.
- Parkland County's total allocation is 1,164 m^3/d which includes 374 m^3/d for Entwistle. This is maximum day demand based on a peaking factor of 1.8 and an average day demand of 300 L/person/d.
- Based on a density of 3 people per lot, 488 lots can be serviced outside of Entwistle.
- The tendency is that once homes receive municipal water servicing their consumption increases. However, for a trickle fill system, because each homeowner has storage, the peaking factor may be reduced.
- Servicing the different locations was investigated for cost effectiveness with the most cost effective alternative prioritized.
- Hamlets including Fallis, Entwistle, Carvel and Duffield as well as country residential subdivisions and rural areas were identified as potential service areas as part of the WILD Business Plan. Specific country residential or rural areas were not identified.
- As the country residential areas are closest to the WILD line, they are the most cost effective to service, as shown in Table 7.1.

Table 7.1: Water Servicing Cost Estimation Summary

Location	Total Cost	Cost per Lot	Cost per Person
Country Residential	$18,225,000	$40,300	$13,500
Duffield	$2,506,000	$82,700	$27,600
Carvel	$3,164,000	$379,700	$126,600
Fallis	$4,186,000	$176,900	$59,000
Entwistle	$15,134,000	-	$21,900

- It is currently unknown which subdivisions have wells and which have cisterns. It is likely that residents with wells will be less likely to desire servicing that those with cisterns.
- Parkland County has requested that the WILD Commission increase the capacity in the WILD water line to 11,467 m^3/day to accommodate 4,286 m^3/day for the future servicing of the 5th Meridian Area.

Recommendations

- Country residential areas were found to be the most cost effective to service; therefore, it is recommended that water servicing be provided to country residential developments.
- It is recommended that public consultation be conducted to gauge the desire for servicing in the country residential areas near the WILD alignment.
- It is recommended that the water consumption be monitored. If the peaking factor is less than 1.8 there may be potential to service more homes with the same allocation.
- A trickle fill system is recommended especially if the subdivisions have cisterns.

7.2 Wastewater Servicing

Conclusions

- The same design criteria utilized in the design of the WILD water line was applied to the wastewater servicing.

- To service Entwistle by connecting to the ACRWC system, a 150 mm force main approximately 85 km long will be required. This is a very long force main and needs multiple lift stations along the way due to the change of elevations. It is very unlikely that this would be feasible unless there are major issues with the existing lagoon in Entwistle.
- New country residential subdivisions in the vicinity of the ACRWC line are good candidates for wastewater servicing.
- It may be very unlikely that residents with functioning private septic fields would desire wastewater servicing.
- Low pressure systems are often the most cost effective.
- The estimated cost to provide water servicing to the county residential areas is provided in Table 7.2.

Table 7.2: Wastewater Servicing Cost Estimation Summary

Location	Total Cost	Cost per Lot	Cost per Person
Country Residential	$20,760,000	$46,000	$15,500

Recommendations

- It is recommended that wastewater servicing be provided to the same country residential areas that are provided with water servicing.
- To service the country residential areas, a low pressure system can be developed by putting grinder pumps at every lot. The wastewater will go to a 150 mm force main through a 50-75 mm collection system. A 15 km long force main will then tie to the ACRWC Parkland Sewage Transmission Line.

7.3 Environmental Overview

- A desktop environmental study was conducted for the project area.
- Several environment concerns have been identified which may restrict construction activities in the proposed project area at certain times of year.

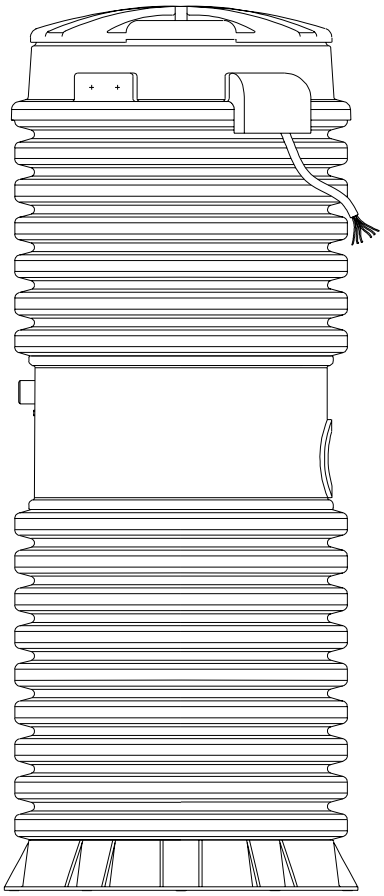
7.4 Grant Funding

- AECOM has also accessed the potential funding availability to construct the project. The Alberta Municipal Water/Wastewater Partnership provides cost-shared funding to eligible municipalities to assist in the construction of municipal water supply and treatment and wastewater treatment and disposal facilities.
- Parkland County is an active member of the WILD Regional Water Services Commission and the ACRWC.
- The water main line from Wabamun to Entwistle will be treated as part of regional system and will be eligible for 90% funding.
- The wastewater forcemain from country residential to the ACRWC Parkland Sewage Transmission System line will also be eligible for 90% funding.
- For pumps and reservoirs under the WILD project, 59.5% of project costs will be available for funding.

Appendix A

Low Pressure Sewer System Design Guide

E/ONE EXTREME SERIES



Low Pressure Sewer Systems Using Environment One Grinder Pumps

Contents

Introduction

E/One low pressure sewer (LPS) systems offer the designer new freedom in solving many problem situations that have defied reasonably economical solutions using the conventional approach.

Each LPS system design should be considered on the basis of its own unique circumstances. On such a basis, a sound choice between gravity and low pressure systems can be made.

General criteria aid the engineer in making a preliminary choice between several alternative systems: entirely low pressure, entirely gravity, entirely vacuum or a combination of systems. These criteria are presented and are intended to serve as a general guide. The final decision and design are the responsibility of the project consulting engineer, whose knowledge of local conditions, including construction costs, regulatory requirements and the client's particular needs, become vital to the preparation of the final designs and specifications.

Advantages of LPS Systems

LPS systems have low initial (front end) cost compared to gravity systems, which have nearly all the total investment allocated in the first stage. With the LPS system, grinder pump costs are incurred only as construction progresses. These costs will be deferred for many years in certain types of development programs.

An LPS system is not subject to infiltration from ground water or from surface storm water entering through leaking pipe joints and manholes. With zero infiltration, treatment plants need not be sized to handle the peak flow rates caused by infiltration. Treatment efficiencies can be more consistent, and treatment plant operating costs decrease.

An LPS system may become the critical factor in determining whether "marginal" land can be economically developed. Many attractive sites have been considered unsuitable for development because of the excessive costs typically associated with conventional sewer systems — sites with hilly terrain, land with negligible slope, high water tables, poor percolation characteristics, rock, seasonal occupancy or low population density.

Many communities are planning to convert from septic tanks to central sewage collection and treatment systems to minimize health hazards and/or environmental deterioration. The major reduction in cost and the simplicity of installation of an LPS system have strong appeal for such community improvement programs. Small-diameter pipe pressure mains can be laid along existing roadways with minimum disruption to streets, sidewalks, lawns, driveways and underground utilities. Surface restoration costs are similarly minimized. Sewage delivered to the treatment plant (because it contains no infiltration) is more uniform in "strength," the volume is smaller, and peaks are greatly reduced.

Description and Operation

Grinder pumps of approved design accomplish all pumping and sewage-grinding processes for small-diameter LPS systems.

The system consists of conventional drain, waste and vent (DWV) piping within the residence connected to the grinder pump inlet. The grinder pump may be installed above or below grade, indoors or outdoors. Depending on flow factors and model used, it may serve one or more resi-

dences, or several families in the case of apartment buildings.

Grinder pumps discharge a finely ground slurry into small–diameter pressure piping. In a completely pressurized collection system, all the piping downstream from the grinder pump (including laterals and mains) will normally be under low pressure. Pipe sizes will start at 1 1/4 inches for house connections (compared to 4 or 6 inches in gravity systems) and will be proportionally smaller than the equivalent gravity pipeline throughout the system. All pipes are arranged as zone networks without loops.

Depending on topography, size of the system and planned rate of buildout, appurtenances may include valve boxes, flushing arrangements, air release valves at significant high points, check valves and full-ported stops at the junction of each house connection with the low pressure sewer main.

Pump Operation

Low pressure sewer systems have become feasible with the availability of the Environment One grinder pump, the reliability of which has been proven in almost 40 years of service. The grinder pump station provides adequate holding capacity, reliable grinding and pressure transport of a fine slurry to an existing gravity sewer, pump station or directly to a wastewater treatment plant.

In operation, the grinder pump station will handle sewage and many items that should not, but often do, appear in domestic wastewater. For example, plastic, wood, rubber and light metal objects can be routinely handled without jamming the grinder or clogging the pump or piping system. The grinder pump will discharge this slurry at a maximum rate of 15 gpm or 11 gpm at a pressure of 40 psig. Transporting sewage several thousand feet to a discharge point at a higher elevation is possible as long as the sum of the static and friction losses does not exceed design limits of 185 feet TDH (80 psig).

The grinder pump is actuated when the depth of the sewage in the tank reaches a predetermined “turn-on” level, and pumping continues until the “turn off” level is reached. The pump’s running time is short, power consumption is low, and long pump life is ensured. The unit is protected against backflow from discharge lines by an integral check valve. Several grinder pump station models are available to satisfy various total and peak demand conditions.

Pump Type

The semi-positive displacement pump in the grinder pump station has a nearly vertical H-Q curve. This is the best type of pump for successful parallel operation of many pumps into a system of common low pressure mains. Since each pump will be located at a different point along common low pressure mains and at various elevations, each pump should operate in an efficient and predictable manner, whether one pump or numerous pumps are operating at a given moment; the pumps in such a system do not have a single fixed “operating point,” but must operate consistently over a wide range of heads that are continually, and often rapidly, changing.

The Environment One grinder pump has the capability of operating above the LPS system design criteria of 80 psig, or 185 feet (Figure 1). Based on the maximum daily number of pumps operating simultaneously (Table 3) versus the number of pumps connected to the system at the design pressure of 185 feet, the capability to operate significantly above the system’s design pressure is mandatory in order for the system to operate properly during the approximately bimonthly peaks when

the “absolute maximum” numbers of pumps are operating. This feature also ensures that pumping will continue under those conditions when higher–than–normal pressure occurs in the pipeline.

System designs with calculated heads approaching the upper limits of recommended heads should be reviewed by Environment One application specialists. Contact your local Environment One Regional Sales Office or authorized distributor for a no-cost, computerized review of your design.

Occasionally during “normal” operation, there will be short periods when higher-than-design pressures will be experienced. These can result from a variety of causes including solids buildup (obstructions) or air bubbles.

Deposits of solids or air accumulation will be purged from the line since the pump continues to produce an essentially constant flow, even though the cross section of the pipeline has temporarily been reduced. Higher velocities through the reduced cross section will provide the scouring action needed to correct such conditions as soon as they start to appear.

These higher–than–expected pressure conditions are transitory occurrences. The only requirement is that no damage be done to the pumping equipment, pipelines or appurtenances during these occasional short periods. Environment One grinder pumps are driven by motors rated for continuous operation at 104 F/40 C above ambient temperature. They can operate at 50 percent above rated pressure for at least 5 minutes without excessive temperature rise. Based on the Albany, New York, demonstration project[4], for this type of overload to last even as long as one minute would be rare.

Motor Selection

A grinder pump station is an electromechanical system that depends on electric power for its operating, control and alarm functions. The design and selection of Environment One’s pump, motor, grinder and level–sensing controls were accomplished by optimizing the wastewater transport function of the unit within the necessary constraints for unattended, trouble–free operation in a residential environment.

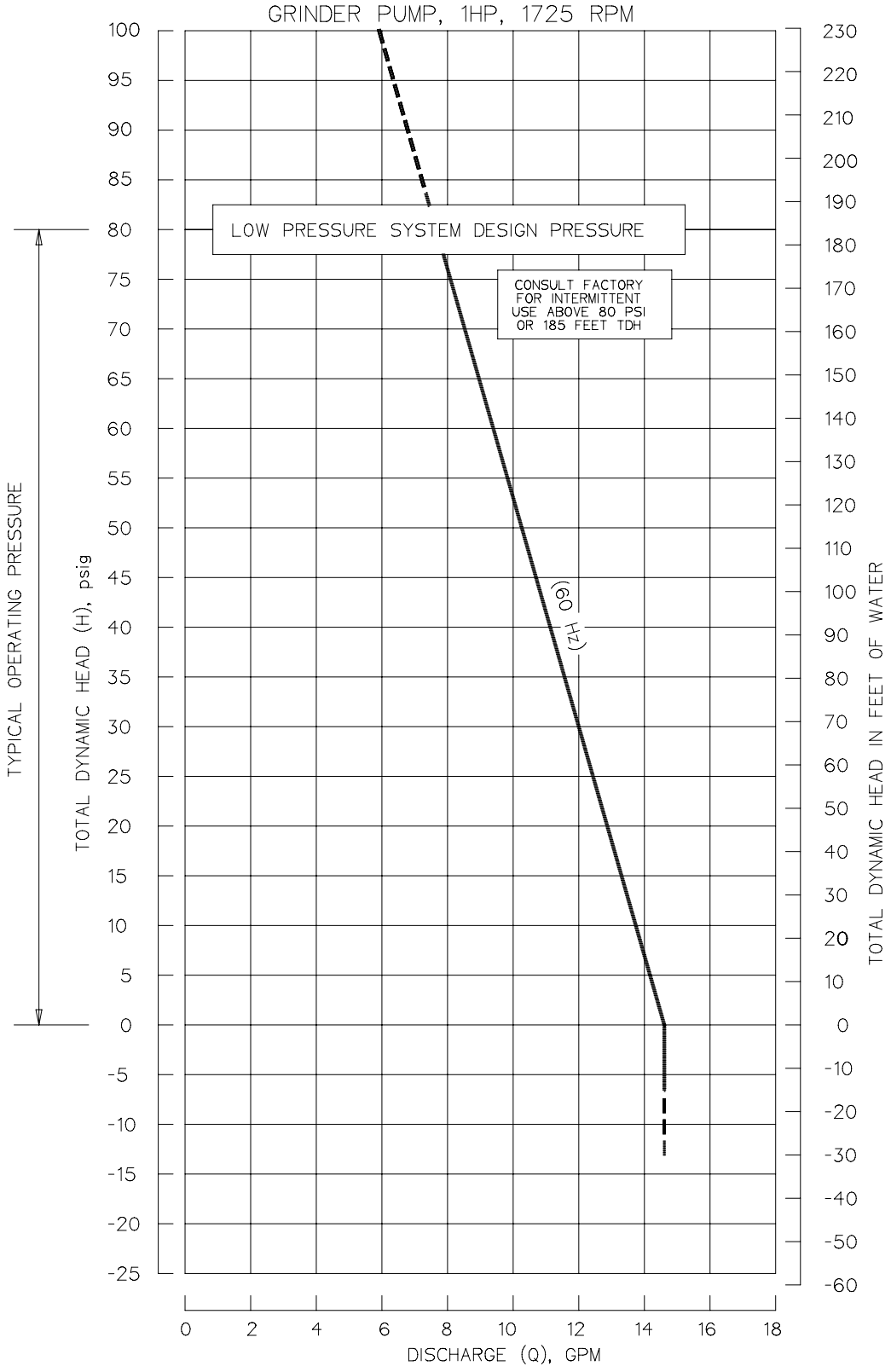
A single grinder pump core is common to all models of Environment One grinder pumps (models DH071, DH151, DH152, DH272 and DH502). This central core contains all of the working and control elements of the unit and is powered by a 1 hp, 240v (or 120v), 1,725 rpm capacitor start, thermally protected induction motor. Each of these motor features was carefully considered in the design of the grinder pump station.

The pump should be considered as a residential appliance. For this reason, performing the grinding and pumping functions using no more than 1 hp to permit occasional use at 120v in older homes not wired for 240v is desirable. In order to achieve the high heads desired and provide constant flow at varying heads, the 1-hp motor is coupled to a pump of semi-positive displacement design (Figure 1).

At a rating of 1 hp and 1,725 rpm, the Environment One grinder pump develops more than 8.4 foot-pounds of torque. Motors used to drive centrifugal pumps are often rated at 2.0 hp at 3,450 rpm and may produce less torque. When handling residential sewage, grinding torque may be demanded during any portion of the starting or running cycle. When the pump stops (controlled by level) in the midst of grinding hard objects (e.g. tongue depressors, plastic items, etc.), it must, upon restarting, be able to provide sufficient torque to the grinder to overcome the resistance of any object remaining from the previous cycle.

Figure 1

Grinder Pump Performance Characteristics



Power Outages

Environment One grinder pump stations have adequate excess holding capacity to provide wastewater storage during most electrical power outages (Figure 2). This excess holding capacity is shown on curve A. Data from the Federal Power Commission on national electrical power outages is plotted as a cumulative distribution function (curve B). Note that only volume above the normal "turn-on" level was counted as available storage. The average flow of 1.54 gallons/hour/person is based on the actual measured flow over a one-year period at the Albany Demonstration Project[4].

The local electrical power utility should be contacted to obtain a history on the power interruptions of the feeder(s) scheduled to serve the low pressure sewer site. From this data, curve B should be replotted to reflect local conditions. In those rare local areas where the frequency and/or the duration of outages exceed 7.5 hours, the use of Model DH151, with its greater holding capacity than that of the DH071, could be considered.

When power has been restored after a power outage, it is likely that nearly all the pumps in the system will try to operate simultaneously. Under these conditions, the dynamic head loss component of the total head will rise significantly. A number of pumps in the system would see a total back pressure high enough to cause the thermal overload protectors to automatically trip in a few minutes. Operation under conditions that could cause damage to the pumps or the system would be avoided. While these pumps are offline, other pumps in the system would be able to empty their tanks. After one to two minutes, the group that tripped off on thermal overload would cool and restart. The system back pressure would have been reduced and the group would be able to pump down normally. This process repeats itself automatically under the influence of each unit's own thermal protector, reliably restoring the system to normal operation.

Power Consumption

Monthly power consumption of a residential grinder pump station is substantially less than that of other major appliances. The power consumption will vary based on the system operating parameters. The monthly cost can be approximated using the following equation and operating data:

$$\frac{\text{* Watts} \times \text{GPD} \times \text{Days/Mo}}{\text{** GPM} \times \text{60 min} \times \text{1000}} = \text{kwhr per month}$$

Discharge Pressure (PSI)	0	25	60	80
* Watts	690	770	1100	1400
** Flow (GPM)	15	12.4	9.3	7.7

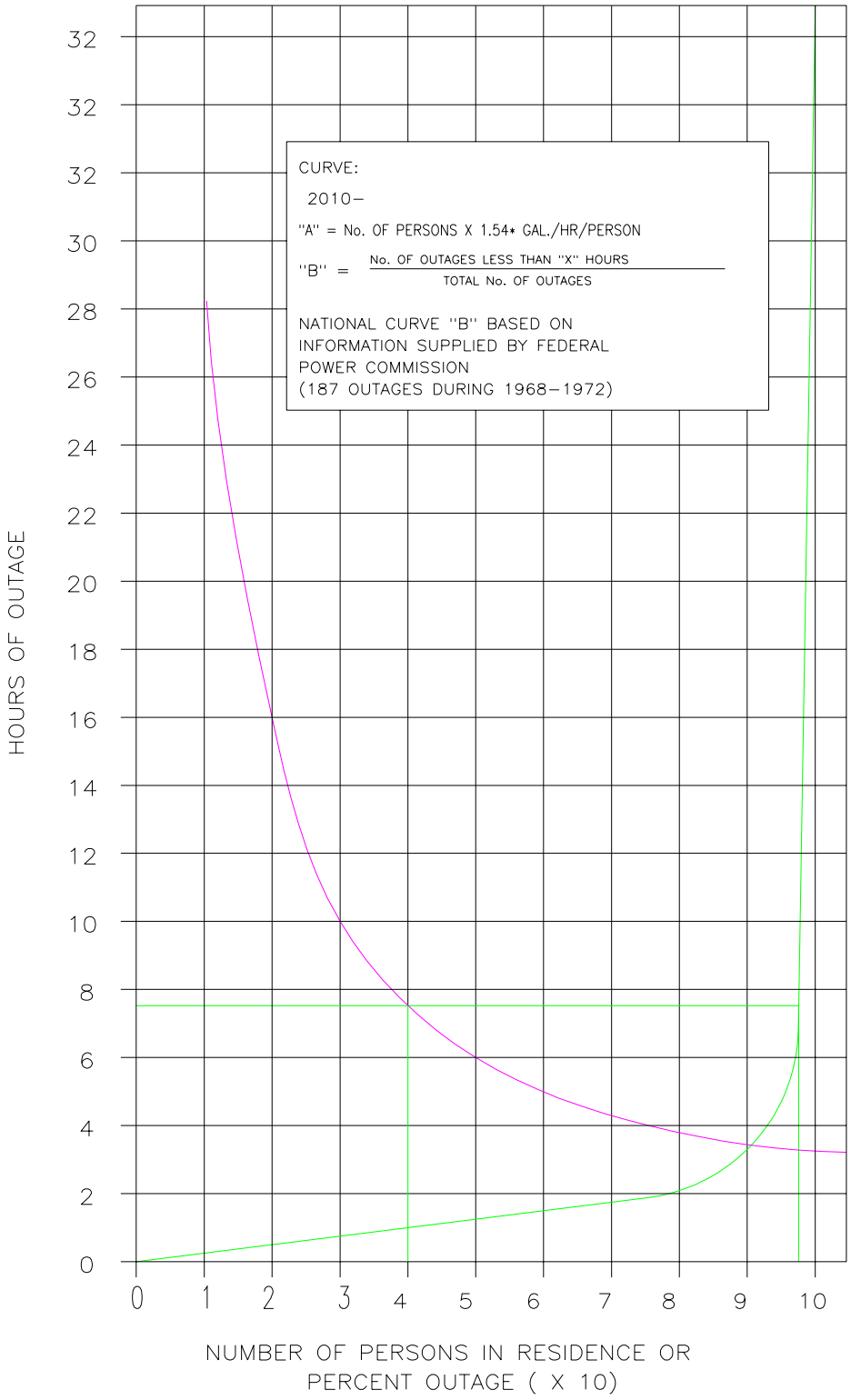
As an example of the calculation for a typical single-family home using 250 GPD, pumping at 25 psi is:

$$\frac{770\ \text{W} \times 250\ \text{GPD} \times 30\ \text{Days}}{12.4\ \text{GPM} \times 60\ \text{min} \times 1000} = 7.76\ \text{kwhr per month}$$

Then, multiply the kilowatt hours by the current cost of electricity and you will have an approximate monthly cost of running the unit.

Figure 2

Relationship of GP Storage Capacity to Power Outage Experience



EXAMPLE:

1. GP 2010 INSTALLED
2. FOUR PERSONS IN RESIDENCE
3. FOLLOW VERTICAL LINE 4 UPWARD TO CURVE "A" FOR GP 2010
4. HORIZONTALLY LEFT SHOWS 7–1/2 HOURS OF STORAGE CAPACITY
5. HORIZONTALLY RIGHT TO CURVE "B"
6. VERTICALLY DOWN SHOWS 97% OF THE NATIONS OUTAGES ARE SATISFIED

LPS System Design

Once the initial analysis of a project has confirmed the feasibility of using the low-pressure approach, the completion of a preliminary system design is straightforward. This is primarily a result of two characteristics of E/One's semi-positive displacement pump: near-constant flow over the entire range of operating pressures and the ability of the pump to handle transient overpressures.

The balance of this section outlines a systematic approach to LPS system design, leading from pump model and pipe selection to a detailed zone and system analysis.

Information Required

The information that should be assembled prior to initiation of the LPS system design includes:

- Topography map
- Soil conditions
- Climatic conditions (frost depth, low temperature and duration)
- Water table
- Applicable codes
- Discharge location
- Lot layout (with structures shown, if available)
- Total number of lots
- Dwelling type(s)
- Use and flow factors (seasonal occupancy or year-round, appliances, water supply sources)
- Area development sequence and timetable

Grinder Pump Station Size Selection

Use this table to select grinder pump models for the types of occupancy to be served.

Model	Recommended Flow (gpd)	Adequate for Managing …
DH071	up to 700	Flow from one average single-family home, and up to two average, single-family homes where codes allow and with consent of the factory.
DH151	up to 1,500	Flow from up to two average single-family homes, and up to six average, single-family homes where codes allow and with consent of the factory.
DH152	up to 3,000	Flow from up to four average single-family homes, and up to 12 average, single-family homes with consent of the factory.
DH272	up to 5,000	Flow from up to six average single-family homes, and up to 20 average, single-family homes with consent of the factory.
DH502	up to 6,000	Flow from up to nine average single-family homes,

and up to 24 average, single-family homes with consent of the factory.

Considerations include:

- Wetwell and discharge piping must be protected from freezing
- Model and basin size must be appropriate for incoming flows, including peak flows
- Appropriate alarm device must be used
- Suitable location

Daily flows above those recommended may exceed the tank's peak flow holding capacity and/or shorten the interval between pump overhauls. The company should be consulted if higher inflows are expected.

The final selection will have to be determined by the engineer on the basis of actual measurements or best estimates of the expected sewage flow.

Grinder Pump Placement

The most economical location for installation of the grinder pump station is in the basement of the building it will serve. However, due consideration must be given when choosing an indoor location. If there is a risk of damage to items located in the basement level, other provisions should be made during basement installation or an outdoor unit should be considered.

Considerations such as ownership of the pumps by a municipality or private organization and/or the need for outdoor accessibility frequently dictate outdoor, in-ground installations. For outdoor installations, all GP models are available with high density polyethylene (HDPE) integral accessways ranging in height up to 10 feet. By keeping the unit as close as possible to the building, the lengths of gravity sewer and wiring will be minimized, keeping installation costs lower while reducing the chances of infiltration in the gravity flow section.

AC power from the building being served should be used for the grinder pump. Separate power sources add to installation and O&M costs, decrease overall reliability and frequently represent an aesthetic issue.

When two dwellings are to be served by a single unit, the station is usually placed in a position requiring the shortest gravity drains from each home. With multi-family buildings, more than one grinder pump may be required.

Pipe Selection

The final determination of the type of pipe to be used is the responsibility of the consulting engineer. In addition, the requirements of local codes, soil, terrain, water and weather conditions that prevail will guide this decision.

Although pipe fabricated from any approved material may be used, most LPS systems have been built with PVC and HDPE pipe. Continuous coils of small-diameter, HDPE pipe can be installed with automatic trenching machines and horizontal drilling machines to sewer areas at lower cost.

Table 1
PIPE WATER CAPACITY
Gallons/100 feet of Pipe Length

Nominal Pipe Size (in.)	Sch 40 PVC	SDR 21 PVC	SDR 11 HDPE
1 1/4	7.8	9.2	7.4
1 1/2	10.6	12.1	9.9
2	17.4	18.8	15.4
2 1/2	23.9	27.6	—
3	38.4	40.9	33.5
4	66.1	67.5	55.3
5	103.7	103.1	84.5
6	150.0	146.0	119.9
8	260.0	249.0	203.2

Table 2
PVC PIPE COMPARISONS
Nominal Pipe Size = 2 in.

Parameter	Sch 40	SDR 21
Wall Thickness, in.	0.154	0.113
Inside Diameter, in.	2.067	2.149
50 gpm Friction Loss, ft/100 ft	4.16	3.44

Table 1 compares the water capacity of two types of PVC pipe commonly used: SDR-21 and Sch 40, and one type of HDPE, SDR-11. All three have adequate pressure ratings for low pressure sewer service.

Although both types of PVC pipes are suitable, the three parameters compared in Table 2 illustrate why SDR-21 is suggested as a good compromise between capacity, strength, friction loss characteristics and cost.

System Layout

A preliminary sketch of the entire pressure sewer system should be prepared (Figure 3). Pump models should be selected and their location (elevation) should be noted. The location and direction of flow of each lateral, zone and main, and the point of discharge should be shown.

The system should be designed to give the shortest runs and the fewest abrupt changes in direction. “Loops” in the system must be avoided as they lead to unpredictable and uneven distribution of flow.

Although not shown in Figure 3, the elevation of the shutoff valve of the lowest-lying pump in each zone should be recorded and used in the final determination of static head loss. Since Environment One grinder pumps are semi-positive displacement and relatively insensitive to changes in head, precisely surveyed profiles are unnecessary.

Air/vacuum valves, air release valves and combination air valves serve to prevent the concentration of air at high points within a system. This is accomplished by exhausting large quantities of air as the system is filled and also by releasing pockets of air as they accumulate while the system is in operation and under pressure. Air/vacuum valves and combination air valves also serve to prevent a potentially destructive vacuum from forming.

Air/vacuum valves should be installed at all system high points and significant changes in grade. Combination air valves should be installed at those high points where air pockets can form. Air release valves should be installed at intervals of 2,000 to 2,500 feet on all long horizontal runs that lack a clearly defined high point.

Air relief valves should be installed at the beginning of each downward leg in the system that exhibits a 30-foot or more drop. Trapped pockets of air in the system not only add static head, but also increase friction losses by reducing the cross sectional area available for flow. Air will accumulate in downhill runs preceded by an uphill run.

Long ascending or descending lines require air and vacuum or dual-function valves placed at approximately 2000-foot intervals. Long horizontal runs require dual function valves placed at approximately 2000-foot intervals.

Pressure air release valves allow air and/or gas to continuously and automatically released from a pressurized liquid system. If air or gas pockets collect at the high points in a pumped system, then those pressurized air pockets can begin to displace usable pipe cross section. As the cross section of the pipe artificially decreases, the pump sees this situation as increased resistance to its ability to force the liquid through the pipe.

Air relief valves at high points may be necessary, depending on total system head, flow velocity and the particular profile. The engineer should consult Environment One in cases where trapped air is considered a potential problem.

Cleanout and flushing stations should be incorporated into the pipe layout. In general, cleanouts should be installed at the terminal end of each main, every 1,000 to 1,500 feet on straight runs of pipe, and whenever two or more mains come together and feed into another main.

Zone Designations

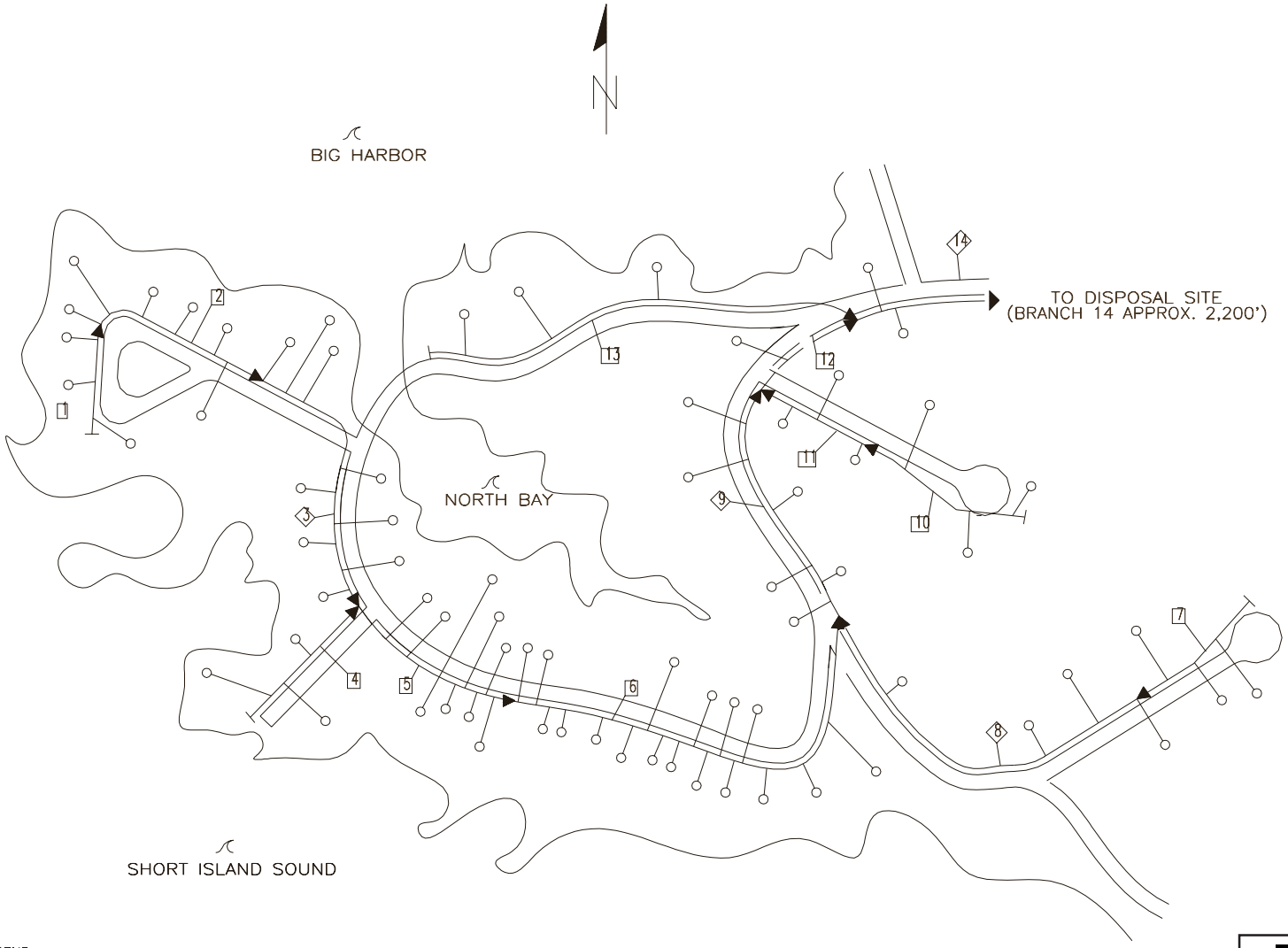
The LPS system illustrated in Figure 3 contains 72 pumps and is divided into 14 individually numbered zones. Division into zones facilitates final selection of pipe sizes, which are appropriate in relation to the requirements that flow velocity in the system is adequate and that both static and dynamic head losses are within design criteria. Assignment of individual zones follows from the relationship between the accumulating total number of pumps in a system to the predicted number that will periodically operate simultaneously (Table 3).

Table 4 was initially developed after careful analysis of more than 58,000 pump events in a 307-day period during the Albany project (4). It was extended for larger systems by application of probability theory. The validity of this table has since been confirmed by actual operating experience with thousands of large and small LPS systems during a 34-year period.

Using Figure 3, the actual exercise of assigning zones is largely mechanical. The single pump farthest from the discharge point in any main or lateral constitutes a zone. This and downstream pumps along the main are accumulated until their aggregate number is sufficient to increase the number of pumps in simultaneous operations by one, i.e., until the predicted maximum flow increases by 11 gpm.

Figure 3 shows that zones 1, 2 and 3 end when the number of pumps connected total 3, 6 and 9, and the number of pumps in daily simultaneous operation are 2, 3 and 4, respectively.

Any place where two or more sections of main join, or where the outfall is reached, also determines the end of a zone. This design rule takes precedence over the procedure stated above, as seen in



LEGEND:

- FLUSHING CONNECTION
- INLINE FLUSHING CONNECTION
- BRANCH DIVIDER & FLOW INDICATOR
- GRINDER PUMP STATION
- 3 – ZONE NUMBER
- DISCHARGE

SYSTEM FLOW DIAGRAM
ILLUSTRATED EXAMPLE

e|one	
PRESSURE SEWER	
FIRST MADE FOR –	
AE-732	–
DRAWING NUMBER SH OF	REV

zones 3, 4, 6, 8, 9, 11, 12, 13 and 14.

Completion of Pipe Schedule and Zone Analysis

The data recorded on the System Flow Diagram (Figure 3) is then transferred to Table 4.

Table 4 Column No.	Designation
1	Zone Number
2	Connects to Zone
3	Number of Pumps in Zone
4	Accumulated Pumps in Zone
11	Length of Main this Zone in Feet

Column 4 is completed by referring to Table 3, where the maximum number of pumps in simultaneous operation is given as a function of the number of pumps upstream from the end of the particular zone. The output of each zone will vary slightly with head requirements, but under typical conditions, the flow is approximately 11 gpm. Calculate the maximum anticipated flow for each zone by multiplying the number of simultaneous operations in Column 7 by 11 gpm and record the results in Column 8.

To complete columns 9, 10, 12 and 13, refer to Flow Velocity and Friction Head Loss table for the type of pipe selected — in this case, Table 5 for SDR-21. It will be seen that the engineer will frequently be presented with more than one option when selecting pipe size. Sometimes a compromise in pipe size will be required to meet present needs as well as planned future development. As a general rule, pipe sizes should be selected to minimize friction losses while keeping velocity near or above 2 feet per second.

For example, Zone 1 has a maximum of two pumps running (Column 7). Table 5 offers a choice of 1.25-inch, 1.5-inch or 2-inch pipe. 1.5-inch pipe is selected since flow velocity equals

Table 3
MAXIMUM NUMBER OF GRINDER PUMP CORES OPERATING DAILY

Number of Grinder Pump Cores Connected	Maximum Daily Number of Grinder Pump Cores Operating Simultaneously
1	1
2–3	2
4–9	3
10–18	4
19–30	5
31–50	6
51–80	7
81–113	8
114–146	9
147–179	10
180–212	11
213–245	12
246–278	13
279–311	14
312–344	15
345–377	16
378–410	17
411–443	18
444–476	19
477–509	20
510–542	21
543–575	22
576–608	23
609–641	24
642–674	25
675–707	26
708–740	27
741–773	28
774–806	29
807–839	30
840–872	31
873–905	32
906–938	33
939–971	34
972–1,004	35

BY:	DATE:	PRELIMINARY LOW-PRESSURE SEWER SYSTEM PIPE SCHEDULE AND ZONE ANALYSIS OF:	Environment/One CORPORATION	
PIPE: SDR 21 PVC			AE	
PREPARED FOR:		Illustrated Example Table 4	SHEET NO. OF	REV

1 ZONE NO.	2 CONN. TO ZONE	3 NO. PUMPS IN ZONE	4 ACCUM. PUMPS IN ZONE	5 GAL/DAY PER CORE	6 MAX. FLOW PER CORE	7 MAX. SIM OPS	8 MAX. FLOW (gpm)	9 PIPE SIZE (in)	10 MAX. VELOCITY (FPS)	11 LENGTH OF MAIN THIS ZONE	12 FRICTION LOSS FACTOR (ft/100 ft)	13 FRICTION LOSS THIS ZONE	14 ACCUM. FRICTION LOSS (ft)	15 MAX. MAIN ELEV.	16 MIN. PUMP ELEV.	17 STATIC HEAD (ft)	18 TOTAL DYNAMIC HEAD (ft)
1	2	3	3	200	11	2	22	1.5	3.04	205	2.15	4.41	73.41	40	10	30	103.41
2	3	6	9	200	11	3	33	2.0	2.92	380	1.54	5.86	69.00	40	10	30	99.00
3	5	9	18	200	11	4	44	2.0	3.89	630	2.63	16.56	63.14	40	5	35	98.14
4	5	3	3	200	11	2	22	1.5	3.04	310	2.15	8.46	53.25	40	5	35	88.25
5	6	9	30	200	11	5	55	3.0	2.24	800	0.60	4.83	46.58	40	5	35	81.58
6	9	17	47	200	11	6	66	3.0	2.69	1,000	0.85	8.46	41.75	40	5	35	76.75
7	8	3	3	200	11	2	22	1.5	3.04	175	2.15	3.77	49.56	40	5	35	84.56
8	9	4	7	200	11	3	33	2.0	2.92	810	1.54	12.50	45.80	40	30	10	55.80
9	12	6	60	200	11	7	77	3.0	3.14	520	1.12	5.85	33.30	40	10	30	63.30
10	11	3	3	200	11	2	22	1.5	3.04	230	2.15	4.95	37.03	40	10	30	67.03
11	12	3	6	200	11	3	33	2.0	2.92	300	1.54	4.63	32.08	40	10	30	62.08
12	14	1	67	200	11	7	77	3.0	3.14	240	1.12	2.70	27.45	40	10	30	57.45
13	14	3	3	200	11	2	22	1.5	3.04	985	2.15	21.19	45.94	40	5	35	80.94
14	14	2	72	200	11	7	77	3.0	3.14	2,200	1.12	24.75	24.75	40	30	10	34.75

3.04 ft/sec and friction loss equals 2.15 ft/100 ft. Since the zone is 205 feet in length (Column 11), the total friction loss (Column 13) is:

$$HF = (2.15 \text{ ft}/100 \text{ ft})(205 \text{ ft}) = 4.41 \text{ ft}$$

For Zone 14, with 72 upstream pumps, it is seen that a maximum of seven pumps can be running simultaneously. Table 5 provides options of:

3-inch pipe: V = 3.14 ft/sec; HF = 1.12 ft/100 ft

or

4-inch pipe: V = 1.90 ft/sec; HF = 0.33 ft/100 ft

The smaller-diameter 3-inch pipe is selected because of the increased velocities, especially with the TDH below 185 feet. A choice of 3-inch pipe would lead to a friction loss in this zone of:

$$HF = (1.12 \text{ ft}/100 \text{ ft})\ (2200 \text{ ft}) = 24.75 \text{ ft}$$

Accumulated friction loss (Column 14) for each zone is next determined by adding the friction loss for each zone from the system outfall (Zone 14) to the zone in question. Thus, from Figure 3 it is seen that the accumulated friction loss for Zone 1 is:

Zone Number	Friction Loss (ft)
14	24.75
12	2.70
9	5.85
6	8.46
5	4.83
3	16.56
2	5.86
1	4.41

73.41 ft = Accumulated friction loss, Zone 1

The same summation is completed for each zone.

To complete the hydraulic analysis, refer to the drawing contours and record in Column 15 the maximum line elevation between the point of discharge and the zone under consideration. In Column 16, record the elevation of the lowest pump in the zone. Subtract the values in Column 16 from

those in Column 15 and record only positive elevation differentials in Column 17. Add the values in Column 14 to those in Column 17 and record the total in Column 18 to show the maximum combination of friction and static head a pump will experience at any given point in the system.

Review

The accumulated data in Table 4 should finally be reviewed for conformity with the criteria of flow velocity greater than or equal to 2.0 ft/sec and total design head less than or equal to 185 feet. If the system pressure exceeds 92 feet, the number of cores operating will remain the same and the flow from each pump will be reduced from 11 gpm to 9 gpm.

Data should be reviewed to determine whether system improvements could result from construction modifications. As an example, deeper burial of pipe in one or two critical high-elevation zones might bring the entire system into compliance with design criteria. Environment One should be consulted in marginal cases and/or concerning:

- Odor control issues
- Frost protection issues
- Excessive static head conditions
- Excessive total dynamic head conditions
- Unusual applications

Table 5
SDR 21 PVC PIPE

Flow Velocity and Friction Head Loss *vs* Pumps in Simultaneous Operation (C = 150)

	1 1/4 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		5 in.		6 in.		8 in.		
N	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**N**
1	1.99	**1.15**	1.52	**0.60**															1
2	3.99	**4.16**	3.04	**2.15**	1.95	**0.73**													2
3	5.98	**8.82**	4.56	**4.56**	2.92	**1.54**	1.99	**0.61**											3
4	7.97	**15.02**	6.08	**7.77**	3.89	**2.63**	2.66	**1.04**	1.79	**0.40**									4
5					4.87	**3.97**	3.32	**1.57**	2.24	**0.60**									5
6					5.84	**5.57**	3.99	**2.20**	2.69	**0.85**									6
7					6.81	**7.41**	4.65	**2.93**	3.14	**1.12**	1.90	**0.33**							7
8							5.32	**3.75**	3.59	**1.44**	2.17	**0.42**							8
9							5.98	**4.66**	4.04	**1.79**	2.44	**0.53**							9
10							6.64	**5.67**	4.49	**2.18**	2.71	**0.64**							10
11									4.93	**2.60**	2.98	**0.76**	1.95	**0.27**					11
12									5.38	**3.05**	3.25	**0.90**	2.13	**0.32**					12
13									5.83	**3.54**	3.52	**1.04**	2.31	**0.37**					13
14									6.28	**4.06**	3.80	**1.19**	2.48	**0.43**					14
15											4.07	**1.36**	2.66	**0.48**	1.88	**0.21**			15
16											4.34	**1.53**	2.84	**0.55**	2.00	**0.23**			16
17											4.61	**1.71**	3.02	**0.61**	2.13	**0.26**			17
18											4.88	**1.90**	3.19	**0.68**	2.25	**0.29**			18
19											5.15	**2.10**	3.37	**0.75**	2.38	**0.32**			19
20											5.42	**2.31**	3.55	**0.82**	2.50	**0.35**			20
21											5.69	**2.53**	3.73	**0.90**	2.63	**0.39**			21
22											5.96	**2.76**	3.90	**0.98**	2.75	**0.42**			22
23											6.24	**2.99**	4.08	**1.07**	2.88	**0.46**			23
24													4.26	**1.16**	3.00	**0.49**			24
25													4.44	**1.25**	3.13	**0.53**			25
26													4.61	**1.34**	3.25	**0.57**			26
27													4.79	**1.44**	3.38	**0.61**	1.99	**0.17**	27
28													4.97	**1.54**	3.50	**0.66**	2.07	**0.18**	28
29													5.15	**1.64**	3.63	**0.70**	2.14	**0.19**	29
30													5.32	**1.75**	3.75	**0.75**	2.21	**0.21**	30
31													5.50	**1.86**	3.88	**0.79**	2.29	**0.22**	31
32													5.68	**1.97**	4.01	**0.84**	2.36	**0.23**	32
33													5.86	**2.08**	4.13	**0.89**	2.44	**0.25**	33
34													6.03	**2.20**	4.26	**0.94**	2.51	**0.26**	34
35													6.21	**2.32**	4.38	**0.99**	2.58	**0.28**	35
36															4.51	**1.05**	2.66	**0.29**	36
37															4.63	**1.10**	2.73	**0.30**	37
38															4.76	**1.16**	2.81	**0.32**	38
39															4.88	**1.21**	2.88	**0.34**	39
40															5.01	**1.27**	2.95	**0.35**	40
41															5.13	**1.33**	3.03	**0.37**	41
42															5.26	**1.39**	3.10	**0.39**	42
43															5.38	**1.45**	3.17	**0.40**	43
44															5.51	**1.52**	3.25	**0.42**	44
45															5.63	**1.58**	3.32	**0.44**	45
46															5.76	**1.65**	3.40	**0.46**	46
47															5.88	**1.72**	3.47	**0.47**	47
48															6.01	**1.78**	3.54	**0.49**	48
49															6.13	**1.85**	3.62	**0.51**	49
50															6.26	**1.92**	3.69	**0.53**	50

Head Loss Calculations
From Modified Hazen - Williams Formula

$$H_F = .2083 \left[\left(\frac{100}{C}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}} \right]$$

$$V = .3208 \frac{q}{A}$$

$A = \frac{d^2\pi}{4}$ = cross-sectional flow, sq. in.

C = 150

q = flow in gallons per minute

d = I.D. of pipe in inches =
[average O.D. - (2 x min. wall thickness]

N = Number of pumps operating at 11 gpm

V = Flow velocity in ft/sec

H_F = Friction head loss in ft/100 ft of pipe

Table 6
SCHEDULE 40 PVC PIPE

Flow Velocity and Friction Head Loss *vs* Pumps in Simultaneous Operation (C = 150)

	1 1/4 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		5 in.		6 in.		8 in.		
N	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**N**
1	2.36	**1.74**	1.73	**0.82**	1.05	**0.24**													**1**
2	4.72	**6.28**	3.47	**2.97**	2.10	**0.88**	1.47	**0.37**											**2**
3	7.08	**13.31**	5.20	**6.29**	3.15	**1.86**	2.21	**0.79**											**3**
4			6.93	**10.71**	4.21	**3.18**	2.95	**1.34**	1.91	**0.46**									**4**
5					5.26	**4.80**	3.68	**2.02**	2.39	**0.70**									**5**
6					6.31	**6.73**	4.42	**2.83**	2.87	**0.99**									**6**
7							5.16	**3.77**	3.34	**1.31**	1.94	**0.35**							**7**
8							5.89	**4.83**	3.82	**1.68**	2.22	**0.45**							**8**
9							6.63	**6.01**	4.30	**2.09**	2.49	**0.56**							**9**
10									4.78	**2.54**	2.77	**0.68**							**10**
11									5.25	**3.03**	3.05	**0.81**	1.94	**0.27**					**11**
12									5.73	**3.56**	3.33	**0.95**	2.12	**0.32**					**12**
13									6.21	**4.13**	3.60	**1.10**	2.29	**0.37**					**13**
14											3.88	**1.26**	2.47	**0.42**					**14**
15											4.16	**1.43**	2.65	**0.48**					**15**
16											4.44	**1.62**	2.82	**0.54**	1.95	**0.22**			**16**
17											4.71	**1.81**	3.00	**0.60**	2.08	**0.25**			**17**
18											4.99	**2.01**	3.17	**0.67**	2.20	**0.27**			**18**
19											5.27	**2.22**	3.35	**0.74**	2.32	**0.30**			**19**
20											5.54	**2.44**	3.53	**0.81**	2.44	**0.33**			**20**
21											5.82	**2.67**	3.70	**0.89**	2.56	**0.36**			**21**
22											6.10	**2.91**	3.88	**0.97**	2.69	**0.40**			**22**
23													4.06	**1.05**	2.81	**0.43**			**23**
24													4.23	**1.14**	2.93	**0.47**			**24**
25													4.41	**1.23**	3.05	**0.50**			**25**
26													4.59	**1.32**	3.17	**0.54**			**26**
27													4.76	**1.42**	3.30	**0.58**			**27**
28													4.94	**1.52**	3.42	**0.62**	1.98	**0.16**	**28**
29													5.11	**1.62**	3.54	**0.66**	2.05	**0.17**	**29**
30													5.29	**1.72**	3.66	**0.70**	2.12	**0.19**	**30**
31													5.47	**1.83**	3.79	**0.75**	2.19	**0.20**	**31**
32													5.64	**1.94**	3.91	**0.79**	2.26	**0.21**	**32**
33													5.82	**2.06**	4.03	**0.84**	2.33	**0.22**	**33**
34													6.00	**2.17**	4.15	**0.89**	2.40	**0.23**	**34**
35													6.17	**2.29**	4.27	**0.94**	2.47	**0.25**	**35**
36															4.40	**0.99**	2.54	**0.26**	**36**
37															4.52	**1.04**	2.61	**0.27**	**37**
38															4.64	**1.09**	2.68	**0.29**	**38**
39															4.76	**1.15**	2.75	**0.30**	**39**
40															4.88	**1.20**	2.82	**0.32**	**40**
41															5.01	**1.26**	2.89	**0.33**	**41**
42															5.13	**1.31**	2.96	**0.35**	**42**
43															5.25	**1.37**	3.03	**0.36**	**43**
44															5.37	**1.43**	3.11	**0.38**	**44**
45															5.49	**1.49**	3.18	**0.39**	**45**
46															5.62	**1.56**	3.25	**0.41**	**46**
47															5.74	**1.62**	3.32	**0.43**	**47**
48															5.86	**1.68**	3.39	**0.44**	**48**
49															5.98	**1.75**	3.46	**0.46**	**49**
50															6.11	**1.81**	3.53	**0.48**	**50**

Head Loss Calculations
From Modified Hazen - Williams Formula

$$H_F = .2083 \left[\left(\frac{100}{C}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}} \right]$$

$$V = .3208 \frac{q}{A}$$

$$A = \frac{d^2\pi}{4} = \text{cross-sectional flow, sq. in.}$$

C = 150

q = flow in gallons per minute

d = I.D. of pipe in inches =
[average O.D. - (2 x min. wall thickness]

N = Number of pumps operating at 11 gpm
V = Flow velocity in ft/sec
H_F = Friction head loss in ft/100 ft of pipe

Table 7
SDR 11 HDPE PIPE

Flow Velocity and Friction Head Loss *vs* Pumps in Simultaneous Operation (C = 155)

	1 1/4 in.		1 1/2 in.		2 in.		3 in.		4 in.		5 in.		6 in.		8 in.		
N	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**V**	**H_F**	**N**
1	2.47	**1.84**	1.86	**0.92**													**1**
2	4.95	**6.63**	3.72	**3.32**	2.38	**1.12**											**2**
3	7.42	**14.04**	5.58	**7.03**	3.57	**2.37**	1.64	**0.36**									**3**
4			7.44	**11.98**	4.76	**4.04**	2.19	**0.61**									**4**
5					5.95	**6.11**	2.74	**0.92**									**5**
6					7.14	**8.56**	3.29	**1.30**	1.99	**0.38**							**6**
7							3.83	**1.72**	2.32	**0.51**							**7**
8							4.38	**2.21**	2.65	**0.65**							**8**
9							4.93	**2.75**	2.98	**0.81**	1.95	**0.29**					**9**
10							5.48	**3.34**	3.31	**0.98**	2.17	**0.35**					**10**
11							6.03	**3.98**	3.65	**1.17**	2.39	**0.42**					**11**
12									3.98	**1.38**	2.60	**0.49**					**12**
13									4.31	**1.60**	2.82	**0.57**	1.99	**0.24**			**13**
14									4.64	**1.83**	3.04	**0.65**	2.14	**0.28**			**14**
15									4.97	**2.08**	3.25	**0.74**	2.29	**0.32**			**15**
16									5.30	**2.35**	3.47	**0.84**	2.45	**0.36**			**16**
17									5.63	**2.63**	3.69	**0.94**	2.60	**0.40**			**17**
18									5.97	**2.92**	3.90	**1.04**	2.75	**0.44**			**18**
19									6.30	**3.23**	4.12	**1.15**	2.90	**0.49**			**19**
20											4.34	**1.27**	3.06	**0.54**			**20**
21											4.56	**1.39**	3.21	**0.59**			**21**
22											4.77	**1.51**	3.36	**0.64**	1.98	**0.18**	**22**
23											4.99	**1.64**	3.52	**0.70**	2.08	**0.19**	**23**
24											5.21	**1.77**	3.67	**0.76**	2.17	**0.21**	**24**
25											5.42	**1.91**	3.82	**0.82**	2.26	**0.23**	**25**
26											5.64	**2.06**	3.98	**0.88**	2.35	**0.24**	**26**
27											5.86	**2.21**	4.13	**0.94**	2.44	**0.26**	**27**
28											6.07	**2.36**	4.28	**1.01**	2.53	**0.28**	**28**
29													4.43	**1.08**	2.62	**0.30**	**29**
30													4.59	**1.15**	2.71	**0.32**	**30**
31													4.74	**1.22**	2.80	**0.34**	**31**
32													4.89	**1.29**	2.89	**0.36**	**32**
33													5.05	**1.37**	2.98	**0.38**	**33**
34													5.20	**1.44**	3.07	**0.40**	**34**
35													5.35	**1.52**	3.16	**0.42**	**35**
36													5.50	**1.60**	3.25	**0.44**	**36**
37													5.66	**1.69**	3.34	**0.47**	**37**
38													5.81	**1.77**	3.43	**0.49**	**38**
39													5.96	**1.86**	3.52	**0.52**	**39**
40													6.12	**1.95**	3.61	**0.54**	**40**
41															3.70	**0.57**	**41**
42															3.79	**0.59**	**42**
43															3.88	**0.62**	**43**
44															3.97	**0.65**	**44**
45															4.06	**0.67**	**45**
46															4.15	**0.70**	**46**
47															4.24	**0.73**	**47**
48															4.33	**0.76**	**48**
49															4.42	**0.79**	**49**
50															4.51	**0.82**	**50**

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From Modified Hazen - Williams Formula

$$H_F = .2083 \left[\left(\frac{100}{C}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}} \right]$$

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d = I.D. of pipe in inches =
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N = Number of pumps operating at 11 gpm

V = Flow velocity in ft/sec

H_F = Friction head loss in ft/100 ft of pipe

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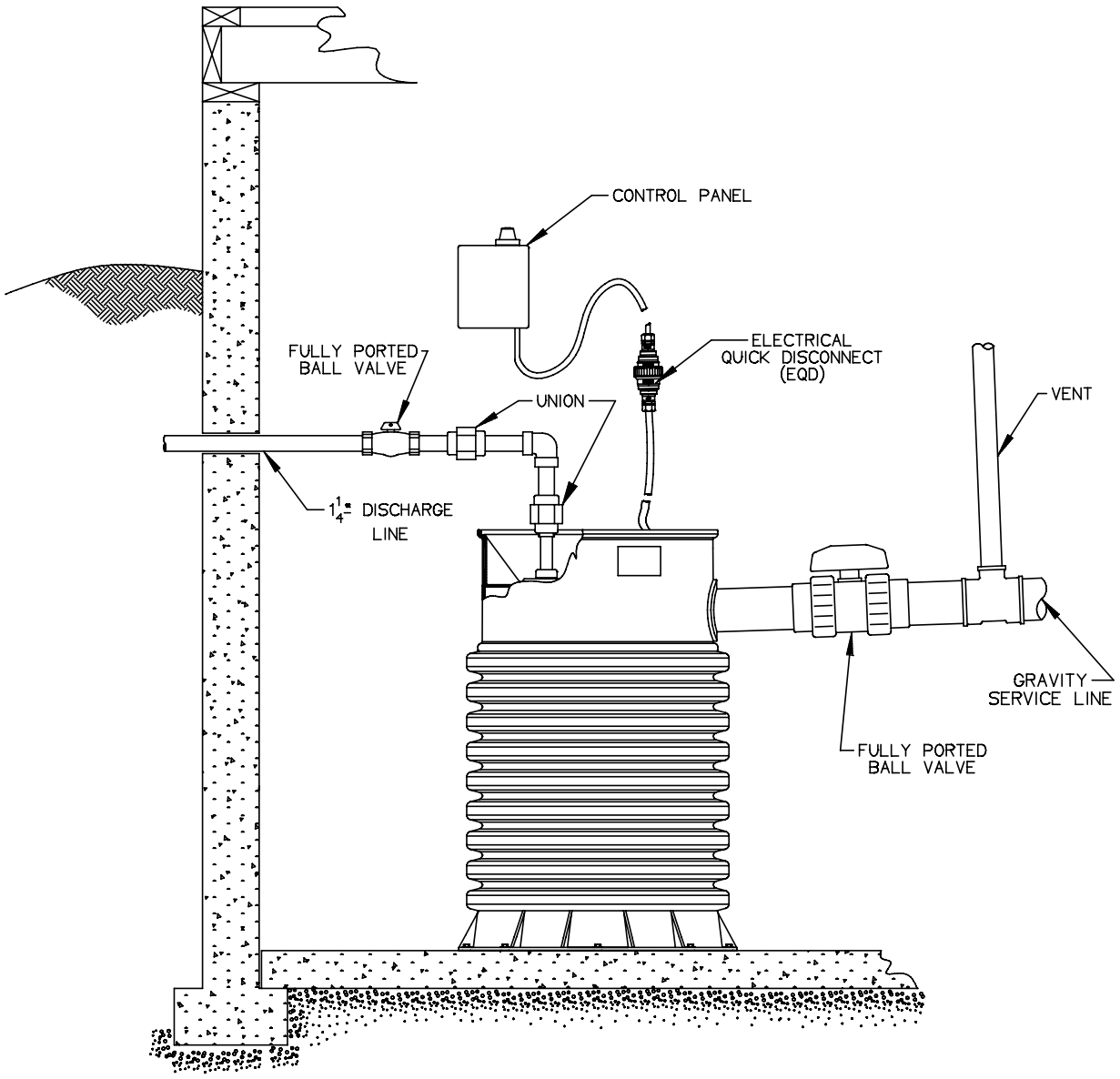

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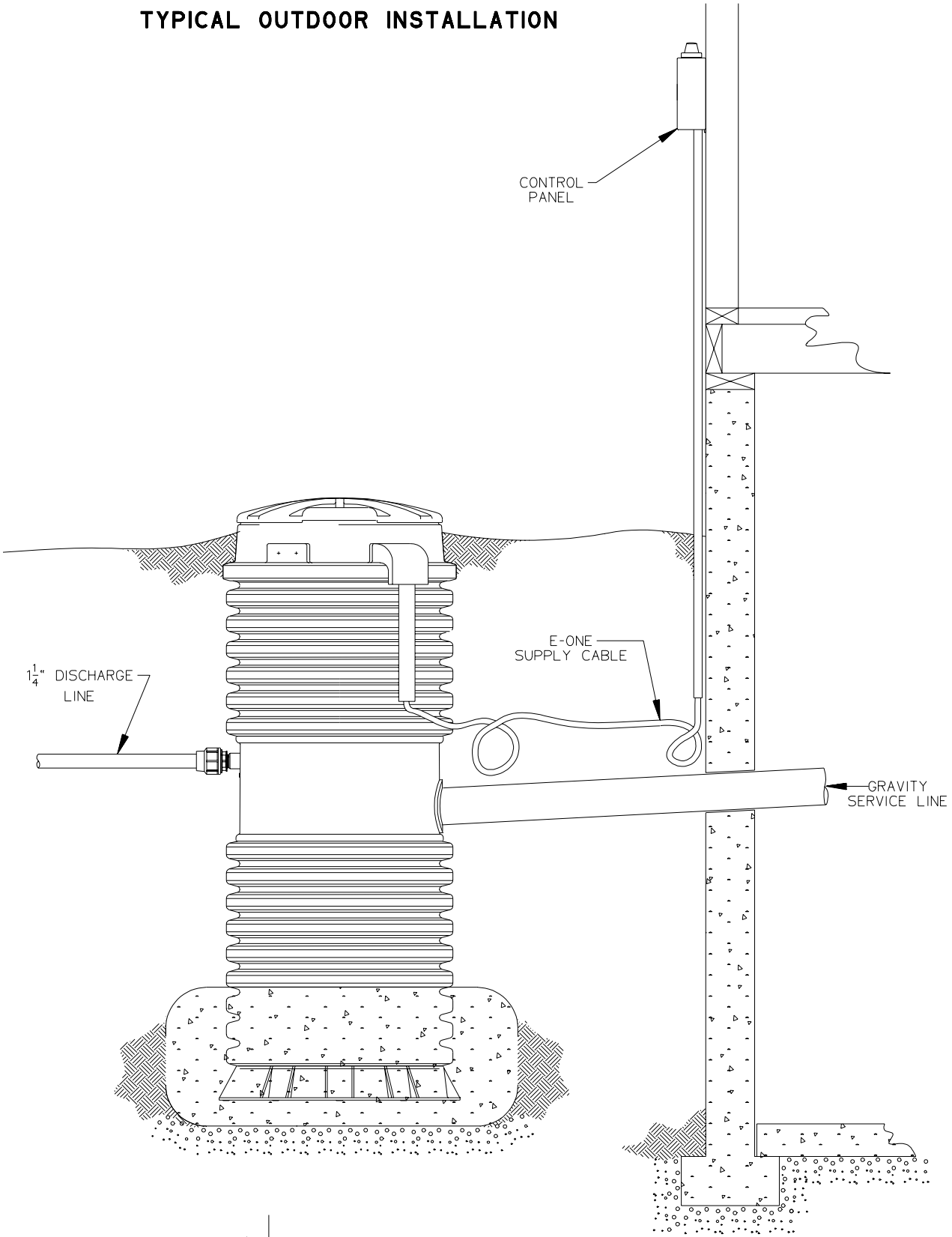

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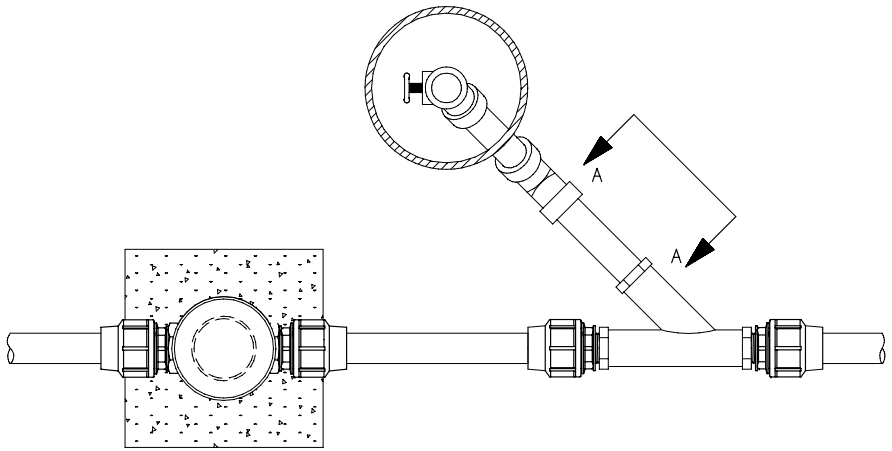

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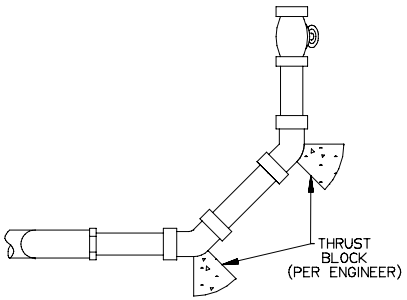

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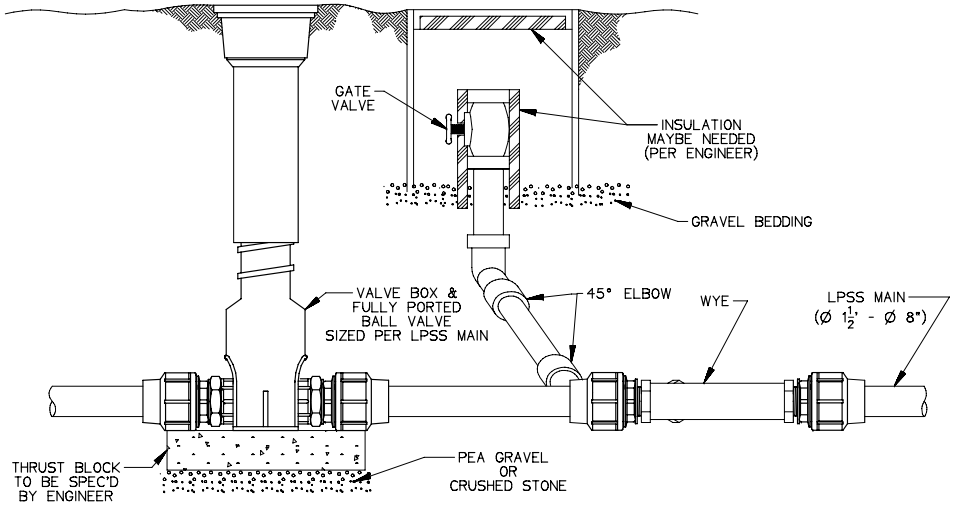

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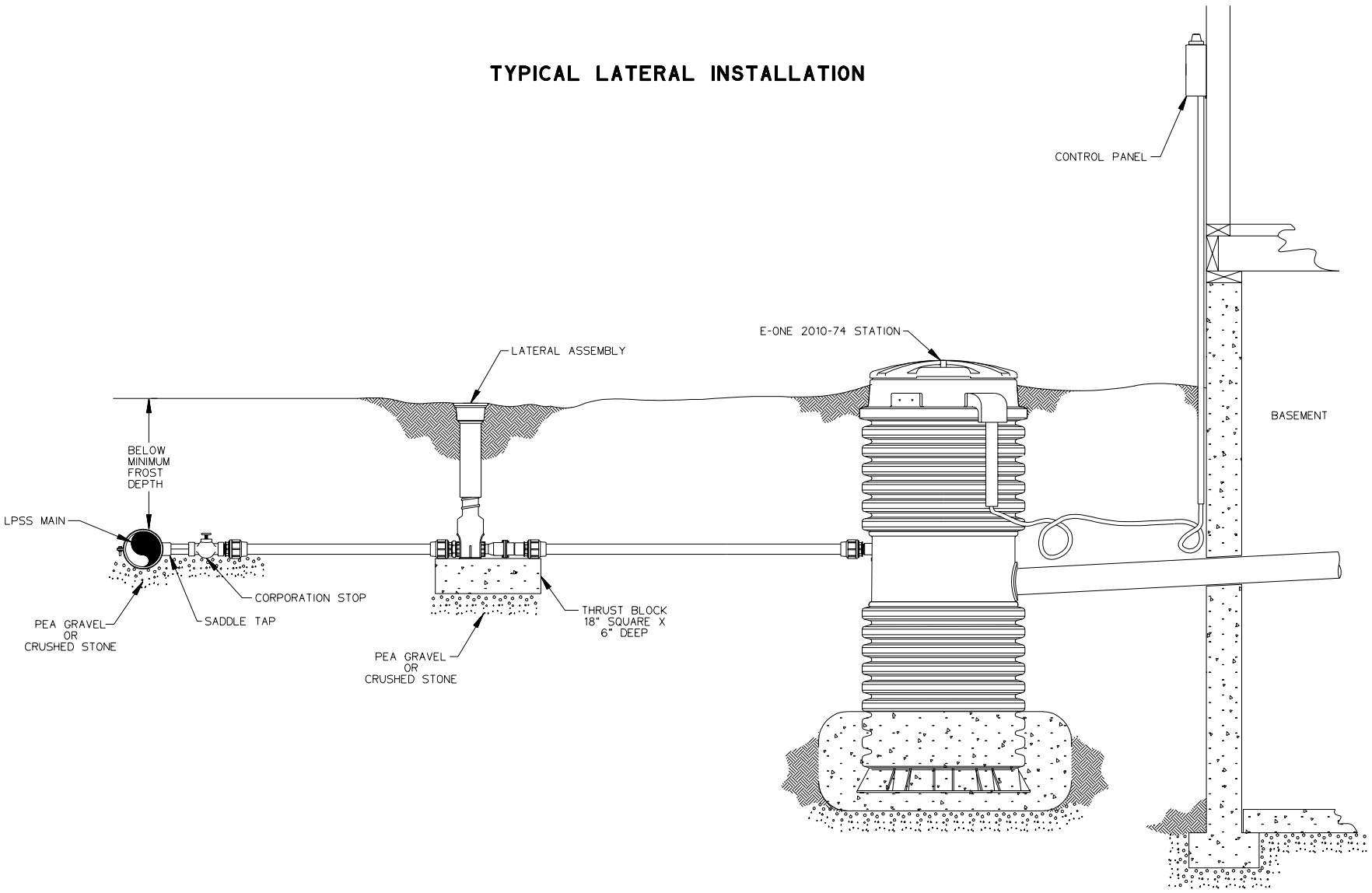

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TYPICAL DROP CONNECTION
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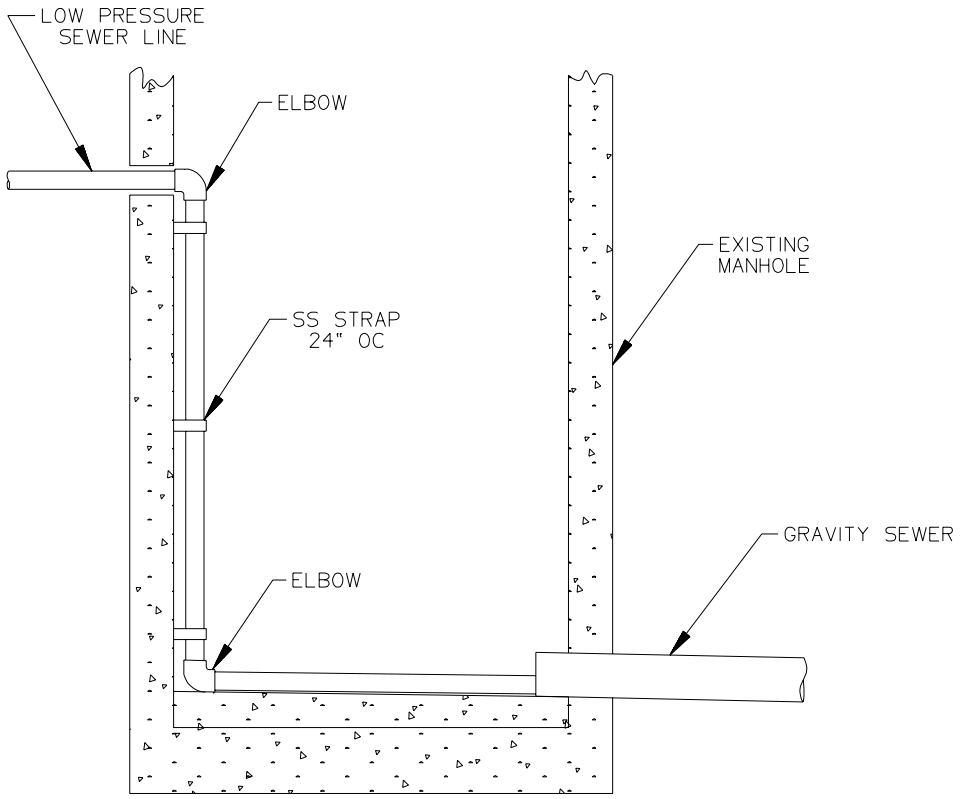

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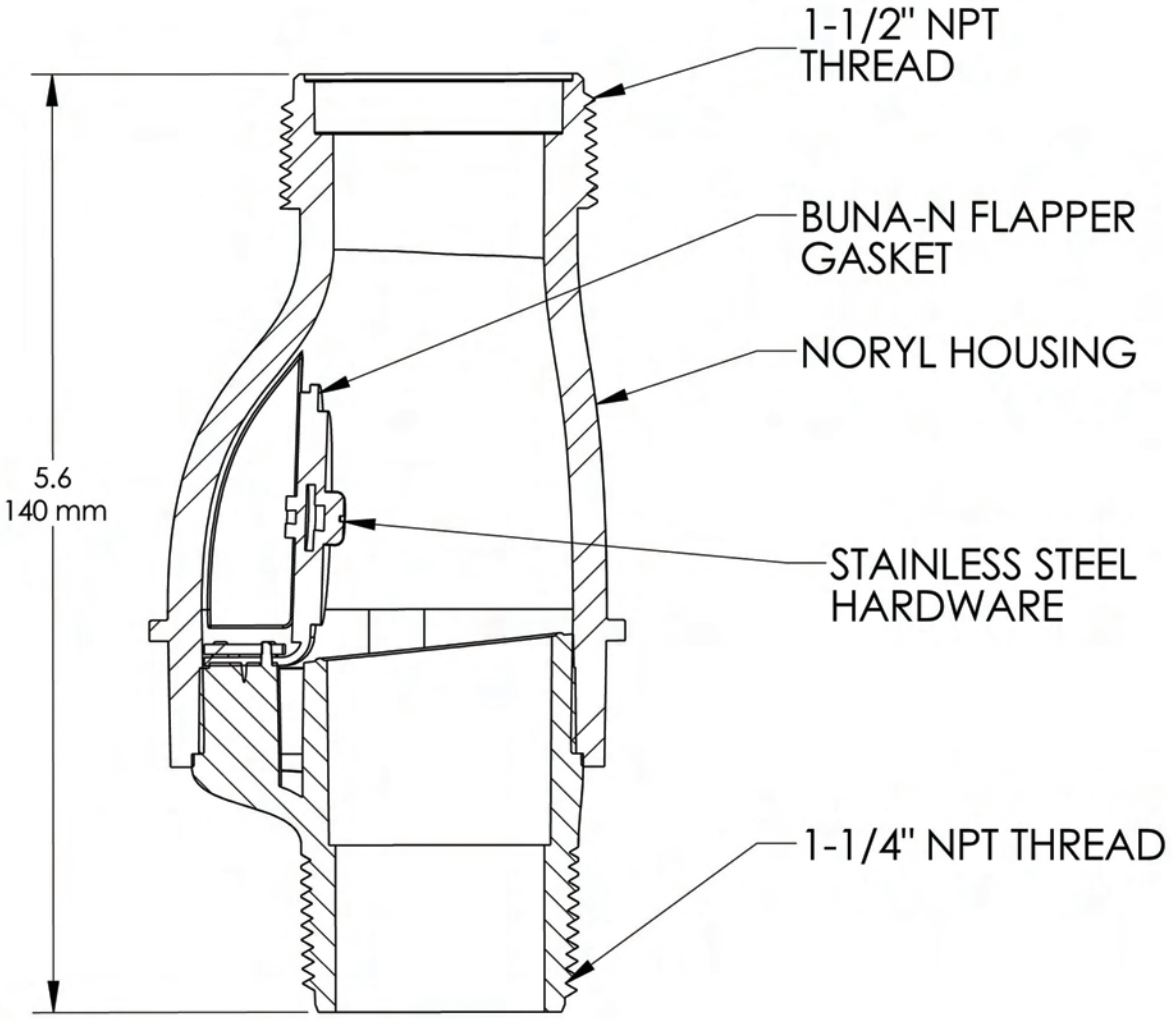

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ENVIRONMENT ONE CORPORATION

REDUNDANT CHECK VALVE

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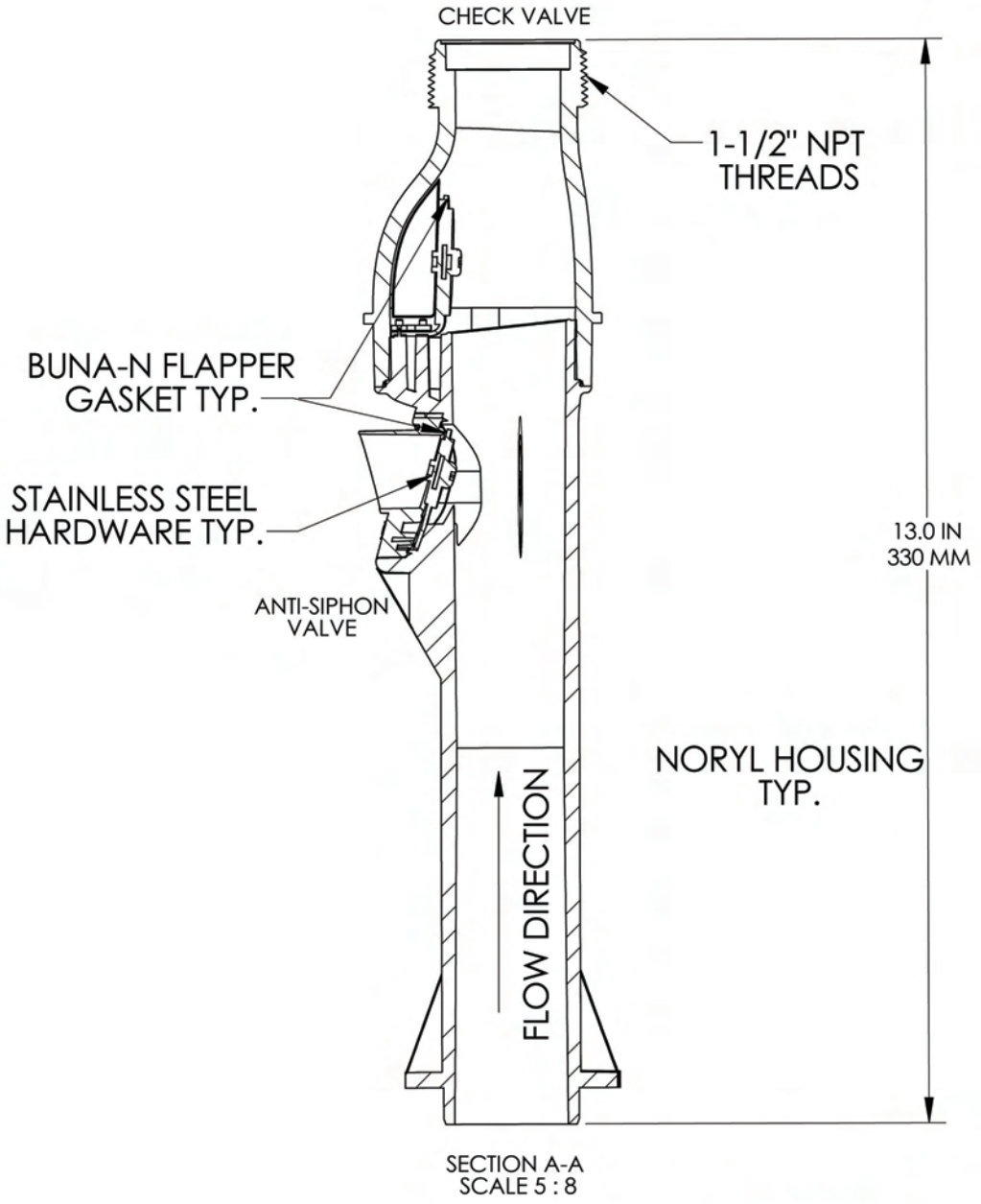
DRAWING NUMBER	SH 1 OF 1



SECTION A-A
SCALE 5 : 8

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ANTI-SIPHON CHECK VALVE

SERVICE #:

DRAWING NUMBER

SH 1 OF 1

Manufacturer Evaluation List

	General Requirements for Low Pressure Sewer Systems
Service and Maintenance Check List	• Local fast-response service and maintenance organization has been designated • Manufacturers of all equipment specified for the system have supplied all installation details • Warranties for all equipment specified for the system have been evaluated • Fast replacement parts availability for all equipment in the system has been ensured by each equipment manufacturer • User instructions have been supplied to homeowners
Grinder Pump	• Designated for the specific purpose of grinding and pumping domestic wastewater • Suitable for parallel operation in a system containing thousands of pumps connected to a common discharge line • Has a history of reliable operation • Compatible with existing power sources and provides economical operation • Simple to service and troubleshoot, easily accessible for removal of grinder pump core; designed with simple wiring and controls; easily disassembled and reassembled • Warranty covering parts and labor for a reasonable length of time • Supported by a thoroughly detailed installation manual, service manual and facilities for service training
Certifications	• Canadian Standards Association • Underwriters Laboratories, Inc. • National Sanitation Foundation
Required Features	• Non-clogging pump • Non-jamming grinder • Anti-siphon valve integral with grinder pump • All valves of non-clogging design: integral check valve, anti-siphon valve and redundant check valve • High-level warning alarm
Motor	• Low rpm (1,725) • Overload protection, built-in, automatic reset • High torque, low starting current
Tank	• Self scouring • Completely sealed • Non-corroding material
Level Sensing Control	• Non-fouling type • No moving parts in contact with sewage
Motor Controls	• Completely protected • Simple to service or replace • UL-listed alarm panel

A Precision Castparts Company

Environment One Corporation
2773 Balltown Road
Niskayuna, New York USA 12309–1090

Voice: (01) 518.346.6161
Fax: 518.346.6188

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LM000353 Rev. A
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Appendix B

Environmental Review Report

Environment

Parkland County

WILD Water Line Servicing Study Environmental Overview

Prepared by:

AECOM
17007 – 107th Avenue
Edmonton, AB, Canada T5S 1G3
www.aecom.com

780 486 7000 tel
780 486 7070 fax

Project Number:

60313882 (403)

Date:

May 22, 2014

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

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- may be based on information provided to Consultant which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

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AECOM: 2012-01-06

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Revision #	Revised By	Date	Issue / Revision Description
0	Courtney Mason	May 25, 2014	Draft

AECOM Signatures

Report Prepared By:

Courtney Mason, B.Sc., B.I.T.
Biologist

Report Prepared By:

Jamie Kalla, B.Sc.
Biologist

Report Reviewed By:

Krista Bird, Ph.D., P. Biol.
Terrestrial Biologist

Executive Summary

Parkland County has retained AECOM Canada Limited (AECOM) to complete an environmental overview regarding the environmental impact affiliated with expanding the West Inter Lake District (WILD) regional water system to service the hamlets of Entwistle, Duffield, Carvel, Fallis, and other country residential developments. This environmental overview report provides a broad desktop review of all applicable legislation, protected areas, and environmental conditions within the project area. For the purpose of this environmental overview, the project has been divided into three search areas: Search Area A includes Sewage Line 1 and Water Line 1 from Entwistle to Wabamun, Search Area B includes Water Line 2 from Wabamun to Carvel, and Search Area 3 includes Sewage Line 2 from Duffield to the Alberta Capital Regional Wastewater Commission (ACRWC) connection in Stony Plain.

This project lies within the Dry Mixedwood Natural Subregion of the Boreal Forest Region of Alberta. This subregion is characterized by aspen forests, cultivated lands, and fens in low lying areas. Topography is gently rolling. Luvisolic soils occur on imperfectly drained forest sites, Brunisols are common on well drained fluvial or eolian sediments, and gleysols and organic soils are associated with wetlands or poorly drained soils. The Alberta Conservation Information Management System (ACIMS) identified 10 occurrences of rare plants within Search Area A and two within Search Area B.

The desktop assessment identified numerous protected areas within the three search areas. The Colonial Nesting Bird Key Wildlife Layer for the Great Blue Heron (*Ardea herodias)* was found within all search areas. Portions of Search Area C fall within the Sharp-tailed Grouse Key Range Layer. Work should be limited between March 15th and June 15th due to the Sharp-tailed Grouse (*Tympanuchus phasianellus*) lekking (breeding) season. Search Area A contains three Environmentally Significant Areas (ESAs), Search Area B contains one ESA, and Search Area C does not contain any ESAs. Search Area A includes areas of the Pembina River Provincial Park. Search Area B borders the Wabamun Lake Provincial Park, but the actual sewage and water lines do not cross into these two parks. Regulatory bodies have established these ranges for the protection of critical areas and to preserve them from development.

A total of 30 Species at Risk, designated by federal and provincial legislation, have the potential to occur in the project area. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists eight species as “Special Concern”, seven species as “Threatened”, and two species as “Endangered”. Alberta Environment and Sustainable Resource Development (AESRD) lists 19 species as “Sensitive”, five as “May Be At Risk”, three as “At Risk”, and one as “Extirpated/Extinct”.

There are a total of 28 water crossings on the proposed route of the WILD lines. Three of these crossings are mapped Class C water bodies and 13 are unmapped Class C water bodies, all with Restricted Activity periods of April 16th to June 30th. No records for Species at Risk were noted in the water bodies crossed by the proposed project routes. Various wetland types occur throughout the project area as well. Search Area A includes areas of marsh, open water, fens, and swamps for a total of 353.6 hectares (ha). Search Area B and Search Area C include areas of marsh, open water, bogs, and fens for a total of 1045.2 ha and 866.5 ha, respectively.

The major type of land use in the area is agriculture, with several Country Residential Districts along the proposed line. All projects on Public Lands must undergo a First Nations Consultation assessment request through AESRD prior to construction activities to determine consultation needs and requirements. Search Areas B and C travel along the east border of Wabamun 133A, but the actual lines do not enter the First Nations lands.

Energy Resources Conservation Board (ERCB) records were searched for spills and complaints within the project search areas and indicated a total of 12 spills and 4 complaints. On August 3, 2005, 43 Canadian National (CN) rail cars derailed, releasing petroleum hydrocarbons into Wabamun Lake.

Water quality testing was immediately started following the spill, and a long-term monitoring program was put in place. Ongoing monitoring has showed that the initial effects of the oil spill on fish in the area have diminished and the condition of the lake has improved.

A review of the proposed project area concluded that most of the area was previously disturbed by other activities suggesting there is little potential for finding undisturbed historical resource sites. The only areas that remain undisturbed fall within Search Area B (Carvel to Duffield), which would require further historical assessment should this alignment be chosen.

Pipeline construction must adhere to the *Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body* under the *Water Act*, with a notification sent to the regional Natural Resources Service office of AESRD. Multiple environmental and historical resources assessments would need to be completed prior to development. A Conservation and Reclamation Report will need to be prepared for this project as Class 1 pipelines are included in the proposed project plans. Both federal and provincial legislation, as well as land use guidelines, must be included during the planning stages of any project and adhered to prior to development. Mitigation strategies will have to be followed in areas identified as sensitive within the project area.

Table of Contents

List of Figures

List of Tables

Appendices

1. Introduction

1.1 Project Location and Description

AECOM Canada Ltd. (AECOM) has been retained by Parkland County to complete an environmental overview regarding the environmental impact affiliated with expanding the West Inter Lake District (WILD) regional water system to service the Hamlets of Entwistle, Duffield, Carvel, Fallis, and other country residential developments. The project location examined in this overview includes the Wabamun to Entwistle line, the Wabamun to Carvel line, and the Duffield to Stony Plain line. The Hamlet of Duffield is within the Wabamun to Carvel line, and the Hamlet of Fallis is within the Wabamun to Entwistle line. Environmental impacts of each line were accessed separately when the impacts were line-specific. For the purpose of this environmental overview, the project has been divided into three search areas: Search Area A includes Sewage Line 1 and Water Line 1 from Entwistle to Wabamun, Search Area B includes Water Line 2 from Wabamun to Carvel, and Search Area 3 includes Sewage Line 2 from Duffield to the Alberta Capital Regional Wastewater Commission (ACRWC) connection in Stony Plain. See Appendix I, **Figure A1** for an overview map of the project areas.

The scope of this report is to examine the governing regulations pertaining to the proposed project and to identify potential impacts specifically in the vicinity of the identified natural areas. These considerations should be incorporated into the consultation, design, and construction phases of the proposed project.

Activities completed under the scope of this report include:

- A review of existing databases and reports containing biological resource information
- A review of the historical information for the study area
- Compiling a list of jurisdictional consultation requirements and potential environment-related permit requirements for the proposed project

2. Review of Existing Resource Information

2.1 Natural Subregion Description

The project lies within the Dry Mixedwood Natural Subregion of the Boreal Forest Region of Alberta. This subregion is characterized by distinct climactic, vegetation, wildlife, and soil types, as outlined in the Natural Regions and Subregions of Alberta (Natural Regions Committee 2006).

2.1.1 Climactic Zone

The climate has predominantly short summers, and long, cold winters, with a mean annual temperature around 1.1 degrees Celsius (°C). The mean annual precipitation of the Dry Mixedwood Subregion is 461 millimetres (mm), with about 70% of the precipitation falling between April and August (Natural Regions Committee 2006).

2.1.2 Expected Vegetation Types

The Dry Mixedwood Subregion is characterized by aspen forests, cultivated lands, and fens in low lying areas. Porcupine grass (*Stipa spartea*), June grass (*Koeleria*), sedges, and pasture sagewort (*Artemisia frigida*) can be found on steep slopes. On less steep slopes with greater moisture, northern and slender wheat grasses are more abundant, with Saskatoon-buckbrush shrublands in ravines or gullies. A common reference type for a site with average moisture is an aspen (*Populus tremuloides*) forest with an understory of beaked hazelnut (*Corylus cornuta*), prickly rose (*Rosa acicularis*), wild sarsaparilla (*Aralia nudicaulis*), cream coloured vetchling (*Astragalus racemosus*), purple peavine (*Lathyrus venosus*), and bluejoint (*Calamagrostis canadensis*). The reference type for more northern areas is an aspen forest with an understory of low bush cranberry (*Viburneum edule*), rose (*Rosa*), Canada buffaloberry (*Shepherdia canadensis*), hairy wild rye (*Leymus innovates*), and bunchberry (*Cornus canadensis*) (Natural Regions Committee 2006).

2.1.3 Soil and Subsoil Types

According to Natural Regions Committee (2006), Luvisolic soils occur on imperfectly drained forest sites, Brunisols are common on well drained fluvial or eolian sediments, and gleysols and organic soils are associated with wetlands or poorly drained soils.

Regional parent material generally consists of Cretaceous shales, which is manifested on the surface as uplands covered entirely by kettled to dissected, deep, loamy to clayey-textured glacial till, lacustrine deposits, and inclusions of coarse, fluvioglacial deposits. Topography is gently rolling.

2.2 Protected Areas and Land Use

2.2.1 Environmentally Significant Areas

Environmentally Significant Areas (ESAs) represent places in Alberta that are important to the long-term maintenance of biological diversity, soil, water, or other natural processes, at multiple spatial scales. They are identified as areas containing rare or unique elements in the province, or areas that include elements that may require special management consideration due to their conservation needs. ESAs do not represent government policy and are not necessarily areas that require legal protection, but instead are intended to be an information tool to help inform land use planning and policy at local, regional, and provincial scales (Government of Alberta 2009).

Search Area A contains three ESAs within the Boreal Natural Region: ESA 441 has a provincial significance rating, contains seven elements of conservation concern, and important wildlife habitat. ESA 442 contains eight elements of conservation concern, and important wildlife habitat and ESA 444 has a provincial rating, contains three elements of conservation concern, rare or unique landforms (Evansburg Area gorges/canyons), and intact riparian areas.

Search Area B contains ESA 442 (ATPR 2014a). Search Area C does not contain any ESAs. **Figure A2** shows the location of the Boreal ESA areas.

2.2.2 Key Wildlife Layers

Key wildlife layers are based on areas that are important for the viability and productivity of Alberta's wildlife, and mitigation strategies are used to maintain the intent of these areas (AESRD 2013). These wildlife feature layers provide industry, government, and the public with the best information available on the range of wildlife sensitivities in the Province (AESRD 2013). Specific operating procedures apply to industrial activities in these zones in order to reduce impacts to habitat and wildlife populations (AESRD 2013). The Colonial Nesting Bird Key Wildlife Layer for the Great Blue Heron (*Ardea herodias*) was found within all Search Areas (**Figure A3**).

2.2.3 Key Range Layers

Key Range Layers serve to provide industrial operators, the government, and the general public with the most up-to-date information available on the extent of wildlife sensitivities (AESRD 2013). Range layers in Alberta are based on the known or partial extent of a species' range. Such information can assist with surveys for identification of a feature, or identify where mitigation strategies need to be applied (AESRD 2013). Portions of Search Area C fall within the Sharp-tailed Grouse Key Range Layer (**Figure A3**). Work should be limited between March 15th and June 15th due to the Sharp-tailed Grouse (*Tympanuchus phasianellus*) lekking (breeding) season.

2.2.4 Parks

The *Provincial Parks Act* establishes Provincial Parks to preserve and protect Alberta's natural heritage, promote the conservation of wildlife and plants, preserve natural features (that have geological, ecological, cultural, historical, archaeological, and paleontological importance), promote outdoor recreation and education, and guarantee protection of the land. The following activities are prohibited within provincial parks: the removal of any plant or animal life, the excavation or removal of archaeological or paleontological material, the introduction of invasive species, and the removal of natural material. Provincial parks are established through the Provincial Parks Act and governed according to its associated regulations, which restrict construction activities, however, disposition may be granted under certain circumstances by the Minister (ATPR 2013).

Search Area A includes areas within the Pembina River Provincial Park, although Sewage Line 1 does not cross over into the park (**Figure A4**). The Pembina River Provincial Park provides recreational activities such as camping, fishing, hiking, swimming, and wildlife viewing (ATPR 2014b). Search Area B travels around the north and east border of Wabamun Lake Provincial Park (**Figure A5**). This park provides recreational activities such as birding, camping, fishing, hiking, and sailing (ATPR 2014b).

2.3 Wildlife

The Government of Canada Species at Risk Public Registry (Government of Canada 2012a) was searched for Species at Risk within the Alberta area. The results of the search were narrowed to species that were likely to occur in the project area based on known ranges identified in field reference books (Udvardy and Knoft 1977, Knopf and Whitaker 1996). Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports were then cross-referenced to confirm these ranges. The results of these searches are in **Table 1.0**.

In addition, a list of Fisheries and Wildlife Management Information System (FWMIS) documented species within 10 kilometres (km) of the project area was provided by Alberta Environment and Sustainable Resource Development (AESRD). Of these records, the Species at Risk are in **Table 1.0**. Rationale for implementing the 10 km buffer was to capture Species at Risk with large home ranges that could be potentially impacted by the proposed project.

Table 1.0 - Species at Risk with Potential to Occur In the Project Area

Common Name	Scientific Name	AESRD[1]	COSEWIC	SARA	Schedule	Notes:
Bank Swallow	*Riparia riparia*	Secure	Threatened	No Status	No Schedule	Breeding Range
Barn Swallow	*Hirundo rustica*	Sensitive	Threatened	No Status	No Schedule	Breeding Range
Barred Owl[2]	*Strix varia*	Sensitive	No Status	No Status	No Schedule	
Black Tern[2]	*Chlidonias niger*	Sensitive	Not At Risk	No Status	No Schedule	
Bobolink	*Dolichonyx oryzivorus*	Sensitive	Threatened	No Status	No Schedule	Breeding Range
Canadian Toad[2]	*Anaxyrus hemiophrys*	May Be At Risk	Not At Risk	No Status	No Schedule	
Canada Warbler	*Cardellina canadensis*	Sensitive	Threatened	Threatened	Schedule 1	
Common Nighthawk	*Chordeiles minor*	Sensitive	Threatened	Threatened	Schedule 1	
Forster's Tern[2]	*Sterna forsteri*	Sensitive	No Status	No Status	No Schedule	
Great Blue Heron[2]	*Ardea herodias*	Sensitive	No Status	No Status	No Schedule	
Great Gary Owl[2]	*Strix nebulosa*	Sensitive	Not At Risk	No Status	No Schedule	
Horned Grebe	*Podiceps auritus*	Sensitive	Special Concern	No Status	No Schedule	Western Population
Little Brown Myotis	*Myotis lucifugus*	Secure	Endangered	No Status	No Schedule	
Monarch	*Danaus plexippus*	Sensitive	Special Concern	Special Concern	Schedule 1	
Northern Goshawk[2]	*Accipiter gentilis*	Sensitive	Not At Risk	No Status	No Schedule	
Northern Leopard Frog	*Lithobates pipiens*	At Risk	Special Concern	Special Concern	Schedule 1	
Northern Myotis	*Myotis septentrionalis*	May Be At Risk	Endangered	No Status	No Schedule	
Northern Pygmy-owl[2]	*Glaucidium gnoma*	Sensitive	No Status	No Status	No Schedule	
Olive-sided Flycatcher	*Contopus cooperi*	May Be At Risk	Threatened	Threatened	Schedule 1	
Osprey[2]	*Pandion haliaetus*	Sensitive	No Status	No Status	No Schedule	
Peregrine Falcon[2]	*Falco peregrinus*	At Risk	Special Concern	Special Concern	Schedule 1	
Pileated Woodpecker[2]	*Dryocopus pileatus*	Sensitive	No Status	No Status	No Schedule	
Plains Bison	*Bison bison bison*	Extirpated/Extinct	Threatened	No Status	No Schedule	Original Range
Rusty Blackbird	*Euphagus carolinus*	Sensitive	Special Concern	Special Concern	Schedule 1	
Sharp-tailed Grouse[2]	*Tympanuchus phasianellus*	Sensitive	No Status	No Status	No Schedule	
Short-eared Owl	*Asio flammeus*	May Be At Risk	Special Concern	Special Concern	Schedule 1	
Trumpeter Swan[2]	*Cygnus buccinator*	At Risk	Not At Risk	No Status	No Schedule	
Western Grebe[2]	*Aechmophorus occidentalis*	Sensitive	No Status	No Status	No Schedule	
Western Toad[2]	*Anaxyrus boreas*	Sensitive	Special Concern	No Status	No Schedule	Calling & non-calling population
Wolverine	*Gulo gulo*	May Be At Risk	Special Concern	No Status	No Schedule	

1 = General Status of Alberta Wildlife (AESRD 2011)

2 = Identified within 10 km of the project area from the FWMIS dataset provided by AESRD

Project delays and/or project related modifications may arise should any Species at Risk occur within the project area. Specific mitigation is required for Species at Risk, which include restricted timing windows, disturbance free zones, and the inability to destroy or alter specific habitat features (e.g. dens, nests, hibernacula, etc.). Similarly, migratory birds and their nests are protected under the federal *Migratory Birds Convention Act*.

2.4 Aquatic Resources

2.4.1 Fisheries

The online FWMIS Internet Mapping Tool was reviewed in April 2014 to determine water bodies crossed by the project, fish species that may occur within the Project area, and possible Restricted Activity Periods (RAPs). **Table 2.0** describes the various watercourses crossed by this project, the class of these watercourses, the respective RAPs, and the fish species present.

There are a total of 28 water crossings on the proposed project route, with three crossings listed as mapped Class C water bodies, and 13 unmapped Class C water bodies, all with a RAP from April 16th to June 30th. The water body at crossing 4 contains Brook Stickleback (*Culaea inconstans*), Fathead Minnow (*Pimephales promelas*), Lake Chub (*Couesius plumbeus*), and White Sucker (*Catostomus commersonii*). Crossing 4 occurs within Search Area A (**Figure A6**). Mink Creek at crossing 17 contains Brook Stickleback, Fathead Minnow and Lake Chub. Crossing 17 occurs within Search Area B (**Figure A7**). Construction around crossings 3 to 7, 9, and 15 to 22 will have to occur outside of the RAP of April 16th to June 30th. Construction around crossing 1a will have to occur outside of the RAP of September 1st to June 30th. No records for Species at Risk were noted in the water bodies crossed by the proposed project routes.

Water crossings were determined using the FWMIS Internet Mapping Tool only, and may vary depending on the final project location. Information accessible through this site is not intended to be a definitive statement on the presence, absence, or status of a species within a given area, nor is it a substitute for on-site surveys.

Table 2.0 - Streams/Rivers Crossed by the Proposed Pipeline Route (AESRD 2014)

Wabamun to Entwistle					
Crossing	**Waterbody ID / Common Name**	**Coordinates (UTM Zone 11)**	**Class**	**RAP**	**Species Present**
1a	471270	633852E 5940884N	Unmapped Class C	September 1 – June 30	
2b	26833	635019E 5940423N	Unmapped	None	
1	26833	634283E 5939526N	Unmapped	None	
2	26832	635229E 5939373N	Unmapped	None	
3	117414	640415E 5939448N	Unmapped Class C	April 16 - June 30	
4	24393	641507E 5939879N	Mapped Class C	April 16 - June 30	BRST, FTMN, LKCH, WHSC
5	268331	642876E 5940309N	Mapped Class C	April 16 - June 30	
6	117937	645639E 5939619N	Unmapped Class C	April 16 - June 30	
7	117395	650685E 5939705N	Unmapped Class C	April 16 - June 30	
8	117460	653100E 5939779N	Unmapped	None	
9	24390	653845E 5939804N	Unmapped Class C	April 16 - June 30	
10	117608	656996E 5939886N	Unmapped	None	
11	24389	657947E 5939918N	Unmapped	None	
12	117567	658551E 5939927N	Unmapped	None	
13	24215	658661E 5939937N	Unmapped	None	
Wabamun to Stony Plain					
14	118310	670975E 5937533N	Unmapped	None	
15	118310	671567E 5935550N	Unmapped Class C	April 16 - June 30	
16	546649	675096E 5935742N	Unmapped Class C	April 16 - June 30	
17	1128/Mink Creek	675918E 5935076N	Mapped Class C	April 16 - June 30	BRST, FTMN, LKCH
18	119495	675935E 5934605N	Unmapped Class C	April 16 - June 30	
19	119495	676436E 5933884N	Unmapped Class C	April 16 - June 30	
19a	119495	676803E 5933340N	Unmapped Class C	April 16 - June 30	
20	119367	678534E 5933590N	Unmapped Class C	April 16 - June 30	
20a	119367	678401E 5933403N	Unmapped Class C	April 16 - June 30	
21	119789	681407E 5934130E	Unmapped Class C	April 16 - June 30	
22	119789	680812E 5934933N	Unmapped Class C	April 16 - June 30	
23	26828	695356E 5937451N	Unmapped	None	
24	26828	695512E 5937741N	Unmapped	None	

2.4.2 Wetlands

2.4.2.1 Marsh

Marshes are shallow wetlands that are prone to fluctuating water levels due to influxes of water (largely from precipitation and surface runoff) and evaporative fluxes. Marshes are minerotrophic wetlands that have a tendency to be dominated by graminoid species.

Hydrophytic species common to marshes include rushes, reeds, grasses, sedges, as well as shrubs (primarily willows; National Wetlands Working Group 1997). Species composition in marshes is often grouped in concentric patterns around the deepest portion of the wetland. These species groupings are based gradient, water depth, frequency of drawdowns or disturbance, and water chemistry (National Wetlands Working Group 1997).

2.4.2.2 Open Water

Open water wetlands (or shallow water wetlands) are wetlands that are in transition between being seasonally wet and being deep permanent water bodies, such as lakes. These wetlands are generally permanently flooded and typically have a water depth of less than 2 metres (m). The open water portion of the wetland usually accounts for 75% of the water body. Groundwater is generally responsible for the influx of water into this type of wetland (National Wetlands Working Group 1997).

2.4.2.3 Bog

A bog is a raised peat landform, formed primarily from precipitation, and snowmelt. Bogs can be thought of as having two layers: a surface layer and deep layer (National Wetlands Working Group 1997). The surface layer is the living soil layer while the deep layer consists of the decomposed material, or water-logged peat, resulting in stratification of peat within most bogs. Water flows through the surface layer considerably faster than it does through the deep layer, developing the patterns of peat on the bog surfaces (National Wetlands Working Group 1997).

2.4.2.4 Fen

A fen is a peatland dominantly composed of decomposed sedge and brown moss, with a fluctuating water table. Surface water movement is common through channels, pools, and other open water bodies, forming surface patterns. Vegetation in fens depends on the depth of the water table with graminoid vegetation found in wetter fens, and shrubs and trees found predominantly in drier fens (National Wetlands Working Group 1997).

2.4.2.5 Swamp

A swamp is a treed or tall shrub-dominated wetland influenced by minerotrophic groundwater. Swamps are not as wet as bogs, fens, or marshes as the water table is below the major portion of the ground surface (National Wetlands Working Group 1997). Swamps can be categorized as shrub swamps, coniferous swaps, or hardwood swamps. They all contain highly decomposed woody peat and organic material (National Wetlands Working Group 1997).

The Merged Wetland Inventory acquired from AESRD (2012) identified wetland areas that were classified using the Canadian Wetland Classification System (CWCS; National Wetlands Working Group 1997). **Table 3.0** describes the wetlands that intersect the 100 m buffer of the three Search Areas, the total number of each wetland type, and the area (in hectares) each covers. As per the *Water Act* (Government of Alberta 2013a), all wetlands that fall within the white zone are protected and any impacts to a wetland as a result of the proposed project will require compensation. It is important to note that this dataset does not account for any temporary wetlands. To account for these types of wetlands, a wetland inventory must be completed. **Figure A4** shows the location of the wetlands that intersect Search Area A within a 100 m buffer and **Figure A5** shows the location of the wetlands that intersect Search Areas B and C within a 100 m buffer.

Table 3.0 - Total Wetland Areas and Types Occurring Along Both Project Lines

	Marsh	Open Water	Bog	Fen	Swamp	Total
Search Area A	19	2	0	7	3	31
	274.3 ha	2.9 ha	0 ha	73.6 ha	2.8 ha	353.6 ha
Search Area B	29	4	2	7	0	42
	778.0 ha	200.1 ha	3.3 ha	63.9 ha	0 ha	1045.2 ha
Search Area C	34	4	3	7	0	48
	761.9 ha	29.0 ha	7.3 ha	67.6 ha	0 ha	866.5 ha

2.5 Vegetation

A search of the Alberta Conservation Information Management System (ACIMS) for Non-Sensitive Element Occurrences identified several plant species in the project area. Search Area A contained 13 element occurrences, Search Area B contained two element occurrences, and Search Area C contained no occurrences. **Table 4.0** shows the common name and scientific name of every non-sensitive element occurrence identified in each search area. None of the plant species identified are listed as Species at Risk under the *Alberta Wildlife Act.* **Figure A8** and **Figure A9** show the location of these rare plant species in relation to the project areas.

Table 4.0 - Non-sensitive Element Occurrences Identified in Each Search Area

Search Area	Common Name	Scientific Name
A	Undulated crane's bill moss	*Atrichum undulatum*
	Flagon-fruited splachnum moss	*Splachnum ampullaceum*
	Flat fruited pelt lichen	*Peltigera horizontalis*
	Hooded ramalina	*Ramalina obtusata*
	Liverwort	*Lophozia badensis*
	Marsh muhly	*Muhlenbergia racemosa*
	Plains forktail	*Ischnura damula*
	Porcupine sedge	*Carex hystericina*
	Rigid screw moss	*Didymodon rigidulus*
	Slender hairy-cap moss	*Polytrichum longisetum*
	Twisted bog moss	*Sphagnum contortum*
	Two-leaved waterweed	*Elodea bifoliata*
	Two-ridge rams-horn	*Helisoma anceps*
B	Two-leaved waterweed	*Elodea bifoliata*
	Two-ridge rams-horn	*Helisoma anceps*

3. Other Environmental Issues

3.1 Abadata, Database of Energy Resources Conservation Board (ERCB) Records

AbaData is an online database of ERCB records, which is updated monthly. Abadata records for spills and complaints within the project search areas were reviewed in April, 2014, and indicated a total of 12 spills and four complaints. The results of the search are summarized in **Table 5.0.** The Spill and Complaint reports are located in **Appendix II**.

Table 5.0 - Summary of Spills and Complaints in the Project Search Area

Spills					
Location	**Date of Notification**	**Date of Completion**	**Source**	**Licensee**	**Cause**
04-11-053-04W5M	27-Sep-09	08-Dec-09	Crude Oil Pipeline	Barnwell of Canada, Ltd.	Equipment Failure-Valve or fitting failure
16-13-053-06W5M	04-Oct-05	14-Nov-05	Natural Gas Pipeline	Atco Gas and Pipeline Ltd.	Equipment Failure-seam rupture
10-18-053-06W5M	13-Jun-94	26-Jul-95	Natural Gas Pipeline	North Canadian Oils Ltd.	Conversion-construction damage
16-18-053-06W5M	31-Mar-97	31-Mar-97	Gas Well	Northwestern Utilities Ltd.	Conversion-cumulative release
9-18-053-06W5M	29-Jul-02	29-Jul-02	Natural Gas Pipeline	Sun Gro Horticulture Canada Ltd.	Conversion-corrosion external
01-20-053-07W5M	20-Oct-77	04-Sep-79	Miscellaneous	Meota Gas Co-operative Association Ltd.	Conversion-Valve failure
01-22-053-05W5M	18-Oct-77	27-Jan-94	Natural Gas Pipeline	North Canadian Oils Ltd.	Conversion-valve or fitting failure
02-24-053-06W5M	04-Oct-05	07-Oct-05	Natural Gas Pipeline	Atco Gas and Pipeline Ltd.	Equipment Failure-Valve or fitting failure
01-24-053-06W5M	01-Jul-91	27-Jan-94	Natural Gas Pipeline	Northwestern Utilities Ltd.	Conversion-mechanical joint failure
14-12-053-04W5M	26-Jul-93	27-Jan-94	Natural Gas Pipeline	West Parkland Gas Co-op Ltd.	Conversion-corrosion external
04-13-053-04W5M	06-May-04	09-Dec-04	Natural Gas Pipeline	Atco Gas and Pipeline Ltd.	External-third party damage
02-33-052-02W5M	21-Aug-95	22-Aug-95	Natural Gas Pipeline	West Parkland Gas Co-op Ltd.	Conversion-corrosion external
Complaints					
Location	**Date of Notification**	**Date of Completion**	**Source**	**Licensee**	**Concerns**
NE-13-053-06W5M	24-Jan-07	29-Jan-07	unknown	unknown	H2S odours
16-18-053-06W5M	17-Nov-95	17-Nov-95	unknown	Northwestern Utilities Ltd.	THC odours
16-18-053-06W5M	14-Sep-95	14-Sep-95	unknown	Northwestern Utilities Ltd.	THC odours
9-18-053-06W5M	31-Dec-01	31-Dec-01	unknown	Atco Ltd.	Odours-other

3.2 Wabamun Lake Oil Spill

On August 3, 2005, 43 Canadian National (CN) rail cars derailed, releasing petroleum hydrocarbons into Wabamun Lake.

Water quality testing was initiated immediately following the spill and a long-term monitoring program was put in place to assess the effects, if present, on the water chemistry and biological community. Results from the early stages of the monitoring program have determined that sediments have not been impacted from the spill (Alberta Environment 2006). Metal concentrations in the water are comparable to those recorded in 2002 prior to the spill. Low level organics contamination was recorded within the water following the spill, with a potential threat to aquatic life in the littoral zone (Alberta Environment 2006). It was hypothesized that this could be due to recovery operations along the shoreline or wind patterns distributing the surface (Alberta Environment 2006).

Golder Associates was responsible for monitoring the effects of the spill. They looked at both Pike (*Esox lucius*) and Whitefish (*Coregonus clupeaformis*) eggs to see the impact the spill had on these species in the area of the spill by observing the impact contaminants have on living tissue. Their results showed that while Pike did not show a significant difference between the control and spill groups, the Whitefish larvae in the spill area were found to develop with more deformities than normal. Ongoing monitoring has demonstrated that the condition of the lake has improved since the fish studies were carried out (Golder 2014).

3.3 Clubroot Fungus

The clubroot fungus assessment is of particular importance for this project because of its high level of occurrence within Parkland County. Clubroot is a serious soil-borne disease that affects canola and mustard, as well as vegetable crops such as cabbage, broccoli, and cauliflower (Government of Alberta 2010). The disease can cause devastating yield losses and was added as a declared pest to the *Agricultural Pests Act* in April 2007. Companies operating on agricultural land must follow the clubroot control measures specified in the Alberta Clubroot Management Plan. Some of these measures include: cleaning equipment when leaving infested sites, removing/stockpiling topsoil on leases with clubroot before moving other equipment on site, avoiding equipment traffic during wet conditions in infested areas, and preparing clubroot protocols for staff and contractors.

4. Historical Resources Overview

The Archaeology Group Inc. was contacted to prepare a Statement of Justification under the Historical Resources Act for the proposed project area. Almost all of the area within the proposed project area was previously disturbed by agricultural use, road/highway construction, or infrastructure, which suggests there is little potential for finding undisturbed historical resources sites. The only section of the project area containing undisturbed lands falls within a portion of Search Area B (Carvel to Duffield). Upon review of the proposed WILD line routes, it is recommended that the only section of pipeline that would require further archaeological assessment lies in Sections 28, 29, and 30, Twp 52, Range 2, W5M and Sections 25 and 26, Twp 52, Range 3, W5M where previously undisturbed lands may lie along the CN rail line. The full report and figures from the Archaeology Group can be found in **Appendix III**.

Should suspected historical, archaeological, or paleontological resources be encountered during any phase of construction, development proponents and their representatives must report these resources to Alberta Culture. Work in proximity to archaeological, paleontological, or historical sites discovered during construction must be suspended.

A Historical Resources Impact Assessment (a more in-depth archaeological survey) has not been completed at this time.

5. Land Use

Agriculture is the dominant land use in the project area, with several Country Residential Districts also along the proposed line. The land use between the hamlets of Duffield and Carvel is primarily Country Residential. Any industrial or commercial expansion has been directed to existing business parks. Subdivisions have been developed to make use of the regional water and sewer lines currently existing in Parkland County's eastern portion (Municipal Development Plan Bylaw).

The Municipal Development Plan was checked for possible existing and future land uses which would conflict with the project, and none were identified.

6. Regulatory Considerations

Some considerations for regulatory approvals required within the proposed project area include the following:

6.1 Federal Jurisdictions

Canadian Environmental Assessment Act

The Canadian Environmental Assessment Agency (the Agency) is the agency responsible for the administration of the regulations and legislation associated with the *Canadian Environmental Assessment Act* (CEAA) (S.C. 1992, c.37; Government of Canada 2012b). Under the *Act*, an Environmental Assessment (EA) is required for projects that have been designated by regulation, Ministerial Order, or if the project is located on federal lands. The review process considers only those areas with federal jurisdiction, such as Aboriginal peoples, fish and fish habitat (*Fisheries Act*), aquatic species (SARA), and migratory birds (*Migratory Birds Convention Act*). A Project Description is initially supplied to the Agency for initial comment. Upon initial review, the Minister of the Environment can refer a designated project to a review panel or joint review panel (joint with Alberta, for example, under the Canada-Alberta Agreement). It is important to note that the Minister may, however, designate a physical activity not identified in the Regulation if it has the potential to cause adverse environmental effects or if public concerns related to those effects warrant the decision.

As per the *Regulations Designating Physical Activities* (SOR/2012-147; Government of Canada 2013a) under CEAA, activities included in this Project are not likely to require an environmental assessment. The proposed length of Water Line 1 line is approximately 35 km, which is below the CEAA Environmental Assessment criteria of 40 km. However, a detailed project description can be sent to the Agency for confirmation once detailed design information is available.

Migratory Birds Convention Act

The Migratory Birds Convention Act (MBCA; S.C. 1994, c.22; Government of Canada 2010a) and Migratory Birds Regulations (C.R.C., c.1035; Government of Canada 2013b) are administered by Environment Canada. Under the MBCA, Canadian Wildlife Service has jurisdictional interest with respect to the management of migratory birds and migratory bird populations, protecting nationally significant nesting habitats, and regulating the hunting of migratory game birds such as ducks and geese. Section 6(a) of the General Prohibitions of the Migratory Birds Regulations states that it is an offence to “disturb, destroy or take a nest, egg, or nest shelter” of a migratory bird. Additionally, Section 35(1) stipulates that “no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds”.

The MBCA and its associated regulation specify that efforts should be made to preserve and protect habitat necessary for the conservation of migratory birds. This includes nesting and wintering grounds, migratory bird corridors, and encompasses such activities as tree clearing, wetland consolidation, and temporary and permanent disturbances occurring in proximity to migratory bird habitat.

In the southern Parkland and Boreal ecozones of Alberta, Environment Canada advises that habitat destruction activities (e.g. vegetation clearing, flooding, draining, construction, etc.) in upland areas attractive to migratory birds are prohibited between May 1st and August 20th. In wetland areas attractive to migratory birds, the window is between April 15th and August 20th (Paul Gregoire, Environment Canada, personal communication).

Species at Risk Act

The Species at Risk Act (SARA) (S.C. 2002, c.29; Government of Canada 2013c) provides protection for Canadian indigenous species, subspecies, and distinct populations and their critical habitats on federal lands, but does not apply to lands held by the Province of Alberta or its private citizens unless "the laws of Alberta do not effectively protect the species or the residences of its individuals". The Minister may issue an order in council to protect federally listed species that occur on provincial or private lands, but this has not yet occurred in the project area.

Fisheries Act

The *Fisheries Act* (R.S.C., 1985, c. F-14; Government of Canada 2013d) applies to all Canadian fisheries waters and Fisheries and Oceans Canada (DFO) has the responsibility to administer and enforce the conservation and protection of fish habitat on private property, as well as on provincial and federal lands. Section 36(3) of the *Fisheries Act* prohibits the discharge of deleterious substances into a water body; Section 20(1) requires that any works conducted in and around a water body accommodate fish passage; and Section 35(1) prohibits serious harm to fish, which includes fish and fish habitat that are part of or support commercial, recreational, or Aboriginal fisheries. Serious harm is defined in the *Fisheries Act* as the death of fish, a permanent alteration to fish habitat, and/or the destruction of fish habitat.

DFO has established a self-assessment tool outlining project activities and criteria that do not require DFO review. DFO also provides *Measures to Avoid Harm to Fish and Fish Habitat,* which are designed to avoid causing harm and comply with the *Fisheries Act.* If a project does not meet the criteria established by DFO to avoid serious harm to fish and effects cannot be mitigated, a Request for Review must be submitted for consideration by the Minister of Fisheries and Oceans.

If the project makes use of temporary dams and pumps or diversion channels for construction site isolation purposes, can avoid killing fish, and can restore the site back to its existing condition, a request for review will not have to be submitted. Best practices will still have to be followed to avoid causing serious harm to fish, including construction activities occurring outside all applicable RAPs.

Navigable Waters Protection Act

The Transport Canada Navigable Waters Protection Program supports the regulation of works constructed or placed in, on, over, under, through, or across navigable waters in Canada in accordance with the Navigable Waters Protection Act (NWPA) (R.S.C., 1985, c. N-22; Government of Canada 2009). As part of the Federal Government's 2012 Bill C-45, amendments were made to the NWPA including implementation of a schedule listing major waterways for which regulatory approval is required. A review will not be required by Transport Canada as the waterways crossed by the project are not included in the Schedule of the Act.

6.2 Provincial Jurisdictions

Alberta Environmental Protection and Enhancement Act (EPEA)

AESRD is the provincial ministry responsible for the administration of the *Environmental Protection and Enhancement Act* (EPEA; R.S.A. 2000, c. E-12; Government of Alberta 2013b). This Act is one of the most faceted pieces of environmental legislation in Alberta.

The EPEA covers the provincial Environmental Assessment Process. A Director appointed by the Minister is responsible for reviewing project summaries submitted by the proponents.

This initial review process will determine if the project is Mandatory (requires an Environmental Impact Assessment (EIA) report), Exempted (from the Environmental Assessment Process), or Discretionary (an EIA not required, but other approvals may be required, or more information is required to make a determination). A list of Mandatory and Exempted activities can be found in the most recent *Environmental Assessment (Mandatory and Exempted Activities) Regulation*. Similar to the CEAA process, the Director may decide that the potential for environmental impacts warrant further consideration and can order an EIA to be undertaken for projects not listed as a Mandatory activity in the Regulation.

The proposed project is not listed as a mandatory activity under *Environmental Assessment (Mandatory and Exempted Activities) Regulation,* but does require an approval under the *Activities Designation Regulation.*

Conservation and Reclamation Approvals

Within Alberta, a Class 1 pipeline requires a Conservation and Reclamation Approval under EPEA and the *Activities Designation Regulation.* A Class 1 pipeline is defined as a pipeline where the length (in km) multiplied by the outside pipe diameter (in mm) equals, or is greater than an index value of 2690. The proposed project design for Water Line 1, Sewage Line 1, and Sewage Line 2 classify them as Class 1 Pipelines. Water Line 2 is a Class 2 pipeline, which does not require approval under EPEA, but is still subject to the Environmental Protection Guidelines for Pipelines. See **Table 6.0**for line specific width, diameter, index, and class.

Table 6.0 - Proposed Pipeline Diameter, Length, Index and Class

Line	Length (km)	Diameter (mm)	Index	Pipeline Class
Water Line 1	35	150	5250	1
Water Line 2	15.4	100	1540	2
Sewage Line 1	35	100	3500	1
Sewage Line 2	27.1	100	2710	1

Class 1 pipelines are subject to the terms and conditions of the approval, as well as the Environmental Protection Guidelines for Pipelines. These guidelines apply to the construction, operation, maintenance, and reclamation of the pipeline, as well as all associated works (roads, compressor sites, pump stations, work camps, etc.). Class 1 pipelines are also subject to environmental protection orders and must meet the criteria for reclamation certification.

Conservation and Reclamation Report Requirements

A Conservation and Reclamation Report should include findings of any background information reviews and environmental surveys conducted for the project. It also provides potential environmental constraints related to biophysical resources, mitigative measures that should be incorporated into the planning and design of the proposed project, and a project-specific Environmental Protection Plan (EPP). Specific field surveys that will be required for the proposed project as part of the Conservation and Reclamation Report include:

- Clubroot fungus assessment
- Soil investigation
- Vegetation survey
- Rare plant surveys
- Wetland survey
- Wildlife surveys
    - Birds
    - Mammals
    - Amphibians and reptiles

  - Special status species
- Watercourse crossings (fish and fish habitat survey)

Wildlife Act

Alberta's *Wildlife Act* (R.S.A. 2000, c. W-10; Government of Alberta 2013c) protects the residences of wildlife on private and public lands. More specifically, a person must not wilfully harm, disturb or destroy a house, nest or den of certain species. Section 96 of the *Wildlife Regulation* (Government of Alberta 2013d) outlines the wildlife species, areas, and time of year when the Act applies. All endangered wildlife, upland game birds, some migratory birds, snakes and bat dens, and beavers (in some instances) are covered under Section 36 of the *Act*. For most wildlife, disturbing the habitat of these animals is prohibited year-round throughout Alberta. AESRD staff may recommend timing restrictions on activities to minimize disturbance to the nest of breeding wildlife and birds. The *Wildlife Act* also protects endangered plant species (both vascular and non-vascular) listed in the *Wildlife Regulation*.

Public Lands Act

All Crown land, including the bed and shores of all permanent watercourses and water bodies, are considered Alberta Public Lands unless they are owned by the Government of Canada. As such, approvals from AESRD under the *Public Lands Act* (R.S.A. 2000, c. P-40; Government of Alberta 2013e) are required for any activity on Public Lands or the bed or shore of Crown owned rivers, streams, or lakes. A list of activities that require a *Public Lands Act* approval is available from the AESRD website.

Water Act

All water resources located within the province of Alberta are owned by the Provincial Government. AESRD administers the Alberta *Water Act,* which is the primary legislation governing the use and management of Alberta's water resources, including wetlands. Alberta's *Water Act* (R.S.A. 2000, c. W-3; Government of Alberta 2013a) requires approval and/or attainment of a license before undertaking construction in a surface water body or activities related to a water body which have the potential to impact the aquatic environment.

Water Act Codes of Practice

A notification to the department is required for activities that adhere to the Codes of Practice. There are four Codes of Practice that require notification:

- Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body
- Code of Practice for Watercourse Crossings
- Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines
- Code of Practice for Outfall Structures on Water Bodies

Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body

Any pipeline that crosses a water body is regulated under the *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*. The codes of practice regulate activities under the *Water Act that* would normally require an approval to be obtained. They set out regulations and standards that minimize the disturbance and impact on the environment when conducting the activities governed by the code. The project will need to adhere to this code and send notification to the regional Natural Resources Service office of Alberta Environment.

Alberta's Wetland Policy

AESRD released Alberta's new Wetland Policy in September 2013 (Government of Alberta 2013f). This policy will be phased in during the summer of 2014.

Until then, the "Wetlands Management in the Settled Area of Alberta – an Interim Policy" (1993) provides a framework to conserve wetlands within Alberta. In addition to conserving wetlands, this document also introduces the mitigation of wetland impacts as well as the enhancement, restoration, or creation of ephemeral wetlands. In 2007, the Alberta Government released the revised edition of the Provincial Wetland Restoration/Compensation Guide, which provides recommendations to achieve the policy's goals, intent, objectives, and mitigation requirements.

The new wetland policy will apply to all wetlands in the province (no discrimination between wetlands located in the green versus white zone of Alberta) and will focus on conserving and minimizing wetland losses. Wetlands to be impacted will need to be evaluated by a Qualified Wetland Aquatic Environment Specialist (QWAES) using a standardized tool to determine Wetland Value. The score determined from the tool will be used in the decision making process in order to avoid, mitigate, or replace wetland losses. Wetland Value will also be used to determine wetland replacement/compensation ratios that are necessary for the *Water Act* approval process (Government of Alberta 2013a).

First Nations

The Alberta Government requires that all projects on Public Lands undergo a First Nations Consultation assessment request through AESRD, as required by *Alberta's First Nations Consultation Policy and Guidelines on Land Management and Resource Development* at the start of the project to determine consultation needs and requirements. As the project crosses through public land and multiple water bodies, a First Nations Consultation assessment request will be required.

Water Line 2 and Sewage Line 2 travel southward just to the east of Wabamun 133A, but will not travel within the reserve.

Historical Resources Act

The *Historical Resources Act* (R.S.A. 2000, c. H-9; Government of Alberta 2013g) is administered by Alberta Culture. The Act protects all historical resources in Alberta, including paleontological, prehistoric, historic, archaeological, and certain cultural or natural objects, sites, or structures. Pursuant to the Act, a Historical Resource Clearance is needed for projects where effects on known and unknown historical resources could occur.

6.3 Municipal Jurisdictions

The proposed project is within the Parkland County municipal district, and must be compatible the land use zoning, future lands uses, and obtain all applicable permits within the county. According to the Parkland County Land Use Bylaw (Bylaw No. 20-2009), a water line is a minor utility and is a compatible land use across all Land Use Districts the proposed project crosses. Bylaw No. 20-2009 also indicates that "the installation, maintenance and repair of public works, services and utilities carried out by or on behalf of federal, provincial or municipal authorities on land that is publicly owned or controlled" does not require a development permit. As the proposed project takes place along existing road right of ways, it should not require a permit. Municipal development plan was checked for possible existing and future land uses which would conflict with the project, and none were identified. The Planning and Development Services department should be consulted to confirm the project is complying with all land use, development restrictions, and permitting requirements of the county.

6.4 Summary of Regulatory Requirements

A summary of regulatory requirements applicable to this project is provided in **Table 7.0**.

Table 7.0 - Summary of Regulatory Requirements

Legislation, Policy, or Guidelines	Responsible Authority	Description	Required Action
Federal Legislation			
Canadian Environmental Assessment Act	Canadian Environmental Assessment Agency	To assess the environmental effects of projects requiring federal actions or decisions, and ensure that the environmental effects of projects be considered early in their planning stages.	Submission of a Project Description to determine if an Environmental Assessment under CEAA is required. As the project stands, an EA will not be required.
Fisheries Act	Fisheries and Oceans Canada	Prohibits any harmful alteration, disruption, or destruction of fish habitat.	No project review required provided the project activities and criteria meet the DFO self-assessment for a project that doesn't require a review
Migratory Birds Convention Act	Environment Canada	Prohibits the killing, capturing, injuring, taking, or disturbing of migratory birds. Prohibits the damaging, destroying, removing, or disturbing of all migratory bird nests	Vegetation clearing restricted from May 1st to August 20th. Disturbance of wetlands attractive to migratory birds restricted from April 15th to August 20th.
Provincial Legislation			
Environment Protection and Enhancement Act	Alberta Environment and Sustainable Resource Development	Support and promote the protection, enhancement, and wise use of the environment.	Conservation and Reclamation Approval due to *Activities Designation Regulation for Water Line 1, Sewage Line 1, and Sewage Line 2.*
Water Act	Alberta Environment and Sustainable Resource Development	The *Water Act* focuses on managing and protecting *Alberta's* water, while streamlining administrative processes.	Adhere to the *Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body* under the *Water Act,* and send notification to the department
Alberta's Wetland Policy	Alberta Environment and Sustainable Resource Development	Manages the enhancement, restoration, or creation of permanent wetlands.	Wetland conservation and creation according to the wetland policy. Will be required if wetlands are impacted.
Alberta Historical Resources Act	Alberta Culture	Provides a framework for Historic Resources Impact Assessments.	Historical Resource Assessment required on undisturbed lands (Carvel to Duffield) along CN line.
Public Lands Act	Alberta Environment and Sustainable Resource Development	Any activity that alters or occupies the bed and shore of a water body requires written approval.	Public Lands Dispositions will be required for any structures on Crown-owned watercourses and/or land. A Temporary Field Authorization will be required for any temporary access on public land.
Alberta Wildlife Act	Alberta Environment and Sustainable Resource Development	Prohibits the harm of residences of species at risk. Provides restricted timing windows and disturbance setback distances for Species at Risk.	Consult with AESRD if species at risk are present. Vegetation clearing restricted from March 1st to August 31st for sensitive species, year-round for others.

7. Summary

The desktop review for the WILD pipeline project identified several environmental concerns:

- The WILD line would cross several water courses that are classified as Mapped Class C, which have a Restricted Activity Period from April 16th to June 30th
- Unmapped Class C water bodies are also crossed by this project and have a RAP of April 16th to June; one Unmapped Class C water body imposes a RAP from September 1st to June 30th
- Several Species at Risk have the potential to occur in the area
- Clubroot fungus has a high level of occurrence in the Parkland County area

The project Search Areas occur within Environmentally Significant Areas, the Colonial Nesting Bird Wildlife Layer for the Blue Heron, the Sharp-tailed Grouse Key Range, and Parks areas. Work should be limited between March 15th and June 15th due to the Sharp-tailed Grouse lekking (breeding) season.

A total of 30 Species at Risk have been identified as having a potential to occur within the Search Areas with COSEWIC ratings ranging from “Special Concern” to “Endangered”. Environment Canada restricts activities that cause habitat destruction (e.g. vegetation clearing, flooding, draining, construction, etc.) in upland areas attractive to migratory birds between May 1st and August 20th and in wetland areas the restriction occurs between April 15th and August 20th.

Within proposed project area, wetlands have been identified from the Wetland Inventory dataset. Within Search Area A, 19 marsh, two open water, seven fen, and three swamp areas occur for a total area of 353.6 hectares (ha). Within Search Area B, 29 marsh, four open water, two bog, and seven fen areas occur for a total area of 1045.2 ha. Search Area C contains 34 marsh, four open water, three bog, and seven fen areas in a total area of 866.5 ha.

Rare plant species have been identified within the Project Search Areas, none of which are listed as Species at Risk. Clubroot has a high level of occurrence within Parkland County. This disease can cause devastating yield losses to canola and vegetable crops and is a declared pest within the Agricultural Pests Act. As such, the clubroot fungus assessment is of particular importance should this project be approved, as well as clubroot control measures specified in the Alberta Clubroot Management Plan must be followed. The line within Search Area B (Carvel to Duffield) will require a historical resource assessment as portions of this line are within undisturbed lands should this alignment be approved.

Since Water Line 1, Sewage Line 1, and Sewage Line 2 are all classified as a Class 1 pipelines, this project will require a Conservation and Reclamation Report. This project will affect water crossings, but no project review will be required as long as the project activities meet the DFO self-assessment. The *Code of Practice for Pipelines and Telecommunications Lines Crossing a Water Body* under the *Water Act* will need to be adhered to. All restricted activity periods must be adhered to as well.

If the proposed project is approved, a Conservation and Reclamation Report will need to be prepared for this project as Class 1 pipelines are included in the proposed project plans. A full suite of field surveys for the Conservation and Reclamation Report will be required. The following is a list of required environmental surveys and assessments that must be completed for approval prior to the commencement of any construction activities:

- Fish and fish habitat surveys
- Wetland assessments
- Vegetation inventories
- Club root fungus assessment

- Rare plant surveys
- Soil and terrain surveys
- Wildlife and wildlife habitat surveys
- Species at risk surveys
- Historical resources impact assessment

It is important to note that the presence of protected birds, amphibians, mammals, and/or plant species may restrict construction activities in the proposed project area at certain times of year.

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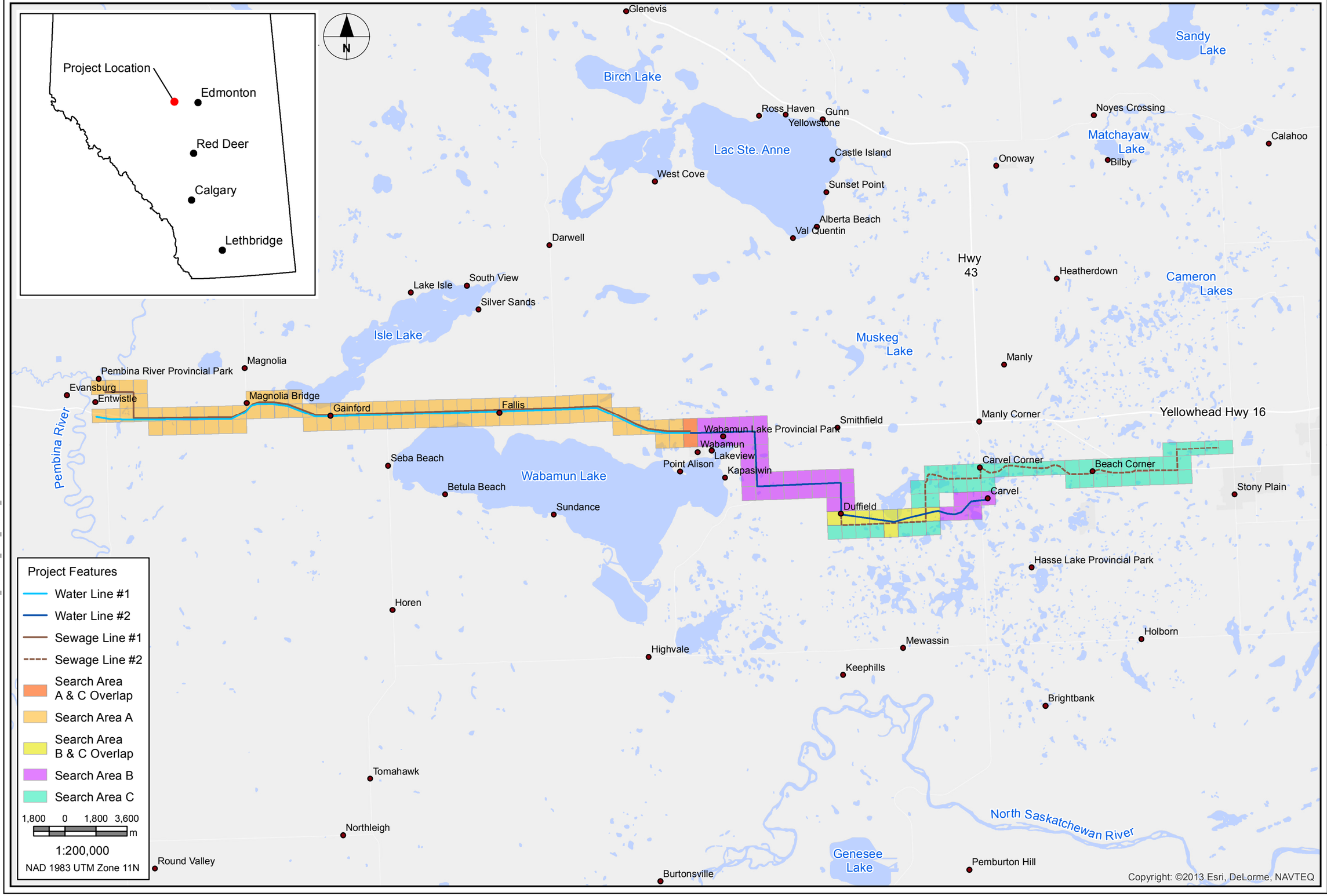
Appendix I

Figures



Project Management Initials: Designer: Checked: Approved:

ANSI B 279.4mm x 431.8mm

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AECOM

Figure: A1

Overview Map with Proposed Approximate Project Line Locations, and Search Areas

WILD Water Line Servicing Study
Environmental Overview
Parkland County

ANSI B 279.4mm x 431.8mm

Approved:

Checked:

Designer:

Project Management Initials:

Last saved by: MAHEC (2014-05-18) Last Plotted: never
Filename: P:\A155004-11\GIS\60313882-WILD ENVIRONMENTAL - JAMIE KALLAI\G002_60313882_01V1_FIGURE_2.MXD

AECOM

Figure: A2

Environmentally Significant Areas, and Key Wildife and Biodiversity Zones

WILD Water Line Servicing Study
Environmental Overview
Parkland County

N

Park Court
Matthews Crossing
Pembina River Provincial Park
Magnolia
Evansburg
Entwistle
Magnolia Bridge
Gainford
Fallis
Pembina River
Lac Ste. Anne
Ross Haven
Gunn
Castle Island
West Cove
Sunset Point
Alberta Beach
Val Quentin
Darwell
Lake Isle
South View
Silver Sands
Isle Lake
Seba Beach
Betula Beach
Wabamun Lake
Sundance
Wabamun Lake Provincial Park
Wabamun
Lakeview
Point Alison
Kapasiwin
Smithfield
Duffield
Noyes Crossing
Matchayaw Lake
Calahoo
Onoway
Bilby
Hwy 43
Heatherdown
Cameron Lakes
Muskeg Lake
Manly
Manly Corner
Yellowhead Hwy 16
Carvel Corner
Beach Corner
Carvel
Stony Plain
Hasse Lake Provincial Park
Horen
Highvale
Mewassin
Holborn
Keephills
Brightbank
Tomahawk
Northleigh
Round Valley
Burtonsville
Genesee Lake
North Saskatchewan River
Pemburton Hill
Huggett

Key Wildlife and Biodiversity Zones

ESA 2009

Boreal

Project Features

Search Area A

Search Area B

Search Area C

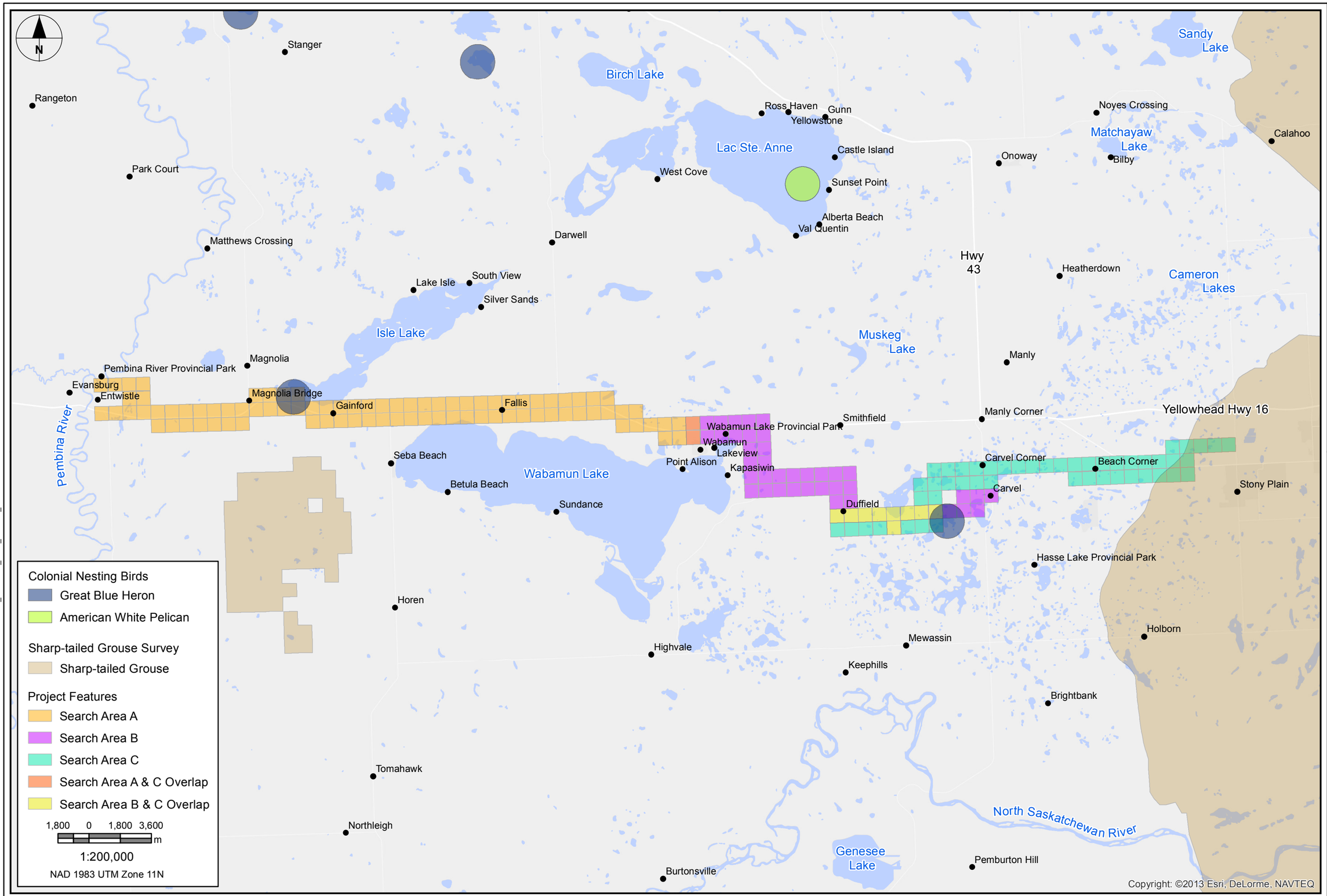
Search Area A & C Overlap

Search Area B & C Overlap

1,800 0 1,800 3,600
m

1:200,000

NAD 1983 UTM Zone 11N



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Project Management Initials: Designer: Checked: Approved:

ANSI B 279.4mm x 431.8mm

AECOM

Figure: A3

Key Wildlife and Range Layers

WILD Water Line Servicing Study
Environmental Overview
Parkland County

Figure: A4

AECOM

Provincial Parks Within Search Area A & Wetlands Intersecting Each Line (Within a 100 Metre Buffer)

WILD Water Line Servicing Study
Environmental Overview
Parkland County

Rangeton
Park Court
Matthews Crossing
Pembina River
Pembina River Provincial Park
Evansburg
Entwistle
Magnolia
Magnolia Bridge
Gainford
Fallis
Ross Haven
Yellowstone
Lac Ste. Anne
West Cove
Darwell
Lake Isle
South View
Silver Sands
Isle Lake
Wabamun Lake Provincial Park
Wabamun
Lakeview
Point Alison
Kapasiwin
Seba Beach
Wabamun Lake
Betula Beach
Sundance
Horen

ESA 2009
- Natural Area
- Provincial Park

Project Features
- Water Line #1
- Sewage Line #1
- Search Area A Wetlands
- Search Area A

1,100 0 1,100 2,200 m

1:120,000

NAD 1983 UTM Zone 11N

ANSI B 279.4mm x 431.8mm
Project Management Initials: Designer: Checked: Approved:
Last saved by: MAHEC (2014-05-20) Last Plotted: never
Filename: P:\A155\004-11\GIS\60313882_WILD ENVIRONMENTAL - JAMIE KALLA\G004_60313882_01V1_FIGURE_4.MXD

ANSI B 279.4mm x 431.8mm

Project Management Initials: Designer: Checked: Approved:

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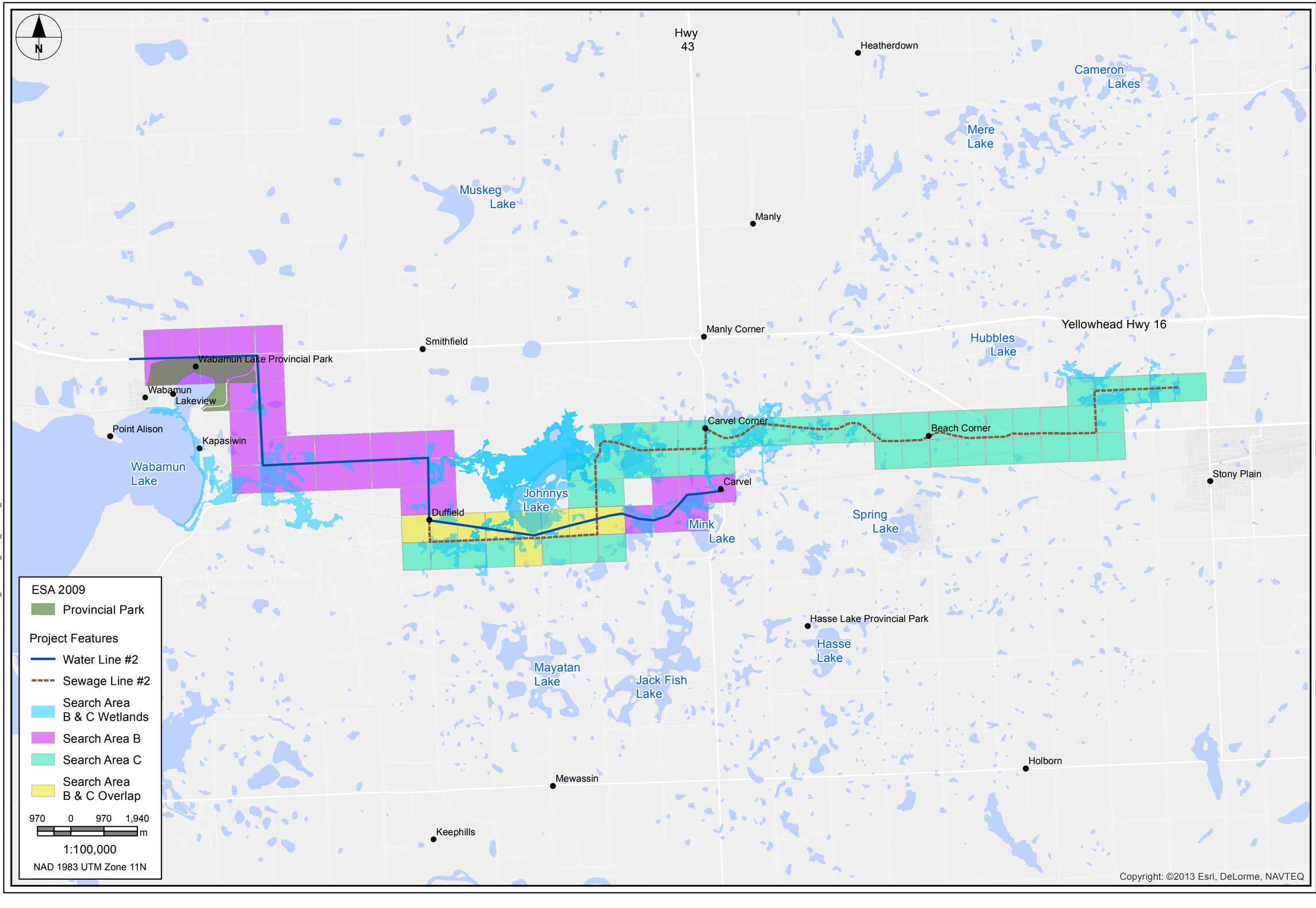
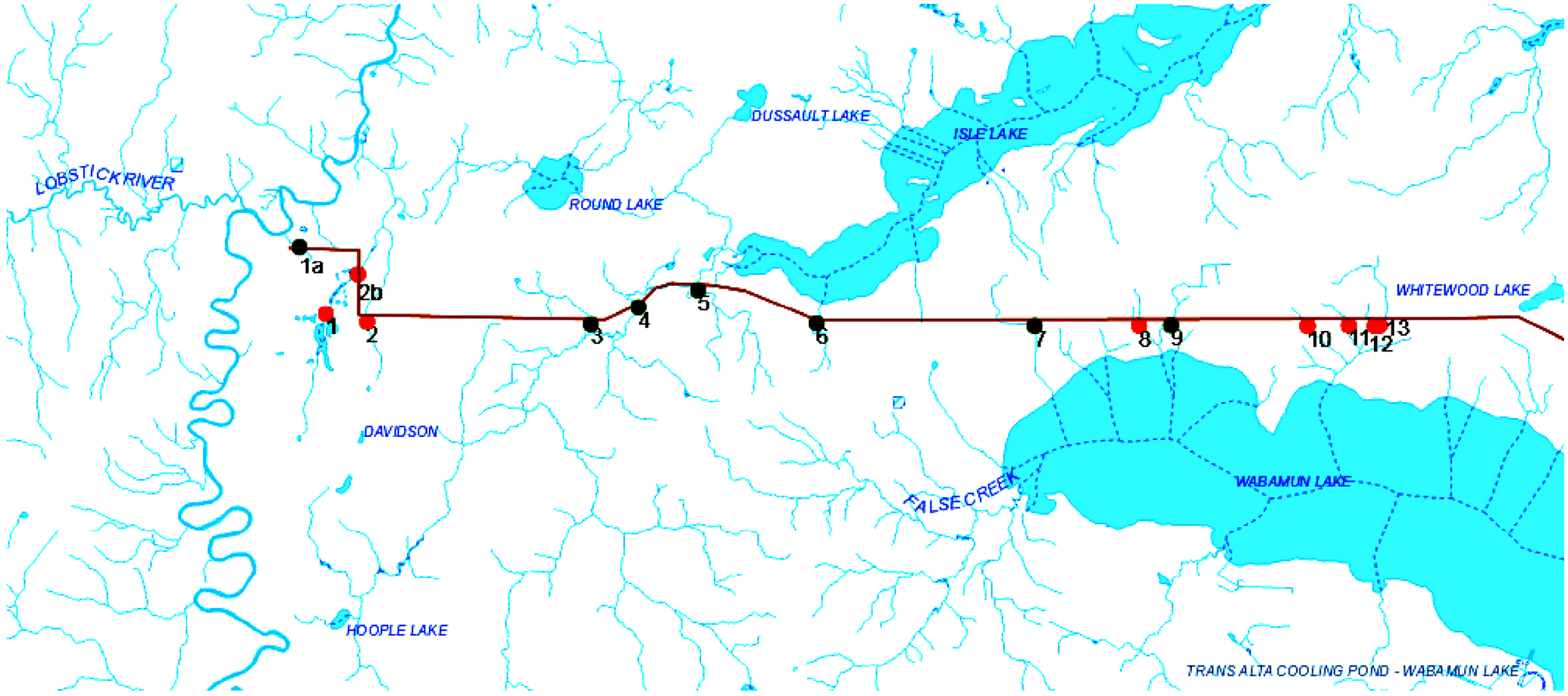
AECOM

Figure: A5

Provincial Parks Within Search Area B & Wetlands Intersecting Each Line (Within a 100 Metre Buffer)

WILD Water Line Servicing Study
Environmental Overview
Parkland County





● Crossings with RAP

● Crossings without RAP

Scale: NTS

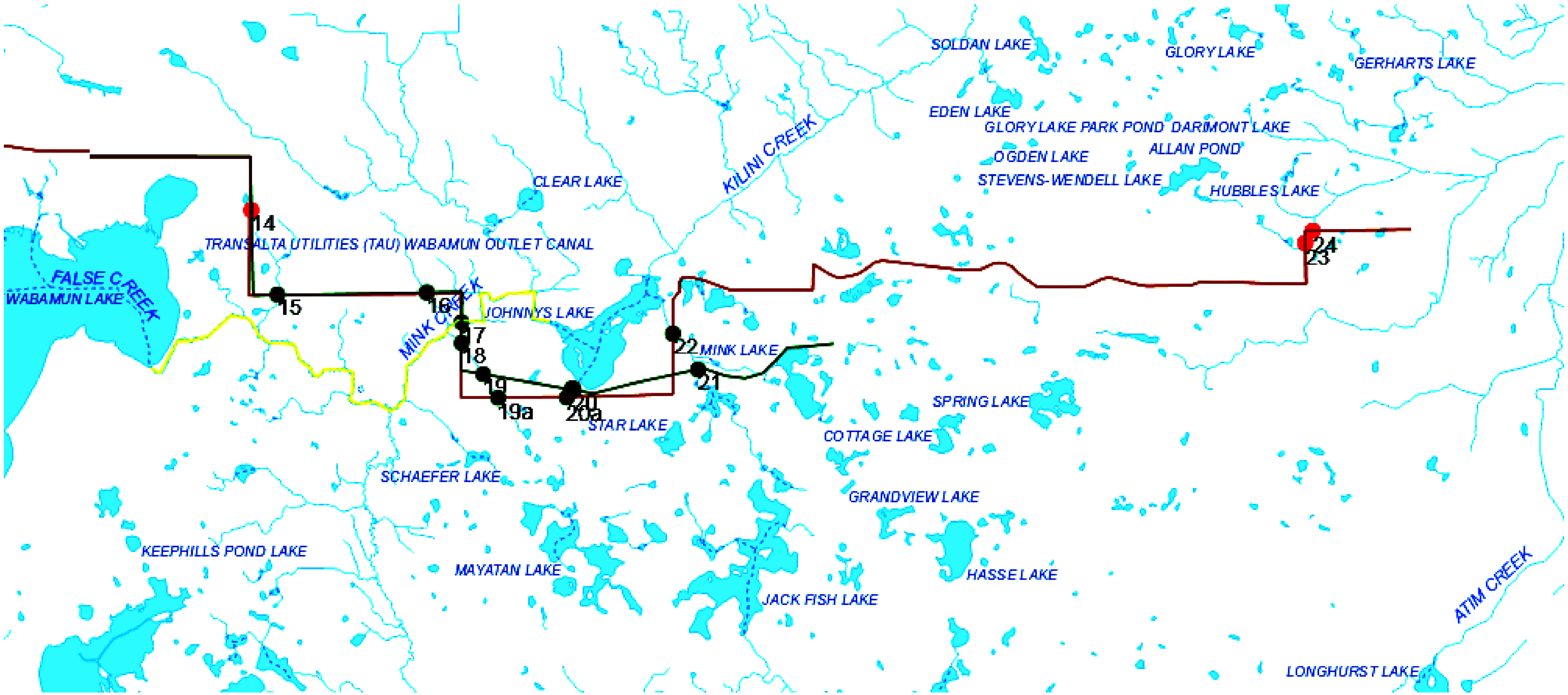
Image Source: AESRD. 2014. The Fish and Wildlife Internet Mapping Tool. Retrieved May, 2014 from: http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx

AECOM

Figure: A6

Water Crossings From Wabamun to Entwistle

WILD Water Line Servicing Study
Environmental Overview
Parkland County



● Crossings with RAP

● Crossings without RAP

Scale: NTS

Image Source: AESRD. 2014. The Fish and Wildlife Internet Mapping Tool. Retrieved May, 2014 from: http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx

Figure: A7

Water Crossings from Wabamun to Stony Plain

WILD Water Line Servicing Study
Environmental Overview
Parkland County

ANSI B 279.4mm x 431.8mm

Project Management Initials: Designer: Checked: Approved:

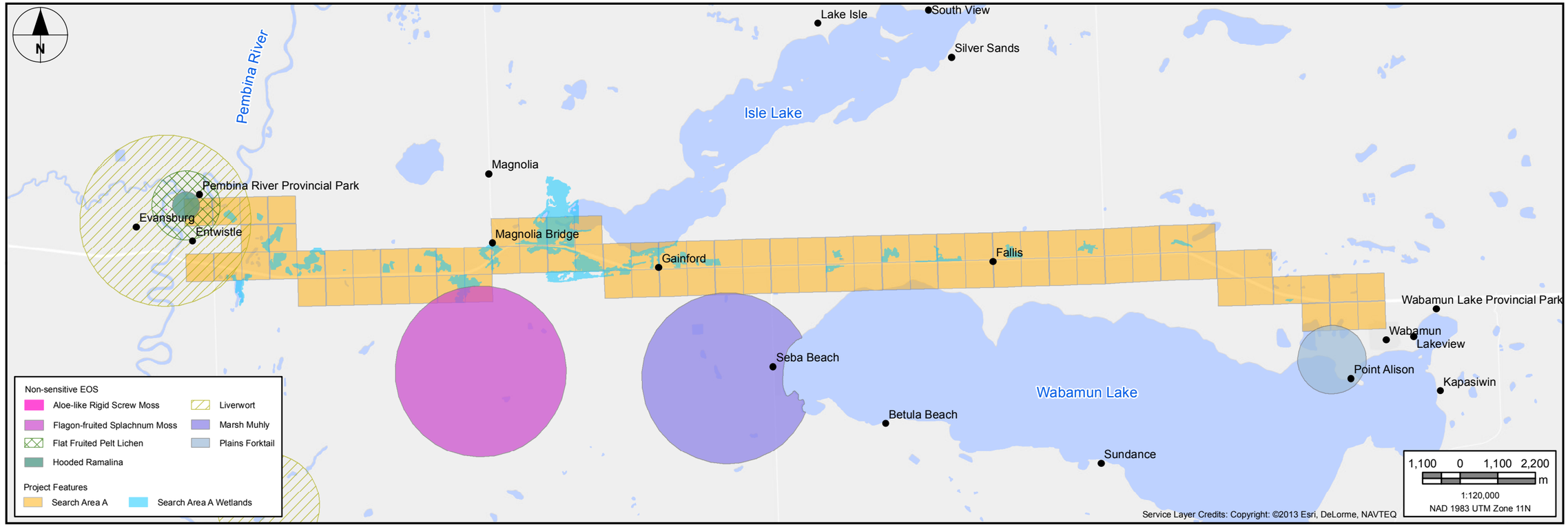
Last saved by: MAHEC (2014-05-21) Last Plotted: never
Filename: P:\A155004-11\GIS\60313882 - WILD ENVIRONMENTAL - JAMIE KALLAI\G008_60313882_01V1_FIGURE_8.MXD

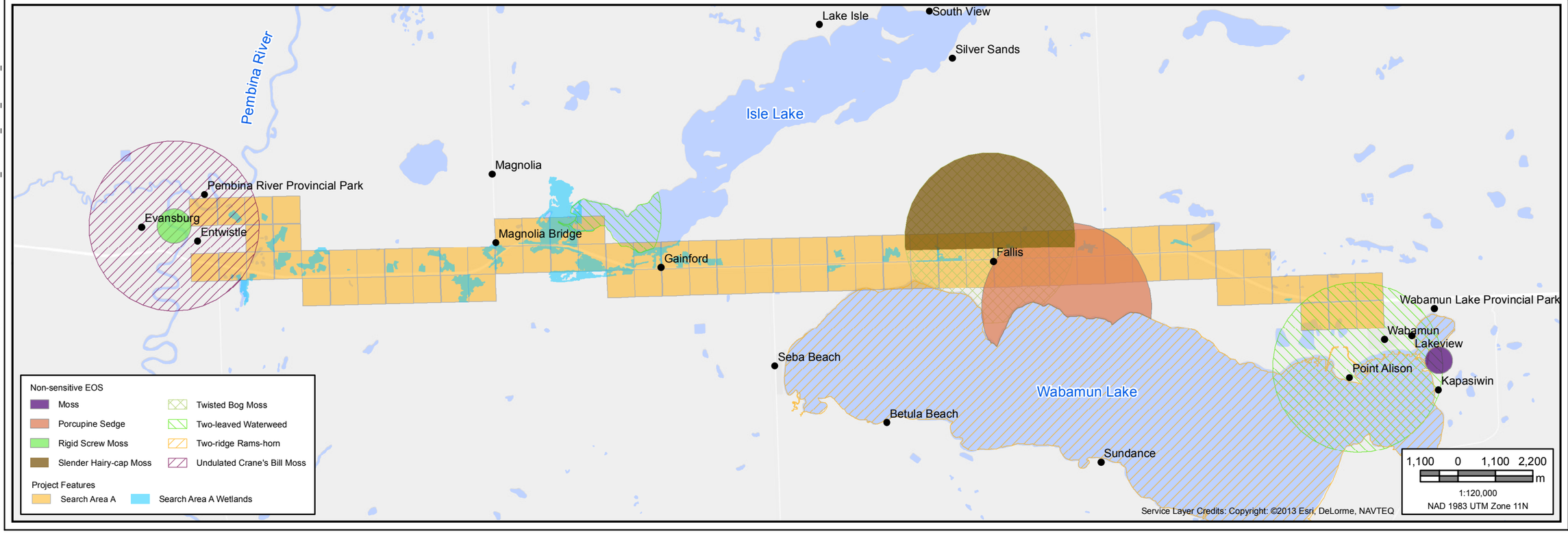
AECOM

Figure: A8

Rare Plants Within Search Area A

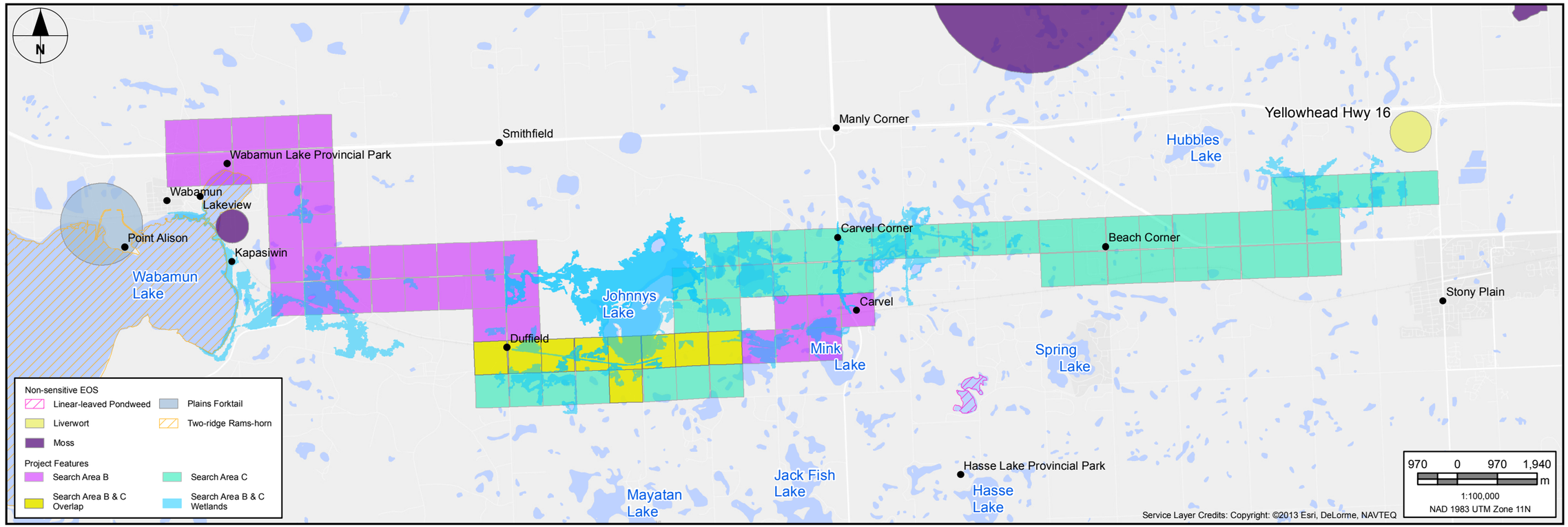
WILD Water Line Servicing Study
Environmental Overview
Parkland County

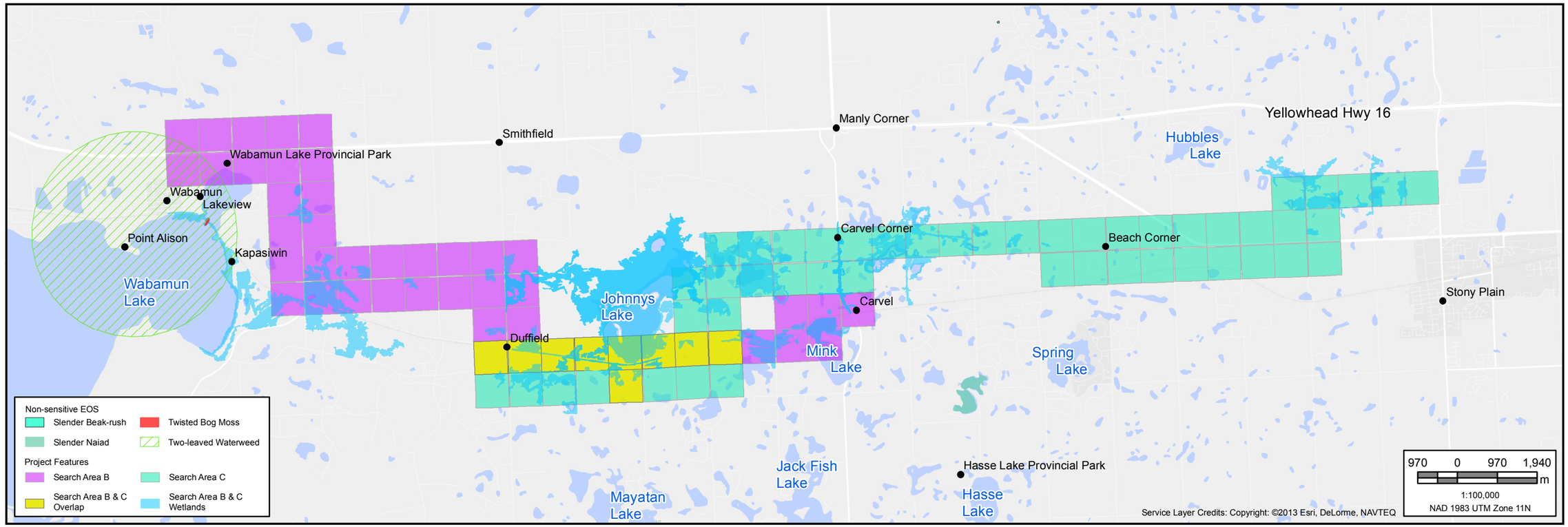




ANSI B 279.4mm x 431.8mm

Project Management Initials: Designer: Checked: Approved:





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AECOM

Figure: A9

Rare Plants Within Search Area B and C

WILD Water Line Servicing Study
Environmental Overview
Parkland County

Appendix II

ERCB Search Results

AER SPILL / COMPLAINT INCIDENTS FOR 04-11-053-04W5M

SPILL - SEPTEMBER 27, 2009 - INCIDENT NUMBER: 20091878			
AER NOTIFIED:	SEPTEMBER 27, 2009	**INCIDENT COMPLETE:**	DECEMBER 8, 2009
LICENCE #:	8807 - 1 (Pipeline Licence)		
LICENCEE:	BARNWELL OF CANADA, LIMITED		
SOURCE:	CRUDE OIL PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	3.18
PIPELINE GRADE:	X42		
CAUSE:	EQUIPMENT FAILURE - MALFUNCTION		
FAILURE TYPE:	VALVE OR FITTING FAILURE		
JURISDICTION:	CROWN ANY AREA		
STRIKE AREA:		**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW)		

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AER SPILL / COMPLAINT INCIDENTS FOR 04-11-053-04W5M

SPILL - SEPTEMBER 27, 2009 - INCIDENT NUMBER: 20091878			
AER NOTIFIED:	SEPTEMBER 27, 2009	**INCIDENT COMPLETE:**	DECEMBER 8, 2009
LICENCE #:	8807 - 1 (Pipeline Licence)		
LICENCEE:	BARNWELL OF CANADA, LIMITED		
SOURCE:	CRUDE OIL PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	88.9	**PIPELINE WT:**	3.18
PIPELINE GRADE:	X42		
CAUSE:	EQUIPMENT FAILURE - MALFUNCTION		
FAILURE TYPE:	VALVE OR FITTING FAILURE		
JURISDICTION:	CROWN ANY AREA		
STRIKE AREA:		**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW)		

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AER SPILL / COMPLAINT INCIDENTS FOR 14-12-053-04W5M

SPILL - JULY 26, 1993 - INCIDENT NUMBER: 19931303			
AER NOTIFIED:	JULY 26, 1993	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:	8966 - 4 (Pipeline Licence)		
LICENCEE:	WEST PARKLAND GAS CO-OP LTD.		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	168.3	**PIPELINE WT:**	3.18
PIPELINE GRADE:	2901		
CAUSE:	CONVERSION		
FAILURE TYPE:	CORROSION EXTERNAL		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:		**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	JANUARY 27, 1994
SUBSTANCES SPILLED:	2 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

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AER SPILL / COMPLAINT INCIDENTS FOR 04-13-053-04W5M

SPILL - MAY 6, 2004 - INCIDENT NUMBER: 20041121			
AER NOTIFIED:	MAY 6, 2004	**INCIDENT COMPLETE:**	DECEMBER 9, 2004
LICENCE #:	28593 - 1 (Pipeline Licence)		
LICENCEE:	ATCO GAS AND PIPELINES LTD. (SOUTH)		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	RUPTURE	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	273.1	**PIPELINE WT:**	5.6
PIPELINE GRADE:	A		
CAUSE:	EXTERNAL - THIRD PARTY DAMAGE		
FAILURE TYPE:	DAMAGE BY OTHERS		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:		**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	1	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	
SUBSTANCES SPILLED:	0 (1000m^3) GAS PRODUCTION (MARK		

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AER SPILL / COMPLAINT INCIDENTS FOR NE-13-053-06W5M

COMPLAINT - JANUARY 24, 2007 - INCIDENT NUMBER: 20070251			
AER NOTIFIED:	JANUARY 24, 2007	**INCIDENT COMPLETE:**	JANUARY 29, 2007
LICENCE #:			
LICENCEE:	UNKNOWN		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	VENTING - PLANNED MAINTENANCE		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
CONCERNS:	ODOURS - H2S		

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AER SPILL / COMPLAINT INCIDENTS FOR 16-13-053-06W5M

SPILL - OCTOBER 4, 2005 - INCIDENT NUMBER: 20052387			
AER NOTIFIED:	OCTOBER 4, 2005	**INCIDENT COMPLETE:**	NOVEMBER 14, 2005
LICENCE #:	2813 - 3 (Pipeline Licence)		
LICENCEE:	ATCO GAS AND PIPELINES LTD. (SOUTH)		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	60.3	**PIPELINE WT:**	3.91
PIPELINE GRADE:	2901		
CAUSE:	EQUIPMENT FAILURE - MECHANICAL/STRCTURAL		
FAILURE TYPE:	SEAM RUPTURE		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	OCTOBER 5, 2005
SUBSTANCES SPILLED:	4 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

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AER SPILL / COMPLAINT INCIDENTS FOR 10-18-053-06W5M

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SPILL - JUNE 13, 1994 - INCIDENT NUMBER: 19942141			
AER NOTIFIED:	JUNE 13, 1994	**INCIDENT COMPLETE:**	JULY 26, 1995
LICENCE #:	788 - 1 (Pipeline Licence)		
LICENCEE:	NORTH CANADIAN OILS LIMITED		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	RUPTURE	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	273.1	**PIPELINE WT:**	5.56
PIPELINE GRADE:	X46		
CAUSE:	CONVERSION		
FAILURE TYPE:	CONSTRUCTION DAMAGE		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JULY 26, 1995
SUBSTANCES SPILLED:	1 (1000m^3) GAS PRODUCTION (RAW) (0 (1000m^3) RECOVERED)		

AER SPILL / COMPLAINT INCIDENTS FOR 16-18-053-06W5M

SPILL - MARCH 31, 1997 - INCIDENT NUMBER: 19971415			
AER NOTIFIED:	MARCH 31, 1997	**INCIDENT COMPLETE:**	MARCH 31, 1997
LICENCE #:			
LICENCEE:	NORTHWESTERN UTILITIES LIMITED		
SOURCE:	GAS WELL		
CAUSE:	CONVERSION		
FAILURE TYPE:	CUMULATIVE RELEASE		
JURISDICTION:			
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	MARCH 31, 1997
SUBSTANCES SPILLED:	2 m3 CONDENSATE (0 m3 RECOVERED)		
COMPLAINT - NOVEMBER 17, 1995 - INCIDENT NUMBER: 19952742			
AER NOTIFIED:	NOVEMBER 17, 1995	**INCIDENT COMPLETE:**	NOVEMBER 17, 1995
LICENCE #:			
LICENCEE:	NORTHWESTERN UTILITIES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
CONCERNS:	ODOURS - THC		
COMPLAINT - SEPTEMBER 14, 1995 - INCIDENT NUMBER: 19952164			
AER NOTIFIED:	SEPTEMBER 14, 1995	**INCIDENT COMPLETE:**	SEPTEMBER 14, 1995
LICENCE #:			
LICENCEE:	NORTHWESTERN UTILITIES LIMITED		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
CONCERNS:	ODOURS - THC		

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AER SPILL / COMPLAINT INCIDENTS FOR 09-18-053-06W5M

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SPILL - JULY 29, 2002 - INCIDENT NUMBER: 20021766			
AER NOTIFIED:	JULY 29, 2002	**INCIDENT COMPLETE:**	JULY 29, 2002
LICENCE #:	11490 - 2 (Pipeline Licence)		
LICENCEE:	SUN GRO HORTICULTURE CANADA LTD.		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	60.3	**PIPELINE WT:**	2.16
PIPELINE GRADE:	T1A		
CAUSE:	CONVERSION		
FAILURE TYPE:	CORROSION EXTERNAL		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	JULY 29, 2002
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (RAW) (0 (1000m^3) RECOVERED)		

COMPLAINT - DECEMBER 31, 2001 - INCIDENT NUMBER: 20020079			
AER NOTIFIED:	DECEMBER 31, 2001	**INCIDENT COMPLETE:**	DECEMBER 31, 2001
LICENCE #:			
LICENCEE:	ATCO LTD.		
SOURCE:	UNKNOWN		
SOURCE IN COMPLAINCE?			
CAUSE:	CONVERSION		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
CONCERNS:	ODOURS - OTHER		

AER SPILL / COMPLAINT INCIDENTS FOR 01-20-053-07W5M

SPILL - OCTOBER 20, 1977 - INCIDENT NUMBER: 19771001			
AER NOTIFIED:	OCTOBER 20, 1977	**INCIDENT COMPLETE:**	SEPTEMBER 4, 1979
LICENCE #:			
LICENCEE:	MEOTA GAS CO-OPERATIVE ASSOCIATION LIMITED		
SOURCE:	MISCELLANEOUS		
CAUSE:	CONVERSION		
FAILURE TYPE:	VALVE FAILURE		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:		**CLEANUP DATE:**	SEPTEMBER 4, 1979
SUBSTANCES SPILLED:	21 m3 CRUDE OIL (12 m3 RECOVERED)		

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AER SPILL / COMPLAINT INCIDENTS FOR 01-22-053-05W5M

SPILL - OCTOBER 18, 1977 - INCIDENT NUMBER: 19770993

AER NOTIFIED:	OCTOBER 18, 1977	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:	788 - 1 (Pipeline Licence)		
LICENCEE:	NORTH CANADIAN OILS LIMITED		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	273.1	**PIPELINE WT:**	6.35
PIPELINE GRADE:	0X46		
CAUSE:	CONVERSION		
FAILURE TYPE:	VALVE OR FITTING FAILURE		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	JANUARY 27, 1994
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

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AER SPILL / COMPLAINT INCIDENTS FOR 02-24-053-06W5M

SPILL - OCTOBER 4, 2005 - INCIDENT NUMBER: 20052388			
AER NOTIFIED:	OCTOBER 4, 2005	**INCIDENT COMPLETE:**	OCTOBER 7, 2005
LICENCE #:	2813 - 1 (Pipeline Licence)		
LICENCEE:	ATCO GAS AND PIPELINES LTD. (SOUTH)		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	60.3	**PIPELINE WT:**	3.91
PIPELINE GRADE:	BW1		
CAUSE:	EQUIPMENT FAILURE - MALFUNCTION		
FAILURE TYPE:	VALVE OR FITTING FAILURE		
JURISDICTION:	FREEHOLD PRIVATE LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	YES	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	NO AFFECT/NORMAL NOTIFICATION		
WILDLIFE AFFECTED:	NO AFFECT		
AREA AFFECTED:	100 SQUARE METERS OR LESS		
ENVIRONMENT AFFECTED:	AIR/LAND		
# EVACUATED:	0	**CLEANUP DATE:**	OCTOBER 5, 2005
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

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AER SPILL / COMPLAINT INCIDENTS FOR 01-24-053-06W5M

SPILL - JULY 1, 1991 - INCIDENT NUMBER: 19911071

AER NOTIFIED:	JULY 1, 1991	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:	2813 - 2 (Pipeline Licence)		
LICENCEE:	NORTHWESTERN UTILITIES LIMITED		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	60.3	**PIPELINE WT:**	2.77
PIPELINE GRADE:	2901		
CAUSE:	CONVERSION		
FAILURE TYPE:	MECHANICAL JOINT FAILURE		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	JANUARY 27, 1994
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

OPTIONS

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AER SPILL / COMPLAINT INCIDENTS FOR 01-24-053-06W5M

SPILL - JULY 1, 1991 - INCIDENT NUMBER: 19911071

AER NOTIFIED:	JULY 1, 1991	**INCIDENT COMPLETE:**	JANUARY 27, 1994
LICENCE #:	2813 - 2 (Pipeline Licence)		
LICENCEE:	NORTHWESTERN UTILITIES LIMITED		
SOURCE:	NATURAL GAS PIPELINE		
PIPELINE DAMAGE:	LEAK	**PRESSURE TEST FAILURE?**	NO
PIPELINE OD:	60.3	**PIPELINE WT:**	2.77
PIPELINE GRADE:	2901		
CAUSE:	CONVERSION		
FAILURE TYPE:	MECHANICAL JOINT FAILURE		
JURISDICTION:	CROWN PUBLIC LANDS		
STRIKE AREA:	TOMAHAWK	**FIELD CENTRE:**	DRAYTON VALLEY
# OF INJURIES:	0	**# OF DEATHS:**	0
SPILL OFFSITE?	NO	**SENSITIVE AREA?**	NO
PUBLIC AFFECTED:	CONVERSION FROM ENV SYSTEM		
WILDLIFE AFFECTED:	CONVERSION FROM ENV SYSTEM		
AREA AFFECTED:	CONVERSION FROM ENV SYSTEM		
ENVIRONMENT AFFECTED:			
# EVACUATED:		**CLEANUP DATE:**	JANUARY 27, 1994
SUBSTANCES SPILLED:	0.1 (1000m^3) GAS PRODUCTION (MARK (0 (1000m^3) RECOVERED)		

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Appendix III

Historical Resources Statement of Justification

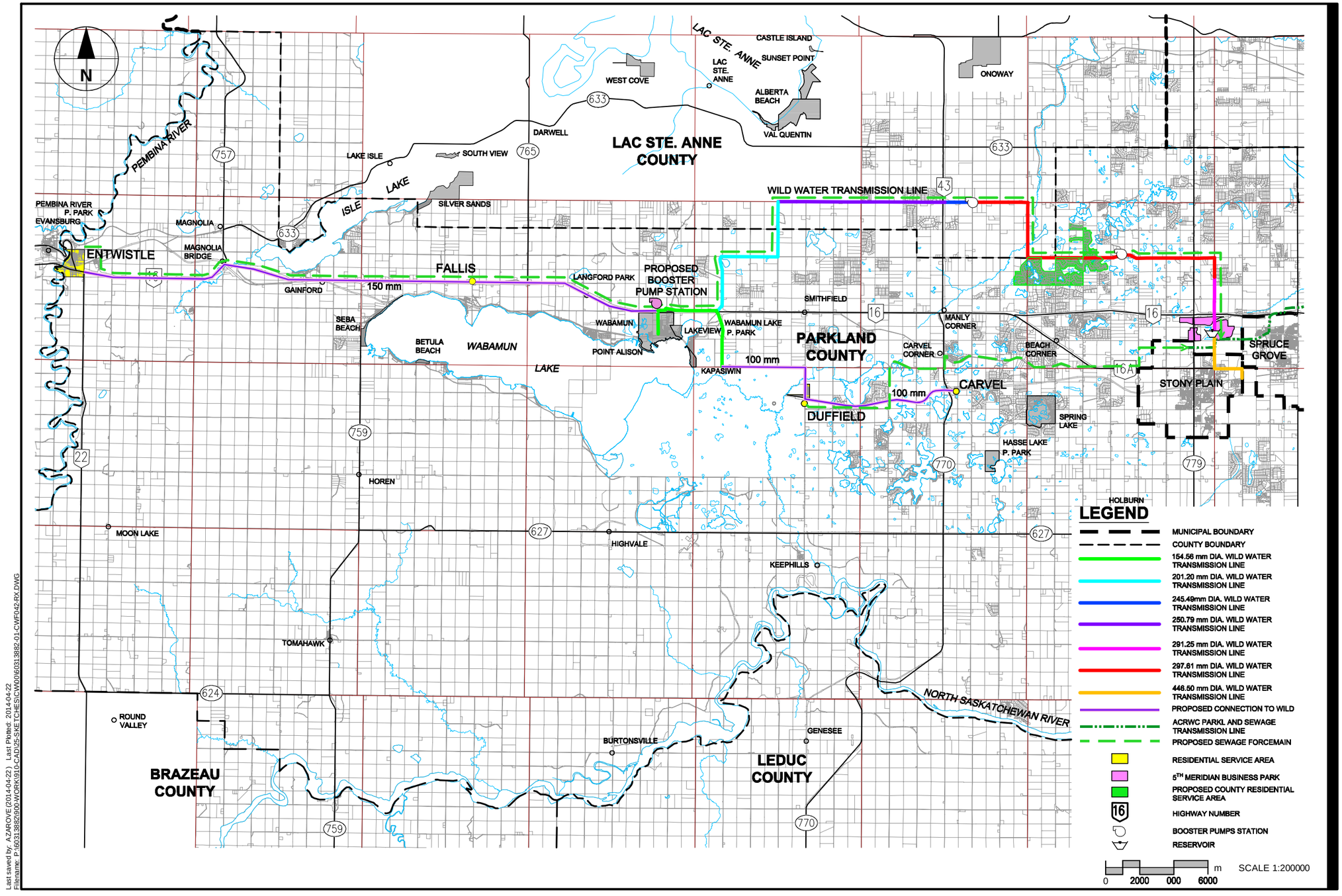

Figure 1. Concept map for the Wild Water lines.

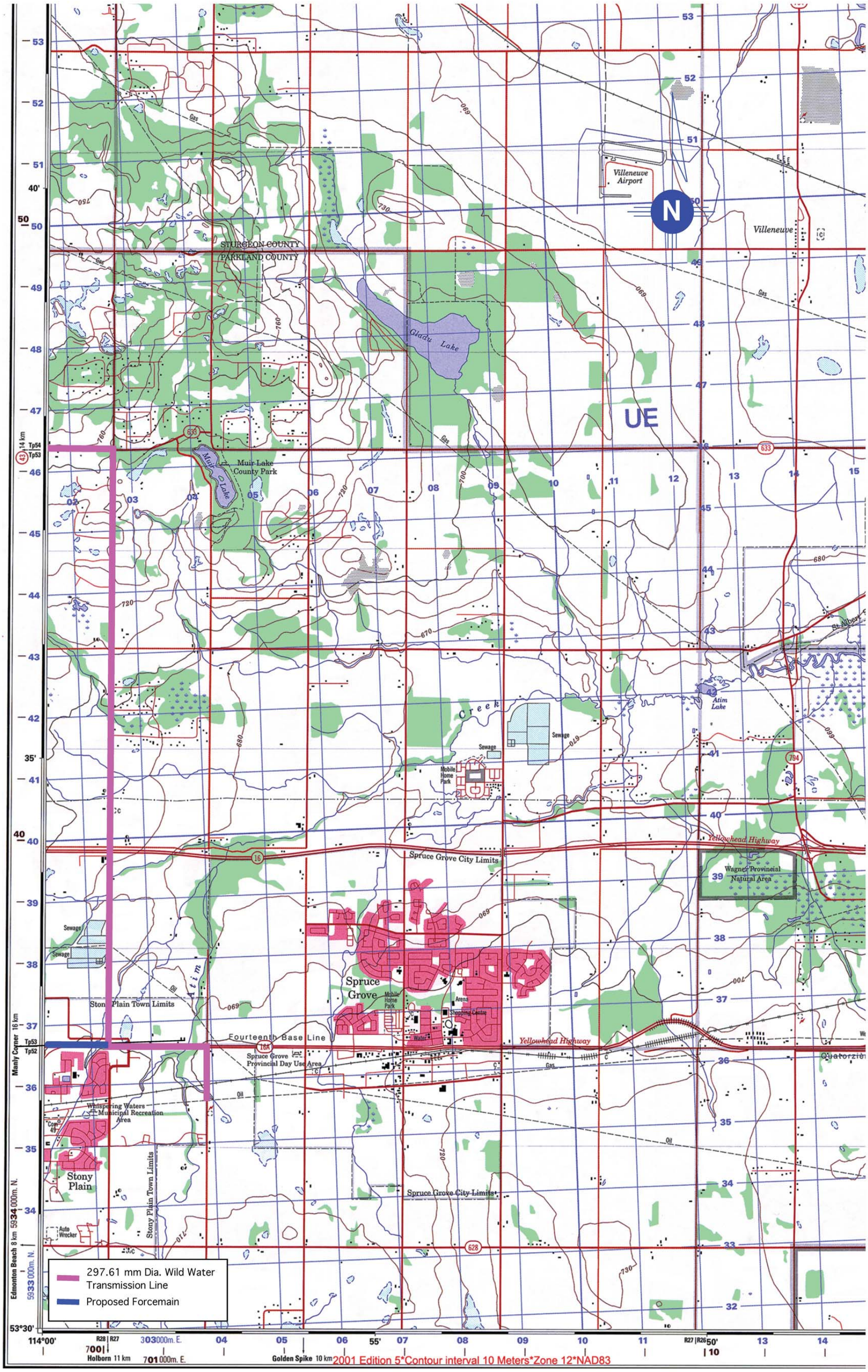

Figure 2. Map showing the eastern end of the proposed project lines running north and west of Stony Plain (after 1:50,000 NTS Map 83 H/12 – St. Albert).

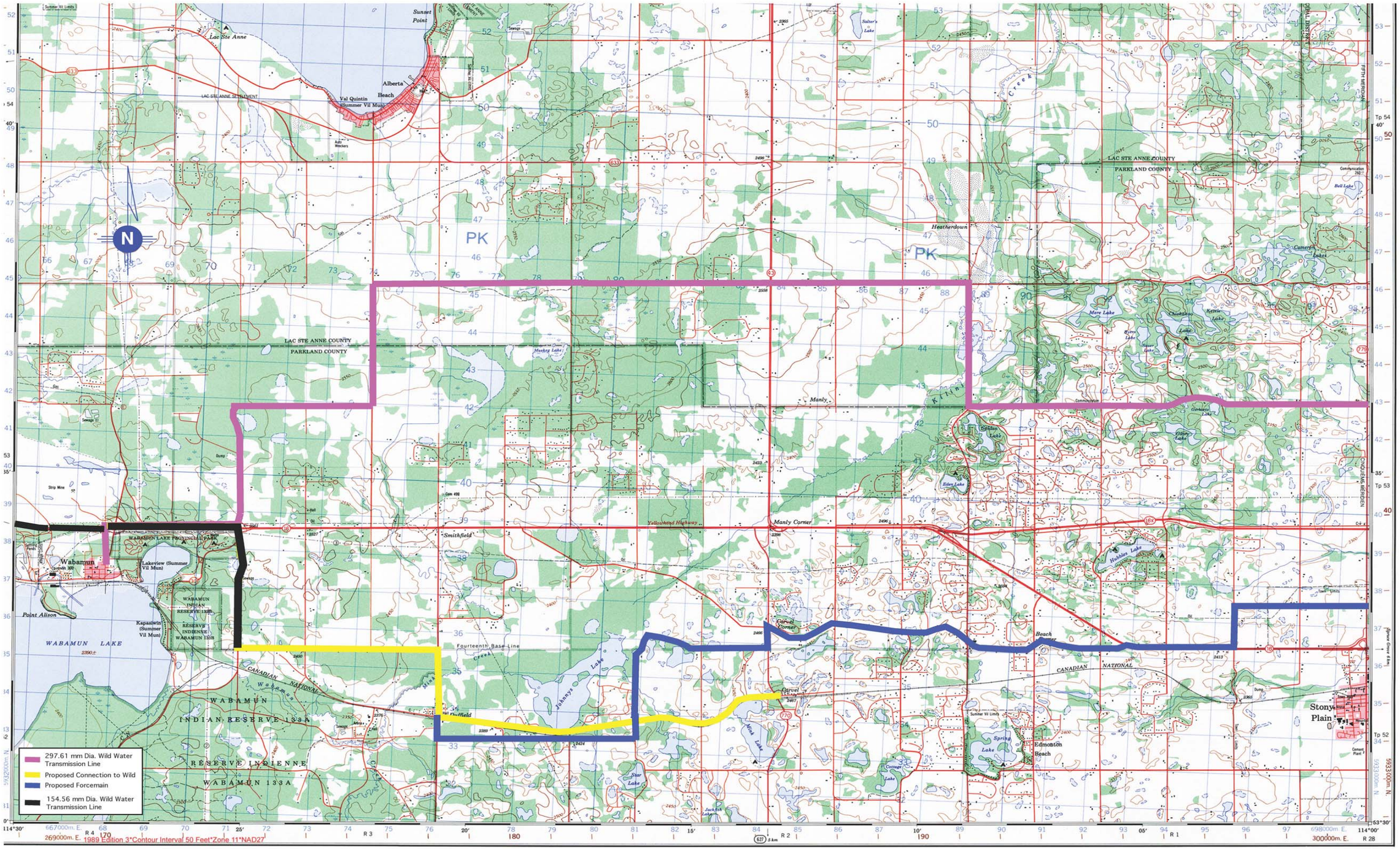

Figure 3. Map showing the central portion of the proposed project lines running between Stony Plain and Wabamun Lake (after 1:50,000 NTS Map 83 G/9 – Onoway).

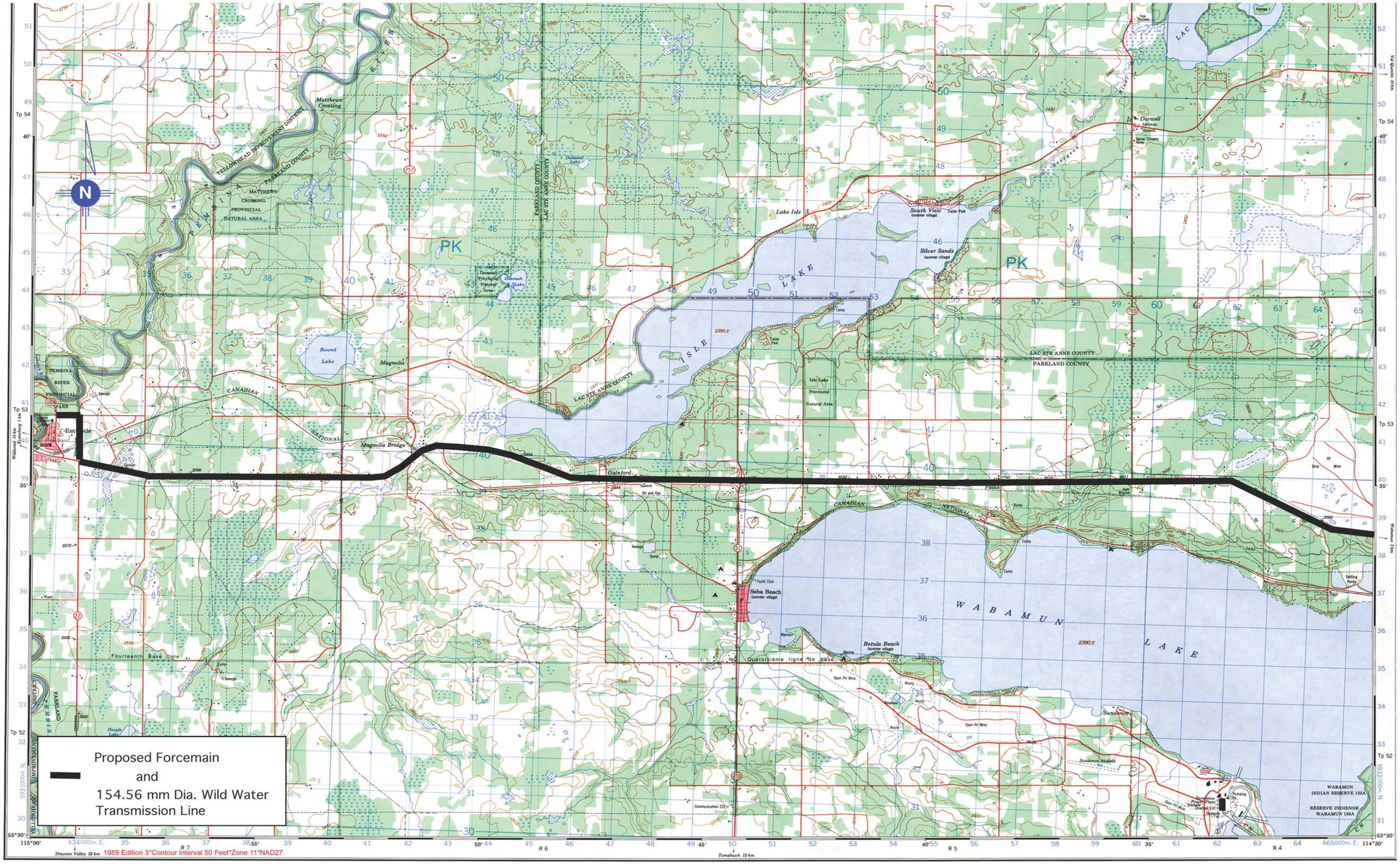

Figure 4. Map showing the western portion of the proposed project lines running between Wabamun and Entwhistle (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

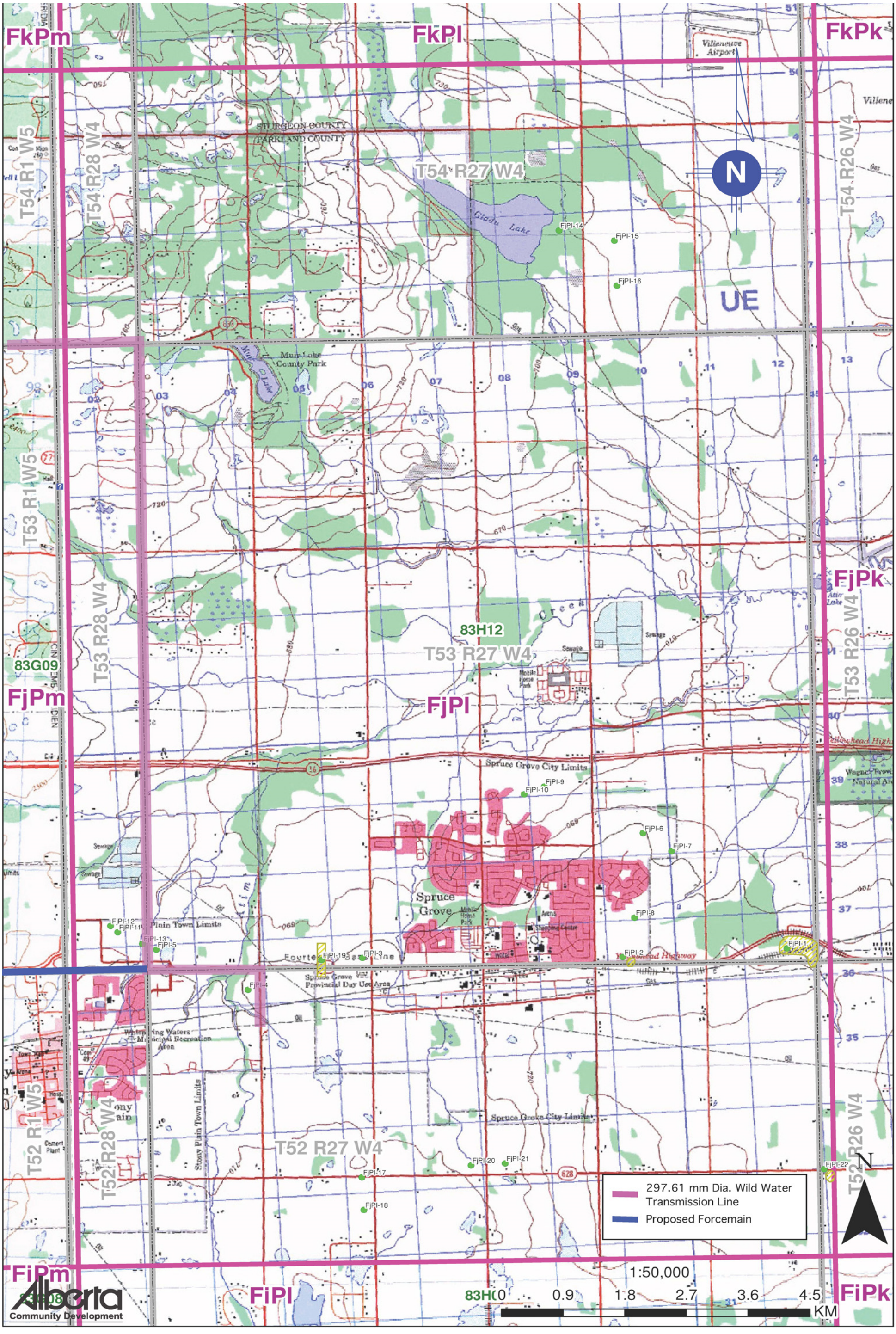

Figure 5. Map showing the locations of previously recorded sites in Borden Block FjPl encompassing the eastern end of the proposed project lines (after 1:50,000 NTS Map 83 H/12 – St. Albert). The transmission line running northward from Stony Plain was previously surveyed under Archaeological Permit 12-123.

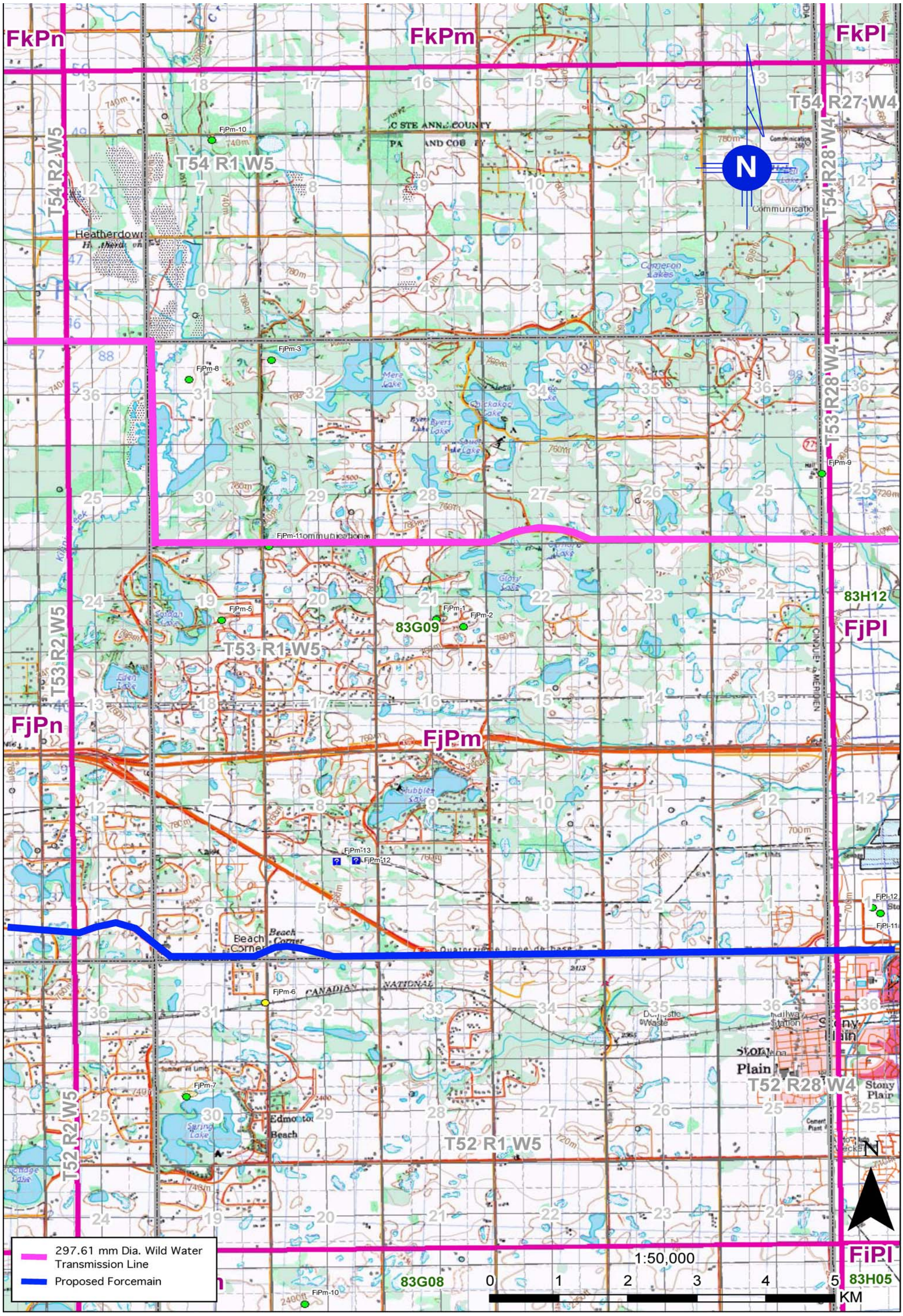

Figure 6. Map showing the locations of previously recorded sites in Borden Block FjPm immediately west of Stony Plain (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123.

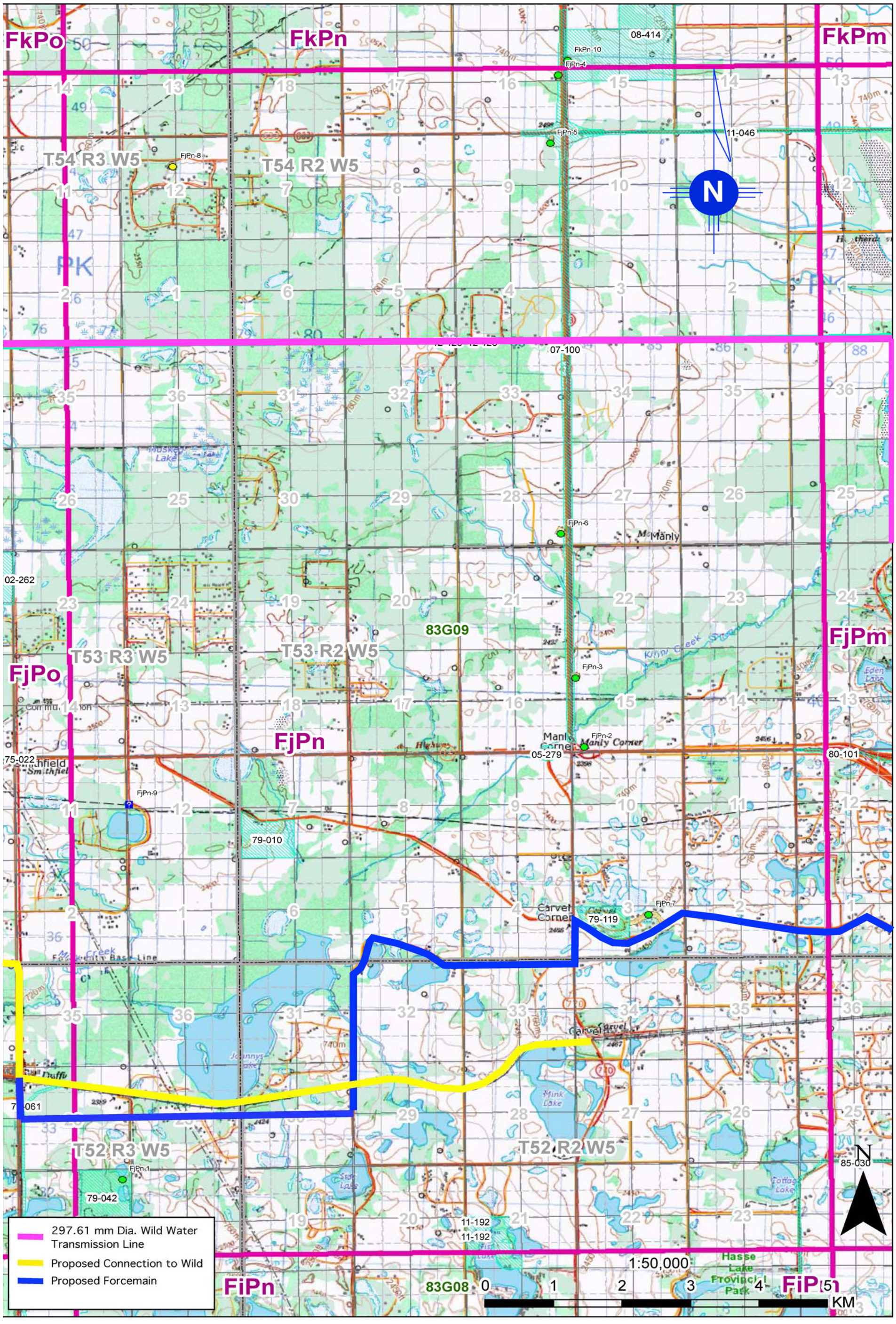

Figure 7. Map showing the locations of previously recorded sites in Borden Block FjPn (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123. The yellow line from Carvel to Duffield runs beside the CN railway tracks and some of these lands may be not have been previously disturbed.

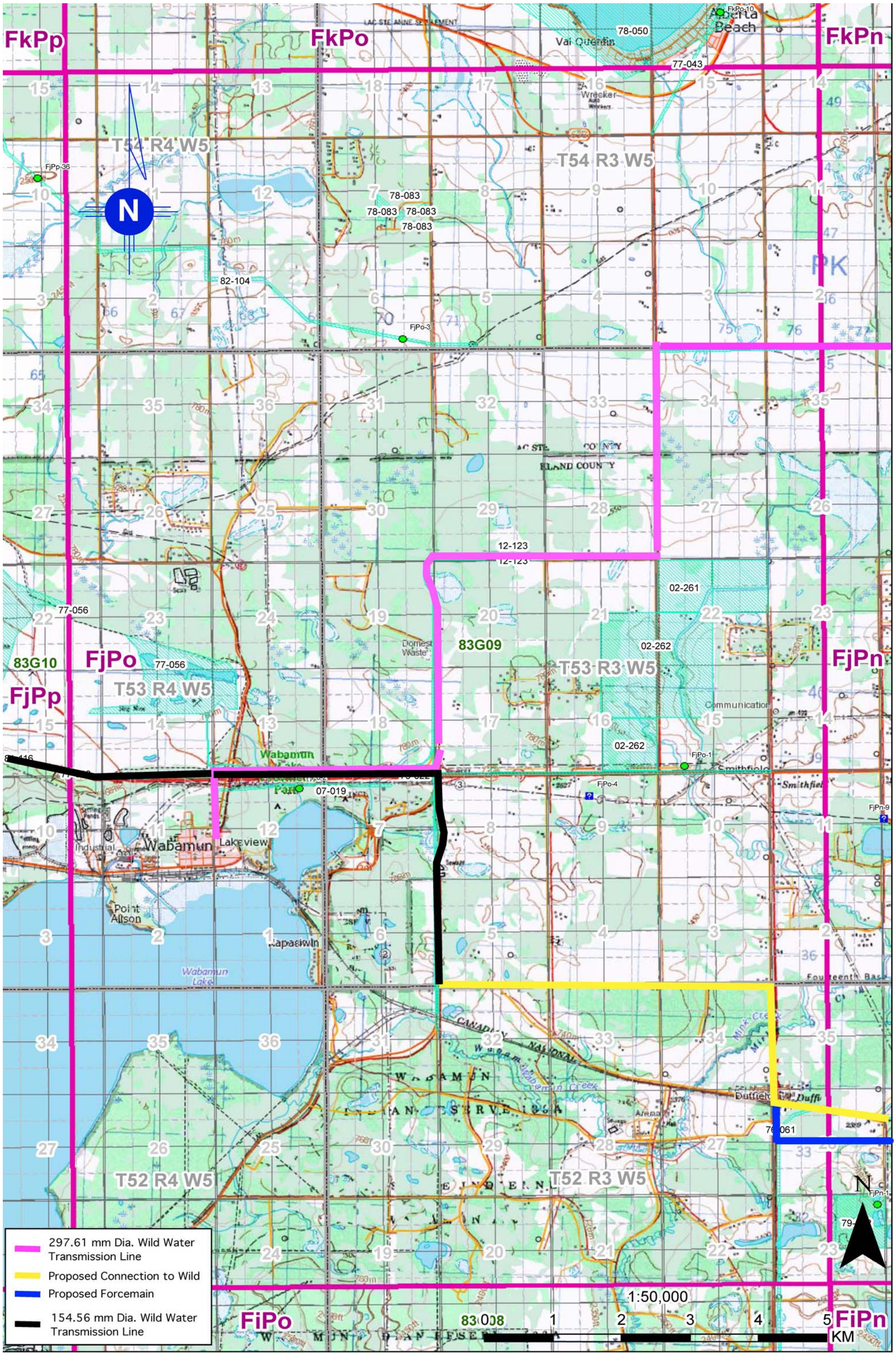

Figure 8. Map showing the locations of previously recorded sites in Borden Block FjPo by Wabamun Lake (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123.

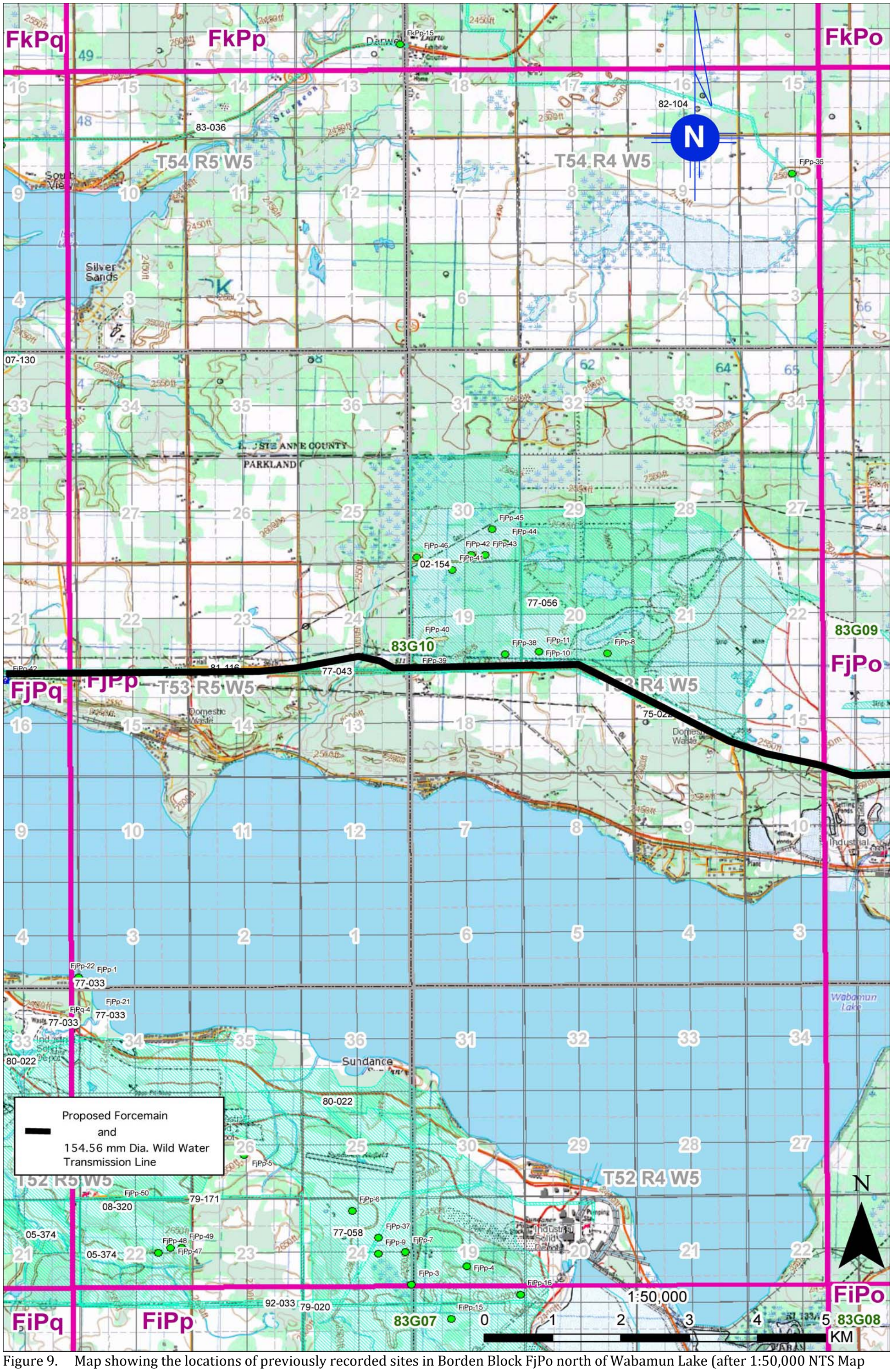

Figure 9. Map showing the locations of previously recorded sites in Borden Block FjPo north of Wabamun Lake (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

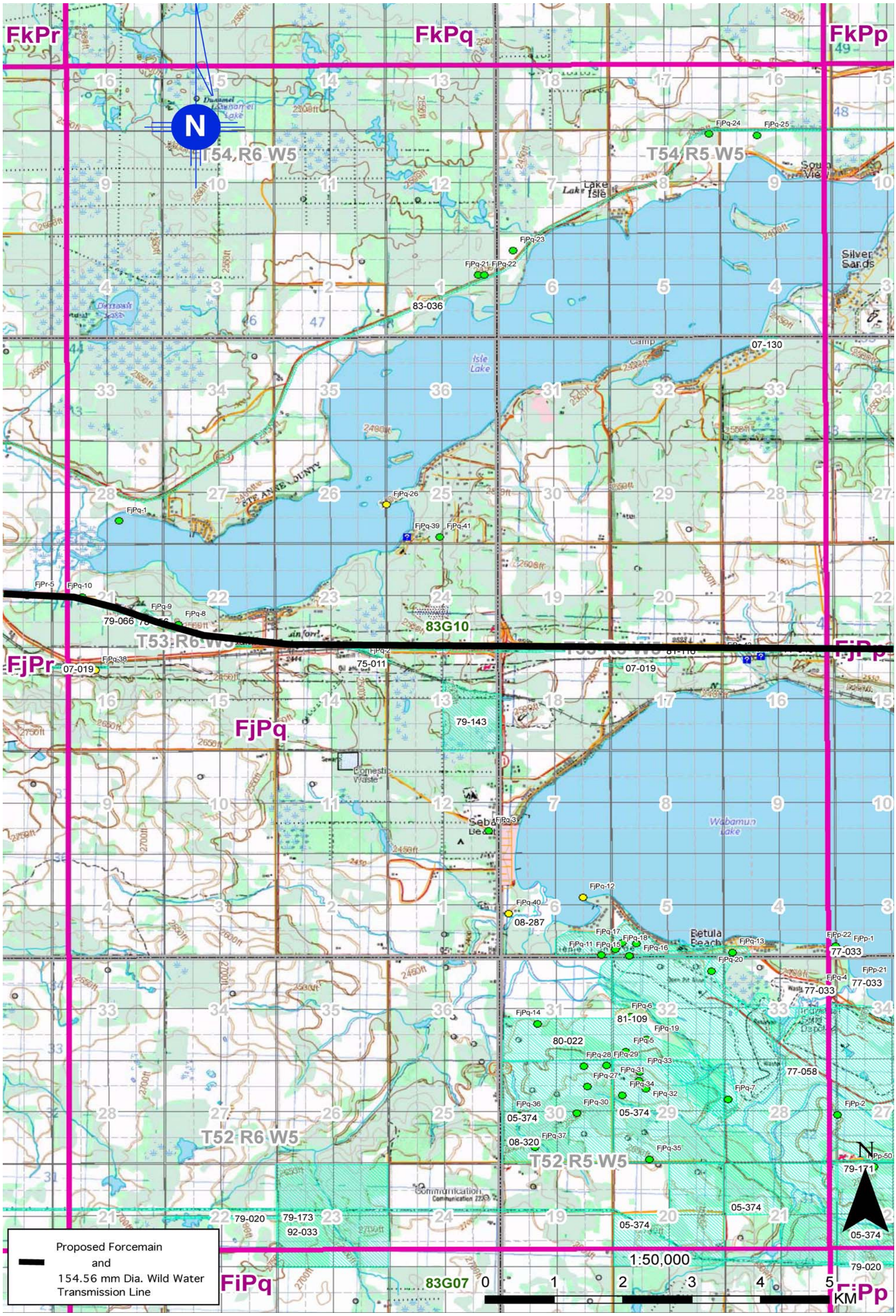

Figure 10. Map showing the locations of previously recorded sites in Borden Block FjPq north and west of Wabamun Lake (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

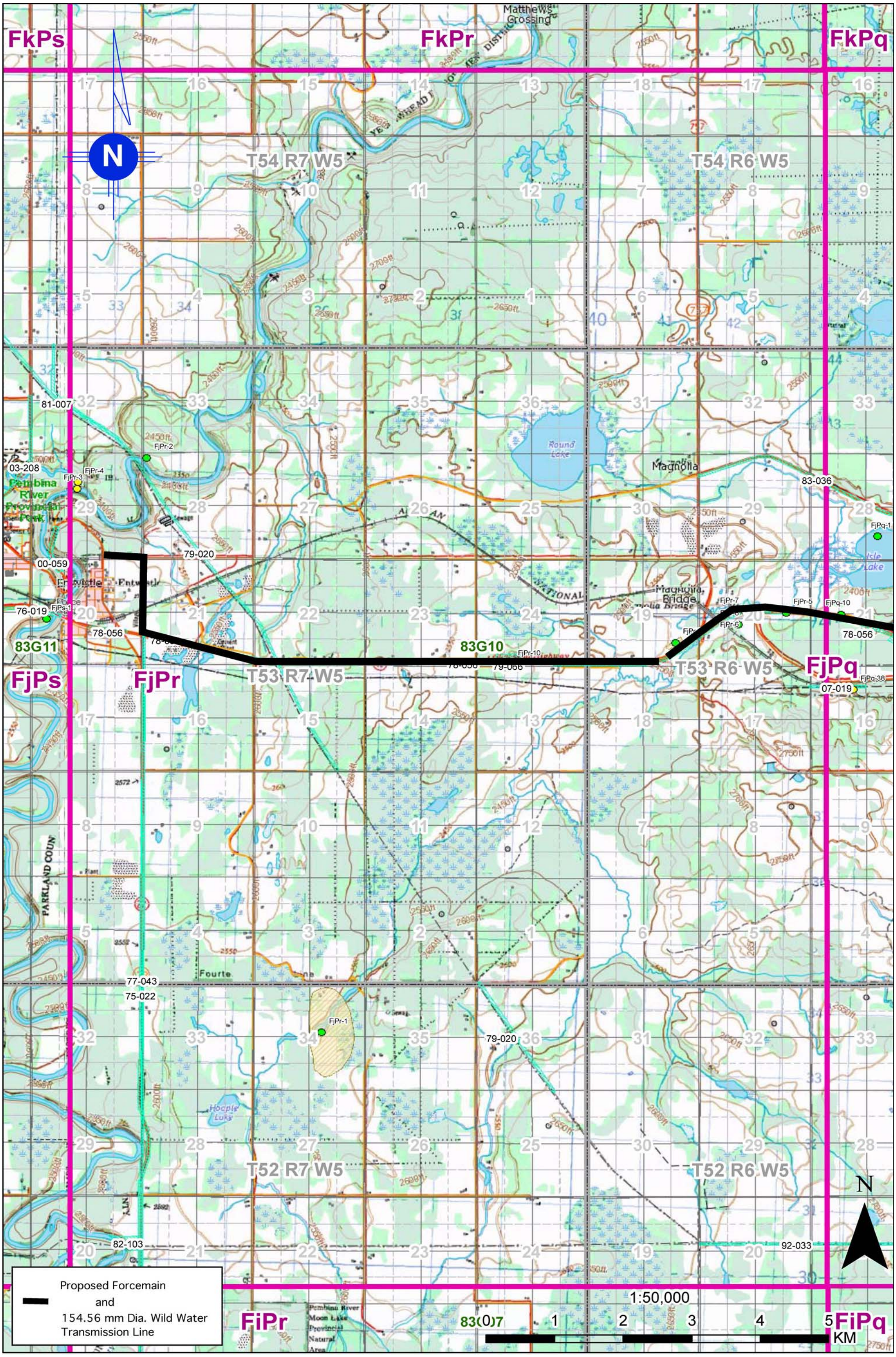

Figure 11. Map showing the locations of previously recorded sites in Borden Block FjPr immediately east of Entwhistle (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

Statement of Justification for *Historical Resources Act*
Requirements for projects other than small-scale oil and gas

This document contains sensitive information about Historic Resources that are protected under provisions of the *Alberta Historical Resources Act*. This information is to be used to assist in planning the proposed project only. It is not to be disseminated, and no copies of this document are to be made without written permission of Historic Resources Management Branch, Alberta Culture.

Project Name or Project Identifier

West Inter Lake District (WILD) Water Line Servicing Study

Disposition Type & Number

Name: Walt Kowal
Corporate name of consulting company: The Archaeology Group
Address: 2526 Bell Court S.W.
Edmonton, Alberta
T6W 1J8
Phone number: (780) 438-4262
E-mail address: w.kowal@shaw.ca

Name of proponent contact: Chantal McKenzie, P. Eng., Engineering Coordinator
Corporate name of proponent: Parkland County
Address: 53109A HWY 779
Parkland County, AB
T7Z 1R1
Phone number: (780) 968-8888
E-mail address: cmckenzie@parklandcounty.com

Name of agent: Jamie Kalla
Corporate name of agent: **AECOM**
Address: 17007 – 107 Avenue
Edmonton, Alberta
T5S 1G3
Phone number: (780) 486-7000
Direct (780) 638-2211
Fax: (780) 486-7070
E-mail: Jamie.Kalla@aecom.com

Lands Affected

Legal Description	HRV	Identifier
LSD's 8,9,13,14,15,16 Section 31-52-27-W4M	N/A	N/A
	N/A	N/A
LSD's 5,12,13 Section 32-52-27-W4M	N/A	N/A
LSD's 1,8,9,16 Section 1-53-27-W4M	N/A	N/A
LSD's 1,8,9,16 Section 12-53-27-W4M	N/A	N/A
LSD's 1,8,9,16 Section 13-53-27-W4M	N/A	N/A

LSD’s 1,8,9,16 Section 24-53-27-W4M	N/A	N/A
LSD’s 1,8,9,16 Section 25-53-27-W4M	N/A	N/A
LSD’s 13,14 Section 36-52-28-W4M	N/A	N/A
LSD’s 13-16 Section 31-52-1-W5M	N/A	N/A
LSD’s 15,16 Section 32-52-1-W5M	N/A	N/A
LSD’s 13-16 Section 33-52-1-W5M	N/A	N/A
LSD’s 13-16 Section 34-52-1-W5M	N/A	N/A
LSD’s 13-16 Section 35-52-1-W5M	N/A	N/A
LSD’s 13-16 Section 36-52-1-W5M	N/A	N/A
LSD’s 1-4 Section 1-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 2-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 3-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 4-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 5-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 6-53-1-W5M	N/A	N/A
LSD’s 13-16 Section 19-53-1-W5M	N/A	N/A
LSD’s 13-16 Section 20-53-1-W5M	N/A	N/A
LSD’s 13-16 Section 21-53-1-W5M	N/A	N/A
LSD’s 13 &16 Section 22-53-1-W5M	N/A	N/A
LSD’s 13-16 Section 23-53-1-W5M	N/A	N/A
LSD’s 13-16 Section 24-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 25-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 26-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 27-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 28-53-1-W5M	N/A	N/A
LSD’s 1-4 Section 29-53-1-W5M	N/A	N/A
LSD’s 1-4,5,12,13 Section 30-53-1-W5M	N/A	N/A
LSD’s 4,5,12,13 Section 31-53-1-W5M	N/A	N/A
LSD’s 1,8,9,16 Section 25-53-2-W5M	N/A	N/A
LSD’s 13-16 Section 31-53-2-W5M	N/A	N/A
LSD’s 13-16 Section 32-53-2-W5M	N/A	N/A
LSD’s 13-16 Section 33-53-2-W5M	1 (historical)	Sharman House
LSD 14 Section 34-53-2-W5M	N/A	N/A
LSD’s 13,15,16 Section 34-53-2-W5M	N/A	N/A
LSD’s 13-16 Section 35-53-2-W5M	N/A	N/A
LSD’s 13-16 Section 36-53-2-W5M	N/A	N/A
LSD’s 1-4 Section 1-54-2-W5M	N/A	N/A
LSD’s 1-4 Section 2-54-2-W5M	N/A	N/A
LSD’s 1-4 Section 3-54-2-W5M	N/A	N/A
LSD’s 1-4 Section 4-54-2-W5M	N/A	N/A
LSD’s 1-4 Section 5-54-2-W5M	N/A	N/A
LSD’s 1-4 Section 6-54-2-W5M	N/A	N/A
LSD’s 1-8 Section 1-53-2-W5M	N/A	N/A
LSD’s 1,2,5-8 Section 2-53-2-W5M	N/A	N/A
LSD’s 1-8 Section 3-53-2-W5M	N/A	N/A
LSD’s 1-4 & 8 Section 4-53-2-W5M	N/A	N/A
LSD’s 1-5 Section 5-53-2-W5M	N/A	N/A
LSD’s 12,13,14 Section 28-52-2-W5M	N/A	N/A
LSD’s 9,10,13-16 Section 29-52-2-W5M	N/A	N/A
LSD’s 9-16 Section 30-52-2-W5M	N/A	N/A
LSD’s 1,8,9,16 Section 31-52-2-W5M	N/A	N/A
LSD’s 4,5,12,13 Section 32-52-2-W5M	N/A	N/A
LSD’s 1,2,3 Section 33-52-2-W5M	N/A	N/A
LSD’s 9,10-14 Section 25-52-3-W5M	N/A	N/A
LSD’s 13-16 Section 26-52-3-W5M	N/A	N/A
LSD 16 Section 27-52-3-W5M	N/A	N/A
LSD 16 Section 31-52-3-W5M	N/A	N/A
LSD’s 13-16 Section 32-52-3-W5M	N/A	N/A
LSD’s 13-16 Section 33-52-3-W5M	N/A	N/A
LSD’s 13-16 Section 34-52-3-W5M	N/A	N/A

LSD's 4,5,12,13 Section 35-52-3-W5M	N/A	N/A
LSD 4 Section 2-53-3-W5M	N/A	N/A
LSD's 1-4 Section 3-53-3-W5M	N/A	N/A
LSD's 1-4 Section 4-53-3-W5M	N/A	N/A
LSD's 1-4,5,12,13 Section 5-53-3-W5M	N/A	N/A
LSD's 1,8,9,16 Section 6-53-3-W5M	N/A	N/A
LSD's 13-16 Section 7-53-3-W5M	N/A	N/A
LSD's 4,5,12,13 Section 8-53-3-W5M	N/A	N/A
LSD's 4,5,12,13 Section 17-53-3-W5M	N/A	N/A
LSD's 1-4,8,9,16 Section 18-53-3-W5M	N/A	N/A
LSD's 1,8,9,16 Section 19-53-3-W5M	N/A	N/A
LSD's 4,5 Section 20-53-3-W5M	N/A	N/A
LSD's 13-16 Section 21-53-3-W5M	N/A	N/A
LSD 13 Section 22-53-3-W5M	N/A	N/A
LSD's 4,5,12,13 Section 27-53-3-W5M	N/A	N/A
LSD's 1,8,9,16 Section 28-53-3-W5M	N/A	N/A
LSD's 1-4 Section 29-53-3-W5M	N/A	N/A
LSD 1 Section 30-53-3-W5M	N/A	N/A
LSD's 1,8,9,16 Section 33-53-3-W5M	N/A	N/A
LSD's 4,5,12,13-16 Section 34-53-3-W5M	N/A	N/A
LSD's 13-16 Section 35-53-3-W5M	N/A	N/A
LSD's 13-16 Section 36-53-3-W5M	N/A	N/A
LSD's 1-4 Section 1-54-3-W5M	N/A	N/A
LSD's 1-4 Section 2-54-3-W5M	N/A	N/A
LSD's 1-4 Section 3-54-3-W5M	N/A	N/A
LSD 1 Section 4-54-3-W5M	N/A	N/A
LSD's 8,9,13-16 Section 11-53-4-W5M	N/A	N/A
LSD's 5,12,13 Section 12-53-4-W5M	N/A	N/A
LSD's 1-4 Section 13-53-4-W5M	N/A	N/A
LSD's 1-4 Section 14-53-4-W5M	N/A	N/A
LSD's 1-4 Section 15-53-4-W5M	N/A	N/A
LSD's 1,6,7,8,11,12 Section 16-53-4-W5M	N/A	N/A
LSD's 9,13-16 Section 17-53-4-W5M	N/A	N/A
LSD's 13-16 Section 18-53-4-W5M	N/A	N/A
LSD's 1-4 Section 19-53-4-W5M	1 (historical)	St. Aidan & St. Hilda Anglican Church
LSD 4 Section 20-53-4-W5M	N/A	N/A
LSD's 2-3 Section 20-53-4-W5M	N/A	N/A
LSD's 13-15 Section 14-53-5-W5M	N/A	N/A
LSD's 13-16 Section 15-53-5-W5M	N/A	N/A
LSD's 13-16 Section 16-53-5-W5M	N/A	N/A
LSD's 13-16 Section 17-53-5-W5M	N/A	N/A
LSD's 13-16 Section 18-53-5-W5M	N/A	N/A
LSD's 1-4 Section 19-53-5-W5M	N/A	N/A
LSD's 1-4 Section 20-53-5-W5M	N/A	N/A
LSD's 1-4 Section 21-53-5-W5M	N/A	N/A
LSD's 1-4 Section 22-53-5-W5M	N/A	N/A
LSD's 1-4 Section 23-53-5-W5M	N/A	N/A
LSD's 1-4 Section 24-53-5-W5M	N/A	N/A
LSD's 1-4 Section 13-53-6-W5M	N/A	N/A
LSD's 1-4 Section 14-53-6-W5M	N/A	N/A
LSD's 13,14,15 Section 18-53-6-W5M	N/A	N/A
LSD's 1-4,8 Section 19-53-6-W5M	5 (archaeological)	FjPr-7
LSD's 5,10,12 Section 20-53-6-W5M	4 (archaeological)	FjPr-7
LSD 11 Section 20-53-6-W5M	N/A	N/A
LSD 9 Section 20-53-6-W5M	N/A	N/A
LSD's 1,6,7,8,12 Section 21-53-6-W5M	N/A	N/A
LSD's 1-5 Section 22-53-6-W5M	N/A	N/A
LSD's 1-4 Section 23-53-6-W5M	N/A	N/A
LSD's 1-4 Section 24-53-6-W5M	N/A	N/A
LSD's 1-4 Section 13-53-7-W5M	N/A	N/A

LSD's 1-4 Section 14-53-7-W5M	N/A	N/A
LSD's 1-4 Section 15-53-7-W5M	5 (palaeontological)	High Sensitivity
LSD 15 Section 20-53-7-W5M	N/A	N/A
LSD's 8,9,16 Section 20-53-7-W5M	N/A	N/A
LSD's 1-6,12,13 Section 21-53-7-W5M	N/A	N/A
LSD's 1-4 Section 22-53-7-W5M	N/A	N/A
LSD's 1-4 Section 23-53-7-W5M	N/A	N/A
LSD's 1-4 Section 24-53-7-W5M	5 (palaeontological)	High Sensitivity
LSD 1 Section 29-53-7-W5M	N/A	N/A
LSD 2 Section 29-53-7-W5M		

Activity type and Anticipated Ground Disturbance

The proposed West Inter Lake District water line study is to expand the regional water line and wastewater line systems to serve several communities between Stony Plain and Entwistle, Alberta (Figures 1 to 4). The new construction will involve excavation for pipeline emplacements which would destroy any intact historical resources sites in the impact areas. Most of the proposed pipelines will run within highway and rural road rights-of-way and for the most part will not require new lands to be impacted, but a proposed connection from Carvel to Duffield (see Yellow line on Figure 8) will run along an existing CN rail line and new lands may be required for this pipeline.

Project size

Approximately 200 ha

Existing Disturbance

Existing disturbance is present in the form of past agricultural activity, infrastructure emplacements, and road construction.

Landscape and Environmental Information

The project area lies within the Aspen Parkland Ecoregion. Till Blanket sediment: thick and continuous till, and fine grained (Glacio) lacustrine sediment: silt and clay, containing stones and deposited as quiet water sediments, cultivated land, small patches of forested land, and some urban areas characterize this ecoregion. The entire development area was possibly under cultivation for up to 12 decades.

Archaeological Sites in Vicinity = FjPl-4, 5,11,12,13 (see Figure 5); FjPm-3,6,7,8,9,10,11,12,13 (see Figure 6); FjPn-1,2,7,9 (see Figure 7); FjPo-1,2,3,4 (see Figure 8); FjPp-8,10,11,38,39,41,42,43,44,45,46 (see Figure 9); FjPq-1,2,3,8,9,10,26,38,39,41,42,43 (see Figure 10); FjPr-2,3,4,5,6,7,8,9,10 (see Figure 11); FjPs-1 (see Figure 11).

Archaeological Sites Impacted = FjPm-11 (line previously surveyed under Permit 12-123)

Historic Structures in Vicinity = 586 Historic sites recorded previously in the greater project area

Historic Structures Impacted = None

Registered Historic Structures in Vicinity = None

Registered Historic Structures Impacted = None

Previous Permits in Impact Area = 75-011, 75-022, 77-043, 78-056, 78-053, 79-066, 79-018, 81-024, 81-116, 81-183, 83-067, 07-100, 08-318, 12-123

Previous Permits in Vicinity= 75-011, 75-022, 76-019, 77-056, 00-059, 79-020, 78-056, 79-119, 79-143, 81-024, 02-154, 02-262, 05-279, 07-019, 08-318, 11-192, 12-123

Illustrative Materials

Figure 1. Concept map for the Wild Water lines.

Figure 2. Map showing the eastern end of the proposed project lines running north and west of Stony Plain (after 1:50,000 NTS Map 83 H/12 – St. Albert).

Figure 3. Map showing the central portion of the proposed project lines running between Stony Plain and Wabamun Lake (after 1:50,000 NTS Map 83 G/9 – Onoway).

Figure 4. Map showing the western portion of the proposed project lines running between Wabamun and Entwistle (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

Figure 5. Map showing the locations of previously recorded sites in Borden Block FjPl encompassing the eastern end of the proposed project lines (after 1:50,000 NTS Map 83 H/12 – St. Albert). The transmission line running northward from Stony Plain was previously surveyed under Archaeological Permit 12-123.

Figure 6. Map showing the locations of previously recorded sites in Borden Block FjPm immediately west of Stony Plain (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123.

Figure 7. Map showing the locations of previously recorded sites in Borden Block FjPn (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123. The yellow line from Carvel to Duffield runs beside the CN railway tracks and some of these lands may be not have been previously disturbed.

Figure 8. Map showing the locations of previously recorded sites in Borden Block FjPo by Wabamun Lake (after 1:50,000 NTS Map 83 G/9 – Onoway). The 297.61 mm transmission line was previously surveyed under Archaeological Permit 12-123.

Figure 9. Map showing the locations of previously recorded sites in Borden Block FjPo north of Wabamun Lake (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

Figure 10. Map showing the locations of previously recorded sites in Borden Block FjPq north and west of Wabamun Lake (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

Figure 11. Map showing the locations of previously recorded sites in Borden Block FjPr immediately east of Entwistle (after 1:50,000 NTS Map 83 G/10 – Isle Lake).

Evaluation

The proposed West Inter Lake District water line study is for an expansion of the existing regional water line and wastewater line systems to serve several communities between Stony Plain and Entwistle, Alberta (Figures 1 to 4). The new construction will involve excavation for pipeline emplacements which would destroy any intact historical resources sites in the impact areas. Most of the proposed pipelines will run within highway and rural road rights-of-way and for the most part will not require new lands to be impacted, but a proposed connection from Carvel to Duffield (see Figure 8) will run along an existing CN rail line in Sections 28, 29, and 30 Twp 52, Range 2, W5M and Sections 25 and 26 Range 52, Range 3, W5M and new lands may be required for this section of pipeline.

The northernmost line shown on Figures 1 to 9 (the 297.61 diametre Wild Water Transmission Line) was surveyed previously under Archaeological Permit 12-123, and no further work was recommended for this line.

Two previously recorded Historic sites (Sharman House in LSD 14 Section 34-53-2-W5M and St. Aidan & St. Hilda Anglican Church in LSD 4 Section 20-53-4-W5M) will not be impacted or affected by the proposed pipeline construction. Archaeological site FjPr-7 is located just outside the Highway 16 right-of-way on a high knoll in LSD's 5,10,11, and 12 Section 20-53-6-W5M and will not be affected by the proposed pipeline construction within the highway right-of-way.

LSD 15 Section 20-53-7-W5M and LSD 1 Section 29-53-7-W5M by Entwistle (see Figure 11) are identified in the Listing of Significant Sites (2014) as having high palaeontological potential, but since the proposed pipeline construction is following the existing road right-of-way all of the affected lands within these LSD's are well away from the Pembina River where the areas of high palaeontological sensitivity are located.

None of the rest of the proposed new alignment, access roads or interchanges will impact any lands with archaeological potential since these lands are either previously disturbed or are marginal lands whose environmental characteristics suggest no potential for the discovery of intact, previously unrecorded heritage resources.

While numerous Historical Resources sites were found previously within three kilometres of the project areas (see Figures 5-11), only one archaeological site FjPr-7 (a lithic scatter) found adjacent to the Highway 16 right-of-way was considerd to be significant and this site will not be impacted, and no further work was recommended for any of the other sites along or beside the proposed pipeline projects.

Almost all of the area within the proposed project area was previously disturbed by agricultural use, road/highway construction or infrastructure emplacements which suggests that there is little potential for finding undisturbed historical resources sites in most of the affected lands in the study area, with the exception of lands along a possible connection from Carvel to Duffield (see Figure 8) which may run along an existing CN rail line in Sections 28, 29, and 30 Twp 52, Range 2, W5M and Sections 25 and 26 Range 52, Range 3, W5M and previously undisturbed lands may lie along this section of pipeline, and an archeological assessment is warranted for this segment of pipeline if this alignment is chosen.

Recommendations (*Recommendations regarding archaeological resources must be made by a professional archaeologist.)*

Since there has been intensive previous ground disturbance in the general area due to sustained agricultural activity, road construction, and other infrastructure emplacements most of the proposed pipeline alignments associated with the West Inter Lake District (WILD) Water Line Servicing Study project are considered to have low potential for the discovery of intact, previously unrecorded heritage resources, and no further work is recommended for these lines. The only section of pipeline recommended for further archaeological assessment lies in Sections 28, 29, and 30, Twp 52, Range 2, W5M and Sections 25 and 26, Twp 52, Range 3, W5M where previously undisturbed lands may lie along the section of pipeline along the CN rail line.

Recommendations made by:	Date:
 Walt Kowal	May 12, 2014

Appendix C

AMWWP Funding Guidelines

ALBERTA MUNICIPAL WATER/WASTEWATER PARTNERSHIP (AMWWP)

The Alberta Municipal Water/Wastewater Partnership provides cost-shared funding to eligible municipalities to assist in the construction of municipal water supply and treatment and wastewater treatment and disposal facilities. Various initiatives have been included in the program to ensure the needs of Alberta municipalities are met.

Objective
To assist Alberta municipalities with the review and/or identification of their water/wastewater needs under the Alberta Municipal Water/Wastewater Partnership.

Time frame
This is an ongoing initiative implemented on April 1, 1991.

Project eligibility criteria
Municipal eligibility

Funding under this initiative is available to all municipalities with a population of 10,000 or less, that are eligible for funding under the AMWWP.

Project eligibility

Funding may be available for the following types of studies, subject to a detailed assessment of eligibility by the department:

a. Preliminary engineering assessments to review and identify water and wastewater upgrading requirements to existing systems which may then be incorporated into short-term and long-term capital work plans. Such studies should do the following:

- Investigate the need for the project.
- Demonstrate cost-effectiveness of the recommended alternative.
- Establish a priority for implementation.
- Examine affordability of the improvements.
- Examine methods of financing the municipal share of the costs.
- Examine ways to encourage water conservation and consumption based rate structures.

b. Engineering studies which help to establish a five-year capital works program for water and wastewater improvements. Such studies should do the following:

- Outline the necessary improvements for each year of the five-year plan.
- Estimate the improvement costs.
- Present the plan in such a way that annual updates can be undertaken.

All services engaged under this Initiative must be from the private sector.

NOTE: The department is not automatically committed to fund any projects identified as a result of studies conducted under this Initiative.

Associated costs
Funding may be available for associated costs which can include:

a. Engineering costs.
b. Survey fees.
c. Well exploration & testing costs.

NON-Eligible Items
The following will not be considered eligible for funding:

a. Municipal labour and equipment.

b. Administration expenses (i.e. all municipal employee salaries or council member salaries, office administration costs, etc.).
c. Annual updates of five-year capital works program studies produced under this Initiative.
d. Goods and Services Tax.

Funding availability
Municipalities subject to this initiative are eligible for funding on the same cost-sharing basis as under the AMWWP. The final grant will be based on actual study costs to an upset limit established at the time of funding approval.

Procedures
Municipalities wishing to use available funding under this initiative will generally follow AMWWP procedure as outlined previously.
Applications under this initiative should include the following:
a. A letter requesting funding.
b. A copy of the engineering proposal.
c. An implementation schedule.
d. An upset limit of estimated costs.

Regional System

Objective
To support the development of new regional water and wastewater systems under the Alberta Municipal Water/Wastewater Partnership which are more cost-effective and/or environmentally desirable than independent systems.

Time Frame
The Alberta Municipal Water/Wastewater Partnership was initiated in 1991. The Water for Life initiative was implemented on April 5, 2006, and is an ongoing program.

Project Eligibility Criteria
Municipal Eligibility
The water strategy initiative is only available for NEW regional water or wastewater systems or NEW EXTENSIONS to existing regional water or wastewater systems. Funding under these initiatives is available to all regional commissions or groups of two or more municipalities (or eligible hamlets) that are eligible for funding under the AMWWP. Eligible municipalities include groups of Cities, Towns, Villages, Summer Villages, Rural Municipalities, or Metis Settlements. Regional Service Commissions, municipal partnerships, public- private ventures, municipalities with contracted services to privately owned utilities are all eligible to receive grant funding assistance. Municipalities may utilize any arrangement for project implementation that is desired.

Operational Consortia
The capital costs of installing the initial monitoring and control equipment needed for operational consortia is eligible for Water for Life funding at 90 percent as of June 2009. Stand-alone systems eligible for funding under the regular AMWWP qualify if two or more systems are linked.

Project Eligibility and Funding Levels - Existing Regional Systems
Existing regional commissions and municipalities with existing regional systems subject to these initiatives are eligible for funding on the same cost-sharing basis as under the AMWWP for water or wastewater projects. Funding may be available for upgrades to existing regional water supply and treatment and wastewater treatment and disposal facilities under the same project eligibility criteria as the AMWWP, subject to a detailed assessment of eligibility by the department.

Commissions/Municipalities will be required to demonstrate that the regional alternative is cost-effective and can be economically justified compared to alternative facility solutions. Environmental requirements can be taken into account as well as efficiencies in management and operational practices.

A weighted average would be used to calculate the financial assistance for the existing system upgrades and will be calculated based on the cost of the eligible project pro-rated by the official populations of each member municipality. The grant for each member's share will then be calculated based on the formula outlined under the AMWWP, as shown in the following example.

Example 1: Existing Regional Sewage System with a treatment upgrading project with partners as below - total project cost = $150,000. Project serves three communities and one non-eligible industrial partner that needs 33 1/3 percent of the project capacity. Total eligible project cost is $150,000, less ($150,000 x .333) = $100,000.
Three communities = 7,000 total official population

A. Community A = 1,000 official population
Pro-rated project cost = 1,000/7,000 x $100,000 = $14,286
Cost sharing ratio = 75%
Community A grant = $14,286 x 75% = $10,715

B. Community B = 2,300 official population
Pro-rated project cost = 2,300/7,000 x $100,000 = $32,857
Cost sharing ratio = 60.87%
Community B grant = $32,857 x 60.87% = $20,000

C. Community C = 3,700 official population
Pro-rated project cost = 3,700/7000 x $100,000 = $52,857
Cost sharing ratio = 52.03%
Community C grant = $52,857 x 52.03% = $27,500

D. Agricultural Processing Industry that uses 33 1/3 percent of project capacity

TOTAL GRANT = (A)$10,715 + (B)$20,000 + (C)$27,500 = $58,215/$150,000 = 38.81 percent funding

Project Eligibility and Funding Levels - New Pipelines and Treatment Upgrade

Funding for new regional systems will follow the new funding arrangements as set out below. Individual project applications will be evaluated by the department in conjunction with the Departments of Municipal Affairs, Environment and Sustainable Resource Development, and Agriculture and Rural Development. Evaluations will examine the following factors:

- Need for the project; health issues, future water availability, etc.
- Cost effectiveness of the proposed design in relation to other alternatives, including user rates.
- Benefits of the project.
- Conformance to the Water for Life principles and the Water for Life facility assessment (by Alberta Environment and Sustainable Resource Development).
- Ability to fit in with provincial budget availability.
- Appropriate staged construction scheduling and readiness to proceed.
-

The primary purpose of the new pipeline system must be for domestic use. Domestic use is defined as household use. Municipalities wishing to construct pipelines which have primary purposes other than domestic usage, may wish to contact the department for further information.

Pipelines are funded for the total requirements of the area. Industrial, country residential uses, first nation lands, and other uses are included.

New developments planned for the area are considered and a portion may be eligible for assistance. Individual situations must be approved by the department.

Pipelines for new regional systems (water or wastewater) are funded at 90%.

Pipeline capacity for future extensions to the pipeline to additional regional customers may be requested by the Province and would receive 100% funding.

Upgrades required for new customer(s) at a hub-supplier's plant or at a commission-owned plant would be funded at 100%.

If upgrades are not required at the time of the new customer connection, a 100% grant for the estimated cost of the upgrades would be made at the time of the pipeline construction. An example of a grant for a hub supplier extending service to three other municipalities follows.

Example 2: New Regional Water project with partners as below - total project cost = $15,000,000. Project is a pipeline extension to three towns and one non-eligible industrial partner that needs 25 percent of the project capacity. Water is obtained from a fourth hub municipality. Pipeline cost is $10,000,000 and the next logical capacity upgrade at the hub supplier water treatment plant has an estimated cost of $5,000,000. Sixty (60) per cent of the plant upgrade is for the new customers. The cost of the pipeline to serve the three municipalities is $9,000,000 and the Department of Transportation has requested that the pipeline be built large enough for a future extension to a fourth municipality at an additional cost of $1,000,000.
Three communities = 7,000 total official population, Hub supplier's population is 100,000.
Community A = 1,000 official population
Community B = 2,300 official population
Community C = 3,700 official population

d. Agricultural Processing Industry that uses 25 percent of project capacity.

TOTAL GRANT =	90% of pipeline cost ($8,100,000) for the new customers, and 100% of pipeline cost for future users ($1,000,000)
	100% of plant upgrade cost (60% x $5,000,000) for the new customers= $3,000,000
	0% of plant upgrade cost (40% x $5,000,000) for the hub supplier's population=$0
	= $12,100,000 (80.67 %)

Feasibility Study Requirements

Feasibility Studies to evaluate new regional systems may be funded by the department at 100%. Municipalities must receive prior approval for the study. A copy of the terms of reference for the regional feasibility study must be submitted and approved by Alberta Transportation. Applications for regional feasibility studies must include a copy of the selected consultant's proposal. All studies will be managed by a Steering Committee composed of representatives from Alberta Transportation, Alberta Environment, and the municipalities.
The consultant's work plan shall include, but may not necessarily be limited to, the following:

- Collect and review all previous relevant studies.
- Review existing facilities and identify upgrading required on each member municipality's water supply and treatment system and/or wastewater treatment and disposal system for a 25 year design horizon, based on current standards.
- Identify regional servicing options to meet each member municipality's requirements for the 25 year horizon, based on current standards. The regional system will need to demonstrate acceptable design life, per capita flows, industrial flow estimates, and peaking factors.
- Identify environmental issues to be addressed (water licenses, regulations, effluent standards, water conservation strategy).
- Identify public health issues which are associated with each alternative.
- Provide current costs for the upgrading required on the individual systems and the regional options. Cost of the hub supplier's upgrades should be included in the analysis.
- Provide a 25 year net-present-value (NPV) analysis/comparison between the stand-alone systems and the regional option(s). NPV analysis shall include annual operating and maintenance and capital construction costs using whole dollar costs. No consideration shall be given for any provincial and/or federal grants in the analysis/comparisons.
- Provide recommendations for project implementation, including phased construction.

The new system will need to demonstrate acceptable design life, per capita flow estimates, industrial flow estimates, and peaking factors.

Associated Costs
Funding is also available for associated costs under the same eligibility criteria as the AMWWP.

NON-Eligible Items
The following will not be considered eligible for funding:

a. Municipal labor and equipment.
b. Administration costs (i.e. all municipal employee salaries or council member salaries, office administration costs, etc.).
c. Goods and Services Tax.
d. Interim financing costs.

Procedures
Municipalities wishing to use available funding under this initiative will generally follow AMWWP procedure as outlined previously.
Applications under this initiative should include the following:

a. A letter from each member municipality or the regional commission requesting funding.
b. The technical and financial details of the project.
c. An analysis of the project's cost/benefit and cost-effectiveness in respect to alternative regional and independent municipal systems.
d. An implementation schedule.
e. Proposed rates and impact on the cost for services for each member municipality.
f. Rate base for water and sewer service and the extent of metering for each member municipality.

<u>Task 1 - WATER</u>

- "A" level cost estimates, including construction, engineering and contingency but do not include land costs, for each water alternatives as well as for the reservoirs and truck fill station (s) will be prepared based on 2013 dollars. The cost summary for all alternatives will prepared and provided in the report for comparison.

- Life Cycle costing will be prepared for water servicing alternatives based on major activities in the course of the alternative's life span from its commissioning, use, operation and maintenance to its end of service life. The Life Cycle costing comparisons for all alternatives will provided.

- Grant/Funding

  The details and criteria of applicable grant funding from federal and provincial government as well as Federation of Canadian Municipalities (FCM) will be reviewed and elaborated in the report for information and record, so that the Parkland County can apply for grant funding and utilize the funding for construction of the water servicing system.

<u>Task 2 - SAN</u>

- "A" level cost estimates, including construction, engineering and contingency but do not include land costs, for each sanitary servicing alternatives as well as for truck receiving station (s) will be prepared based on 2013 dollars. The cost summary for all alternatives will prepared and provided in the report for comparison.

- Life Cycle costing will be prepared for each sewer servicing alternatives based on major activities in the course of the alternative's life span from its commissioning, use, operation and maintenance to its end of service life. The Life Cycle costing comparisons for all alternatives will provided.

- Grant/Funding

  The details and criteria of applicable grant funding from federal and provincial government as well as Federation of Canadian Municipalities (FCM) will be reviewed and elaborated in the report for information and record so that the Parkland County can apply for grant funding and utilize the funding for construction of the sanitary servicing system.