

Memo

To:	Daris Gillis and Kari Bondaroff
Cc:	
From:	Adil Javed
Date:	12 July 2022
Project #:	VP22-PRD-01-00
Priority:	Normal
Subject:	Charlie Lake Feasibility Study – Land Availability Status

1 INTRODUCTION

The Peace River Regional District (PRRD) is considering installing a public Tank Loader Facility (facility) to comply with the Northern Health Authority's health standards for potable water in the Electoral Area C (Area). Integrated Sustainability was retained to study the feasibility of the facility. One of the objectives of the study is to identify a minimum of three (3) suitable locations for a bulk potable water fill station within the vicinity of Charlie Lake.

The purpose of this memo is to provide a preliminary overview of land availability around Charlie Lake and initial assessment of suitable potential locations to construct the treatment and storage facility using Charlie Lake as the raw water source.

2 OVERVIEW OF THE AREA

Charlie Lake has a surface elevation of 700 metres¹ and is fed by Stoddart Creek, and drains through Fish Creek to the Beatton River which, in turn, is a tributary of the Peace River. Two public parks are established on the shores of the lake, Charlie Lake Provincial Park on the west shore and Beatton Provincial Park on the east shore.

PRRD Electoral Area C surrounds the lower half of Charlie Lake, as shown in **Figure 1**, and covers a land area of about 568 km² with an estimated population of 5,947, based on the

¹ ([https://en.wikipedia.org/wiki/Charlie_Lake_\(British_Columbia\)](https://en.wikipedia.org/wiki/Charlie_Lake_(British_Columbia)))

2021 Census of Population², This represents a drop in population of 10.8 percent since the previous census was taken in 2016. The census data shows there are 2,270 private dwellings in the area (average of 2.6 persons per dwelling) consisting of 80-percent single-detached houses and 20-percent mobile dwellings with an average housing density of 4 dwellings per square kilometre.

2.1 Land Cover Analysis of the Area

The land cover analysis of the area was done by using a near real time 10-m land cover data set³. Generally, land cover analysis gives insight as to how much of an area is covered by forest, wetlands, agriculture, and built-up urban areas. For this assignment the main objective of the land cover analysis was to study and document the “built-up” areas (**Figure 2**) which is strongly correlated with the population density and is a practical method to assess population clusters within a study area.

The built-up area constitutes approximately five percent (5%) of Area C. **Figure 3** shows that most of the built-up area is located near the southern and southwestern shoreline of Charlie Lake. Another cluster of built-up areas is located around the boundary of Fort St. John. The Land Cover analysis suggests that the most suitable location for a Tank Loader Facility, based on proximity to the highest population density within Area C, is along the southern half of Charlie Lake.

3 CROWN OR EQUIVALENT LAND AVAILABILITY STATUS

An analysis of land availability was conducted by analyzing the ownership type of the land in the vicinity of Charlie Lake. The objective of this analysis was to locate suitable property locations to construct the water facility. Logically the preferred location would be on publicly owned land (i.e. Federal, Crown Provincial or Municipal) so that land acquisition could be rather easy and straightforward.

To conduct this analysis, spatially distributed database called ParcelMap BC (PMBC) was downloaded from data catalogue of government of British Columbia website⁴. PMBC is the trusted and sustainable electronic map of active titled parcels and surveyed provincial Crown land parcels in British Columbia. PMBC categorizes the Owner Type in seven categories. **Table A** provides a description of each Owner Type found in the PMBC database within Electoral Area C.

²<https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Peace%20River%20C&DGUIDlist=2021A00055955042&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0>

³ Brown, C.F., Brumby, S.P., Guzder-Williams, B. et al. Dynamic World, Near real-time global 10 m land use land cover mapping.

⁴ <https://catalogue.data.gov.bc.ca/dataset/4cf233c2-f020-4f7a-9b87-1923252fbc24>

Table A. Owner Type and its Reference (PMBC)

Owner Type	Reference
Private	The parcel has a title registered to an Individual or a Private Corporation / Institution (e.g. financial institutions, churches, universities, hospitals, strata corporations, etc.)
Federal	The parcel has a title registered to the Federal government or a Federal Crown agency (e.g. Her Majesty in Right of Canada, Canada Revenue Agency, Transportation Canada, etc.).
Crown Provincial	The parcel has a title registered to the Crown (e.g. Her Majesty in Right of the Province of British Columbia) The parcel has a title registered in the name of a Private individual, corporation, or institution, but either a Legal Notation endorsement of 'Forfeited to Crown' or 'Reverted to Crown' OR a charge of Tax Sale Notice with a 'Forfeited to Crown' endorsement has been registered on title.
Crown Agency	The parcel has a title registered to a Crown Agency or a Crown Corporation (e.g. BC Assessment, BC Ferries, BC Hydro, etc.)
Municipal	The parcel has a title registered to a local government or a school district or trustee.
Untitled Provincial	The parcel does not have an active title in the land title register.
Unclassified	The parcel has a title registered in the land title register, but Owner Type on title could not be determined.

Figure 4 and **Figure 5** shows a map of the property parcel ownership for lands surrounding Charlie Lake, most of which are privately owned. At the southern end of the Charlie Lake, there are seven land parcels whose ownership type is listed as "Municipal" and a small strip of southwestern side of nose whose owner type is listed as "Crown Agency". All these areas are fairly developed as seen from satellite imagery. Charlie Lake Provincial Park, along the west side of Charlie Lake is also a potential location for a Tank loader facility. There are also some smaller parcels of land located along the east side of Charlie Lake identified as "Untitled Provincial" owner type which could be considered.

4 PRELIMINARY IDENTIFICATION OF POTENTIAL SITES

Based on an initial assessment, three potential sites have been identified as suggested locations for the water treatment and storage facility. These locations are shown on **Figure 5** as Locations A, B and C. It is important to note this is based on a preliminary assessment and does not consider the range of factors that would need to be considered including water quality, geotechnical and environmental considerations.

4.1 Methodology

The suggested locations are based on following considerations.

1. Availability of Crown or Equivalent Land Type
2. Proximity to Population
3. Bathymetry of Lake

4.1.1 Availability of Crown or Equivalent Land Type

For this preliminary assessment public ownership is the primary selection criterion along with proximity to population density clusters to reduce the capital and operating cost and efforts required for land acquisition. **Figure 5 A, B, and C** show a close-up satellite image for the three preliminary locations.

4.1.2 Proximity to Population

The factor of proximity of the facility to the population is another important factor which was considered for suggesting the suitable locations. Travel time analysis by driving as a mode of transportation for all three locations was conducted using GIS tools and OpenStreetMap data. Isochrones (catchment areas based on travel time) for 5 minutes and 10 minutes driving time was created for all three locations (**Figure 6 A, B, C**).

The resultant isochrones were then overlapped on the built-up areas to calculate the percentage coverage of 10-minutes drive by each location. The results of this analysis are presented in following Table B:

Table B. Percentage Coverage of built-up area by 10-Minutes drive

Location	Percentage Coverage of built-up area by 10-Minutes drive
Location A	32.24%
Location B	45.03%
Location C	12.65%

4.1.3 Lake Bathymetry

Lake bathymetry is also a very important consideration in determining a suitable location for a lake water intake. Intake structures are characteristically constructed at an optimum depth to provide the most consistent water quality with minimum turbidity. A deeper intake would cost more to construct and likely provide no significant improvement in water quality nor reduce the need for further filtration. A deeper intake may also be more difficult to construct, operate and maintain.

A bathymetric map of Charlie Lake was obtained from Ministry of Environment, British Columbia website⁵ (**Appendix-1**). This bathymetric map was issued on 4-6 June 1985. The map shows a moderate inner slope of lake bank on southern nose with a depth of 4 meters or less within 1000 metres from the southern shore. Both the east and west banks have relatively steep slopes such that a depth of 8 metres could be attained within 250 metres from the shoreline.

A detailed bathymetric survey will need to be carried out for the selected location prior to beginning detailed design.

5 DISCUSSION

As a result of the forgoing analysis, the three preliminary locations are as shown in Table C:

Table C. Summary of Analysis

Location	Land Ownership Type	Percentage Coverage of built-up area by 10-Minutes drive	Bathymetry
Location A	Untitled Provincial	32%	Steep Inner Slope
Location B	Municipal	45%	Steep Inner Slope
Location C	Untitled Provincial	13%	Steep Inner Slope

Table C suggest the most appropriate site is likely Location B (Figure 5B) based on the factors considered in this technical memo. As noted, the assessment is based on available data and the priority factors described and does not include consideration of other potentially important factors such as water availability, water quality, geotechnical and environmental studies.

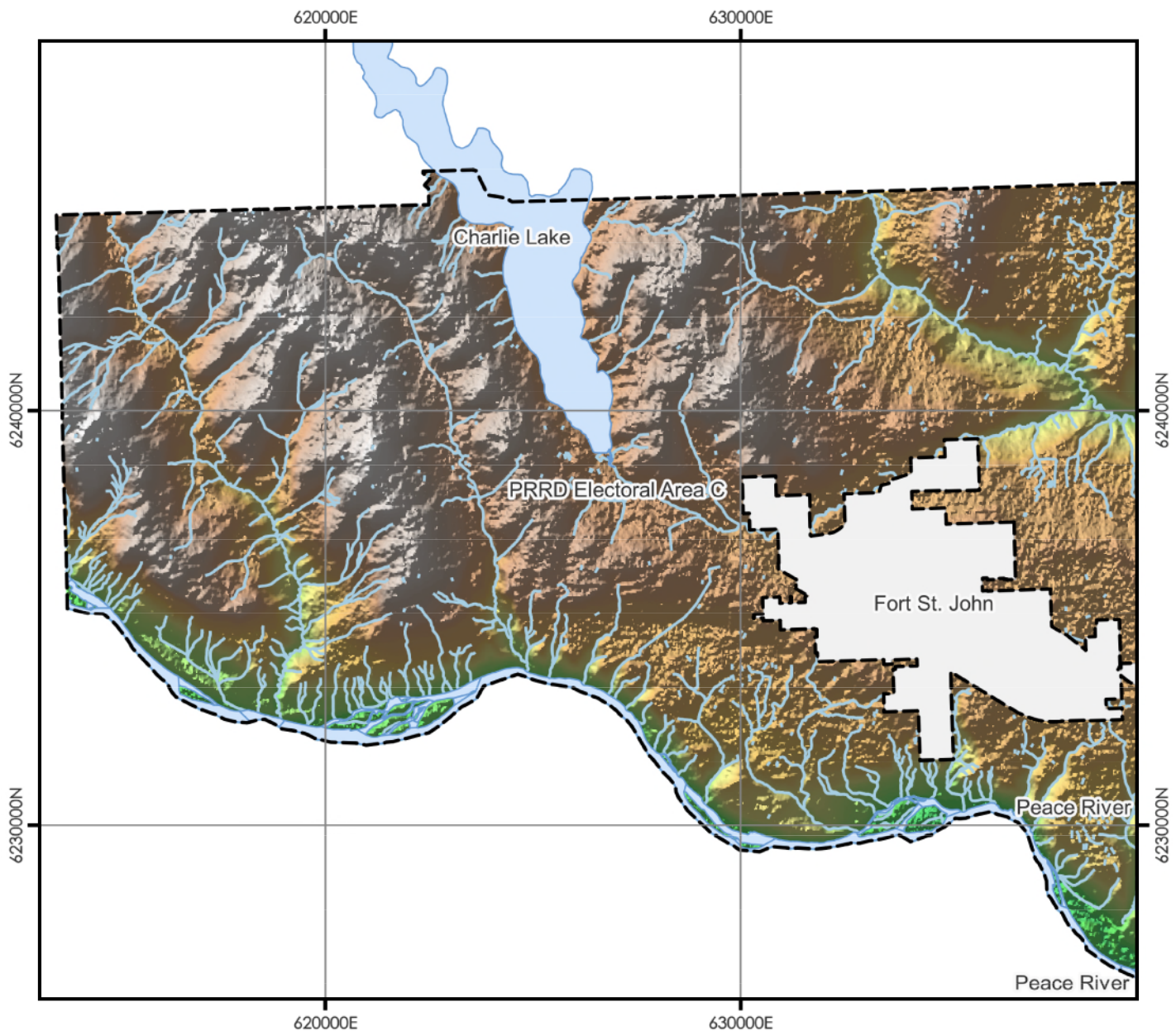
⁵ <https://a100.gov.bc.ca/pub/fidq/searchBathymetricMaps.do?searchCriteria.waterbodyIdentifier=01566LBTN>



Figures

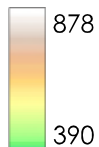
Figure 1

Elevation Map



Legend

Elevation (m)



Streams

Notes

Project

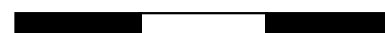
Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 2.5 5 7.5 km

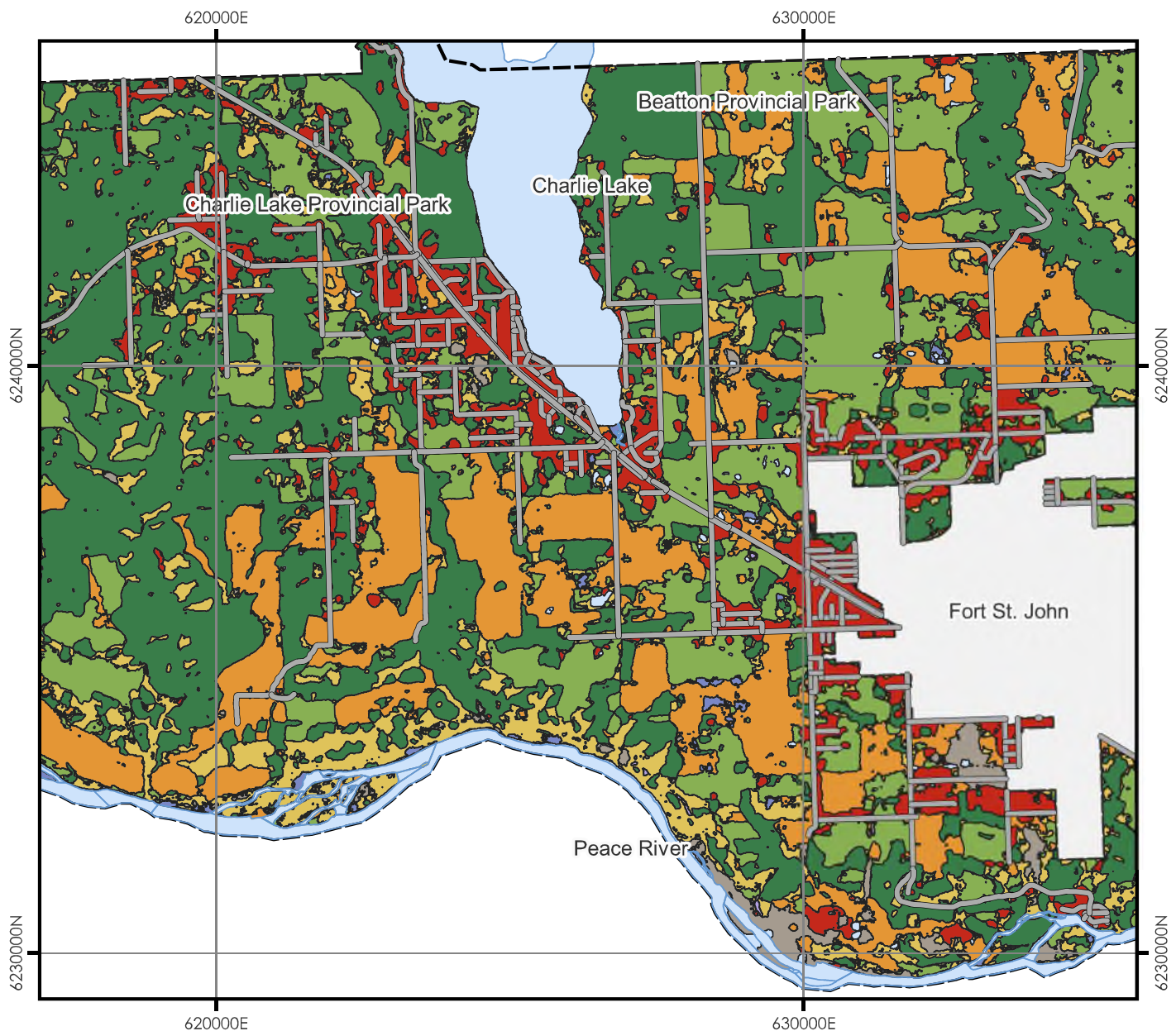


NAD83 / UTM zone 10N



Figure 2

Land Cover/Land Use Type



Legend

Land Cover/Land Use Type

- Bare Land
- Built-up
- Crops
- Flooded Vegetation
- Grass
- Shrub and Scrub
- Snow and ice
- Trees

Notes

Trees	35%
Grass	29%
Flooded Vegetation	2%
Crops	19%
Shrubs and Scrub	9%
Built-up Area	5%
Bare Land	1%

Above table shows percentage of Land cover type in PRRD Area C (April-June 2022)

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 2.5 5 km

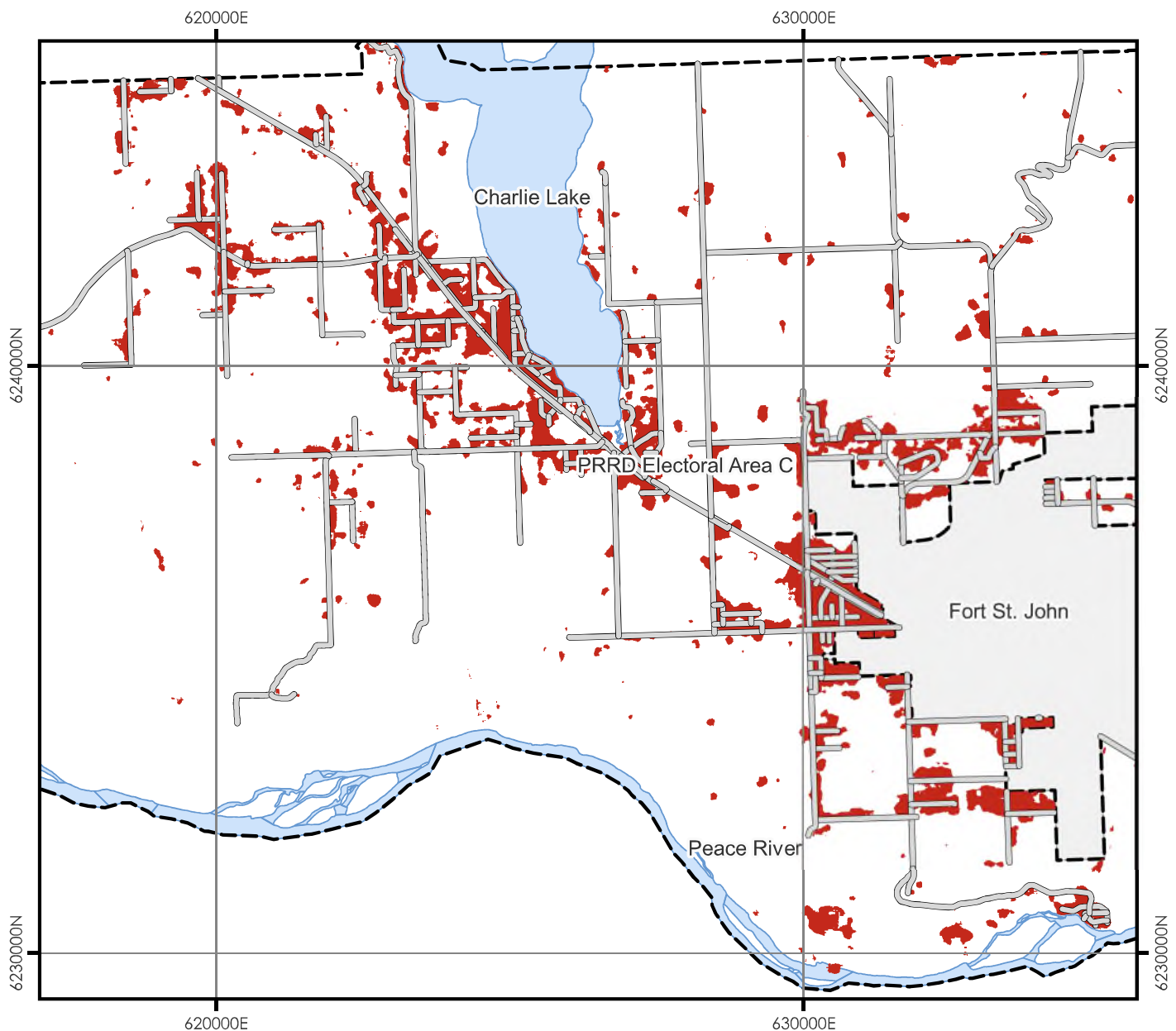


NAD83 / UTM zone 10N



Figure 3

Built-up Areas



Legend

 Built-up Areas

Notes

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Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 2.5 5 km

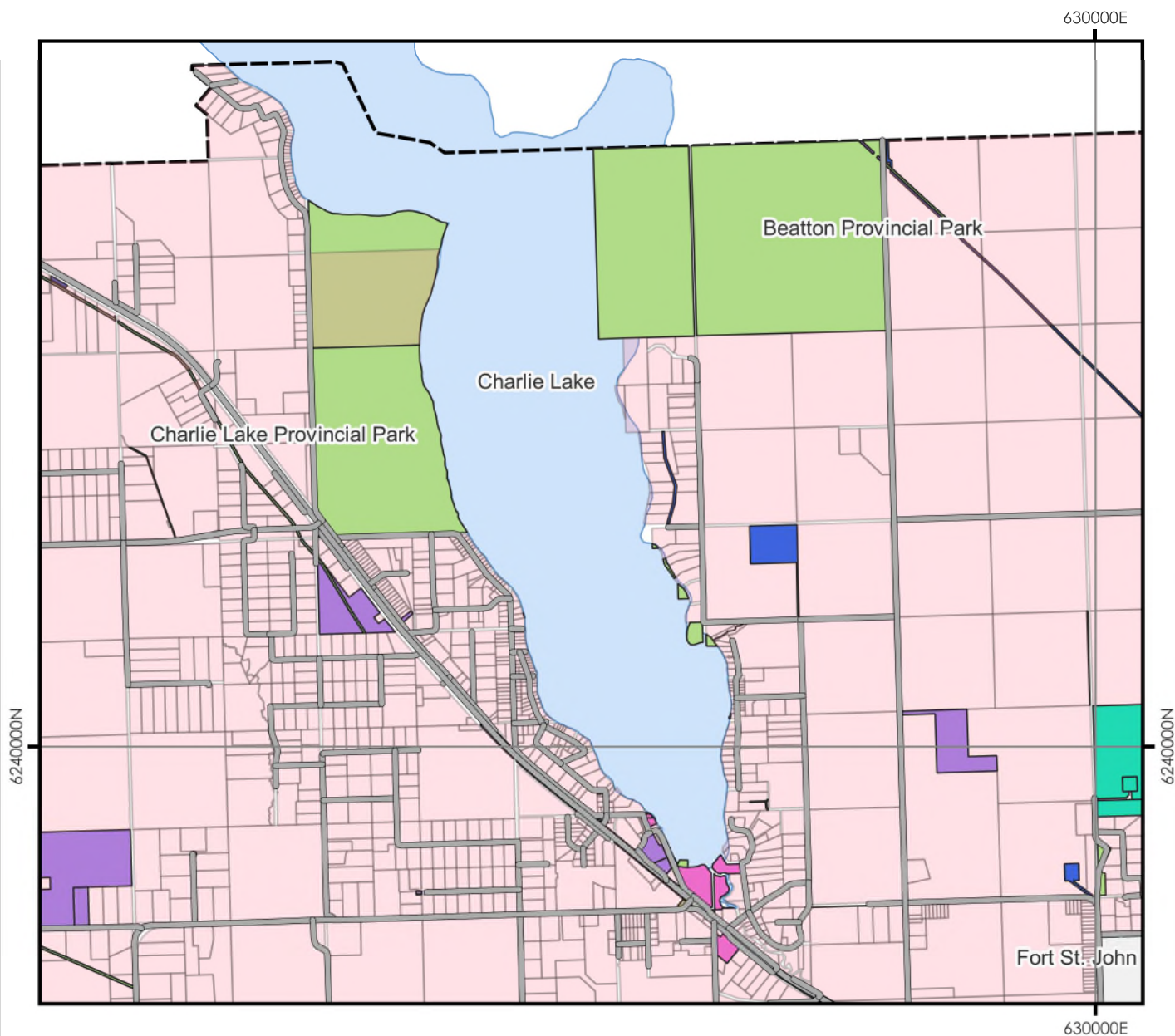


NAD83 / UTM zone 10N



Figure 4

Land Ownership Type



Legend

Ownership Type

- Crown Agency
- Crown Provincial
- Federal
- Municipal
- Private
- Unclassified
- Untitled Provincial

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0

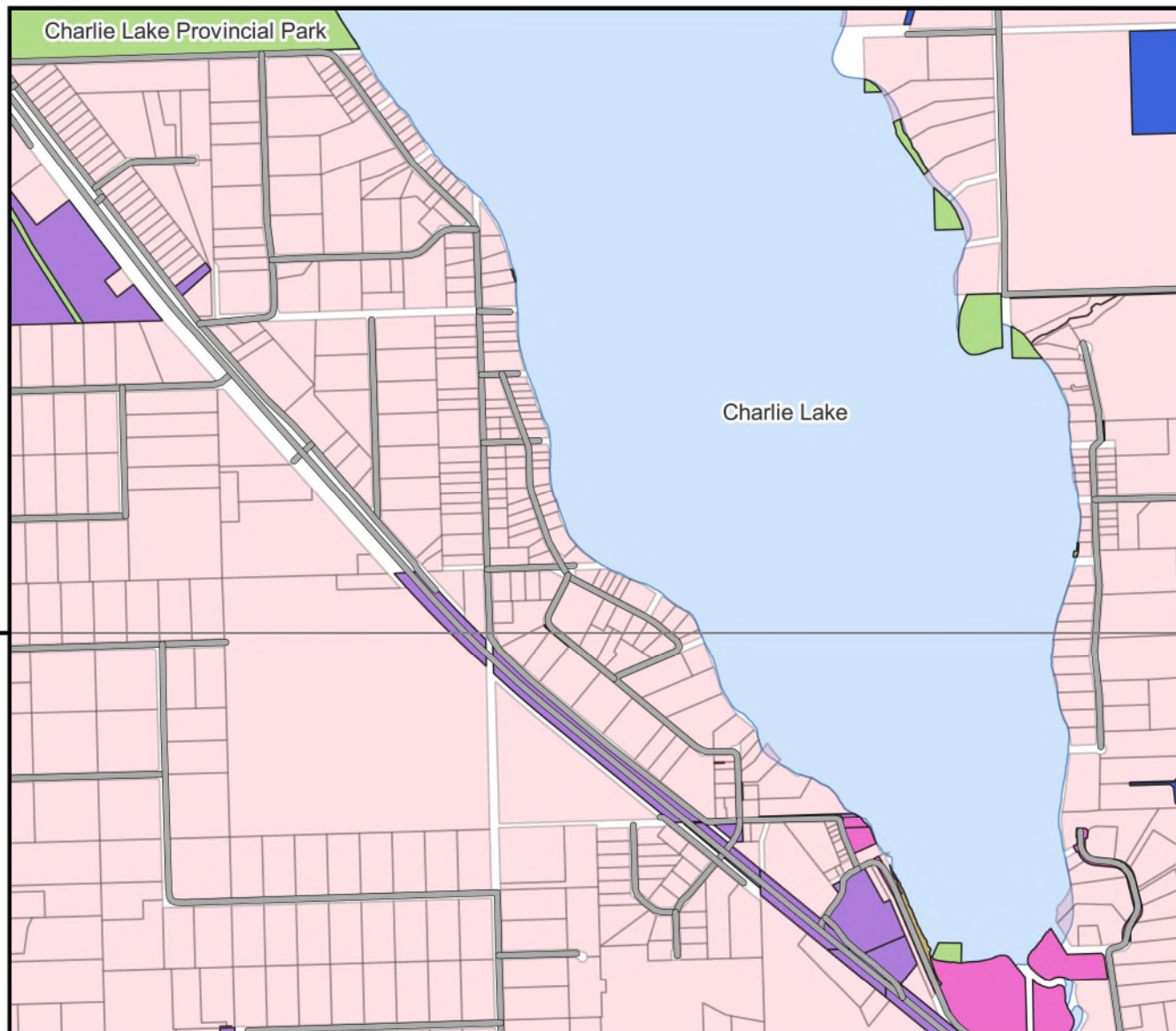
2.5 km

NAD83 / UTM zone 10N



Figure 4A

Land Ownership Type



Legend

Ownership Type

- Crown Agency
- Crown Provincial
- Federal
- Municipal
- Private
- Unclassified
- Untitled Provincial

Notes

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Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0

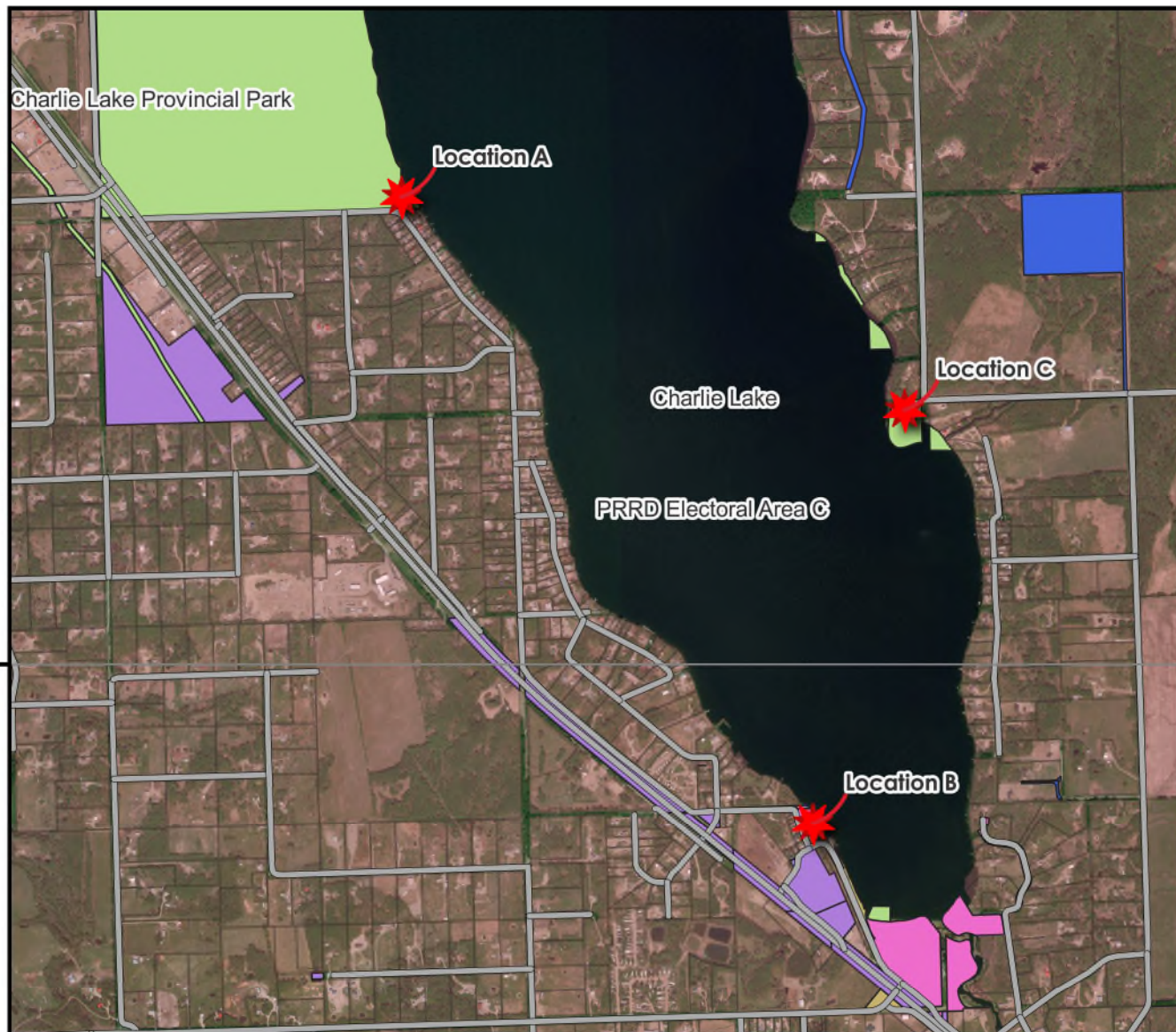
1 km

NAD83 / UTM zone 10N



Figure 5

Possible Locations for Tank Filling Facility



Legend

 Possible Locations

 Roads

Ownership Type

-  Crown Agency
-  Crown Provincial
-  Federal
-  Municipal
-  Private
-  Unclassified
-  Untitled Provincial

Notes

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Potable Water Feasibility – Charlie Lake and Surrounding Area C

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PEACE RIVER
REGIONAL DISTRICT

0 250 500 750 1,000 m



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Figure 5A

Possible Locations for Tank Filling Facility (Location A)



Legend

 Possible Locations

 Roads

Ownership Type

 Untitled Provincial

Notes

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Potable Water Feasibility – Charlie Lake and Surrounding Area C

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PEACE RIVER
REGIONAL DISTRICT

0 50 m



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Figure 5B

Possible Locations for Tank Filling Facility (Location B)



Legend

-  Possible Locations
-  Roads

Ownership Type

-  Crown Provincial
-  Municipal

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

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PEACE RIVER
REGIONAL DISTRICT

0 50 m



NAD83 / UTM zone 10N



Figure 5C

Possible Locations for Tank Filling Facility (Location C)



Legend

 Possible Locations

 Roads

Ownership Type

 Untitled Provincial

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 50 m

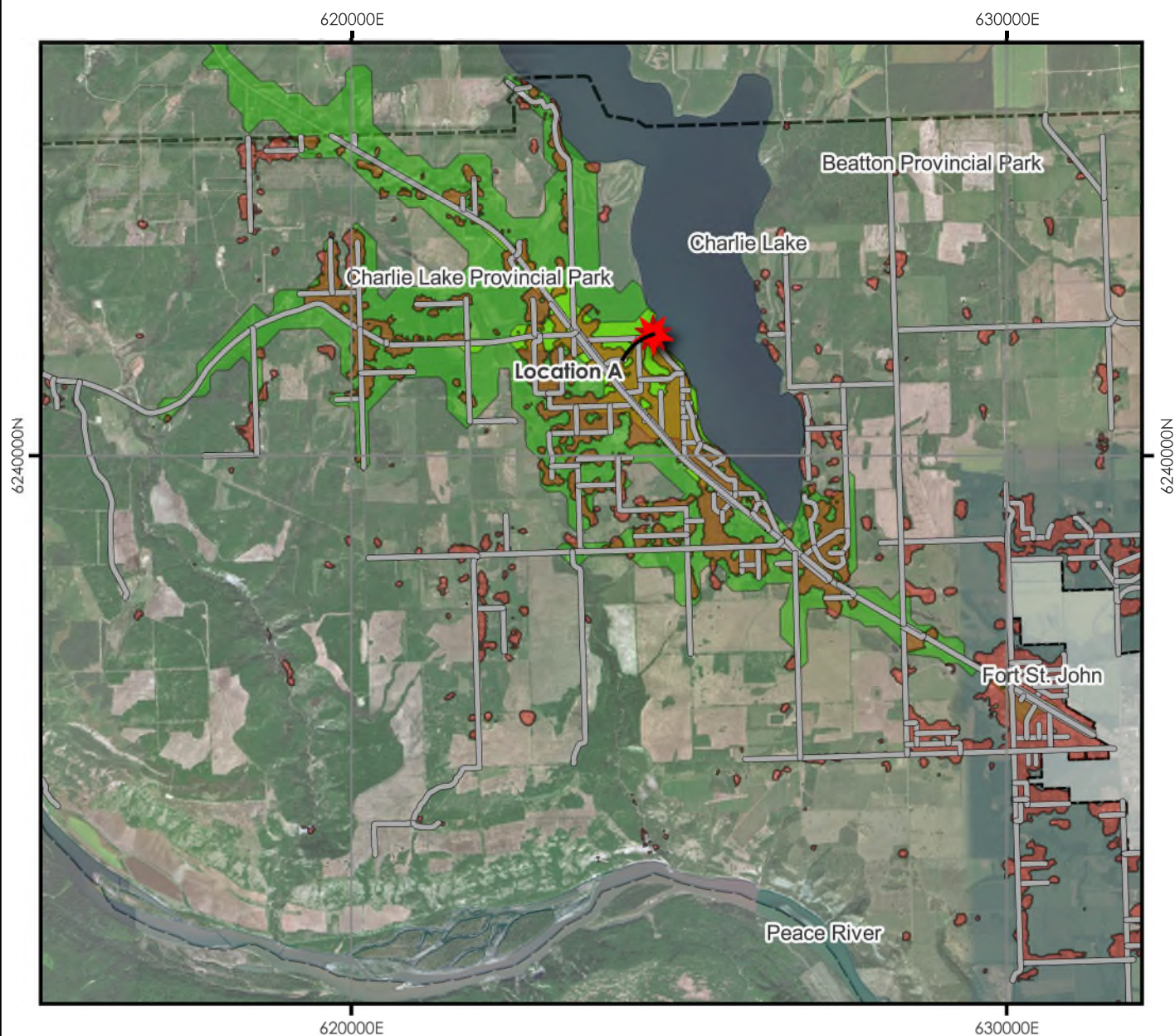


NAD83 / UTM zone 10N



Figure 6A

Travel Time to Location A



Legend

-  Location A
-  Built-up Areas
-  5 minutes to Location A by Driving
-  10 minutes to Location A by Driving
-  Roads

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 1 2 3 4 km

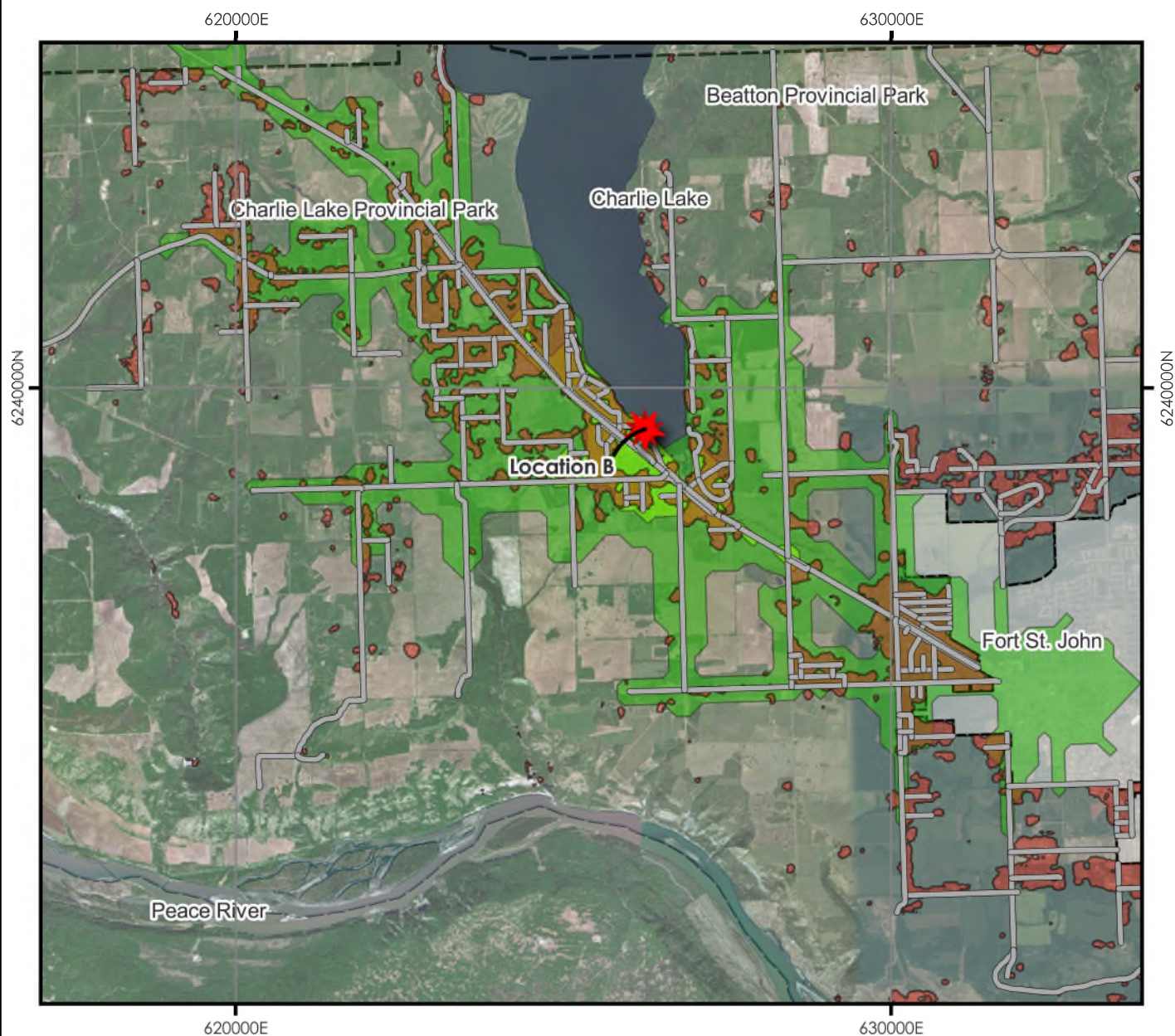


NAD83 / UTM zone 10N



Figure 6B

Travel Time to Location B



Legend

-  Location B
-  Built-up Areas
-  10 minutes to Location B by Driving
-  5 minutes to Location B by Driving
-  Roads

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 1 2 3 4 km

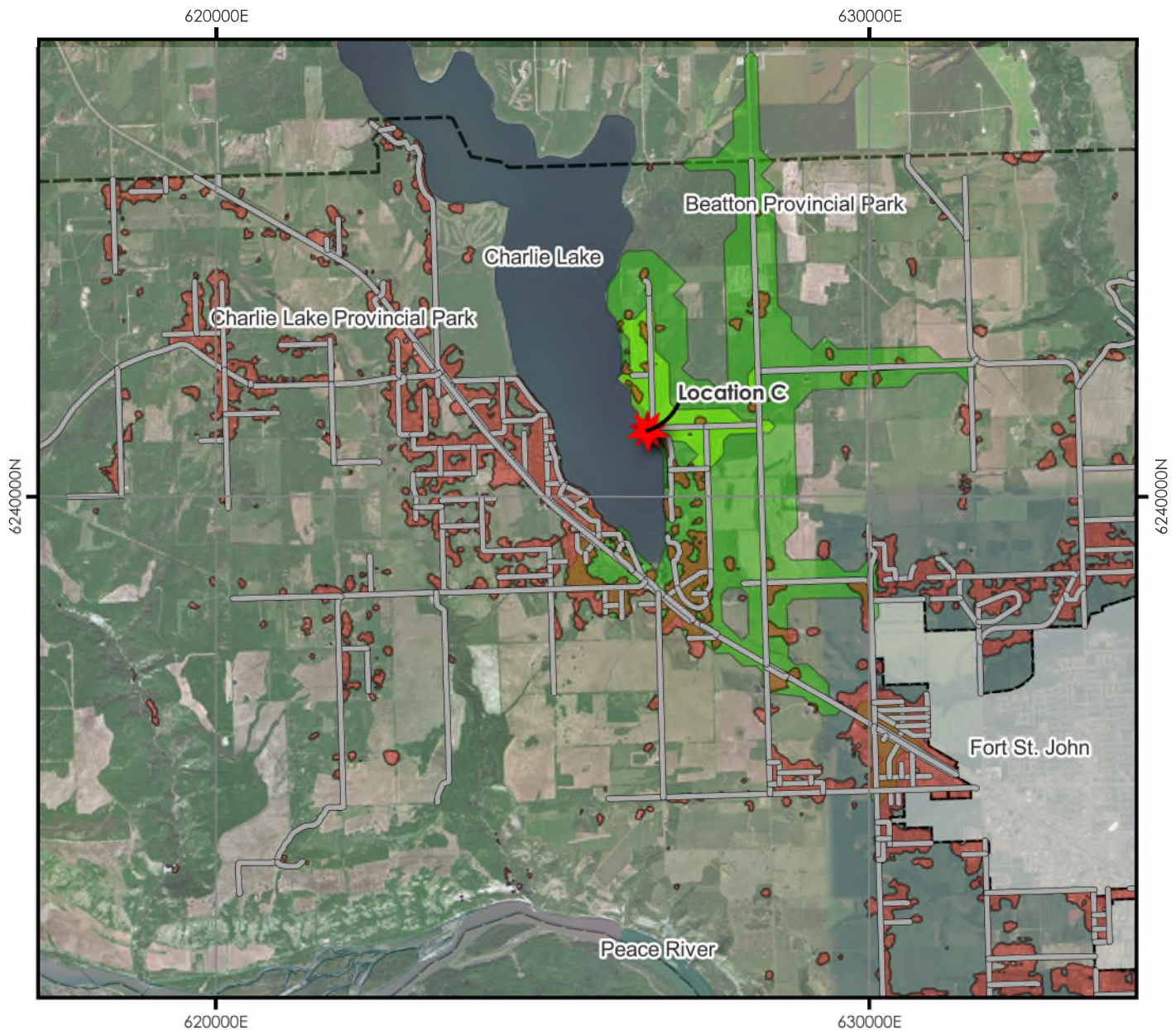


NAD83 / UTM zone 10N



Figure 6C

Travel Time to Location C



Legend

-  Location C
-  Built-up Areas
-  5 minutes to Location C by Driving
-  10 minutes to Location C by Driving
-  Roads

Notes

Project

Potable Water Feasibility – Charlie Lake and Surrounding Area C

Client



PEACE RIVER
REGIONAL DISTRICT

0 1 2 3 4 km



NAD83 / UTM zone 10N





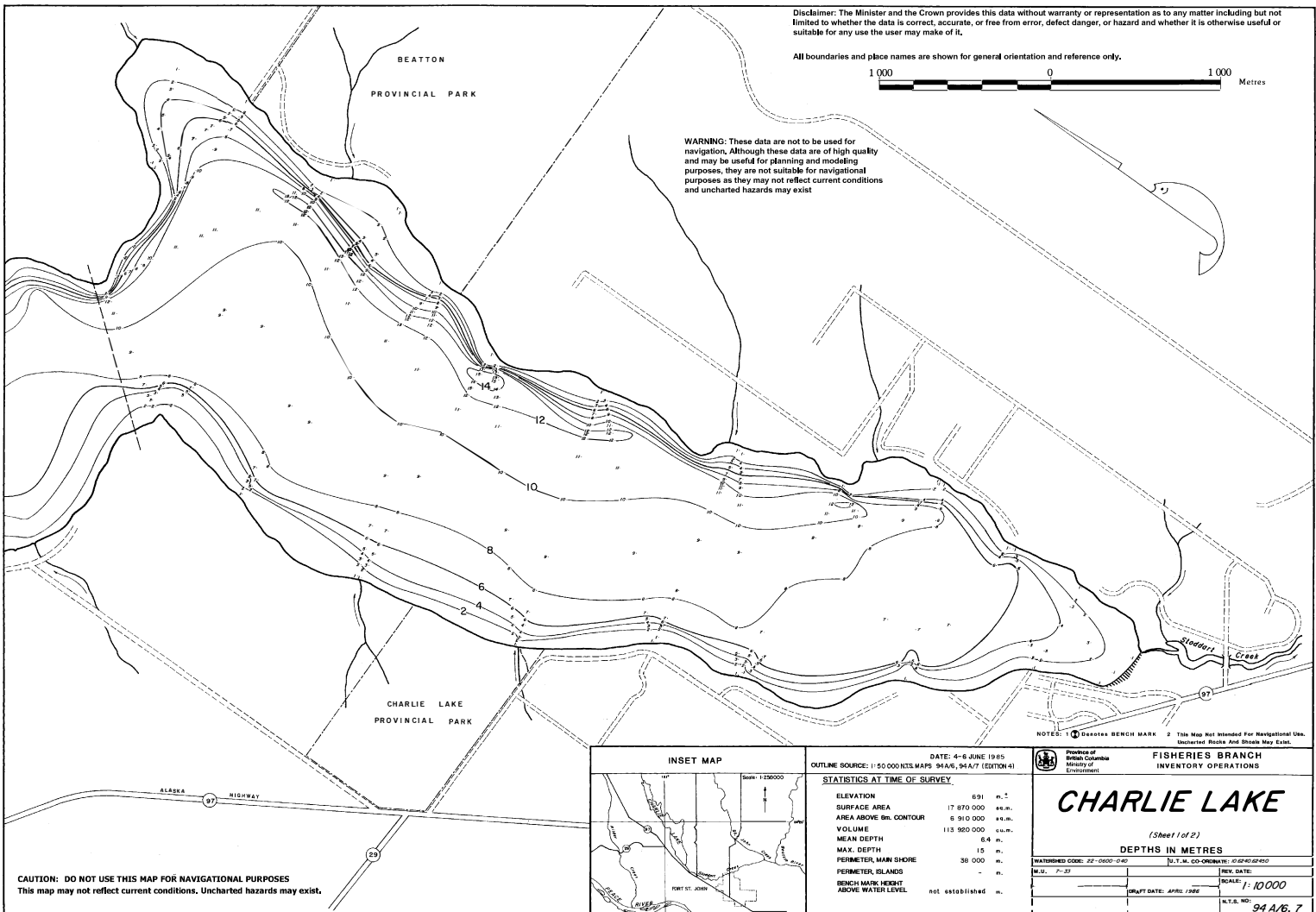
Appendix 1 – Bathymetric Map of Charlie Lake

Disclaimer: The Minister and the Crown provides this data without warranty or representation as to any matter including but not limited to whether the data is correct, accurate, or free from error, defect, danger, or hazard and whether it is otherwise useful or suitable for any use the user may make of it.

All boundaries and place names are shown for general orientation and reference only.

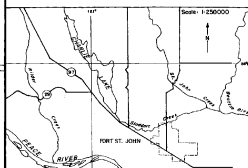
1 000 0 1 000 Metres

WARNING: These data are not to be used for navigation. Although these data are of high quality and may be useful for planning and modeling purposes, they are not suitable for navigational purposes as they may not reflect current conditions and uncharted hazards may exist



CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES
This map may not reflect current conditions. Uncharted hazards may exist.

INSET MAP



DATE: 4-6 JUNE 1985
OUTLINE SOURCE: 1:50 000 N.T.S. MAPS 94A/6, 94A/7 (EDITION 4)

STATISTICS AT TIME OF SURVEY

ELEVATION	6.91	m.
SURFACE AREA	17 870 000	sq.m.
AREA ABOVE B.M. CONTOUR	6 910 000	sq.m.
VOLUME	113 920 000	cu.m.
MEAN DEPTH	6.4	m.
MAX. DEPTH	15	m.
PERIMETER, MAIN SHORE	38 000	m.
PERIMETER, ISLANDS	-	m.
BENCH MARK HEIGHT ABOVE WATER LEVEL	not established	m.



Province of British Columbia
Ministry of Environment

FISHERIES BRANCH
INVENTORY OPERATIONS

CHARLIE LAKE

(Sheet 1 of 2)

DEPTHS IN METRES

WATERSHED CODE: 22-0000-040

U.T.M. CO-ORDINATE: 624049400

SCALE: 1:10 000

DRAFT DATE: APRIL 1986

N.T.S. NO: 94 A/6, 7