SaskPower – Saskatchewan
Preliminary Siting of a Nuclear Power Plant

Stantec

February 2007

Table of Contents

1. EXECUTIVE SUMMARY

SaskPower requested the assistance of Stantec Consulting Ltd. (Stantec) in examining potential candidate sites for a nuclear power plant within two regions – one around Lake Diefenbaker and the second near Lac La Loche. SaskPower requested that Stantec include the following in the evaluation:

- Identify three candidate sites in each of the two regions.
- Assess the candidate sites using environmental and cost factors and identify a preferred site for each region.
- Consider the site criteria established by Atomic Energy Canada Ltd. (AECL).

The assignment includes three phases:

I. Regional Analysis – The objective of this phase was to identify potential candidate sites for the two regions using readily available data.

II. Screening Criteria and Data Collection – The objective of this phase was to develop a simple comparison methodology for the screening of candidate sites.

III. Screening of Sites – Based on the screening criteria identified in Phase 2, the candidate sites for each region are compared and ranked to obtain a preferred candidate site for each region.

Based upon our review of the two regions, using constraint mapping, we identified three candidate areas for the Lake Diefenbaker region and two candidate areas for the Lac La Loche region. Sites in the Lake Diefenbaker region were chosen primarily due to several desirable attributes, including:

- Located on relatively level plains.
- Proximity to the deeper portion of the lake.
- Relatively low population densities in the local rural municipalities.
- Minimal conflict with other land uses, including parks, cottage subdivisions, protected areas, and the Reservoir Development Area boundaries.
- Avoids the more rugged and potentially unstable valley slopes more characteristic of the western portion of the lake.
- Relatively close proximity to existing highways.

Sites in the Lac La Loche region were chosen for similar reasons

Using standard criteria and weighting as part of an evaluation matrix, all five sites in both regions were evaluated. All the sites in the Lake Diefenbaker Region scored higher (better) than the Lac La Loche sites. The two Lac La Loche sites were evaluated to be equal. Site #1 in the Lake Diefenbaker Region scored highest.

Lake Diefenbaker Site # 1 scored the highest of all alternatives for the following criteria:

- Terrestrial Ecological Impact - Location of New and Future Transmission Lines
- Aquatic Ecological Impact - Location of Additional Transmission Lines
- Aquatic Ecological Impact
- Accommodations for Employees
- Regional Amenities For Employees
- Transmission Systems - Distance related Power Losses
- Transmission Systems - Capital Cost

Lake Diefenbaker Site #1 also scored as high as any of the other alternatives for the following criteria:

- Meteorological Conditions
- Geotechnical
- Terrestrial Ecological Impact - Plant location
- Sensitivity to flooding
- Aboriginal Interests
- Archaeology and Heritage
- Radioactivity
- Public Health
- Cooling Water - Proximity to lake
- Cooling Water - Temperature
- Cost of Transportation Construction and Operations

Ironically, the remote location of the Lac La Loche region, compared to Lake Diefenbaker provide both positives and challenges, but the advantages are outweighed by the disadvantages including but not limited to:

- Lack of accommodations for employees
- Lack of regional amenities for employees
- Distance related power losses from transmission systems
- Additional capital costs for extending transmission systems
- Additional capital and operating costs for expanding transportation infrastructure

Recommendations

1. If SaskPower wishes to advance this project, future studies should be undertaken to confirm the suitability of the Lake Diefenbaker Region, specifically to assess the security of water supply due to competing uses upstream and potential climate change, and the competing demands for water downstream.
2. If the above issues are resolved to the satisfaction of all relevant authorities, then further study is required to select the specific property in the Lake Diefenbaker Region for siting the plant.

2. INTRODUCTION AND STUDY REQUIREMENTS

2.1. INTRODUCTION

Saskatchewan Power Corporation (SaskPower) is a crown owned, vertically integrated utility having primary responsibility for generation, transmission and distribution of electricity within the Province of Saskatchewan. SaskPower's aggregate generating capacity is 3,655 megawatts (MW), which includes 3,206 MW capacity of SaskPower's own facilities – three coal-fired stations, seven hydro stations, four natural gas stations, and two wind generation facilities. In addition, they have long-term power purchase agreements with various cogeneration and wind power projects in the province. SaskPower also maintains 154,269 km of power lines (12,159 km transmission and 142,110 km distribution).

SaskPower operates primarily under the mandate and authority of The Power Corporation Act, which grants SaskPower the exclusive franchise and the exclusive obligation to supply, transmit and distribute electricity, as well as provide service to customers. In meeting this mandate, SaskPower explores many options for providing power to their customers. For example, they are actively involved in green power initiatives, are negotiating power purchase agreement with other producers, and have recently announced a potential site for the Clean Coal Project. Should the Clean Coal Project proceed, SaskPower will be owning and operating an advanced clean coal unit that will be the first of its kind in a utility scale application in the world.

Nuclear power is a source of energy currently being explored by SaskPower for potential future development. The potential development of a nuclear power plant within Saskatchewan is still very much at a conceptual stage. However, to further examine the nuclear option, SaskPower requested the assistance of Stantec Consulting Ltd. (Stantec) in examining potential candidate sites for a nuclear power plant (i.e., a preliminary siting evaluation). The requirements of the study are described in the following section.

2.2. STUDY REQUIREMENTS

SaskPower requested consulting services to conduct a preliminary screening and site selection for a nuclear power plant in Saskatchewan. Two regions were identified – one around Lake Diefenbaker and the second near Lac La Loche.

Potentially, the Lake Diefenbaker region could be the site of a CANDU 6 plant configured with two steam turbine generators instead of the standard 750MW single steam turbine unit. Plant output from this option would be split equally between Saskatchewan and Alberta.

The Lac La Loche region could be the site of a cogeneration plant producing electricity for Saskatchewan and steam for **potential** oil sands development in the region. There is currently no oil sands development in the region, and the study did not address proximity to end-point use of the steam in the Lac La Loche region or in North-east Alberta. For the purpose of this study the assumption is that the electrical output would be half of the nominal output of a CANDU 6.

SaskPower requested that Stantec generally include the following in the evaluation:

- Identify three candidate sites in each of the two regions.
- Assess the candidate sites using environmental and cost factors and identify a preferred site for each region.
- Consider the site criteria established by Atomic Energy Canada Ltd. (AECL). These criteria include topics such as cooling water requirements, exclusion zone, seismology, transmission systems, meteorological conditions, and geotechnical conditions.

The assignment includes three phases:

Phase I – Regional Analysis

The objective of this phase was to identify potential candidate sites for the two regions using readily available data. Various criteria were used to identify the areas having constraints and/or opportunities for nuclear plant development.

Phase II – Screening Criteria and Data Collection

The objective of this phase was to develop a simple comparison methodology for the screening of candidate sites. The screening criteria identified should consider environmental concerns, technical feasibility, and costs.

Phase III – Screening of Sites

Based on the screening criteria identified in Phase 2, the candidate sites for each region are compared and ranked to obtain a preferred candidate site for each region.

The following sections provide the results of this study. Section 3 describes Phase I; Section 4 describes Phase II, and Section 5 provides the results of the Phase III site screening.

3. PHASE I – REGIONAL ANALYSIS

Phase I focused on two regions initially identified by SaskPower as having potential for the location of a nuclear power facility. The two regions, one near Lake Diefenbaker and the one near Lac La Loche, were sufficiently large in size that a power plant could potentially be located at some site within a rather large geographic area (Figure 1). The objective of this phase was to examine these two large areas and identify possible development constraints and/or opportunities. Three potential candidate sites for each region were to be identified through this process. The candidate sites would then be subject to a more detailed comparison within Phase II of this study.

The following sections provide an overview of the methods and assumptions used in this Phase, as well as a description of the two regions and the criteria used in identifying the candidate sites. The discussion will also explain why three candidate sites were chosen for the Lake Diefenbaker region and two were chosen for the Lac La Loche region.

3.1. METHODOLOGY AND ASSUMPTIONS

The Phase I Regional Analysis was completed using existing, readily available information. Information used included:

- Ecoregion maps and descriptions[1]
- National Topographic System 1:250,000 and 1:50,000 map sheets. (digital 1:250,000 map sheets were purchased and used a basemap for many of the maps produced in this report).
- Climate information obtained from Environment Canada
- Regional population data (towns, villages, Rural Municipalities) obtained from the 2001 Census of Canada website
- Surficial and bedrock geology digital files obtained from Geological Atlas of Saskatchewan (www.ir.gov.sk).
- The Atlas of Saskatchewan[2]
- General information on Lake Diefenbaker and the South Saskatchewan River Project, obtained from the Saskatchewan Watershed Authority website.
- Transmission line and generating facilities map provided by SaskPower.

Information from these sources was compiled in an ArcGIS database and relevant information was output as a series of maps (Figures 1 to 10). Subsequently, the candidate sites were selected for each region and illustrated on Figures 11 and 12.

The regional evaluation depended upon a few assumptions. These were:

- The IAEA (International Atomic Energy Agency) Site Evaluation for Nuclear Installations (IAEA Safety Standards Series, No. NS-R-S) would serve as a framework for determining the screening criteria used in Phase I.
- Detailed bathymetry was not readily available and some general assumptions on lake depth were made. Based upon a review of existing information it is assumed that the

[1] Acton, D.F., G.A. Padbury & C.T. Stushnoff. 1998. The Ecoregions of Saskatchewan. Saskatchewan Environment and Resource Management and Canadian Plains Research Centre. Regina.
[2] Fung, Ka-Iu (editor). 1999. Atlas of Saskatchewan. University of Saskatchewan. Saskatoon.

deeper portion of Lake Diefenbaker is toward the east and near the Gardiner Dam. Lac La Loche, if similar to nearby lakes (e.g., Peter Pond Lake), is a large, but relatively shallow lake.

- SaskPower will commission detailed, site-specific studies (e.g., Geotechnical, environmental, socio-economic, etc.) prior to finalizing the power plant location.

3.2. DEFINITION OF LAKE DIEFENBAKER REGION

The Lake Diefenbaker region within the agricultural landscape of southern Saskatchewan differs markedly from the forested environment of the Lac La Loche region. For the purposes of this study, regional boundaries were arbitrarily chosen to include the lakes, and are illustrated on Figure 1.

Lake Diefenbaker is a reservoir that was created by the construction of the Gardiner Dam on the South Saskatchewan River. This dam controls water flow on the South Saskatchewan River and is owned and operated by the Saskatchewan Watershed Authority. Another, smaller dam controls water flow through an interbasin transfer to the Qu'Appelle River system to the south. The large reservoir provides water for hydroelectric power generation, irrigation, and recreation. The reservoir is also important to downstream users such as the City of Saskatoon, which obtains their water supply from this lake. There are also three provincial parks, several regional parks, and cottage subdivisions along the shore or in close proximity to the lakeshore.

The lake straddles two ecoregions. The Moist Mixed Grassland ecoregion is located on the eastern edge of the study area and includes both arms of the reservoir. The remainder of the lake to the west lies in the Mixed Grassland ecoregion.

Moist Mixed Grassland[3]

This ecoregion marks the northern extension of open grassland in the province, and is closely correlated with semi-arid moisture conditions and dark brown soils. Most landscapes are comprised of glacial till, and have short, steep slopes and numerous undrained depressions or sloughs, although several large, level glacial lake plains also occur. Native vegetation is confined largely to non-arable pasturelands, where speargrasses and wheatgrasses, along with deciduous shrubs such as snowberry, rose, chokecherry, and wolf willow are among the more common species.

Small aspen groves are typically found around sloughs and are a characteristic feature of the landscape, particularly as compared to the drier Mixed Grassland ecoregion, which is largely treeless. The prairie potholes or sloughs, although less common than in the Aspen Parkland, provide a valuable habitat for waterfowl. Mule deer and white-tailed deer are conspicuous wildlife species. Other notable species include coyote, red fox, badger, Richardson's ground squirrel and jackrabbit.

The western meadowlark, eastern kingbird, yellow-headed blackbird, piping plover, sharp-tailed grouse and Franklin's gull are typical birds. Agriculture is by far the dominant land use, with cereals being the main crop. Feed grains, forage crops and oilseeds are also grown, but to a lesser extent than in the Aspen Parkland.

Mixed Grassland

This ecoregion represents the driest area of the province as evidenced by the absence of native trees and scarcity of wetlands and permanent water bodies. Its diverse landscapes

[3] The ecoregion descriptions for both the Lake Diefenbaker and Lac La Loche regions were obtained from the Saskatchewan Conservation Data Centre website (www.sk.biodiversity.ca)

include level, glacial lake plains; dune-covered, sandhill areas; the hilly, pothole country along the Missouri Coteau; and the rolling expanses of native grassland and intermittent "badlands" near the United States border. The native grasslands are characterized mainly by wheatgrasses and speargrasses and, to a lesser extent, by blue grama grass which gains prominence on extremely droughty soils or under high grazing pressure. Shrub communities composed of snowberry and wolf willow are found in areas of favourable soil moisture.

Aspen, which is characteristic in and around moist depressions in the Moist Mixed Grassland ecoregion, is generally absent here except in valley bottoms and sandhill areas. About half of the area is cultivated, with the remainder used for extensive grazing of livestock on native or introduced grasses. Cereals are the main crop on cultivated land, although feed grains, forages and oilseeds are also grown.

Pronghorn antelope, white-tailed and mule deer, coyote, jack rabbit, Richardson's ground squirrel, horned lizard, prairie rattlesnake and western painted turtle are typical of the region. The only Canadian population of black-tailed prairie dog is found here. Characteristic birds include ferruginous hawk, long-billed curlew, yellow-breasted chat, chestnut-collared longspur, burrowing owl and sage grouse.

Both ecoregions have little natural areas remaining due to the long history of agricultural use. The Matador Grasslands, located near the western end of Lake Diefenbaker, is an important natural area that has received provincial protection.

3.3. DEFINITION OF LAC LA LOCHE REGION

Lac La Loche is located within the Mid Boreal Upland ecoregion of the Boreal Plain Ecozone.

Mid Boreal Upland

This ecoregion includes the area in central and western Saskatchewan immediately south of the Shield, as well as several prominent upland areas known locally as the Thickwood, Pasquia and Porcupine Hills. Typically, the upland areas are characterized by an ascending sequence of steeply sloping, eroded escarpments, hilly glacial till plains and level plateau-like tops. The intervening areas are comparatively level, with large, sparsely treed peatlands being common.

Most of the ecoregion is characterized by loamy, gray soils, although near the Shield the soils are sandy and often poorly drained. The forests grow taller here than on the Shield and account for the bulk of the province's merchantable timber. Aspen occurs throughout the ecoregion and is dominant on the south-facing slopes of the major uplands. Where moisture conditions are favourable, white spruce is often mixed with aspen. Jack pine, in addition to its usual dominance in sandy areas, is found mixed with black spruce on the plateau-like tops of the uplands. Black spruce and tamarack dominate the low-lying peatland areas.

Wildlife populations are high and diverse with moose, woodland caribou, mule deer, white-tailed deer, elk, black bear, timber wolf and beaver being the most prominent. White-throated sparrow, American redstart, ovenbird, hermit thrush and bufflehead are typical birds. Fish populations include northern pike, walleye, whitefish, some perch and scattered populations of lake trout.

La Loche lies within the Garson Lake Plain of this ecoregion, which is a relatively level plain draining toward Peter Pond Lake. A mosaic of peatlands and intermittent upland areas characterizes the low-lying, rolling landscape. The peatlands are relatively shallow and often densely treed with black spruce and tamarack being dominant.

The Clearwater River Provincial Wilderness Park is located within the ecoregion and protects a portion of the Clearwater River valley.

3.4. REGIONAL COMPARISON

3.4.1. Evaluation Topics

The Phase I evaluation examined the two study regions using a variety of screening criteria that were based upon a review of the IAEA (International Atomic Energy Agency) Site Evaluation for Nuclear Installations (IAEA Safety Standards Series, No. NS-R-S), information, identified in the SaskPower Terms of Reference, and our study team's experience with nuclear facilities in Ontario. The Phase I evaluation topics or screening criteria are identified and briefly discussed in Table 3-1.

Table 3-1. Phase I Evaluation Topics

Evaluation Topic	Discussion
Ecological Character	Characteristics of the natural environment that may be affected by potential radiological impacts in operational states and accident conditions should be investigated. They should also be observed and monitored through the lifetime of the installation.
Earthquakes and surface faulting	Earthquakes and surface faulting events are potential hazards that could disrupt the operation of the proposed facility and must be considered.
Surficial geology	Surficial geology will influence site stability, site drainage, and the related issues of site flooding, slumping, etc.
Climate and Meteorological Events (Refer to Table 3.2)	Climate and meteorological conditions are important to consider, particularly extreme events such as tornadoes, fog, blowing snow, thunderstorms, etc. Extreme weather conditions have the potential to affect plant operations. Poor weather conditions may also affect traffic to and from the site.
Population	Population density near the power plant is important, particularly in the event of a severe accident. The general principle is to site the facility in a sparsely populated area that is far from large population centres. Some international guidelines suggest that no other land uses occur within 1 km of the plant site. A protective zone that extends perhaps 5 km also surrounds the plant site, and within this zone are land use restrictions. An emergency planning zone extends for up to 20 km from the plant site. Detailed rescue plans would be made available for this zone. For Phase I, a 5 km planning buffer around the villages, towns, and resort villages near the lakes was used. Additionally, rural municipal population densities were mapped. Some communities have no buffer. These are old communities whose populations are no longer identified individually, but are incorporated within the local rural municipality.

Evaluation Topic	Discussion
Proximity to Lake and deep water	The power generation process will require water, which also requires cooling. Depending upon the process, the cooling may be done by using cooling towers, or by cycling the water back into the lake. Each method has its own set of environmental issues. Cooling towers, for example, could deplete the lake of water, as well as produce excessive ice fog during winter months, which could then produce safety hazards on nearby transportation routes. Recycling water back into the lake has the potential to alter the aquatic habitat and water temperature distributions within the lake.
Transportation	Transportation is required to move extremely heavy materials (e.g., boilers, construction materials, etc.) to the site. Also, waste materials (spent fuel) will need to be transported off-site once operation begins. Individual loads coming and going may exceed 80 tonnes and a high quality transportation infrastructure is required. Also, nearby highways may be prone to icing and fogging from cooling towers.
Land Use Issues	Relationships with other land uses must be considered in siting the power plant.
Regional Amenities	Nuclear power plant operators will be highly trained, have high wages, and likely will expect high quality regional amenities.

Climate and meteorological events are considered important location criteria. Table 3-2 provides a comparison of these characteristics for the two regions.

Table 3-2. Climate and Meteorological Information

Criteria	Lake Diefenbaker Area	La Loche Area
Climate region	Subhumid continental to the east and Steppe or semiarid to the west	Subarctic
General Climate characteristics	The subhumid continental climate has a mean annual daily temperature of 2.4 °C, a mean July temperature of 18.4 °C, and a mean January temperature of –16.7 °C. Mean annual precipitation is approximately 380 mm, with 240 mm of rainfall occurring from May to September. Summers are short and warm, with a frost-free period of 110 days. The semiarid climate characteristic of the more western portion of the region has a mean annual temperature of 4.0 °C, a mean July temperature of 18.9 °C, and a mean January temperature of –12.6 °C. Mean annul precipitation is approximately 350 mm, with 219 mm of rainfall from May to September. Summers are short and warm, with a frost-free period of 112 days.	Mean annual daily temperature is 0.3°C. Mean July temperatures are 16.3 °C and mean January temperature is –18.9 °C. Mean annual precipitation is 450 mm, with 290 mm of rainfall occurring from May to September. Summers are short and cool with a frost-free period of 91 days.
Permafrost	None	Lies within the sporadic, discontinuous zone

Criteria	Lake Diefenbaker Area		La Loche Area	
Snowfall (cm/yr)	80-100		120-140	
Winds (average speed (kph) and prevailing direction)	Dec-Feb	14-20, W	Dec-Feb	10-12, NW
	Mar-May	16-20, S	Mar-May	12-14, ESE
	Jun-Aug	14-18, W & NW	Jun-Aug	10-12, W
	Sep-Nov	16-18, NW	Sep-Nov	12-14, NW
Weather Hazards (mean annual # of days)	Fog	25-30	Fog	20-25
	Blowing snow	20-30	Blowing snow	10
	Freezing rain	6-10	Freezing rain	6-8
	Thunderstorms	20-25	Thunderstorms	15-20
	Hail	2-3	Hail	2-3
	Tornadoes	1-3	Tornadoes	0-1

3.4.2. The Lake Diefenbaker Region

Table 3-3 provides a discussion of the Lake Diefenbaker Region using the topics identified above.

Table 3-3. Lake Diefenbaker Region – A General Evaluation

Evaluation Topic	Lake Diefenbaker Region
Ecological Character	The region lies within a highly modified agricultural landscape. However, there remain several areas having significant ecological qualities. Some of these locations include the sandhills of Douglas Provincial Park, and the protected grasslands near Matador.
Earthquakes and Surface Faulting	Lake Diefenbaker lies within the Phanerozoic Basin and the underlying bedrock is the Bearpaw formation from the Upper Cretaceous. With the exception of a small "Southern Saskatchewan Source Zone", which is located along the Saskatchewan/Montana/North Dakota border, Saskatchewan lies in the lowest earthquake risk category, where seismic ground acceleration, if any, should be less than 4 percent of gravity (i.e., Zone 0) (Fung et al 1999). The Southern Saskatchewan Source Zone is located more than 200 km southeast of Lake Diefenbaker and falls within Zone 1, where seismic ground acceleration should be less than 8 percent of gravity.
Surficial Geology	Lake Diefenbaker is surrounded by a glaciolacustrine plain, hummocky moraine, and flat to undulating ground moraine. The river valley varies from relatively gentle slopes (eastern side) to steep, unstable slopes (e.g., toward the western end). The uplands beyond the valley are often relatively flat, stable, not subject to flooding or reservoir level fluctuations, and may provide good opportunities for site development. The more western portion of Lake Diefenbaker has steep, unstable slopes that may prevent building development in close proximity to the lake. A Reservoir Development Area has been placed along the shoreline and building development is restricted within this variable width zone. In some areas the zone extends for several kilometers.

Evaluation Topic	Lake Diefenbaker Region
Climate and Meteorological Events	Refer to Table 3-2, which provides a climate summary. Global climate change may become an issue in the future. For example, Lake Diefenbaker depends upon spring runoff from the mountains. Should that decrease in the future, the lake may have difficulty reaching full supply level.
Population	The Lake Diefenbaker area has many communities with small populations. Rural municipal population densities are low (often only 1 person per 0.3 km) and no major urban centres are nearby.
Proximity to Lake and deep water	The east end of Lake Diefenbaker is relatively deep and near the Gardiner Dam and Coteau Creek Hydroelectric Station, depths are near 58 m at Full Supply Level (FSL). Close proximity to the reservoir is possible in some locations, although the shoreline, particularly to the west, can be steep and unstable. A Reservoir Development Area of variable width is in place around the lake and does have some restrictions on building development. The lake is a multipurpose reservoir used for hydroelectric power generation, four major irrigation projects, and provides domestic water for approximately 40% of Saskatchewan (includes water drawn from the South Saskatchewan River downstream of the reservoir). The Saskatchewan Watershed Authority owns and operates the South Saskatchewan River Project and is directly responsible for its operation and maintenance. Flow in the river downstream of the dam is not allowed to drop below 42.5 m3/s. The lake's operating range from lowest flow to FSL is 11 m. Detailed studies would be required to determine if a nuclear facility could operate within the constraints of the South Saskatchewan River Project.
Transportation	Lake Diefenbaker has several highways in the vicinity, although only Highways 4, 42 and 19 come near or to the lake.
Land Use Issues	Lake Diefenbaker is surrounded by agricultural lands (crops, grazing) and has numerous recreation sites (provincial parks, regional parks, cottage subdivisions) along its shore. Lake Diefenbaker has land use restrictions within the "Reservoir Development Area", a variable width zone that borders much of the shoreline. Some portions of the shoreline are steep, unstable, and subject to slumping. This is particularly noticeable along the western end of the lake. The RDA poses some constraint to development in these areas. The agricultural land use will likely have no influence on the potential plant development and operation. The recreational areas, however, may be a potential constraint as these locations have campsites and the locations could be difficult to evacuate should that be required during an emergency event.
Regional Amenities	The Lake Diefenbaker area is within a reasonable driving distance of the cities of Saskatoon, Regina, Moose Jaw, and Swift Current. Saskatoon and Regina, in particular, provide a full range of goods and services and have populations greater than 200,000.

3.4.3. The Lac La Loche Region

Table 3-4 provides a discussion of the Lac La Loche region using the topics identified in Section 3.2.1.

Table 3-4. Lac La Loche Region – A General Evaluation

Evaluation Topic	Lac La Loche
Ecological Character	Lac La Loche lies within the boreal forest of Saskatchewan and is located south of the Canadian Shield. Peatlands, and a mosaic of black spruce, jackpine, and aspen characterize the low-lying area. The Clearwater River Provincial Wilderness Park, located to the north of Lac La Loche, protects some of the scenic, unique ecological character of the region.
Earthquakes and surface faulting	La Loche lies within the Phanerozoic Basin and the underlying bedrock is the Mannville Formation of the Lower Cretaceous. With the exception of a small "Southern Saskatchewan Source Zone", which is located along the Saskatchewan/Montana/North Dakota border, Saskatchewan lies in the lowest earthquake risk category, where seismic ground acceleration, if any, should be less than 4 percent of gravity (Fung et al 1999).
Surficial geology	Ground and hummocky moraine and a glaciofluvial terrace surround Lac La Loche. The topographic relief is low and muskegs are common. Local flooding may be a potential development concern at some locations.
Climate and Meteorological Events	Refer to Table 3-2, which provides a climate summary.
Population	The La Loche area has an extremely low population density, with most people living within the community of La Loche.
Proximity to Lake and deep water	Little information is available on the Lac La Loche bathymetry. It is known that nearby Peter Pond Lake has very shallow areas and we assume Lac La Loche may also have large, shallow zones. There are also muskeg areas in the vicinity of the lake and there may be some flooding potential at certain locations. There is a potential that Lac La Loche may not be of appropriate depth for site development, although the lake does have more than adequate surface area should cooling towers be used.
Transportation	La Loche has one highway (#155). This highway has been used to access the Cluff Lake uranium mine, but may require upgrading should a nuclear facility be constructed.
Land Use Issues	An Indian Reserve, the community of La Loche, and a portion of the Clearwater River Wilderness Park border Lac La Loche. The lake is surrounded by forest and muskeg and land use is primarily associated with recreational use (canoe trips, fishing) and traditional use (e.g., trapping, fishing, and hunting). Lac La Loche provides an important recreational connection to the Clearwater River via the historic Methye Portage. There may be some aesthetic incompatibility with the presence of a nuclear facility within visual proximity to the historic canoe route.
Regional Amenities	La Loche is very isolated and accessible by one northern highway. Services are limited or non-existent and the nearest city is several hours drive to the south.

3.5. HIGHLY DESIRABLE AND REJECTION CRITERIA

Based upon the evaluation topics presented in Section 3.4 several criteria were identified that were used to identify potential candidate sites, or exclude (reject) locations within each study region. These were:

- Population densities. Candidate sites were located as far from regional population centres as possible. This was based upon a planning or exclusion zone of 5 km placed around villages, towns, and resort villages (Figure 11).

- Recreation sites. A 5km exclusion zone was placed around provincial and regional parks. Proximity to recreation sites is considered a rejection criterion.

- Proximity to deep water and/or large surface area. Both lakes have enough surface area according to calculations made by AECL. Proximity to deep water is considered a positive criterion.

- Avoidance of unstable slopes. Flat topography (e.g., lacustrine plains, level or gently undulating ground moraine) is considered a favourable criterion. Proximity to unstable slopes is considered a rejection criterion.

- Proximity to lakes. All locations are in relatively close proximity to the lakes. The actual distance from the lake will likely be affected by a range of factors including cost and the requirement to pipe water to and from the lake during operations. We assume that the plant will likely be within 500 to 1000m of the lake.

- Transportation. As there are few major highways in proximity to the lakes, the Phase I evaluation does not consider transportation in any detail. Proximity to transportation routes is addressed in more detail in the Phase II discussion. However, proximity to major transportation routes is considered a favourable criterion.

- Existing transmission facilities. Proximity to existing transmission lines is considered a favourable criterion.

3.5.1. Identification of Candidate Areas

Based upon our review of the two regions and the consideration of the evaluation criteria described in Sections 3.4 and 3.5, we identified three candidate areas for the Lake Diefenbaker region and two candidate areas for the Lac La Loche region. The locations are presented in Figures 11 and 12 and are discussed further in Sections 3.6 and 3.7. These are not absolute locations, but represent general areas having potential suitability.

3.6. RESULTS FOR THE LAKE DIEFENBAKER REGION

The three candidate sites in the Lake Diefenbaker region are located within the eastern half of the lake (Figure 11). The sites were chosen primarily because they displayed several desirable attributes, including:

- Located on relatively level plains
- Proximity to the deeper portion of the lake
- Relatively low population densities in the local rural municipalities
- Minimal conflict with other land uses, including parks, cottage subdivisions, protected areas, and the Reservoir Development Area boundaries

- Avoids the more rugged and potentially unstable valley slopes more characteristic of the western portion of the lake
- Relatively close proximity to existing highways

Generally, at this regional evaluation level, there is little difference between the three sites in the Lake Diefenbaker Region.. However, Site 1 does have some additional attributes worth noting. Site 1 is located on the eastern shore of the lake approximately midway between the Gardiner Dam and the Town of Elbow. Compared to Sites 2 and 3, this site is in closer proximity to existing high voltage transmission lines, Highway 11, and the Coteau Creek Hydroelectric Generating Station. Site 1 is also more accessible from Saskatoon and Regina, as well as the larger regional communities such as Elbow and Outlook. This accessibility may prove beneficial during both the construction and operation phases and may be considered a positive attribute by potential employees.

3.7. RESULTS FOR THE LAC LA LOCHE REGION

Only two candidate sites were selected for the Lac La Loche region because of the smaller size of the region and the potential land use constraints associated with the lake. The two sites (Figure 12) have some similarities. These include being located on relatively flat moraine, near the lake, within a forested environment, and not within Indian Reserve lands. Both sites are also located to be as far as possible from Methye Portage and the Clearwater River Provincial Wilderness Park.

There are potentially significant site differences. Site 1 is located near Highway 155, while Site 2 is located on the other side of the lake and currently has no access. Site 1 is, therefore, also more accessible to the community of La Loche and the existing transmission line. Site 1, however, may be more subject to local flooding as the lands in this area have more muskeg, compared to the more upland environment of Site 2. Detailed ecological and geotechnical investigations would be required to confirm this possibility. Both sites are also very likely within traditionally used lands of the local First Nation and there may be significant constraints imposed by this fact. Detailed public consultation would be required for both sites to confirm their suitability.

4. PHASE 2 – SCREENING CRITERIA AND DATA COLLECTION

4.1. METHODOLOGY AND ASSUMPTIONS

4.1.1. Methodology

In order to properly evaluate alternatives using a Goals Achievement Matrix, both a scoring and a weighting system was developed. Scoring is a method of ranking an alternative's fit against the evaluative criteria. To do this a scale was created that clearly defines how an alternative can be scored against the evaluative criteria.

Criteria with quantitative indicators can be scored relatively easily. Alternatives are scored for each criteria, using the scale, with alternatives scoring higher superior for that criteria.

Qualitative criteria cannot be as easily quantified and in turn scored. In order to alleviate this problem, alternatives have been scored based on available data plus team experience and expertise for each qualitative criteria.

Weighting needs to be done for all evaluative criteria, to assign a relative level of importance. For example, a criterion that is very important would have a weighting of say 5, whereas a criteria that is half as important would have a weighting of 3. By its very nature, weighting is subjective. Having all four members of the project team participate and reach consensus on weighting limits the impact of any individual biases.

Table 4-1.Criteria Weighting

Weight	Definitions
5	Highest Importance
4	High Importance
3	Average Importance
2	Low Importance
1	Lowest Importance

For certain critical criteria, not achieving a minimum benchmark value would eliminate that alternative as a viable option, no matter the weighting assigned. These are called "Knock-Out Criteria". If and where applicable, this scenario would be shown by coloring the cells red in the definitions and evaluative matrix.

In this analysis, there are two knock out criteria:

1) Cooling Water Temperature achieving a temperature of 25.5 degrees or greater
2) Significant or serious land use constraints that cannot be easily accommodated

Fortunately, neither of these knock-out criteria came into effect at this stage of evaluation, i.e. no alternatives were eliminated from evaluating these two knock-out criteria.

The methodology we have adopted is based on a very rigorous, comparative approach using matrix tables. Therefore, throughout the next sections, the reader will be presented with data, exactly as presented in the evaluative matrix.

4.2. ASSUMPTIONS

4.2.1. Technology Assumptions

Table 4-2. Technology Criteria and Assumptions

	Criteria	Assumption
16.1	Cooling Water: Proximity to lake	Ability to cool the plant efficiently is assumed to increase the closer it is to a lake. This criteria was scored based on proximity of site to a lake.
16.2	Cooling Water: Temperature	Lower water temperature is assumed to cool the plant efficiently. This criteria was scored based on a minimum lake temperature of 25.5°C or lower.

4.2.2. Cost Assumptions

Cost of transmission lines is directly related to the length of the additional required transmission lines.

Table 4-3. Cost Criteria and Assumptions

	Criteria	Assumption
17.1	Transmission Systems: Distance related Power Losses	Power losses over transmission lines are assumed to be directly correlated with the length of transmission line. A shorter transmission line experiences less power loss. This criteria was scored based on distance of required transmission lines.
17.2	Transmission Systems: Capital Cost	Transmission system capital costs are assumed to be directly correlated with the length of transmission line. Capital costs increase as the length of the line increases. This criteria was scored based on distance of required transmission lines.
18	Cost of Transportation Construction and Operations	Cost of construction and operations of transportation infrastructure are assumed to be directly correlated with the length of new transportation infrastructure. These costs increase as the length increases. This criteria was scored based on distance of required transportation infrastructure.
19	Site Development: Ease of Land Acquisition	Land acquisition is assumed to be easier to acquire if the land is relatively low cost.

4.2.3. Environmental Assumptions

Table 4-4. Technology Criteria and Assumptions

	Criteria	Assumption
1	Population in Exclusion Zone (Existing and future plans)	Plant operations are assumed to have negative impact on the surrounding population. The Exclusion Zone needs to take into account both the current and future population in the area. This criteria was scored based on current population and growth projections in the exclusion zone.[4]
2	Meteorological Conditions	Moderate and consistent temperatures and, will lower wind speeds, will lower the impact on the plant.
3.1	Geotechnical	Locating the plant in an area with highly stable soil conditions is ideal.
3.2	Seismology	The less seismic activity the better based on ground acceleration data.
4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	The amount of transmission lines is assumed to impact the area's terrestrial ecology. This criteria was scored on the length of required transmission lines.
4.2	Terrestrial Ecological Impact: Plant location	It was assumed that plant locations should avoid any unique and protected ecological areas, including habitat for rare and endangered species.
5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	Negative ecological impact is assumed to be directly correlated with the length of transmission lines.
5.2	Aquatic Ecological Impact: Plant location	Water intake and outlet structure locations can negatively affect important aquatic habitats.
5.3	Aquatic Ecological Impact: Plant Operation	Negative Impact on the aquatic ecology can be minimized if the lake is deep and contains a large volume of water.
6	Sensitivity to flooding	Sensitivity to flooding is minimized by significant elevation above the closest water body
7	Transportation Construction and operations	The environmental impact of construction and operation of transportation infrastructure is assumed to be directly correlated with the length of new transportation infrastructure.

[4] The Exclusion Zone is the area surrounding the plant where no population should reside after the plant is operational.

4.2.4. Social Assumptions

Table 4-5. Social Criteria and Assumptions

	Criteria	Assumption
8	Land Use Constraints	The fewer land use constraints on a site the better. e.g. Zoning and Rights of Way
9	Accommodations for Employees	Better locations will have more, larger and closer local communities.
10	Regional Amenities for Employees	Better locations will have more, and a wider range of amenities. e.g. Recreation facilities, Health Care Facilities, etc.
11	Aboriginal Interests	Plant locations should have minimal impact on Aboriginal land entitlements and traditional use areas.
12	Archaeology and Heritage	The plant should not be located on or near archaeological and heritage sites
13	Radioactivity	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.
14	Public Health	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.
15	Transportation Construction and operations	New transportation infrastructure developed and operated for the plant will have a positive impact on the adjacent communities.

4.3. EVALUATION CRITERIA AND DEFINITIONS

4.3.1. Environmental Criteria

Table 4-6. Environmental Criteria and Definitions

Number	Criteria	Definition
1	Population in Exclusion Zone (Existing and future plans)	Is their minimal current and planned future population within the exclusion zone?
2	Meteorological Conditions	Will the meteorological conditions have minimal impact on the plant operation?
3.1	Geotechnical	Is the location geotechnically able to support the power plant at this site?
3.2	Seismology	Is there minimal risk of seismic activity?
4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	Will the location of the transmission lines have minimal terrestrial impact?
4.2	Terrestrial Ecological Impact: Plant location	Is the plant to be designed and constructed in such a way that it has minimal terrestrial impact?
5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	Will the location of the transmission lines have minimal aquatic Impact?
5.2	Aquatic Ecological Impact: Plant Operation	Will the plant operation at this location have minimal aquatic impact?
6	Sensitivity to flooding	Is there minimal risk of flooding?
7	Transportation Construction and operations	Will the construction and operation of new transportation infrastructure to serve the plant have minimal environmental impact?

4.3.2. Social Criteria

Table 4-7. Social Criteria and Definitions

Number	Criteria	Definition
8	Land Use Constraints	Can the legal land use constraints be easily accommodated? (Zoning and land use)
9	Accommodations for Employees	Is there sufficient housing available for employees within 50 km of the plant site?
10	Regional Amenities for Employees	Are there sufficient amenities available for employees in the local region? (within 150 K)
11	Aboriginal Interests	Will the plant location have minimal impact on Aboriginal land entitlements and traditional use areas?
12	Archaeology and Heritage	Will the plant have minimal impact on archeological and heritage sites?
13	Radioactivity	Is the public's risk of radioactivity exposure minimized?
14	Public Health	Is the negative risk to public health minimized?
15	Transportation Construction and operations	Will the new transportation infrastructure developed and operated for the plant have a positive impact on the adjacent communities?

4.2.3 Technical Criteria

Table 4-8.Technical Criteria and Definitions

Number	Criteria	Definition
16.1	Cooling Water: Proximity to lake	Is the plant close enough to the lake to cool efficiently?
16.2	Cooling Water: Temperature	Is the water temperature cooler than 25.5 C?

4.2.4 Cost Criteria

Table 4-9. Cost Criteria and Definitions

Number	Criteria	Definition
17.1	Transmission Systems: Distance related Power Losses	Total percentage losses due to the transmission lines
17.2	Transmission Systems: Capital Cost	Cost to build required transmission lines
18	Cost of Transportation Construction and Operations	Cost to design and construct additional required transportation infrastructure
19	Site Development: Ease of Land Acquisition	Relative cost of the land acquisition, based on property tax assessment

4.4. SCORING AND WEIGHTING SYSTEM FOR CRITERIA

4.4.1. Weighting

Table 4-10. Criteria Weighting

Criteria Category	Criteria	Assigned Weighting	Weight Description
1	Population in Exclusion Zone (Existing and future plans)	5	Highest Importance
2	Meteorological Conditions	4	High Importance
3.1	Geotechnical	2	Low Importance
3.2	Seismology	5	Highest Importance
4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	4	High Importance
4.2	Terrestrial Ecological Impact: Plant location	4	High Importance
5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	4	High Importance
5.2	Aquatic Ecological Impact: Plant Operation	4	High Importance
6	Sensitivity to flooding	4	High Importance
7	Transportation Construction and operations	2	Low Importance
8	Land Use Constraints	4	High Importance
9	Accommodations for Employees	2	Low Importance
10	Regional Amenities for Employees	1	Lowest Importance
11	Aboriginal Interests	5	Highest Importance
12	Archaeology and Heritage	3	Average Importance
13	Radioactivity	5	Highest Importance
14	Public Health	5	Highest Importance
15	Transportation Construction and operations	2	Low Importance
16.1	Cooling Water: Proximity to lake	3	Average Importance
16.2	Cooling Water: Temperature	5	Highest Importance
17.1	Transmission Systems: Distance related Power Losses	3	Average Importance
17.2	Transmission Systems: Capital Cost	3	Average Importance
18	Cost of Transportation Construction and Operations	3	Average Importance
19	Site Development: Ease of Land Acquisition	2	Low Importance

4.4.2. Environmental Criteria

Table 4-11. Environmental Criteria Scoring

			Score				
No.	**Criteria**	**Definition**	**5**	**4**	**3**	**2**	**1**
1	Population in Exclusion Zone (Existing and future plans)	Is their minimal current and planned future population within the exclusion zone?	<1 Person/ Square KM	>=1 and <5 People/ Square KM	>=5 and<10 People/ Square KM	>=10 and <25 People/ Square KM	>=25 People/ Square KM
2	Meteorological Conditions	Will the meteorological conditions have minimal impact on the plant operation?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
3.1	Geotechnical	Is the location geotechnically able to support the power plant at this site?	Most Favorable	Highly Favorable	Average Favorable	Not Favorable	Least Favorable
3.2	Seismology	Is there minimal risk of seismic activity?	Lowest Ground Acceleration	Low ground Acceleration	Average ground Acceleration	High ground Acceleration	Highest ground Acceleration
4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	Will the location of the transmission lines have minimal terrestrial impact?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
4.2	Terrestrial Ecological Impact: Plant location	Is the plant to be designed and constructed in such a way that it has minimal terrestrial impact? I.e.. Not in unique or protected ecological area.	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	Will the location of the transmission lines have minimal aquatic Impact?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
5.2	Aquatic Ecological Impact: Plant Operation	Will the plant operation at this location have minimal aquatic impact?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
6	Sensitivity to flooding	Is there minimal risk of flooding?	Lowest Risk	Low Risk	Average Risk	High Risk	Highest Risk
7	Transportation Construction and operations	Will the construction and operation of new transportation infrastructure to serve the plant have minimal environmental impact?	<1 km of new transportation infrastructure	>=1 and <10 km of new transportation infrastructure	>=10 and<25 km of new transportation infrastructure	>=25 and <50 km of new transportation infrastructure	>=50 km of new transportation infrastructure

4.4.3. Social Criteria

Table 4-12. Social Criteria Scoring

			Score				
No.	**Criteria**	**Definition**	**5**	**4**	**3**	**2**	**1**
8	Land Use Constraints	Is the plant site free from land use constraints	No land use constraints	Land use constraints that can be easily accommodated	Land use Constraints that can be accommodated	Significant land use constraints that cannot be easily accommodated	Serious land use constraints that cannot be easily accommodated
9	Accommodations for Employees	Is there sufficient housing available for employees in the within 50 km of the plant site?	Housing 100% available	Significant Housing Available	Moderate Housing Available	Insignificant Housing Available	Housing not available
10	Regional Amenities for Employees	Are there sufficient amenities available for employees in the local region? (within 150 K)	Complete amenities availability	Significant Amenities Availability	Average Availability of Amenities	Few Amenities	Very Few Amenities
11	Aboriginal Interests	Will the plant location have minimal impact on Aboriginal land entitlements and traditional use areas?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
12	Archaeology and Heritage	Will the plant have minimal impact on archeological and heritage sites?	Lowest Impact	Low Impact	Average Impact	High Impact	Highest Impact
13	Radioactivity	Is the public's risk of radioactivity exposure minimized?	Lowest Risk	Low Risk	Average Risk	High Risk	Highest Risk
14	Public Health	Is the negative risk to public health minimized?	Lowest Risk	Low Risk	Average Risk	High Risk	Highest Risk
15	Transportation Construction and operations	Will the new transportation infrastructure developed and operated for the plant have a positive impact on the adjacent communities?	>=50 km of new transportation infrastructure	>=25 and <50 km of new transportation infrastructure	>=10 and<25 km of new transportation infrastructure	>=1 and <10 km of new transportation infrastructure	<1 km of new transportation infrastructure

4.4.4 Technical Criteria

Table 4-13.Technical Criteria Scoring

			Score				
No.	**Criteria**	**Definition**	**5**	**4**	**3**	**2**	**1**
16.1	Cooling Water: Proximity to Lake	Is the plant close enough to the lake to cool efficiently?	0-1 km. From lake	1-2 km. From lake	2-5 km. from lake	5-10 km. from lake	>10 km. from lake
16.2	Cooling Water: Temperature	Is the water temperature cooler than 25.5 C?	Below 25.5	NA	NA	NA	Above 25.5

4.4.5 Cost Criteria

Table 4-14.Cost Criteria Scoring

			Score				
No.	**Criteria**	**Definition**	**5**	**4**	**3**	**2**	**1**
17.1	Transmission Systems: Distance Related Power Losses	Total percentage losses due to the transmission lines	Zone 0 , <4%	Zone 1, 4-8%	Zone 3	Zone 4	Zone 5
17.2	Transmission Systems: Capital Cost	Cost to build required transmission lines	0-20 KM of new Construction	20-40 KM of new Construction	40-60 KM of new Construction	60-80 KM of new Construction	>80 KM of new Construction
18	Cost of Transportation Construction and Operations	Cost to design and construct additional required transportation infrastructure	<1 km of new transportation infrastructure	>=1 and <10 km of new transportation infrastructure	>=10 and<25 km of new transportation infrastructure	>=25 and <50 km of new transportation infrastructure	>=50 km of new transportation infrastructure
19	Site Development: Ease of Land Acquisition	Relative cost of land acquisition, based on property tax assessment	Land should be easily acquired	Land should be relatively easily acquired	Land should be acquired with an average level of ease	Land acquisition should be relatively Difficult	Land acquisition should be Difficult

4.5. DATA GATHERING CHALLENGES AND ANOMALIES

4.5.1. General Site Data Challenges

The intent of this early stage siting evaluation was to identify the general location of nuclear power plant and to compare on a relative basis the quality of multiple locations. It is too early in the life cycle of this potential project to identify an exact location for the plant. All alternatives investigated were therefore general areas within a region.

In many cases it was difficult to gather data for an alternative because the exact site was not yet identified due to the fact that the report was evaluating general areas. For example when evaluating geotechnical issues of a potential plant location there are usually significantly different geotechnical conditions within the general area. One specific site within the larger general area could be geotechnically excellent for plant siting while another specific site in the same general area may not be suitable at all for a nuclear plant.

It is therefore important for the reader to note that all data was gathered for the purpose of general siting and that significant additional information will need to be both gathered and evaluated for locating the plant at a specific site.

4.5.2. Lac La Loche Data Challenges

Due to the remote location of the Lac La Loche region there is considerably less information available about the region than the more southerly and more populated Lake Diefenbaker region. Very little information was found about the lake itself. For this reason and because primary research was not part of the scope of this study, evaluative information was estimated in a few cases. Evaluations were based on such factors as local similar information and experience.

It is important to note that because this study was evaluating different alternatives on a relative basis, evaluations can still be valid without specific data as long as all assumptions are clearly stated and applied to all alternatives equally.

For example, without gathering exact data it is clear to see that Lac La Loche has a smaller surface area for evaporative cooling than Lake Diefenbaker does. This allows the two alternatives to be scored on a relative basis. Lac La Loche sites would score lower than Lake Diefenbaker because it has a lower total surface area.

4.6. INFORMATION SOURCES FOR CRITERIA

All information utilized for this study was secondary data. Primary data was not gathered.

Maps were the single largest source of Information source utilized in this analysis. Maps provided information on criteria such as:

- Geotechnical
- Transmission Systems
- Transportation construction and operations

Examples of the types of maps utilized are:

- Switching Maps
- Surficial Geology Maps
- Road Maps
- Land Use Maps

Other sources of information include:

- Land assessment
- Local Community information sites
- Atomic Energy of Canada Limited
- Sask Power

A listing of sources utilized is included in section 3.1

5. PHASE 3 – EVALUATION OF SITES

5.1. RESULTS FOR LAKE DIEFENBAKER REGION

All three sites in the Lake Diefenbaker region scored substantially higher than the sites at Lac La Loche

5.1.1. Evaluation Matrix

Table 5-1. Evaluation of Lake Diefenbaker Sites

				Lake Diefenbaker 1			Lake Diefenbaker 2			Lake Diefenbaker 3		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Environmental	1	Population in Exclusion Zone (Existing and future plans)	**5**	>=1 and <5 People/ Square KM	4	20	>=1 and <5 People/ Square KM	4	20	>=1 and <5 People/ Square KM	4	20
	2	Meteorological Conditions	**4**	Climate and Meteorological Summary	3	12	Climate and Meteorological Summary	3	12	Climate and Meteorological Summary	3	12
	3.1	Geotechnical	**2**	glaciolacustrine plain, hummocky moraine, and flat to undulating ground moraine	3	6	glaciolacustrine plain, hummocky moraine, and flat to undulating ground moraine	3	6	glaciolacustrine plain, hummocky moraine, and flat to undulating ground moraine	3	6
	3.2	Seismology	**5**	Zone 0 SGA<4%	5	25	Zone 0 SGA<4%	5	25	Zone 0 SGA<4%	5	25
	4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	**4**	Moist Mixed Grassland & Mixed Grassland	5	20	Moist Mixed Grassland & Mixed Grassland	4	16	Moist Mixed Grassland & Mixed Grassland	4	16
	4.2	Terrestrial Ecological Impact: Plant location	**4**	Plant location in general avoids known unique and protected ecological areas, including habitat for rare and endangered species	2	8	Plant location in general avoids known unique and protected ecological areas, including habitat for rare and endangered species	2	8	Plant location in general avoids known unique and protected ecological areas, including habitat for rare and endangered species	2	8
	5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	**4**	Approximately 10Km of New Transmission Lines	5	20	Approximately 30km of New Transmission Lines	4	16	Approximately 30km of New Transmission Lines	4	16
	5.2	Aquatic Ecological Impact: Plant Operation	**4**	Water Depth up to 50M significantly sized body of water with constant water flow	4	16	Significantly sized body of water with constant water flow	3	12	Significantly sized body of water with constant water flow	3	12
	6	Sensitivity to flooding	**4**	Significant Topographic Relief	4	16	Significant Topographic Relief	4	16	Significant Topographic Relief	4	16
	7	Transportation Construction and operations	**2**	>=1 and <10 km of new transportation infrastructure	4	8	>=10 and<25 km of new transportation infrastructure	3	6	>=1 and <10 km of new transportation infrastructure	4	8
Environmental Subtotal			**38**			**151**			**137**			**139**

				Lake Diefenbaker 1			Lake Diefenbaker 2			Lake Diefenbaker 3		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Social	8	Land Use Constraints	4	Significant number of land constraints in the form of established zoning and rights of way	3	12	Significant number of land constraints in the form of established zoning and rights of way	3	12	Significant number of land constraints in the form of established zoning and rights of way	3	12
	9	Accommodations for Employees	2	Several local communities with the ability to provide accommodation for employees	4	8	Some local communities with the ability to provide accommodation for employees	3	6	Some local communities with the ability to provide accommodation for employees	3	6
	10	Regional Amenities for Employees	1	Significant Availability of Amenities	4	4	Significant Availability of Amenities	3	3	Significant Availability of Amenities	3	3
	11	Aboriginal Interests	5	Unlikely Impact on Aboriginal land entitlements and traditional use areas?	4	20	Unlikely Impact on Aboriginal land entitlements and traditional use areas?	4	20	Unlikely Impact on Aboriginal land entitlements and traditional use areas?	4	20
	12	Archaeology and Heritage	3	Unlikely to disturb known and/or previously undiscovered heritage resources be affected?	4	12	Unlikely to disturb known and/or previously undiscovered heritage resources be affected?	4	12	Unlikely to disturb known and/or previously undiscovered heritage resources be affected?	4	12
	13	Radioactivity	5	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.	3	15
	14	Public Health	5	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.	3	15
	15	Transportation Construction and operations	2	Approximately 9 Km of new transportation infrastructure	2	4	Approximately 20 Km of new transportation infrastructure	3	6	Approximately 9 Km of new transportation infrastructure	2	4
Social Subtotal			**27**			**90**			**89**			**87**

				Lake Diefenbaker 1			Lake Diefenbaker 2			Lake Diefenbaker 3		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Technical	16.1	Cooling Water: Proximity to lake	3	1 km - 2 km from the lake	4	12	1 km - 2 km from the lake	4	12	1 km - 2 km from the lake	4	12
	16.2	Cooling Water: Temperature	5	Below 25.5 C	5	25	Below 25.5 C	5	25	Below 25.5 C	5	25
Technical Subtotal			**8**			**37**			**37**			**37**
Cost	17.1	Transmission Systems: Distance related Power Losses	3	Approximately 10Km of New Transmission Lines	5	15	Approximately 30km of New Transmission Lines	4	12	Approximately 30km of New Transmission Lines	4	12
	17.2	Transmission Systems: Capital Cost	3	Approximately 10Km of New Transmission Lines	5	15	Approximately 30km of New Transmission Lines	4	12	Approximately 30km of New Transmission Lines	4	12
	18	Cost of Transportation Construction and Operations	3	Approximately 9 Km of new transportation infrastructure	4	12	Approximately 20 Km of new transportation infrastructure	3	9	Approximately 9 Km of new transportation infrastructure	4	12
	19	Site Development: Ease of Land Acquisition	2	Average Assessment per population + $73,000	1	2	Average Assessment per population + $73,000	1	2	Average Assessment per population + $73,000	1	2
Cost Subtotal			**11**			**44**			**35**			**38**
				Lake Diefenbaker 1			**Lake Diefenbaker 2**			**Lake Diefenbaker 3**		
Total			**84**			**322**			**298**			**301**

5.1.2. Site 1 Summary

Site #1 scored the highest overall, with a cumulative score of 322.

Site #1 scored the highest of all alternatives in every category of criteria, except Technical, where the scores were the same for every alternative.

Site # 1 scored the highest of all alternatives for the following criteria:

- 4.1 Terrestrial Ecological Impact - Location of New and Future Transmission Lines
- 5.1 Aquatic Ecological Impact - Location of Additional Transmission Lines
- 5.2 Aquatic Ecological Impact - Plant Operation
- 9 Accommodations for Employees
- 10 Regional Amenities For Employees
- 17.1 Transmission Systems - Distance related Power Losses
- 17.2 Transmission Systems - Capital Cost

Site #1 scored as high as any of the other alternatives for the following criteria:

- 2 Meteorological Conditions
- 3.1 Geotechnical
- 4.2 Terrestrial Ecological Impact - Plant location
- 6 Sensitivity to flooding
- 11 Aboriginal Interests
- 12 Archaeology and Heritage
- 13 Radioactivity
- 14 Public Health
- 16.1 Cooling Water - Proximity to lake
- 16.2 Cooling Water - Temperature
- 18 Cost of Transportation Construction and Operations

5.1.3. Site 2 Summary

Site #2 scored the third overall, with a cumulative score of 298.

Site #2 did not score the highest of all alternatives in any category of criteria, except technical where all alternatives scored the same.

Site # 2 scored the highest of the Lake Diefenbaker alternatives for the social criteria of Transportation construction and operations, meaning that the adjacent communities would greatly benefit from the transportation infrastructure that would need to be added:

Site #2 scored as high as any of the other alternatives for the following criteria:

- 2 Meteorological Conditions
- 3 Geotechnical
- 4.2 Terrestrial Ecological Impact - Plant location
- 6 Sensitivity to flooding
- 11 Aboriginal Interests
- 12 Archaeology and Heritage
- 13 Radioactivity
- 14 Public Health
- 16.1 Cooling Water - Proximity to lake
- 16.2 Cooling Water - Temperature

5.1.4. Site 3 Summary

Site #3 scored second overall, with a cumulative score of 301.

Site #3 did not score the highest of all alternatives in any category of criteria, except for technical where all the alternatives scored the same.

Site #3 scored as high as any of the other alternatives for the following criteria:

2 Meteorological Conditions
3 Geotechnical
4.2 Terrestrial Ecological Impact - Plant location
6 Sensitivity to flooding
11 Aboriginal Interests
12 Archaeology and Heritage
13 Radioactivity
14 Public Health
16.1 Cooling Water - Proximity to lake
16.2 Cooling Water – Temperature
18 Cost of Transportation Construction and Operations

5.2. RESULTS FOR LA LOCHE REGION

Both sites in the Lac La Loche region scored substantially less than the sites in the Lake Diefenbaker Region.

5.2.1. Evaluation Matrix

Table 5-2. Evaluation of Lac La Loche Sites

				Lac la Loche 1			Lac la Loche 2		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Environmental	1	Population in Exclusion Zone (Existing and future plans)	5	<1 Person/ Square KM	5	25	<1 Person/ Square KM	5	25
	2	Meteorological Conditions	4	Climate and Meteorological Summary	3	12	Climate and Meteorological Summary	3	12
	3.1	Geotechnical	2	Ground and hummocky moraine and a glaciofluvial terrace	3	6	Ground and hummocky moraine and a glaciofluvial terrace	3	6
	3.2	Seismology	5	Zone 0 SGA<4%	5	25	Zone 0 SGA<4%	5	25
	4.1	Terrestrial Ecological Impact: Location of New and Future Transmission Lines	4	Mid Boreal Upland	1	4	Mid Boreal Upland	1	4
	4.2	Terrestrial Ecological Impact: Plant location	4	Plant location in general avoids known unique and protected ecological areas, including habitat for rare and endangered species	2	8	Plant location in general avoids known unique and protected ecological areas, including habitat for rare and endangered species	2	8
	5.1	Aquatic Ecological Impact: Location of Additional Transmission Lines	4	Hundreds of km of New Transmission Lines	1	4	Hundreds of km of New Transmission Lines	1	4
	5.2	Aquatic Ecological Impact: Plant Operation	4	Moderately sized body of water	2	8	Moderately sized body of water	2	8
	6	Sensitivity to flooding	4	Topographic relief is low and muskegs are common.	2	8	Topographic relief is low and muskegs are common.	2	8
	7	Transportation Construction and operations	2	>=50 km of new transportation infrastructure	1	2	>=50 km of new transportation infrastructure	1	2
Environmental Subtotal			**38**			**102**			**102**

				Lac la Loche 1			Lac la Loche 2		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Social	8	Land Use Constraints	4	Few land constraints in the form of established zoning and rights of way but	4	16	Few land constraints in the form of established zoning and rights of way but	4	16
	9	Accommodations for Employees	2	Only one small local community which has little ability to provide accommodation for a significant number of employees	1	2	Only one small local community which has little ability to provide accommodation for a significant number of employees	1	2
	10	Regional Amenities for Employees	1	Very Little Amenities	1	1	Very Little Amenities	1	1
	11	Aboriginal Interests	5	Likely Impact on Aboriginal land entitlements and traditional use areas?	2	10	Likely Impact on Aboriginal land entitlements and traditional use areas?	2	10
	12	Archaeology and Heritage	3	There is a significant risk that previously undiscovered heritage resources could be affected.	2	6	There is a significant risk that previously undiscovered heritage resources could be affected.	2	6
	13	Radioactivity	5	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Radioactivity will therefore be equally scored in the Evaluative Matrix.	3	15
	14	Public Health	5	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.	3	15	Emissions from a Nuclear Power Plant are independent of the site but depend on design and operation. Public Health will therefore be equally scored in the Evaluative Matrix.	3	15
	15	Transportation Construction and operations	2	Potentially hundreds of Km of new transportation infrastructure	5	10	Potentially hundreds of Km of new transportation infrastructure	5	10
Social Subtotal			**27**			**75**			**75**

				Lac la Loche 1			Lac la Loche 2		
Criteria Category	Criteria Number	Criteria	Criteria Weight	Data	Raw score	Weighted Score	Data	Raw score	Weighted Score
Technical	16.1	Cooling Water: Proximity to lake	3	1 km - 2 km from the lake	4	12	1 km - 2 km from the lake	4	12
	16.2	Cooling Water: Temperature	5	Below 25.5 C	5	25	Below 25.5 C	5	25
Technical Subtotal			**8**			**37**			**37**
Cost	17.1	Transmission Systems: Distance related Power Losses	3	Hundreds of km of New Transmission Lines	1	3	Hundreds of km of New Transmission Lines	1	3
	17.2	Transmission Systems: Capital Cost	3	Approximately 30km of New Transmission Lines	1	3	Approximately 30km of New Transmission Lines	1	3
	18	Cost of Transportation Construction and Operations	3	Potentially hundreds of Km of new transportation infrastructure	1	3	Potentially hundreds of Km of new transportation infrastructure	1	3
	19	Site Development: Ease of Land Acquisition	2	Average Assessment per population + $4,500	4	8	Average Assessment per population + $4,500	4	8
Cost Subtotal			**11**			**17**			**17**
				Lac la Loche 1			**Lac la Loche 2**		
Total			**84**			**231**			**231**

5.2.2. Summary

Both sites in the Lac La Loche region scored identically for all criteria, with a cumulative score of 231 each.

The Lac La Loche sites did not score higher than the Diefenbaker sites in any category of criteria, except for Technical where all the alternatives scored the same.

The Lac La Loche sites scored higher than the Diefenbaker sites on the following criteria, mostly related to its remote location:

1	Population in Exclusion Zone
3.2	Seismology
8	Land Use Constraints
15	Transportation Construction and Operations (social benefits)
19	Site Development - - Ease of Land Acquisition

Ironically, the prime disadvantages of the Lac La Loche region, compared to Lake Diefenbaker are also related to its remote location, including but not limited to:

- accommodations for employees
- regional amenities for employees
- distance related power losses from transmission systems
- additional capital costs for extending transmission systems
- additional capital and operating costs for expanding transportation infrastructure

5.2.3. Recommended Preferred Site

There is no preferred sight in the La Loche region.

5.3. RECOMMENDATIONS

5.3.1. Recommended Region

The preferred region is Lake Diefenbaker without considering end use for the plant.

5.3.2. Recommended Preferred Site

The preferred site is site #1 at Lake Diefenbaker subject to further investigation.
There is no preferred sight at Lac la Loche subject to further investigation.

5.3.3. Other Recommendations

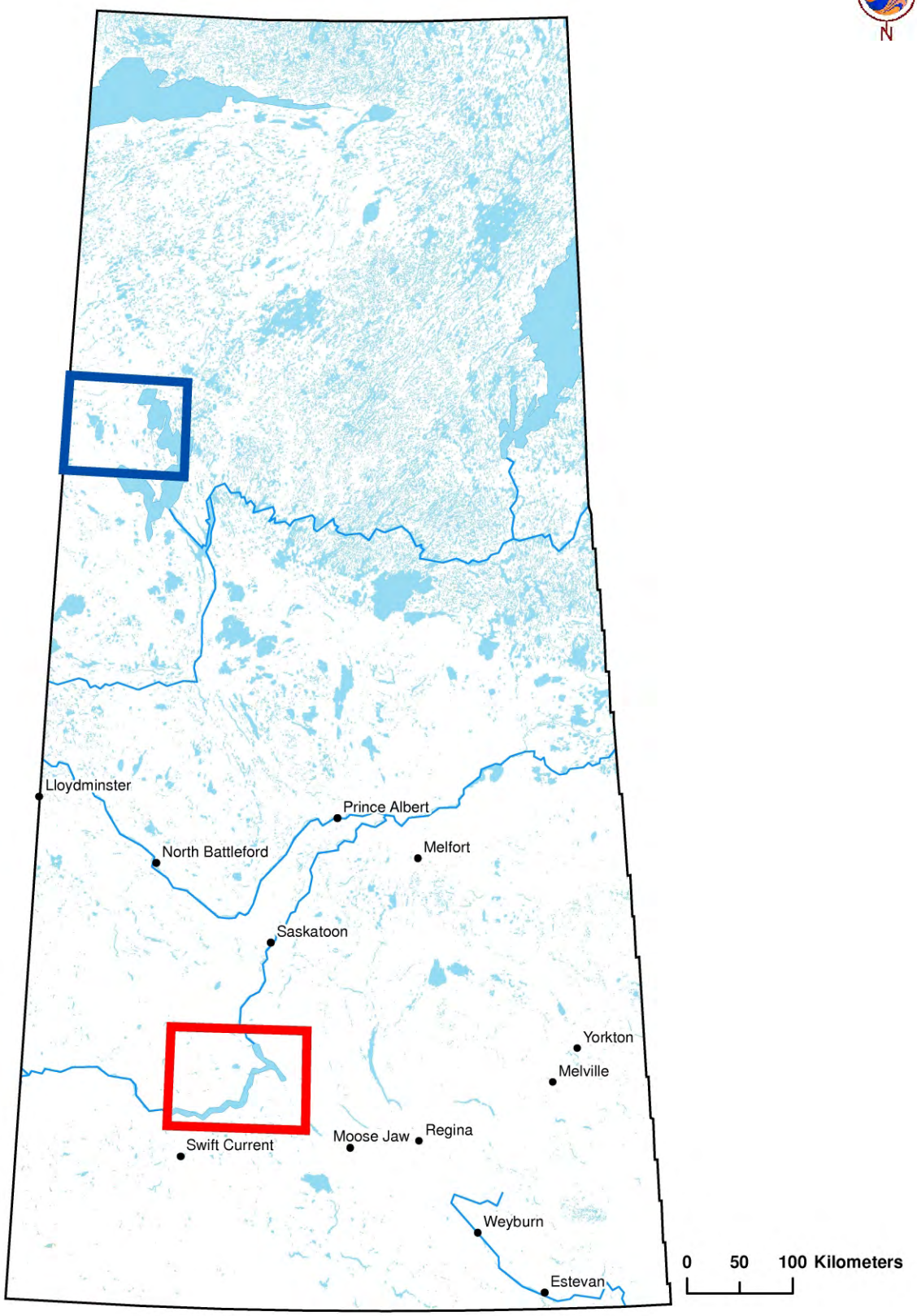
If SaskPower wishes to advance this project, future studies should be undertaken to confirm the suitability of Lake Diefenbaker and Lac la Loche for providing condenser cooling water, while still meeting other local needs and/or regulatory requirements. , The table below summarizes those specific water issues that need to be assessed **Factor for Further Data Gathering Analysis**	**Reason(s)**
Ensuring sufficient distance between cooling water discharge and water extraction for drinking purposes	Lake Diefenbaker which supplies about 40% of Saskatchewan's domestic water drawn from the South Saskatchewan River downstream
Morphometric data (mean depth) and flushing rates for both lakes	To date, only maximum depth data was available for Lake Diefenbaker
Seasonal information on the water temperature profiles for both lakes	It's unclear whether the lake thermally stratifies in summer or if temperature is uniform from top to bottom. This factor could impact the adequacy of water for cooling purposes and aquatic life

2. If the above issues are resolved to the satisfaction of all relevant authorities, then further study is required to select the specific property for siting the plant, with at least the following parameters examined at the micro scale:

- Land ownership
- Geotechnical conditions
- Lake bathymetry in the vicinity of the plant intakes and outlets
- Terrestrial ecological impact
- Aquatic ecological impact
- Aboriginal interests
- Archaeology and heritage resources

3. If not already developed, SaskPower should develop a pro-active communications strategy regarding this project, in the event that news is leaked to the media

Appendix A – Maps



UTM 13U

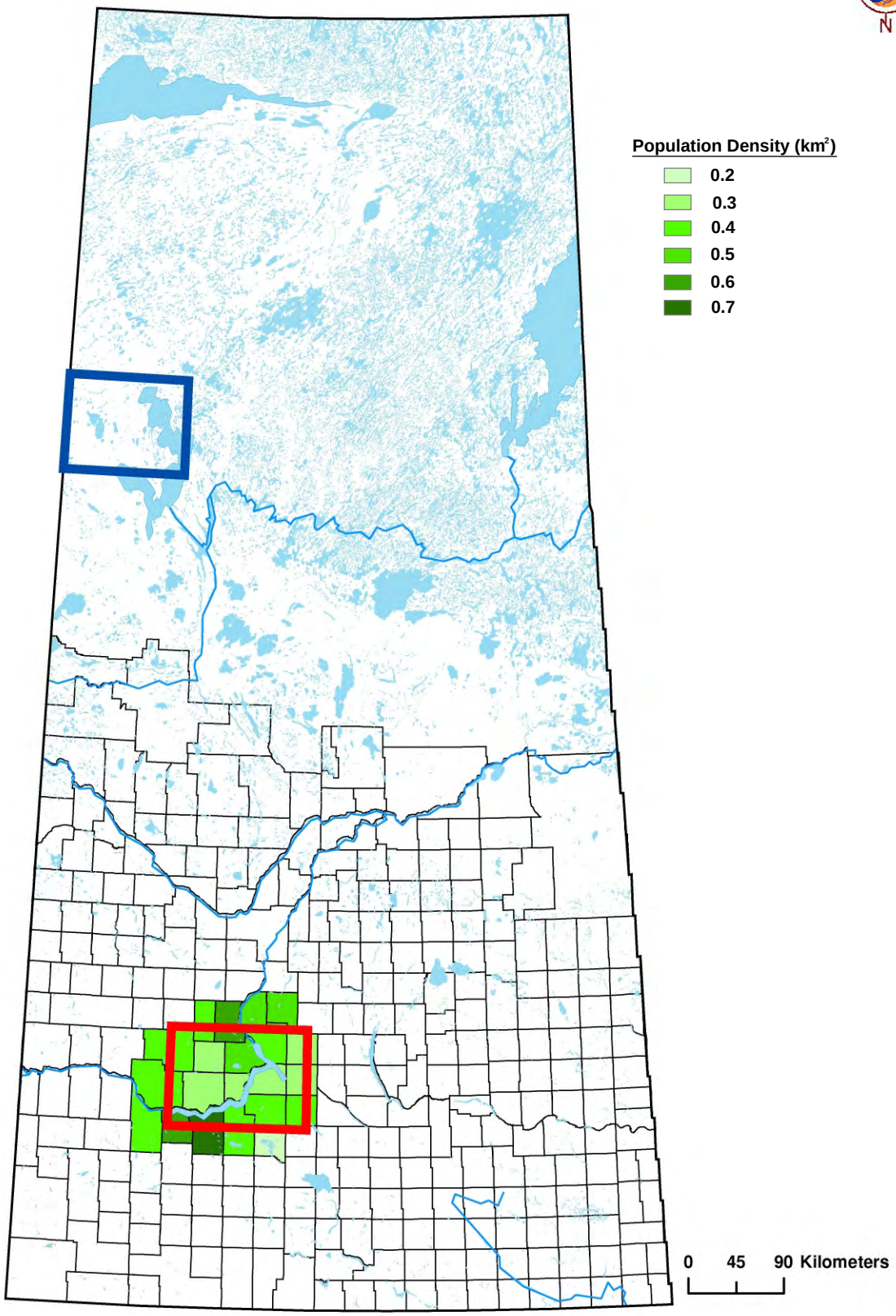
Legend:
- Lac La Loche Study Area
- Lake Diefenbaker Study Area
- Waterbody
- Watercourse

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
1

Title:
Regional Study Areas



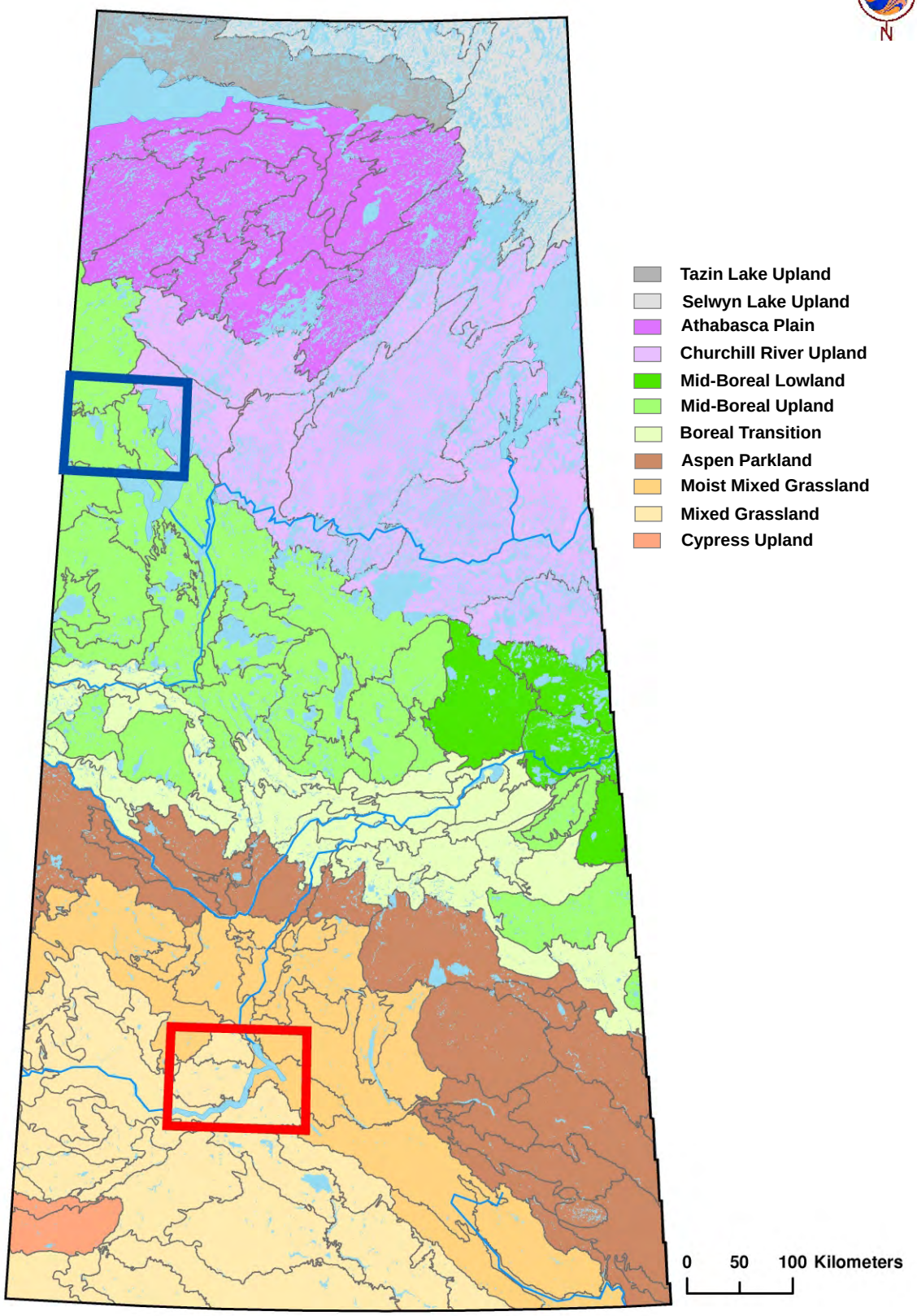
Legend:
- Lac La Loche Study Area
- Lake Diefenbaker Study Area
- RM Boundary
- Waterbody
- Watercourse

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
2

Title:
Rural Municipalities - Population Density



Source: Acton *et al*., 1998

UTM 13U

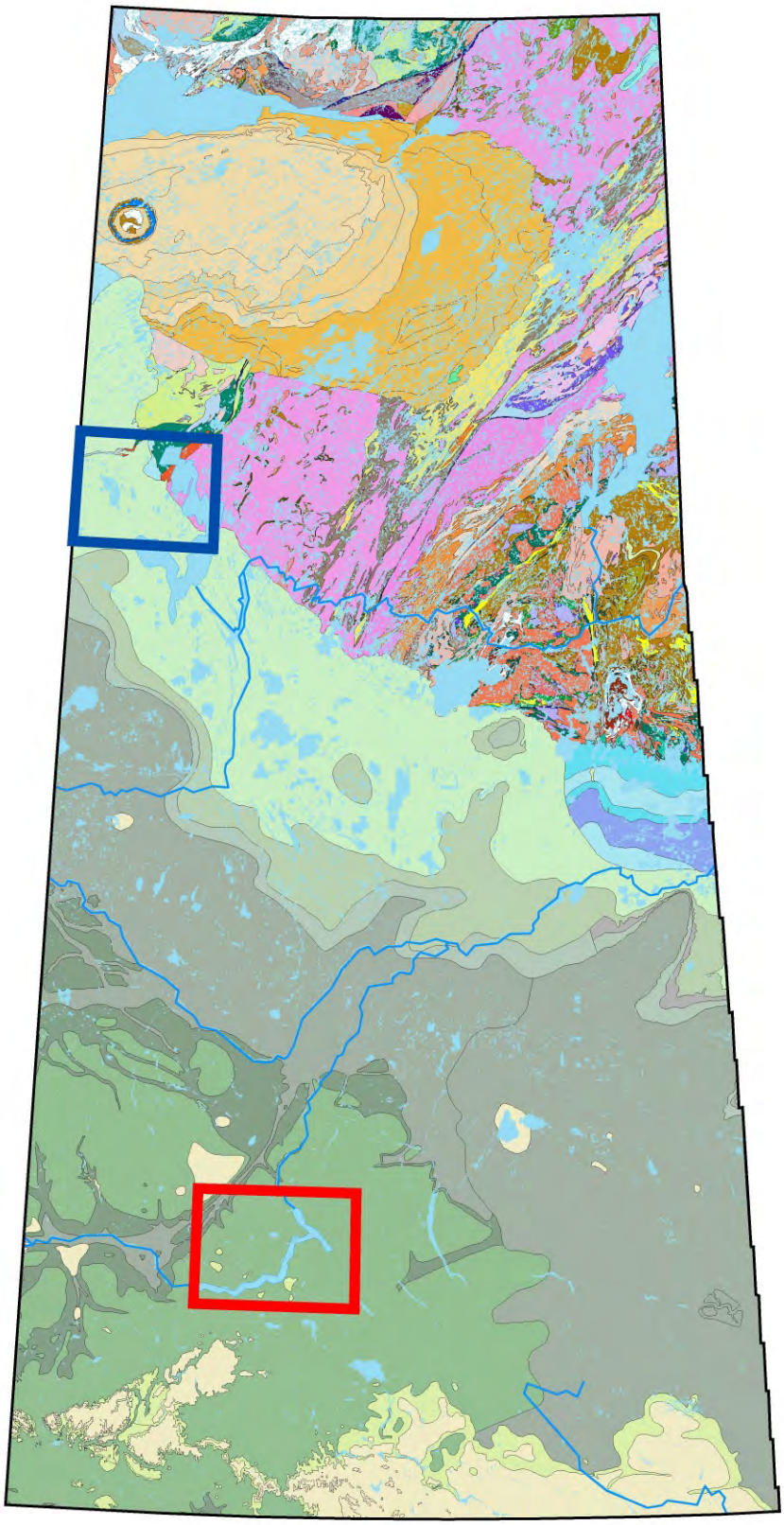
Legend:
- Lac La Loche Study Area
- Lake Diefenbaker Study Area
- Waterbody
- Watercourse

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
3

Title:
Ecoregions



Source: Geological Atlas of Saskatchewan, 2006

UTM 13U

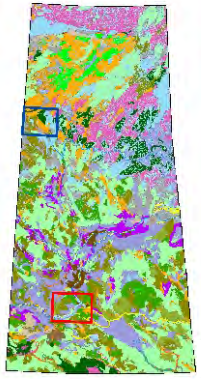
Legend:
- Lac La Loche Study Area
- Lake Diefenbaker Study Area
- Waterbody
- Watercourse

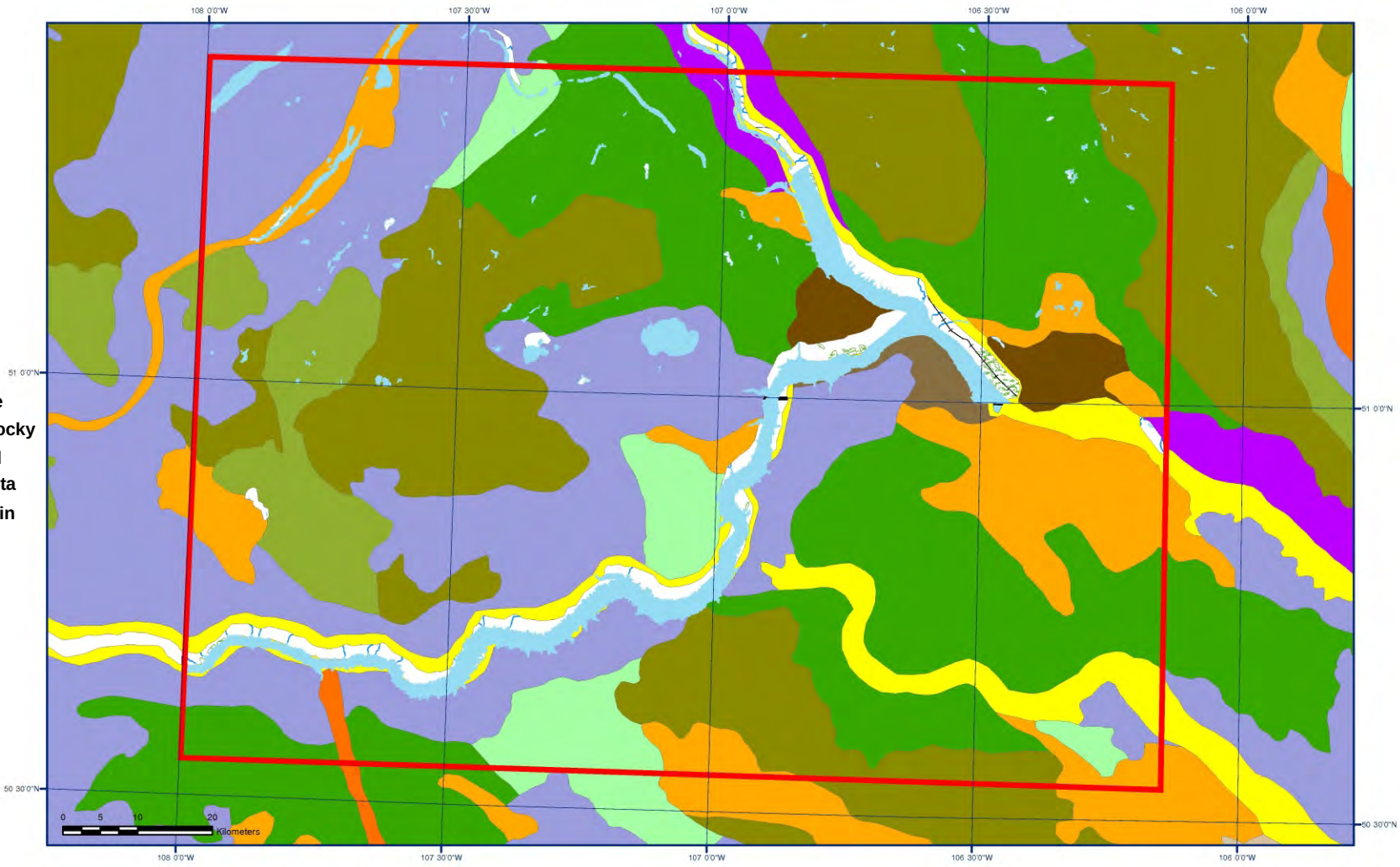
Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
4

Title:
Bedrock Geology





- Alluvial Plain
- Eolian Plain
- Eolian Ridged
- Eolian Hummocky
- Glaciofluvial Plain
- Glaciofluvial Terrace
- Glaciofluvial Hummocky
- Glaciofluvial Eroded
- Glaciolacustrine Delta
- Glaciolacustrine Plain
- Moraine Drumlinoid
- Moraine Eroded
- Moraine Hummocky
- Moraine Plain
- Moraine Ridged
- Moraine Undulating
- Moraine Veneer
- Organic Plain
- Bedrock

Source: Geological Atlas of Saskatchewan, 2006

UTM 13U

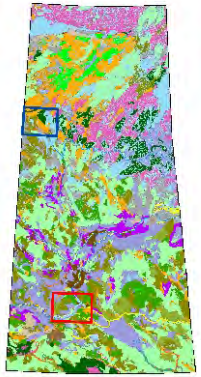
Legend:
- Lake Diefenbaker Study Area
- Waterbody
- Watercourse

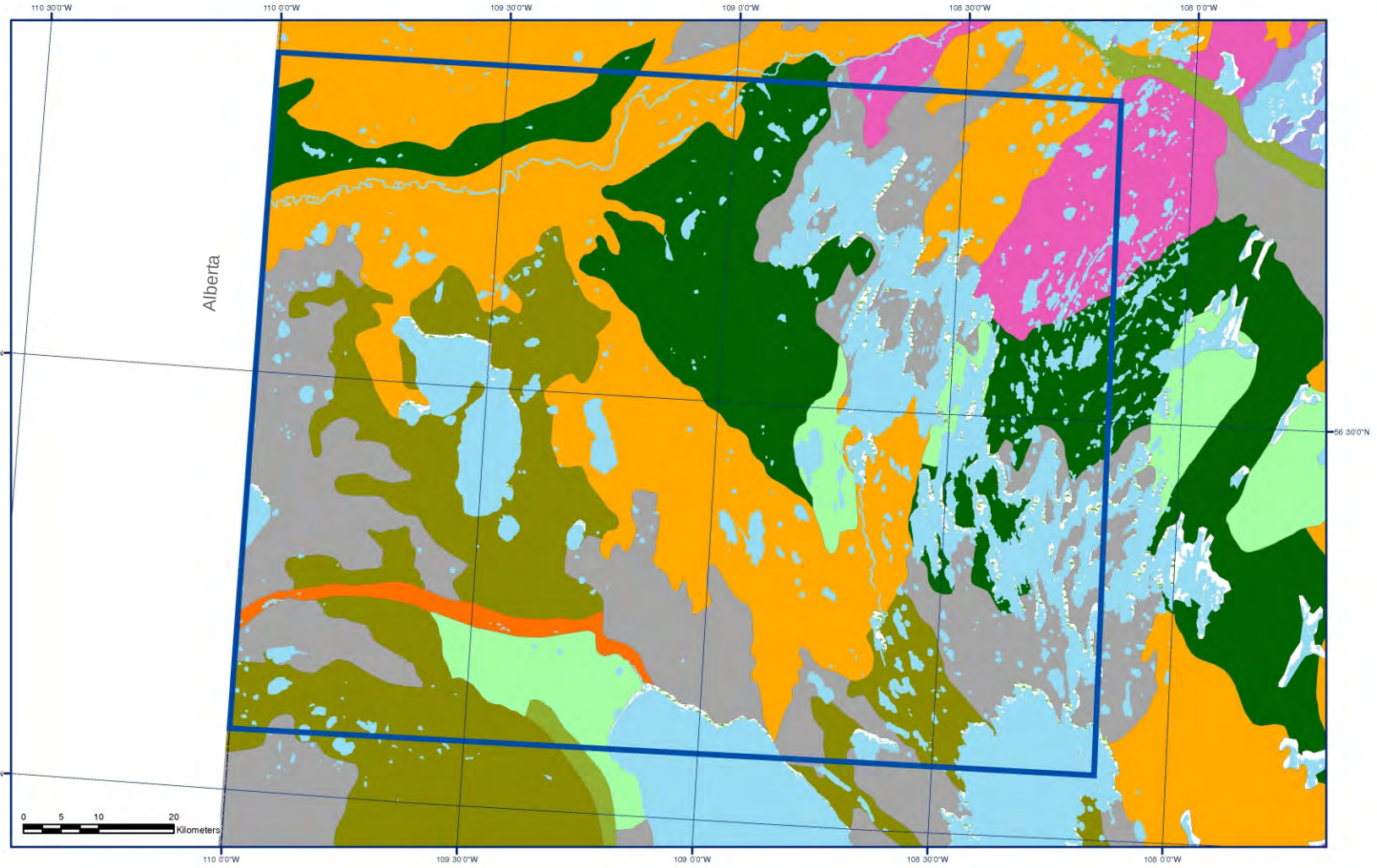
Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
5

Title:
Surficial Geology - Lake Diefenbaker Study Area





- Alluvial Plain
- Eolian Plain
- Eolian Ridged
- Eolian Hummocky
- Glaciofluvial Plain
- Glaciofluvial Terrace
- Glaciofluvial Hummocky
- Glaciofluvial Eroded
- Glaciolacustrine Delta
- Glaciolacustrine Plain
- Moraine Drumlinoid
- Moraine Eroded
- Moraine Hummocky
- Moraine Plain
- Moraine Ridged
- Moraine Undulating
- Moraine Veneer
- Organic Plain
- Bedrock

Source: Geological Atlas of Saskatchewan, 2006

UTM 13U

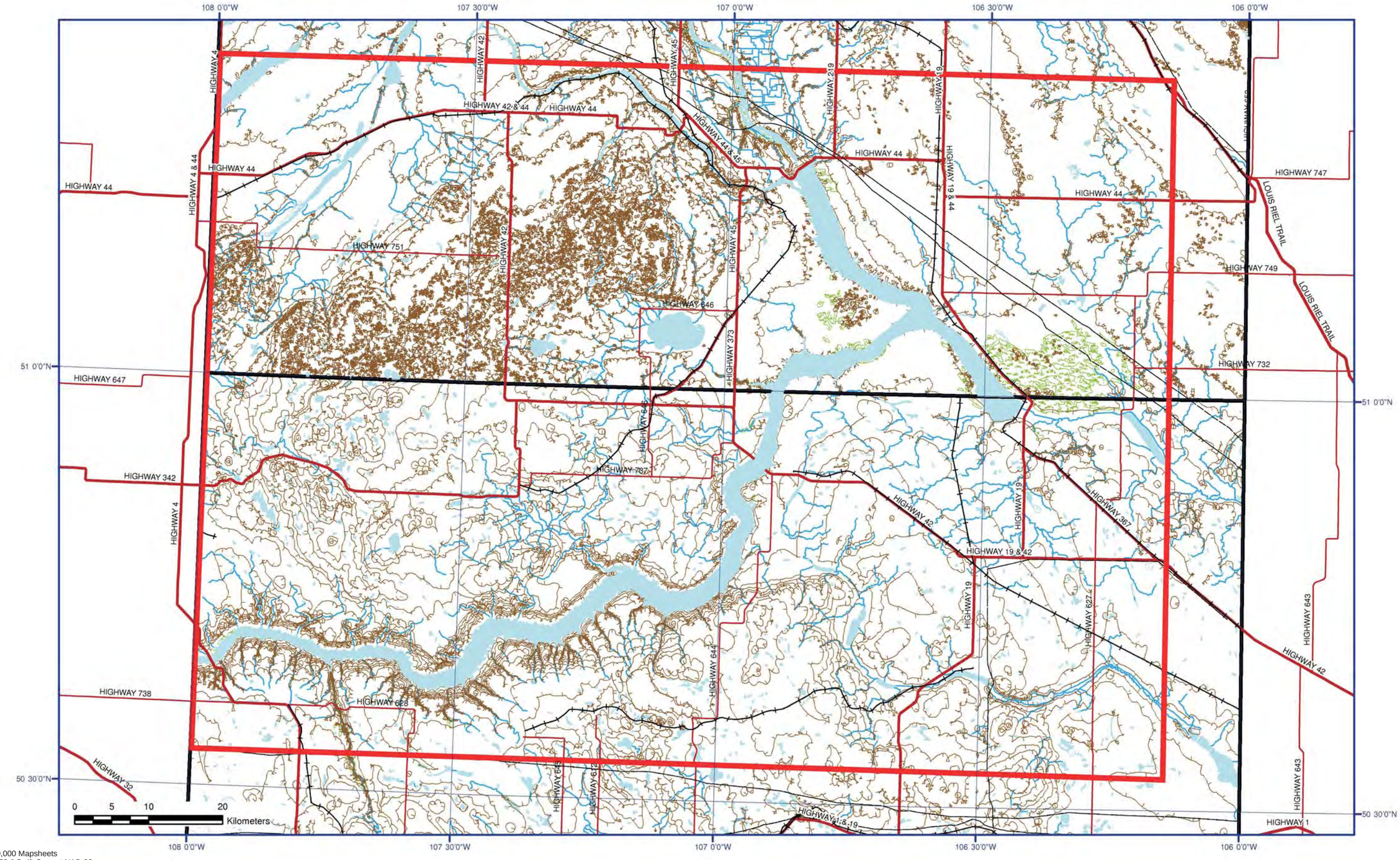
Legend:
- Lac La Loche Study Area
- Waterbody
- Watercourse

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
6

Title:
Surficial Geology - La Loche Study Area



Portion of NTS 1:250,000 Mapsheets
72 O Rosetown and 72 J Swift Current NAD 83

Legend:

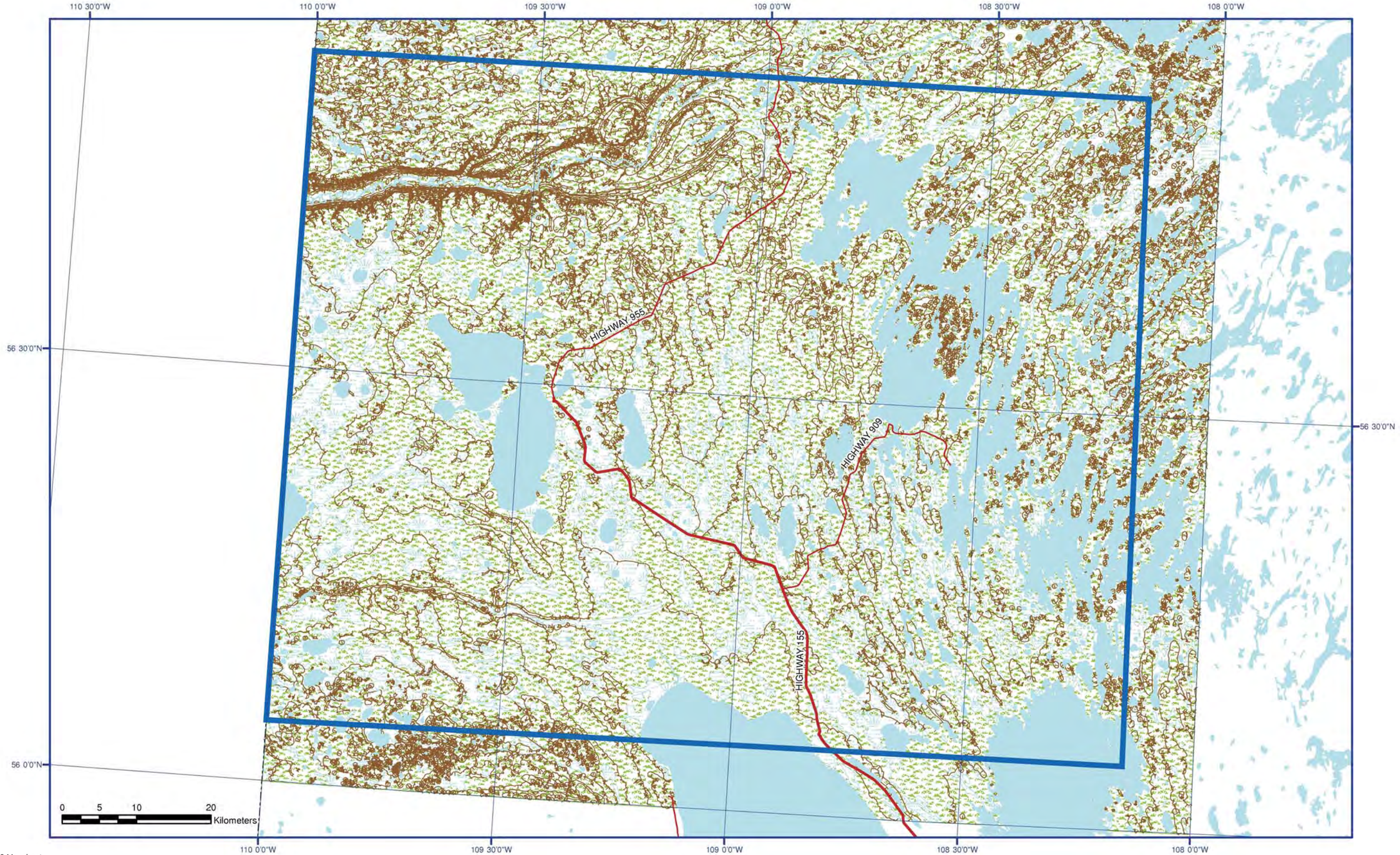
- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Primary Highway
- Secondary Highway
- Pipeline
- Waterbody
- Vegetation
- Wetland

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
7

Title:
Contour Map - Lake Diefenbaker



Portion of NTS 1:250,000 Mapsheet
74 C La Loche NAD 83

Legend:

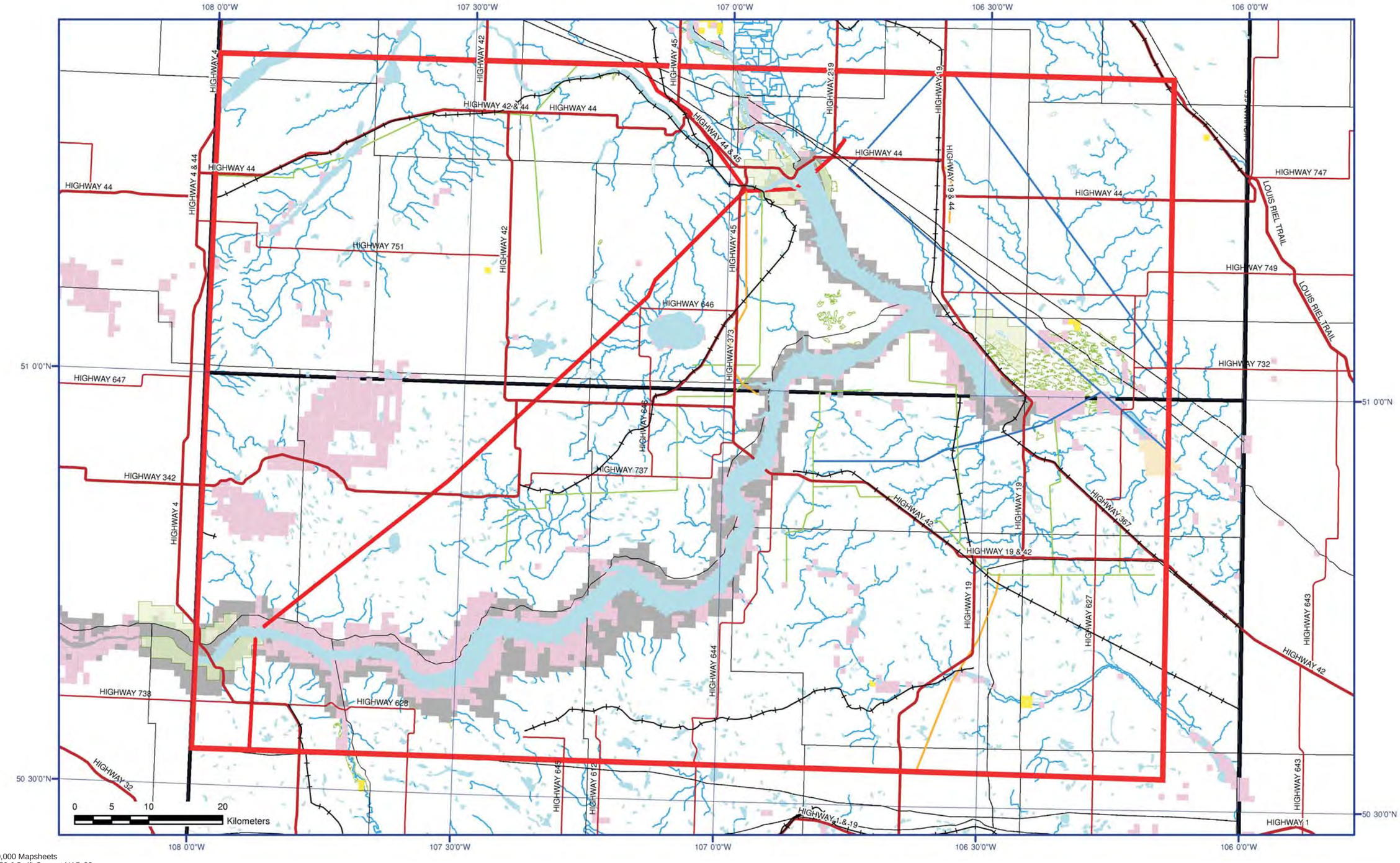
- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Primary Highway
- Secondary Highway
- Pipeline
- Waterbody
- Vegetation
- Wetland

Stantec
139000106.300

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
8

Title:
Contour Map - Lac La Loche



Portion of NTS 1:250,000 Mapsheets
72 O Rosetown and 72 J Swift Current NAD 83

Stantec
139000106.300

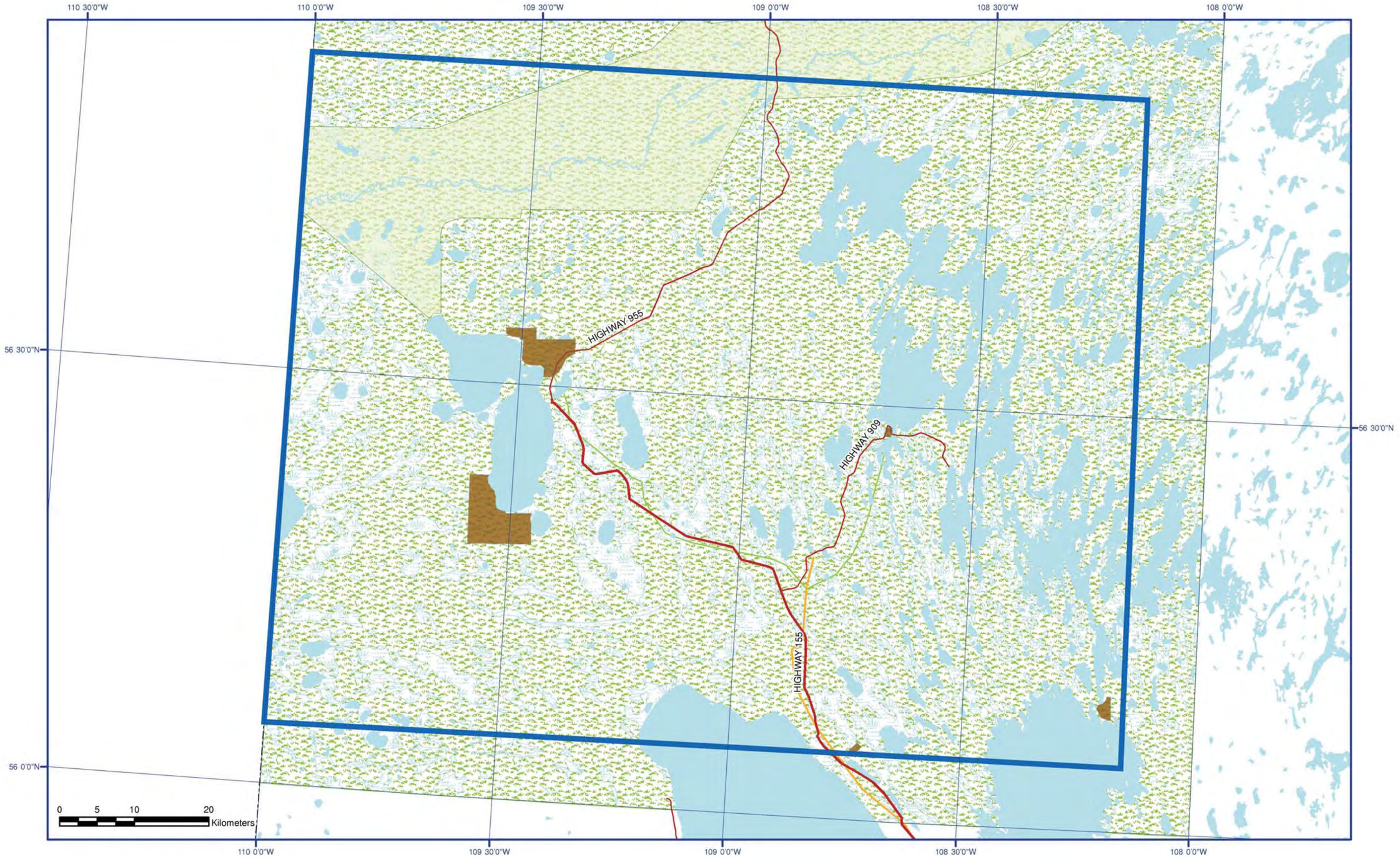
Legend:

- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Primary Highway
- Secondary Highway
- 25 kV Transmission Line
- 72 kV Transmission Line
- 138 kV Transmission Line
- 230 kV Transmission Line
- Waterbody
- Vegetation
- Wetland
- Regional Park
- Provincial Park
- National Park
- Wildlife Refuge
- Representative Areas
- Wildlife Habitat Protection
- SK Watershed Authority Land
- Special Management Area
- Reservoir Development Area
- Private Stewardship Agreement
- Game Preserve
- Fish and Wildlife Development Fund Land
- Ecological Reserve
- Indian Reserve

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
9

Title:
Land Use - Lake Diefenbaker



Portion of NTS 1:250,000 Mapsheet
74 C La Loche NAD 83

Stantec
139000106.300

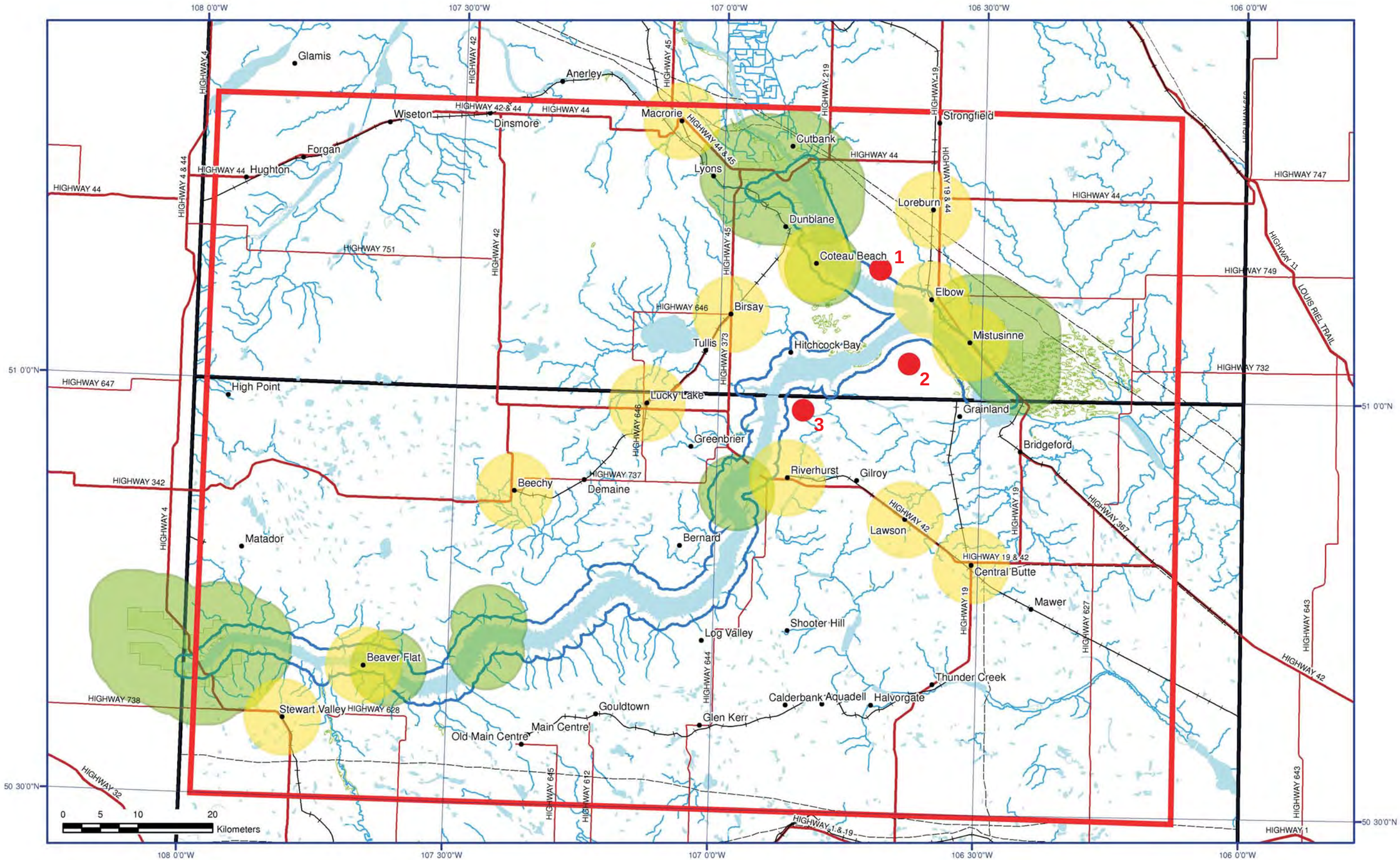
Legend:

- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Primary Highway
- Secondary Highway
- 25 kV Transmission Line
- 72 kV Transmission Line
- 138 kV Transmission Line
- 230 kV Transmission Line
- Waterbody
- Vegetation
- Wetland
- Regional Park
- Provincial Park
- National Park
- Wildlife Refuge
- Representative Areas
- Wildlife Habitat Protection
- SK Watershed Authority Land
- Special Management Area
- Reservoir Development Area
- Private Stewardship Agreement
- Game Preserve
- Fish and Wildlife Development Fund Land
- Ecological Reserve
- Indian Reserve

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
10

Title:
Land Use - Lac La Loche



Portion of NTS 1:250,000 Mapsheets
72 O Rosetown and 72 J Swift Current NAD 83

Stantec
139000106.300

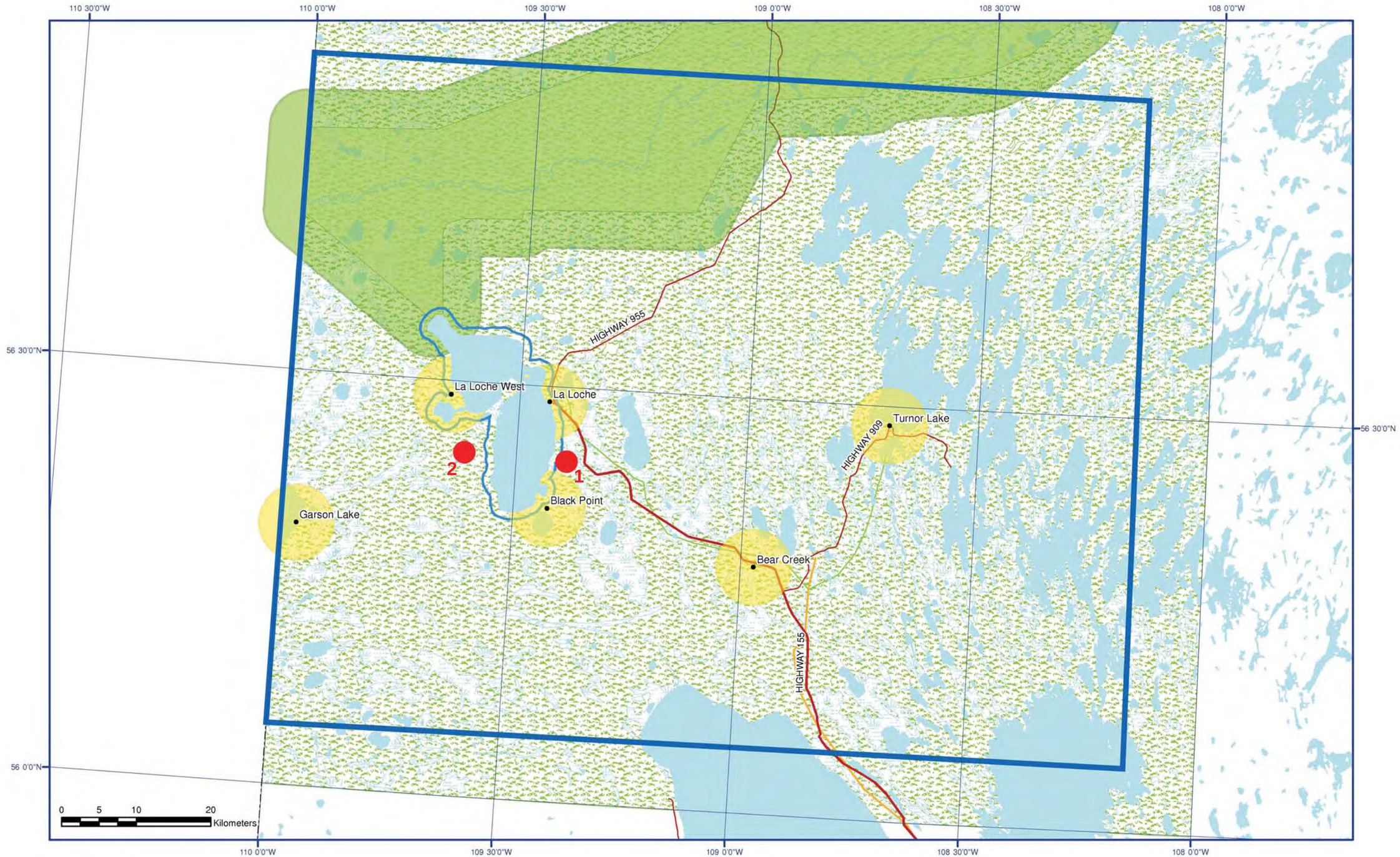
Legend:

- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Waterbody
- Vegetation
- Wetland
- Primary Highway
- Secondary Highway
- 5 km Community Buffer
- 5 km Parks Buffer
- 1 km Lake Buffer
- Tentative Site

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
11

Title:
Tentative Sites - Lake Diefenbaker



Portion of NTS 1:250,000 Mapsheet
74 C La Loche NAD 83

Stantec
139000106.300

Legend:

- Study Area
- Road
- Railroad
- 20 m Contour Interval
- Watercourse
- Waterbody
- Vegetation
- Wetland
- Primary Highway
- Secondary Highway
- 5 km Community Buffer
- 5 km Parks Buffer
- 1 km Lake Buffer
- Tentative Site

Client/Project:
SaskPower
Preliminary Siting of a Nuclear Power Plant
Lake Diefenbaker and Lac La Loche, Saskatchewan

Figure No.:
12

Title:
Tentative Sites - Lac La Loche

Appendix B – Population Data

RM	#	Population, 2001	% change, 1996-2001	Pop Density (km2)
Eyebrow	193	305	-4.1	0.4
Enfield	194	356	-14	0.4
Morse	165	522	-1.1	0.4
Excelsior	166	855	-4.1	0.7
Chaplin	164	160	-19.2	0.2
Saskatchewan Landing	167	506	-4.3	0.6
Riverside	168	495	-10.3	0.4
Lacadena	228	708	-9.9	0.4
Victory	226	474	-4	0.3
Canaan	225	191	11.7	0.3
Maple Bush	224	208	-5.9	0.3
Huron	223	249	-5.3	0.3
Willner	253	281	-11.1	0.3
Loreburn	254	384	-9	0.4
Coteau	255	458	-3.6	0.5
King George	256	244	-10	0.3
Monet	257	564	-8	0.4
Milden	286	289	-11.3	0.4
Fertile Valley	285	602	-4.1	0.6
Rudy	284	430	0.5	0.5
Rosedale	283	493	-5.2	0.5

Community	Population, 2001	% change, 1996-2001
Eyebrow	136	-22.3
Morse	248	-12.7
Chaplin	292	-7
Loreburn	143	-4.7
Coteau Beach	20	5.3
Milden	196	-5.8

Appendix C – Municipalities and Assessments

Municipalities in La Loche Region				
	RM No	Assessment	Population	Assessment/ Popl
Northern Village of La Loche	Far North	unknown	2,136	
Northern Settlement of Garson Lake	Far North	$158,130	34	$4,651
Northern Settlement of Bear Creek	Far North	$141,050	47	$3,001
Northern Hamlet of Turnor Lake	Far North	$835,100	155	$5,388
Northern Settlement of Black Point	Far North	$141,050	47	$3,001
Total, Except Village of La Loche		$1,275,330	283	$4,506

Municipalities in Lake Diefenbaker Region				
	RM No	Assessment	Population	Assessment/ Popl
Village of Tugaske	223	$961,435	116	$8,288
RM of Maple Bush No. 224	224	$27,216,735	208	$130,850
Resort Village of Mistusinne	224	$3,925,740	31	$126,637
Village of Riverhurst	224	$1,605,025	143	$11,224
Village of Lucky Lake	225	$3,381,580	354	$9,552
RM of Loreburn No. 254	254	$80,454,110	384	$209,516
Village of Strongfield	254	$310,220	42	$7,386
Village of Loreburn	254	$1,331,030	143	$9,308
Village of Elbow	254	$7,439,333	298	$24,964
Resort Village of Coteau Beach	255	$3,699,360	20	$184,968
Village of Birsay	255	$360,500	53	$6,802
Total		$130,685,068	1,792	$72,927

http://www.municipal.gov.sk.ca/div/mds/maps/index.html#top