TALTSON

Hydroelectric Expansion Project

Dezé Energy Corporation

PROJECT DESCRIPTION

In Support of the MVLWB Land and Water Applications

May 2007
Revision 1

Date Prepared:	March 2007
Prepared for:	Mackenzie Valley Land and Water Board Box 2130 7th Floor - 4910 50th Avenue Yellowknife, NT X1A 2P6
Submitted by:	Dezé Energy Corporation Suite 206, 5102 - 50th Avenue Yellowknife, NT X1A 3S8
Prepared by:	Cambria Gordon Ltd. Suite 202, 4548 Lakelse Ave. Terrace, BC V8G 1P8 Solstice Consulting Services Ltd. 2067 East Georgia Street Vancouver, BC V5L 2B9

REVISION 01

This revised Project Description was prepared to accommodate a typographical error contained in the March 2007 publication with regard to the legal name of the Métis Energy Company Ltd.

ACKNOWLEDGEMENTS

The authors would like to thank the following people and companies for their assistance with development of this report:

Dan Grabke and Darren Huculak of Northwest Territories Energy Corp., Yellowknife, for document reviews and guidance, and for supplying photos, graphics, and supporting information.

Louie Azzolini of Terra Firma Consultants, Yellowknife, for providing document review, and for text and input on socio-economics, regulatory processes, and land uses.

Rescan Environmental Services Ltd., Vancouver, for preparing Figures 1-2, 8-1, 8-2, 8-3, and 9-2.

Golder Associates Ltd., Calgary, for preparing Figures 8-4, 11-5, 16-1, 16-2, 16-3, 16-4 and 16-5.

As well Chris Wilson, Klohn Crippen, Vancouver, B.C.; Joe Chesham, Ian Hayward International Ltd., Surrey B.C.; and Chris Schell, Smithers, B.C. for providing descriptions and clarifications.

EXECUTIVE SUMMARY

The Taltson Hydroelectric Expansion Project (the "Expansion Project") is a hydroelectric development project that adds a new 36 MW power plant at the existing 18 MW Taltson Twin Gorges plant. This expanded generation facility would supply hydropower to the existing Ekati and Diavik diamond mines, Snap Lake mine (operational in 2007), and Gahcho Kué mine (in permitting) through 690 kilometres of new transmission line. The Project would supply approximately 420 GWh per year of renewable electricity to the mines and existing customers, displacing 90 million litres of diesel fuel per year used for power generation (equivalent to 2,570 Super B Trains). This would result in a substantial reduction of greenhouse gas emissions associated with the use and transport of diesel to generate power at the mines. The Expansion Project would continue to supply the existing customer base of Twin Gorges, without impact.

The Expansion Project is proposed by the Dezé Energy Corporation, which is owned equally by the Akaitcho Energy Corporation; the Métis Energy Company Ltd.; and the Northwest Territories Energy Corporation (03) Ltd. (NTEC). The Akaitcho Energy Corporation and the Métis Energy Company Ltd. are business ventures of the Akaitcho First Nation and Métis Nation respectively, while NTEC is a wholly owned subsidiary of Northwest Territories Power Corporation, a crown corporation owned by the Government of the Northwest Territories.

This unique ownership structure provides an opportunity for collaboration and cooperation among the First Nations of the region and would facilitate a significant, long term and sustainable business opportunity in the South Slave region of the Northwest Territories – a region where economic growth has historically lagged behind other areas in the Northwest Territories and Canada. People of the Akaitcho First Nation and Métis Nation would realize employment opportunities, and communities would benefit from the local ownership of this business venture.

The Expansion Project builds on the existing hydroelectric facility in the Taltson River watershed. This facility has been operating below its existing capacity since the Pine Point mine (for which it was originally built in 1966) closed in 1987. As well, the facility does not make use of the full hydroelectric generating potential at the site. The Expansion Project as envisaged would utilize a substantial portion of the available hydrological resource, with future potential to optimize the hydrological resource generating potential, should the energy demand arise. This would be conducted without any additional flooding of the existing reservoir.

Significant environmental improvements would be realized through the displacement of diesel fuel required to generate power at the existing and proposed diamond mines. The Expansion Project would reduce risks to fish and wildlife habitats that are occurring through the transportation of diesel fuel on winter roads. As well, a substantial reduction in greenhouse

gas generation (43% of the GNWT 1998 proposed objectives) would be realized by replacing diesel power generation with clean, renewable hydroelectric power.

The proposed Expansion Project includes the following key infrastructure components:

- A new 36 MW hydroelectric station at Twin Gorges, utilizing the existing plant Forebay and the full elevation difference between the Forebay and the Taltson River (40 m) below Elsie Falls via a new 1250 m canal, penstocks and tailrace canal;
- A new gated control structure at the outlet of Nonacho Lake, including a micro-hydro plant for site-generated power;
- Interconnection of the new generating station and the existing 18 MW Twin Gorges generation plant in a new 115/161 kV switchyard at Twin Gorges;
- 554 km of 161 kV transmission line from Twin Gorges around the East Arm of Great Slave Lake through the Snap Lake/Gahcho Kué area to the Lac de Gras area;
- 136 km of 69 kV transmission line between Snap Lake and the proposed Gahcho Kué mine site, and between the Ekati and Diavik mine sites; and
- Four new substations, one at each mine site.

Construction is estimated to generate approximately 400 direct jobs over different periods of the Project's construction phase, an equivalent of 216 person-years. Indirect employment in support of construction includes freight and fuel trucking to Twin Gorges, building transmission line storage yards and camps over the three winter road periods, camp operations, flight transportation and engineering support.

The Expansion Project represents a substantial investment in the region, with costs comparable to similar major northern infrastructure projects. It would provide substantial social, economic, and environmental benefits for residents in the Northwest Territories and in the South Slave region in particular, as well as the project owners and customers. These expected benefits would include:

Socio-Economic Benefits

- Providing opportunity for collaboration and cooperation among the First Nations of the region through the unique ownership structure comprised of the Akaitcho First Nation, Métis Nation, and NTEC.
- Establishing a viable business model for future business opportunities that is unique to, and respectful of, the value structure of the Northwest Territories.
- Improving opportunities within the South Slave region, through increased employment, sustainable income, and improved services and infrastructure.

- Sustaining healthy communities, including improved health and well being, community cohesion, and lifestyle.

Environmental Benefits

- Displacing approximately 90 million litres of diesel per year. This would provide for a significant reduction in greenhouse gas emission, equating to 43% of the GNWT 1998 proposed objectives.
- Supporting GNWT energy planning using a sound business model, including:
    1. Encouraging Aboriginal equity positions in energy development projects;
    2. Ensuring protection of the environment; and
    3. Promoting renewable energy for industrial developments for the benefit of all residents.
- Minimal changes to the existing reservoir would occur, with no additional flooding.
- Limited timber clearing along the transmission line. A substantial portion of the transmission line is north of the tree line, and of the section south of the tree line, only those few section where timber is greater that 3m high would need to be cleared.
- Reducing risk from transport truck accidents and spills, and reducing existing impacts to wildlife along the mine road corridors through substantially reduced hauling of diesel fuel by truck.
- Optimizing the hydro-electric generating facility within an existing project, thus avoiding potential impacts of developing a new project in a pristine watershed.

Economic Benefits

- Extending the life of the existing Twin Gorges Power Station.
- Developing an energy corridor and driving economic development of new industries along the corridor, or alternatively providing power to Yellowknife or southern customers.
- Extending mine lives beyond current plans by reducing operating costs.
- Increasing winter road longevity, and negating or delaying the need for alternate transportation options, such as an all season road with higher environmental and economic cost.

Local government and community consultation for the Expansion Project commenced in 2002 and 2003 through formal meetings with the leadership of the Akaitcho First Nations (Salt River First Nation, Smith's Landing First Nation and Deninu Kué First Nation) and the Northwest Territories Métis Nation (locals in Fort Smith, Fort Resolution and Hay River).

These meetings were followed in 2004 with public information sessions in the communities of Fort Smith, Fort Resolution and Hay River. With the development of the Dezé Energy Corporation, further community consultations would occur in early 2007 and continue throughout the regulatory process, detailed design, construction, and operations.

The Expansion Project is located entirely within the Mackenzie Valley regulatory regime as defined by the *Mackenzie Valley Resource Management Act* (MVRMA). Regional Land and Water Boards regulate the use of settlement and Crown land and water use in their respective settlement areas. The applications for a Class A amended Water Licence and Land Use Permit for the new facility and transmission line would initiate a Preliminary Screening by the MVLWB.

The Expansion Project has commenced environmental baseline studies and collected considerable data to-date. Many baseline studies remain in-progress and additional studies are planned in upcoming field seasons in support of the anticipated environmental impact assessment.

The unique ownership arrangement of the Dezé Energy Corporation combines First Nations and Government interests, which include respect for the environment, traditional sites, and land use activities of Aboriginal people. These overarching owner interests create a vision for the Expansion Project that embraces sustainable development by delivering on social and environmental as well as economic objectives.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

ACRONYMS AND ABBREVIATIONS

AEC	Akaitcho Energy Corporation
ARIC	Akaitcho Regional Investment Corporation
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans
DIAND	Department of Indian Affairs and Northern Development
Diavik	Rio Tinto/Aber Resources Diavik Diamond Mine
Ekati	BHP Billiton Ekati Diamond Mine
ELC	Ecological Land Classification
FRPA	Federal Real Property Act and Federal Immovables Act
Gahcho Kué	De Beers/Mountain Province proposed Gahcho Kué mine
GHG	Greenhouse Gas
GNWT	Government of Northwest Territories
GWh	Gigawatt hour
IBP	International Biological Program
INAC	Indian and Northern Affairs Canada
km	kilometres
kV	kilovolt
m	metres
m^3/s	metres cubed per second
masl	metres above sea level
MEC	Métis Energy Company Ltd.
Mm^3	million cubic metres
MOI	Memorandum of Intent
MOU	Memorandum of Understanding
MVA	megavolt ampere
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	Mackenzie Valley Resource Management Act
MW	megawatt
NCPC	Northern Canada Power Commission
NRCan	Natural Resources Canada
NTEC	Northwest Territories Energy Corporation (03) Ltd.
NTPC	Northwest Territories Power Corporation
NWPA	Navigable Waters Protection Act
NWT	Northwest Territories
OS	Operational Statement for Construction of Overhead Lines
ROW	Right of Way
SARA	Species At Risk Act
Snap Lake	De Beers Canada Mining Inc. proposed Snap Lake Diamond Mine
SSMEC	South Slave Métis Economic Corporation
TK	Traditional Knowledge
VC	Valued Ecosystem and Social Components

WCB	Workers Compensation Board
WEMP	Water Effects Monitoring Program
WSC	Water Survey Canada
WWF	World Wildlife Fund Canada

GLOSSARY

Acid Rock Drainage	Refers to the outflow of acidic water usually from areas where the earth of specific geochemical characteristics has been disturbed (e.g. usually from abandoned metal mines or coal mines).
Anthropogenic	Refers to effects or processes that are derived from human activities, as opposed to effects or processes that occur in the natural environment without human influences.
Bedrock	Refers to the native consolidated rock underlying the Earth's surface.
Benthic	Pertaining to the bottom region of a water body, on or near bottom sediments or rocks.
Benthos	Animals that live attached or associated with the bottom of a waterbody.
Berm	A level space, shelf, or raised barrier separating two areas.
Channel	A long deep section of a river or other waterway through which water and sediment flow.
Colluvium	Loose, incoherent deposits at the foot of or on a slope, brought there principally by gravity.
Dam	A structure built as a barrier to the flow of a steam or river. Also refers to the act of impeding the flow of a watercourse.
Discharge	The volume of water transported by a river or stream in a certain amount of time.
Ecology	Ecology is usually considered a branch of biology, the general science that studies living organisms.
Ecoregion	Refers to a relatively large area of land or water that contains a geographically distinct assemblage of natural communities.
Ecosystem	A community of interacting organisms considered together with the chemical and physical factors that make up their environment.
Entrainment	The process by which fish are swept into and through spillways and turbines.

Eolian	Pertaining to the action or effect of the wind. Eolian sedimentation results from the transport of grains by the flow of moving air.
Eskers	A sinuous ridge of constructional form consisting of stratified accumulations of glacial sand and gravel.
Flow	The rate at which water passes a given point in a stream or river, usually expressed in cubic metres per second.
Forebay	Refers to the standing body of water upstream of a dam that provides the hydraulic head for flow through a power generating station.
Francis turbine	A radial inflow reaction turbine.
Freshet	A high river flow in the spring caused by rapid snowmelt.
Glacial Drift	All material in transport by glacier ice and all deposits and landforms produced by such streams.
Glaciofluvial	Pertaining to streams fed by melting glaciers or the deposits and landforms produced by such streams.
Guys	Infrastructure designed to add stability to tall, narrow structures. Guy wires for example refer to a tensioned cable in which one end of the cable is attached to the structure, and the other is anchored to the ground at a set distance from the structure's base.
Head	The difference in elevation between water levels upstream and downstream of a dam.
High flow	The periodic increase in a river's water level as a result of increased precipitation or snowmelt.
Hydrocarbon	A chemical compound that consists only of the elements carbon (C) and hydrogen (H). Hydrocarbons are combustible and are the main components of fossil fuels, which include petroleum, coal, and natural gas.
Hydrograph	A hydrograph is a time record of the discharge of a stream, river or watershed outlet.
Hydrology	The study of the movement, distribution, and quality of water throughout the Earth.

Ice wedges	The formation of ice wedges is typically associated with areas of permafrost. Ice cracks can be formed in the ground due to the freezing of water in the soil. The refreezing of meltwater puts pressure on the crack and thus serves to enlarge it.
Intake	The entrance to a conduit through a dam or water facility.
Invertebrates	A term describing any animal without a spinal column. *Benthic invertebrates* are those invertebrates that inhabit the bottom region of a water body, on or near bottom sediments or rocks.
Kaplan turbine	An axial flow reaction turbine with adjustable runner blades which is used mainly under low head conditions.
Laydown yard	Refers to an equipment and material storage area.
Limnology	The study of the physical, chemical and biological dynamics of lakes and of their plant and animal residents.
Low flow	The periodic natural decline in a river's water level as a result of reduced precipitation.
Microclimate	Refers to a local external atmospheric zone where the climate differs from the surrounding area.
Moraine	Refers to rock debris, fallen or plucked from a mountain and transported by glaciers or ice sheets.
Parent material	Refers to the underlying geological material (generally bedrock or a superficial or drift deposit) in which soil horizons form.
Penstock	The pipeline that carries water from the reservoir to the turbine.
Permafrost	Perennial frozen ground, occurring wherever the temperature remains below zero degrees for several years, whether the ground is actually consolidated by ice or not and regardless of the nature of the rock and soil particles of which the earth is composed.
Plant association	Broadly defined as a unit of vegetation with a uniform composition of plant species and physical structure. Plant associations tend to occupy characteristic habitats.
Regulating gates	Gates that control the amount of water flowing out of a reservoir and down to the turbines of a generating facility.

Riparian	Refers to the interface between land and a flowing surface water body. *Riparian habitat* refers to the area where a species lives and grows within this interface or riparian area.
Rule curves	Rule curves are the historical compromise for water level management that have been established to balance competing interests for target water levels.
Sediment	Any particulate matter that can be transported by fluid flow and which is eventually deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid.
Sluice	A water channel that is controlled at its head by a gate (sluice gate).
Spillway	The channel or passageway around or over a dam through which excess water is released or spilled without passing through the turbines; a safety valve for the dam.
Tailrace	A pipe or channel through which water from a turbine is discharged into a river.
Turbine	A rotary engine that extracts energy from a fluid flow.
Watershed	The area that contributes runoff to a given point location. For the purpose of this report, the Taltson Watershed is defined as the runoff area from Nonacho Lake to the outflow of Tsu Lake.
Weir	A low dam built across a stream to raise the upstream water level.

1 INTRODUCTION AND BACKGROUND

1.1 Document Overview

This report has been prepared in support of amended Water License and Land Use Applications for the Taltson Expansion Project. The report is presented in a number of main sections. Sections 1 – 3 provide a background and overview of the Expansion Project, the Proponent, and the rationale and goals for the Project. Sections 4 – 6 discuss the communities within the Project area, on-going community consultation, and Traditional Knowledge methodology. Section 7 provides a synopsis of the anticipated requirements of the regulatory process for the Project.

The Project characterization is presented in Section 8 – 15. As the existing Twin Gorges facility and basin hydrology are integral components of the Expansion Project, the existing facility and operations, as well as the hydrological regime, are presented in some detail. This is followed by Project alternatives and a description of the preferred option including the proposed new facility and construction and operational phase information.

The environmental setting, baseline studies and discussion of potential effects is presented in Chapters 16 - 17. An extensive reference list of supporting studies and documentation is provided in Chapter 18.

1.2 Project Background

The Taltson Hydroelectric Expansion Project (the "Expansion Project" or "Project") is an infrastructure development that adds a new 36 MW powerplant at the existing 18 MW Taltson Twin Gorges Plant and interlinks the expanded generation facility through a new transmission line to supply hydropower to Ekati and Diavik, and the proposed Snap Lake and Gahcho Kué diamond mines. The Project would supply approximately 420 GWh per year of renewable electricity to the mines and existing customers, displacing a significant portion of the current diesel generation at those mine sites. The existing customer base of the Taltson Twin Gorges Plan would continue to receive uninterrupted power at regulated rates.

The existing Taltson Twin Gorges facility, owned and operated by Northwest Territories Power Corporation (NTPC), is located on the Taltson River, approximately 56 km northeast of Fort Smith and 285 km southeast of Yellowknife. Taltson Twin Gorges was built by the Northern Canada Power Commission (NCPC) in 1964/65 specifically to provide electricity to the Pine Point Mine, a large polymetalic mine developed by Cominco near Fort Resolution, NWT. The mine and associated community operated for approximately 20 years, but were permanently closed and the site reclaimed by 1986. Subsequent to the closure of the mine, Taltson Twin Gorges continued to supply power to Fort Smith, NWT and Fort Resolution, NWT and the distribution system was subsequently extended into the communities of Fort

Fitzgerald, Alberta and Hay River, NWT. The Twin Gorges facility was transferred to NTPC along with a number of other generation assets in the territories in 1988.

As the customer load continues to be significantly less than the plant capacity at Twin Gorges, the full potential of Taltson Twin Gorges has not been utilized for 20 years. Through the 1990's, a number of initiatives to utilize the excess energy available from Taltson Twin Gorges were studied, but none were found to be economically viable. In 2003, with the support of NTPC and the Government of Northwest Territories (GNWT), a study began on supplying energy from Taltson Twin Gorges to the proposed Snap Lake Diamond Mine from a small expansion of the existing plant.

Following the initial 2003 studies, in which it was determined that the Twin Gorges site could support a substantially larger project than that required for Snap Lake Mine power supply, the development concept evolved to a larger expansion of the existing facility, and the supply of power to other mines. The Taltson Hydroelectric Expansion Project as proposed is a 54 MW hydroelectric generation facility at the existing Twin Gorges on the Taltson River and at Nonacho Lake. The Project includes development of a new 36 MW plant, the resulting refurbishment of the existing 18 MW plant, interconnection of these plants, and the development of substantial trunk transmission line and substation infrastructure. In addition to continuing to supply the existing customer base, the Project would supply hydroelectric power to the operating diamond mines of Ekati and Diavik, the Snap Lake diamond mine currently under construction, and the proposed diamond mine at Gahcho Kué (Kennady Lake). The Project also identifies the potential to optimize the available hydrological resource. Should future energy needs arise, a total installed capacity of 74 MW is potentially feasible.

1.2.1 Expansion Overview

The Expansion Project would be designed to service the four operating and/or planned diamond mines with hydroelectric power and thereby displace a significant portion of their diesel generation. The delivery of power to the mines would require the installation of a high voltage trunk transmission line and associated infrastructure running northeast from Twin Gorges and terminating at the Diavik mine site.

The main components of the existing Taltson Twin Gorges facility that would be incorporated and/or refurbished as part of the Expansion Project are the Twin Gorges generating station, Forebay, the South Valley Spillway, the North Valley Perimeter dyke and the Nonacho control structure and spillway.

The Expansion Project includes the following key components:

- A new 36 MW hydroelectric station at Twin Gorges, utilizing the existing plant Forebay and the full elevation difference between the Forebay and the Taltson River (40 m) below Elsie Falls via a 1250 m canal, penstocks and tailrace canal;

- A new gated control structure at the outlet of Nonacho Lake, including a micro hydro plant for site-generated power;
- Refurbishment and life-extension of the existing 18 MW Taltson Twin Gorges powerplant;
- Interconnection of the new generating station and the existing 18 MW Twin Gorges generation plant in a new 115/161 kV switchyard at Twin Gorges;
- 554 km of 161 kV transmission line from Twin Gorges around the East Arm of Great Slave Lake through the Snap Lake/Gahcho Kué area to the Lac de Gras area;
- 136 km of 69 kV transmission line between Snap Lake and the proposed Gahcho Kué mine site, and between the Ekati and Diavik mine sites; and
- Four new substations, one at each mine site.

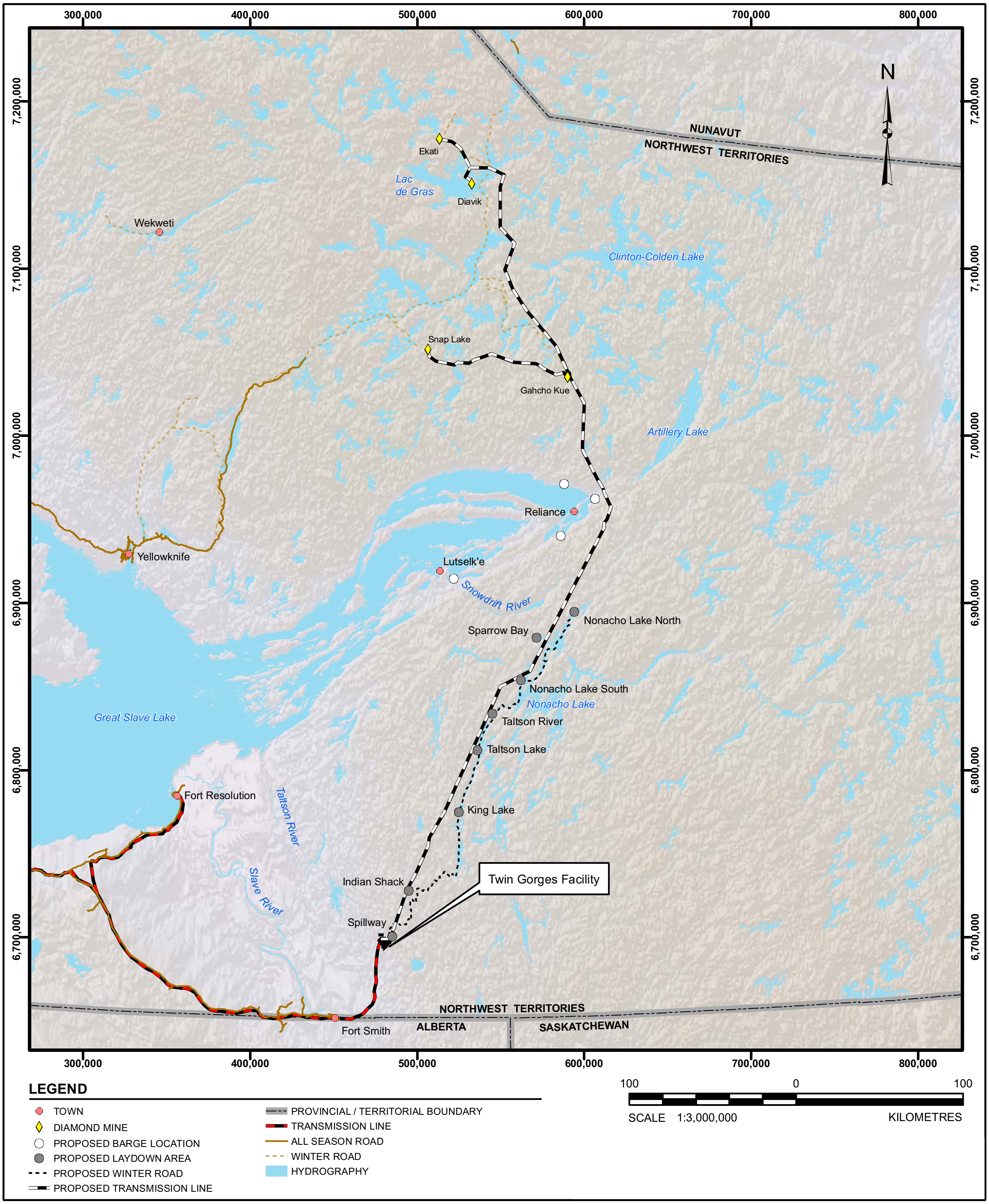
Technical evaluations completed to date indicate that the power generation and delivery concepts are entirely viable and would be completed with standard technology. Technical evaluations have been completed at the feasibility level on the transmission line and substations, and at the pre-feasibility level for the Nonacho Lake control structure and the expansion plant at Twin Gorges. In addition, an assessment of the existing facility's condition has also been completed.

Limited alteration of existing watershed features and no additional flooding would be required to implement the Expansion Project. As currently sized, the Project provides increased resource utilization development with potential future optimization opportunity. When commissioned, the Expansion Project would displace approximately 45 MW of diesel generation at the four mine sites and avoid the delivery and consumption of approximately 90 Million litres of diesel fuel per year in the Northwest Territories. This corresponds to approximately 2,570 Super B Train loads of diesel and the associated supply chain energy necessary to deliver the diesel to the mines. The Project would result in a significant reduction of existing long-term environmental effects through the displacement of this major portion of diesel power generation.

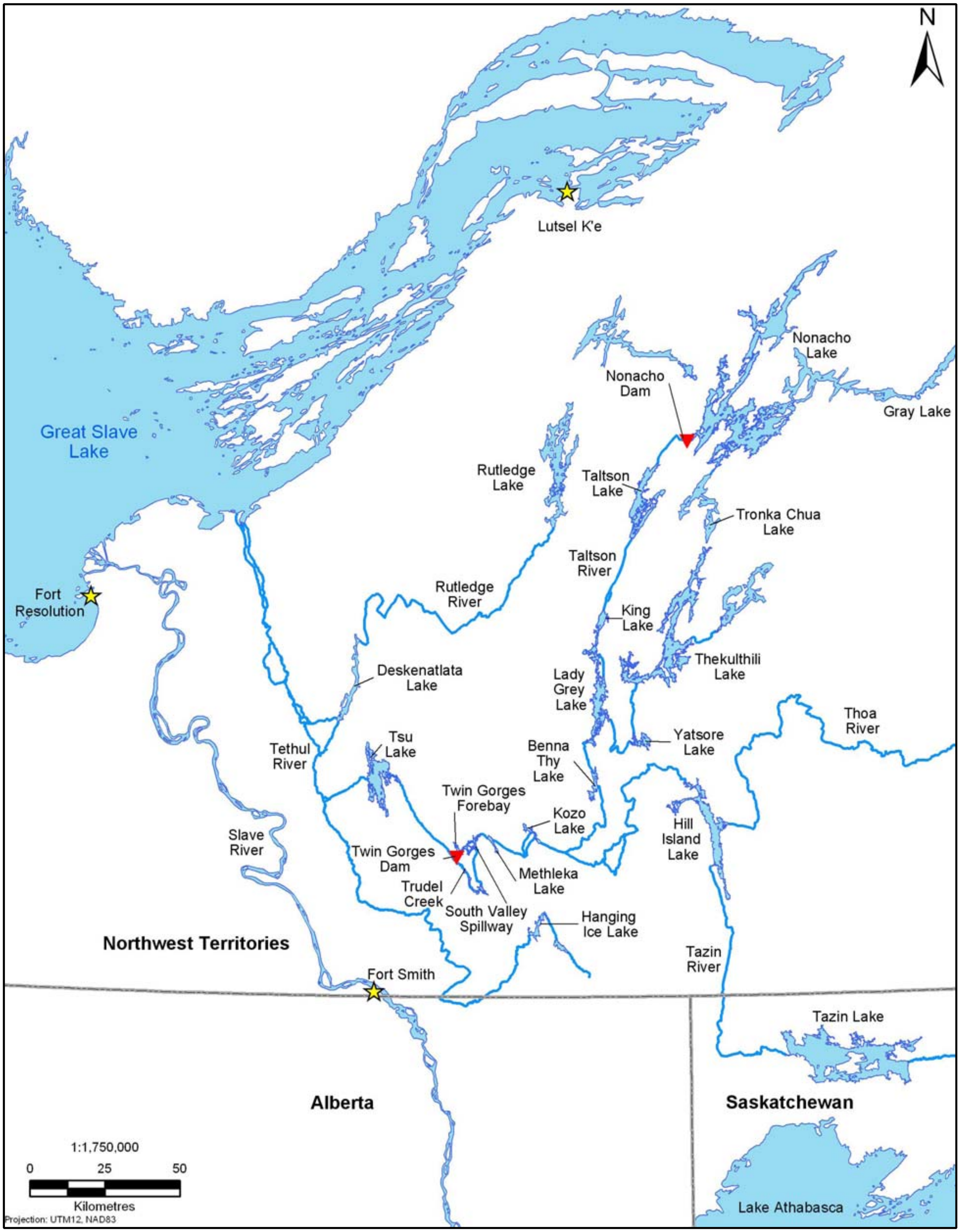
The proposed Expansion Project would provide this reliable energy from a renewable source, with a planned minimum lifetime of at least 40 years. As the mines finish their lives and capital recovery is achieved, low cost electricity may be available to other developments in the area. The Project could be interconnected to Yellowknife, to other mines, or to southern markets as the marginal price of electricity in such markets allows.

Figure 1-1 and Figure 1-2 provide an overview of the Project area and the significant features that are referenced throughout this report.

Dëze Energy Corporation



TALTSON Hydroelectric Expansion Project	Project Description March 2007	**Project Area Overview**	Figure 1 - 1



Geographic Area Overview

2 CORPORATE PROFILE

2.1 Introduction

The Expansion Project is proposed by the Dezé Energy Corporation, consisting of the Akaitcho Energy Corporation (AEC); the Métis Energy Company Ltd. (MEC); and the Northwest Territories Energy Corporation (03) Ltd. (NTEC); each with an equal share of ownership in the company. The formation of this experienced and committed partnership was critical in moving the Taltson Hydro Expansion Project forward.

A 2003 Memorandum of Understanding (MOU) between the Akaitcho, Métis, and NTEC, progressed to a Memorandum of Intent (MOI), and in 2006, this process led to the development of the Dezé Energy Corporation.

This undertaking of a joint venture between a Crown Corporation and Aboriginal groups is a business model that is anticipated to become a template for and enhance the viability of similar undertakings in the future in this region or elsewhere in the Northwest Territories.

2.2 Ownership Group

Dezé Energy Corporation's ownership group consists of three groups, each with an equal share of ownership in the company. These are: The Akaitcho Energy Corporation; the Métis Energy Company Ltd.; and the Northwest Territories Energy Corporation.

2.2.1 Akaitcho Energy Corporation (AEC)

Formerly known as the Akaitcho Regional Investment Corporation (ARIC), the Akaitcho Energy Corporation is an energy development body that is wholly owned by the Akaitcho Territorial Government. As such, it represents the treaty status members of the six Dene First Nations (the Deninu Kue, Lutsel K'e, Salt River, Smith's Landing, Dettah, and N'Dilo) from which the Akaitcho Territorial Government derives its governing authority.

AEC's interest in the Taltson Hydro Expansion Project is a function of its desire to generate economic opportunity for the Akaitcho people, beyond short-term employment opportunities. As owners of the new facility through AEC, the Akaitcho people would receive a long term revenue stream and would be in a position to ensure that its development and operation respects the goals and objectives of First Nations, particularly the protection of traditional lands and ways of life.

2.2.2 Métis Energy Company Ltd. (MEC)

Developed specifically for the purpose of promoting sustainable energy development in the South Slave, the Métis Energy Company Ltd. is the successor company to the South Slave

Métis Economic Corporation (SSMEC). Wholly owed by the Northwest Territories Métis Nation, MEC acts on behalf of the Northwest Territories Métis people in promoting their interests in the area of energy development.

Similar to the AEC, the Métis Energy Company Ltd.'s interest in the Taltson Hydro Expansion Project is one of ownership. As an owner, MEC brings the support of the Northwest Territories Métis Nation to the project, and is positioned to optimize the sustainable long-term benefit that the project brings to the Métis people. Their overarching goal is to ensure that any benefits so derived do not violate the sacred principles of respect for the land and the traditional way of life.

2.2.3 Northwest Territories Energy Corporation (03) Ltd. (NTEC)

The Northwest Territories Energy Corporation (03) Ltd. is a 100% wholly owned subsidiary of the Northwest Territories Power Corporation (NTPC).

As a Crown Corporation that operates independently of the Government of the Northwest Territories, NTPC is fully regulated by the Public Utilities Board of the Northwest Territories. Since being acquired by the territorial government in 1988, NTPC has paid $72 million in dividends and paid in full the $53 million long-term debt the GNWT assumed by taking over ownership of the corporation. Despite operating in one of the most inhospitable environments in Canada, NTPC has consistently delivered exceptionally reliable power to its customers.

NTEC's focus is on development opportunities that lie outside the regulated activity of the Northwest Territories Power Corporation. Specifically, its mission is to position itself as a leader in the facilitation and development of Aboriginal partnerships related to the development of renewable energy business opportunities throughout the territory.

NTEC's primary interest in the Taltson Hydro Expansion Project is to leverage current industrial development in the Northwest Territories to secure profitable business opportunities – for itself and the Aboriginal people of the South Slave – that are commensurate with levels of risk exposure entailed.

As a wholly owned subsidiary of NTPC, NTEC is interested in adding infrastructure that would play an important role in the Northwest Territories' energy future and serve as a catalyst for future economic development in the Slave Geologic Province.

2.3 Development Timeline

The development of the Expansion Project began in 2002 with conceptual discussions between the South Slave Métis Economic Corporation, the Akaitcho Regional Investment Corporation, and the Northwest Territories Energy Corporation concerning the business opportunity represented by the approximately 10 MW of surplus power capacity available from the existing Taltson Hydroelectric plant. Despite their distance from the Twin Gorges site, preliminary investigation quickly pointed to the diamond mines as the most viable customer base for this power supply.

Recognizing the significant business opportunity this represented, the project partners began to formalize their working relationship with the signing of a Memorandum of Understanding (MOU) on June 6, 2003. The intent of this document was to establish a framework, which would enable the Project Partners to continue to work together on the development of the hydroelectric resources of the Taltson River System while simultaneously working toward the establishment of more binding business arrangements.

The signatories to the MOU were the Akaitcho Regional Investment Corporation, the South Slave Métis Economic Corporation, and the Northwest NTEC. In the MOU the parties agreed:

- To establish a corporate entity that would represent the interests of the ARIC and the SSMEC in business arrangements;
- To develop detailed business plans that would provide for profitable business opportunities for ARIC and the SSMEC; and
- To develop a detailed Memorandum of Intent.

Other key clauses in the MOU included the establishment of a Steering Committee to direct and oversee research activities, the drafting of basic business principles, and a commitment to protect the interests of Aboriginal governments negotiating claims and treaty land entitlements.

In August 2006 the partners continued to strengthen the business relationship with the signing of a Memorandum of Intent. Reflecting the evolution of the business case, the Northwest Territories Métis Nation set up a business entity specifically tasked with energy development, and the Métis Energy Company Ltd. signed the MOI on their behalf. At the same time, the Akaitcho Territorial Government (ATG) was in the process of setting up a similar business entity, the Akaitcho Energy Corporation, though for purposes of expediency the ATC itself signed the MOI. In summary, the signatories to the MOI are the ATG, the MEC, and the NTEC. Building on the framework set out in the MOU, the key goals of the MOI were:

- The establishment of a new entity (NEWCO) between the parties;
- To enable the parties to come together and pursue mutually beneficial interests, including the development and transmission of hydropower, on an on-going basis; and
- To enable the parties to develop and manage new opportunities.

The primary focus of the document, however, was to set out the fundamental principles on which NEWCO would be formed. These included the principle of equality based on three equal parties; the implementation of a consensus decision making model; the goal of optimizing Aboriginal participation and benefits to the Aboriginal communities and

and maintaining respect for the protection of the environment, traditional sites and activities of Aboriginal peoples.

Although the parties agreed to defer the setting out of terms with respect to share structure until the Project Development Agreement (PDA) process, the MOI does state that the principle of equality would be used as an instrument on how the final share structure between the partners is to be determined.

As per the goals set out in the MOI, in November 2006 the Project partners established Dezé Energy Corporation (DEC), a development company whose mandate is to enable the partners to work together with a common mandate to pursue mutually beneficial interests in the development and transmission of hydropower. The Taltson Hydro Expansion Project is DEC's immediate priority, with the drafting of the Project Development as well as Shareholder Agreements currently underway and expected to be completed early in 2007.

As noted above, the Akaitcho Energy Corporation, the Métis Energy Company Ltd, and the Northwest Territories Energy Corporation Ltd. own equal amount of shares in DEC.

The Dezé Energy Corporation contact information is as follows:

Suite 206
5102-50th Avenue
Yellowknife, NT X1A 3S8
Phone: 867-669-3390
Fax: 867-669-3395

The Dezé Energy Corporation Board of Directors is listed below:

Akaitcho Energy Corporation

- Don Balsillie, Chairman
- Robert Sayine, Board Director
- Sonny MacDonald, Board Director

Métis Energy Company Ltd.

- Ken Hudson, Vice Chairman
- Vern Jones, Board Director
- Kara King, Board Director

Northwest Territories Energy Corporation (03) Ltd.

- Lew Voytilla, Board Director
- Louis Sebert, Board Director
- Dan Grabke, Board Director

3 EXPANSION PROJECT PURPOSE AND RATIONALE

3.1 General History of Expansion Project Concept

The Expansion Project evolved from a concept to provide sustainable hydropower to some of the main industrial customers of the Northwest Territories, all of whom are currently supplying their electrical power from diesel generation stations. Past consideration has been given to developing sites on the Snare River and Lac La Martre to supply Ekati Mine with hydropower and, more recently, initial studies to utilize the existing surplus power from Twin Gorges in combination with a small additional plant at the site to supply the proposed Snap Lake Mine. In the course of this latter study, occurring largely in 2003, the concept of supplying all of the existing and proposed diamond mines within viable reach of the facility (Ekati, Diavik, Snap Lake, and Gahcho Kué) became an alternative that appeared feasible.

As a result of positive feedback from preliminary discussions with each of the potential diamond mine owners, the proposed Snap Lake Power Supply study areas were expanded in consideration of a much larger project. Initial studies were subsequently undertaken in 2004 to develop concepts, prepare preliminary economic evaluations for the larger hydro generation plant, and begin baseline environmental study work. These evaluations led to a conclusion in late 2004 that the Taltson Expansion Project concept was not economically feasible at the marginal mine-site costs for electrical power, based on mine site diesel prices of approximately $25/barrel. The environmental studies and consultation programs were continued through 2005, but further Project evaluation and planning activities were curtailed.

Since 2005, the price of diesel has risen significantly for the mine customers, and the year-to-year certainty of the annual winter road used to replenish the mines with supplies, including diesel, has diminished. Consequently, potential diamond mine customers have expressed a renewed and invigorated interest in the Expansion Project. All phases of Project development work have now been revisited and advanced, including consultation, environmental assessment, and financial modeling, as well as engineering design, construction methodologies, and line routing options.

The ownership of Dezé Energy Corporation represents a unique business relationship. This relationship provides opportunity for the people of the Akaitcho Territory Government and the Northwest Territories Métis Nation to work together with NTEC to further benefits that satisfy interests of all three parties.

3.2 Project Purpose

The Project purpose and rationale are multi-faceted. First and foremost, the Taltson Expansion Project is a business venture that builds on a private sector market opportunity to generate and sell clean and renewable electrical energy to displace and substitute diesel generation at the four operating and proposed diamond mines in the Northwest Territories – these are the operating Ekati mine owned by BHP Billiton, the operating Diavik diamond mine owned by Rio Tinto/Aber Resources, the Snap Lake diamond mine under construction and owned by De Beers Canada, and the Gahcho Kué diamond mine, in the regulatory process, and owned by De Beers/Mountain Province.

The operating mines are major consumers of electrical power for their operations, which continue on a 24 hour per day, 7 day per week basis. The Expansion Project is targeted specifically at supplying the portion of total electrical generation at each mine for which heat recovery is not required. Therefore, some diesel generation for both heat recovery and for emergency backup would continue at each of the mines.

The energy sale opportunity for diesel displacement would exist only as long as the marginal cost of diesel generation, which includes a risk premium, is above that for which the Project can reliably deliver the same energy. Power purchases from the Expansion Project would not entail such a risk premium, due to the reliability of the firm power.

The opportunity is also highly dependent on the mine life forecasts, which must remain of such duration that the large capital expenditure required for construction of the Project can be financed and repaid through contracts with these customers.

The Dezé Energy Corporation is equally owned by three stakeholders, the Akaitcho First Nations, Métis Energy Company Ltd and the Northwest Territories Energy Corporation (03) Ltd. Each shareholder would share equally in the management decision-making process. Decisions would be made on a consensus basis with a focus on achieving an adequate risk-adjusted financial return while also maintaining the highest respect for the environment and the traditional sites and activities of Aboriginal people. This mandate upholds the vision adopted in the original MOU, which represents the interests of the Akaitcho Regional Investment Corporation and the South Slave Métis Economic Corporation. These organizations and the people they represent would benefit from direct and indirect business and employment opportunities generated from the Project during all phases.

The Project is a major undertaking with capital costs commensurate with projects in northern Canada. In turn, the Project has the potential to bring substantial social, economical, and environmental benefits to the Project Partners, the regional inhabitants, and the Northwest Territories.

3.3 Project Rationale

3.3.1 Environmental

Major Reduction in Diesel Consumption and Greenhouse Gas Emissions

The Project would allow displacement of up to 42 MW of existing and/or planned diesel generation by clean, renewable hydropower generation, and would have the capacity to provide an additional 20 MW for future power demands. At anticipated generation reliability rates for initial displacement, the Taltson Expansion Project would on average supply up to 420 GWh of energy per year to the mines and existing customers. This clean energy power supply for the mines equals an annual consumption of approximately 90 Million litres of diesel, which corresponds to approximately 2,570 Super B Train loads, as well as associated supply chain energy necessary to deliver the diesel to the mines.

In 1998, the GNWT produced the Greenhouse Gas Emission Forecast for the Northwest Territories (Ferguson Clark, 1998) from which strategic reduction initiatives could be developed. The study focus included development of a proposed Northwest Territories contribution to the federal commitments. The forecast reduction objectives were approximately 590 kilotonnes (kt) of CO_2 equivalent annually (Business as Usual scenario) from 2008 to 2013. The replacement, by the Expansion Project, of the mine site diesel fuel emissions would equate to over 255 kt of CO_2 equivalent annually, equating to 43% of the proposed reduction objectives for the Business as Usual scenario objectives.

Support of the NWT Energy Strategy

As a result of Northwest Territory greenhouse gas emission forecasts conducted in 1998, the GNWT created a series of energy policies with multi-spectrum directions, targets and actions. The most recent policies, Energy for the Future, Energy Planning for the Northwest Territories (GNWT, 2006), and its predecessor the NWT Energy Strategy (GNWT, 2003), built on previous studies and strategies with similar goals and objectives.

The Taltson Hydro Electricity Expansion Project supports the policies, principles, and strategic actions of these documents, including the following principles from Energy for the Future (GNWT, 2006):

1. Encourage Aboriginal equity positions in energy development projects and work in partnership with all stakeholders towards sustainable energy solutions for the benefit of all residents;
2. Ensure energy development and management decisions support the high quality of the natural environment and biodiversity of ecosystems, recognizing the absolute importance of the long-term protection of these natural systems to economic, social, and cultural well-being of Northwest Territories residents; and

3. Using available fiscal and regulatory tools, promote the use of renewable energy for industrial developments that contribute to a lasting legacy of affordable and sustainable energy for the benefit of all residents.

As well, the Expansion Project supports the key directions of the NWT Energy Strategy (GNWT, 2003), namely:

1. Make Energy Services Sustainable and Affordable;
2. Develop Northwest Territories Energy Resources; and
3. Ensure Protection of the Environment.

The Expansion Project contributes to the energy and emission targets identified in the Energy Strategy and contributes to many of the 14 specific identified actions.

Limited Environmental Footprint

The facility required for the Taltson Expansion Project would result in greater regulation of Nonacho Lake and minor hydrological changes in the Taltson River watershed. These changes would not be significantly different than the Twin Gorges Project as developed and operated in the period of 1964 - 1986 to support the Pine Point Mine operation. The Expansion Project would utilize the existing Twin Gorges Forebay with no alterations. No additional flooding would occur in any of the lake systems associated with the Project, with operational water levels remaining very similar to that which has existed historically.

The southern section of the new transmission line alignment, south of tree-line, would require a cleared corridor of approximately 30 m wide where trees are greater than three metres in height. Over much of the southern alignment, the line runs through low-lying vegetation and burned areas where only scrub brush has regenerated. In many locations the line would span over ravines and other terrain features that could be left undisturbed. Underbrush and vegetation of less than three metres in height can remain as cover for wildlife. Transmission tower structures are simple guyed steel structures. Existing transmission corridors to Fort Smith and beyond would not be affected.

Increased Winter Road Longevity and Reduced Impacts

The reduction in fuel hauls over the winter road system (approximately 2,570 Super B Trains per year) would reduce the risk associated with accidents and spills, reduce truck related impacts on the terrain, and would reduce existing wildlife impacts associated with the truck traffic. In addition, the reduced truck traffic would be expected to extend the service life of the existing winter road system, negating or delaying the need for alternative goods and material transportation options, such as all-weather roads, that would have higher environmental and economic costs.

Reduction in Flow and Erosion Damage on Trudel Creek

As the Expansion Project would allow greater regulation of the flows entering and leaving the Twin Gorges Forebay, Forebay water levels are expected to be much more stable than is currently the case. This stability would allow much greater control over releases into the Trudel Creek system over the South Valley Spillway. As the very large spills currently occurring have caused erosion in the Trudel system, the management of these flows would very likely result in much less erosion, which could be considered a major improvement to flow conditions in the Trudel system.

Optimized Resource Utilization

The original development of 18 MW at the Twin Gorges site was sized specifically for the Pine Point Mine load. There was little data available or consideration of the site potential, as no other load was forecast. Since 1986 and the mine closure, the existing plant has operated at roughly 50% capacity. Current studies show that the site could support reliable generation with an installed capacity of over 50 MW, potentially up to 74 MW, with virtually no modifications to the basin. The Taltson Expansion Project at 54 MW would therefore represent a much more optimized utilization of the energy resource naturally available at Twin Gorges. The net benefits from the expected additional disturbance are far greater than would be expected from the development of a new power source with no historical disturbances.

3.3.2 Social

Ownership

The ownership structure, comprised of the Akaitcho First Nation, Métis Nation, and NTEC, provides unique opportunity for collaboration and cooperation among the Aboriginal Nations of the region. The Project has potential to build common interests and working ties among the Aboriginal groups. By undertaking a joint venture between a Crown corporation and Aboriginal Nations the Project builds trust and may introduce opportunities for similar undertakings in the future in the Northwest Territories.

Socio-Economic Benefits

The Taltson Expansion Project is a business venture designed to be completely self-supporting and ultimately bring acceptable economic returns to the Project owners. While initially requiring a large capital expenditure and necessary debt structure, the debt arrangement is designed to be paid down through energy sales to the existing customers over relatively conservative (short) assumptions of mine life. As this debt is repaid, and cash flows from electricity sales continue to be realized, revenue in the form of profit would flow to the Project owners. If new customers are found to replace those currently identified, even higher returns could be expected.

Over the longer term, this Project offers an extremely attractive and stable source of revenue to all of the Project owners. In addition, the employment of trades people during the three year period of construction would generate opportunities for residents of the North and South Slave areas. The Project would also employ skilled staff during operations – providing yet further opportunities for those seeking longer-term employment.

3.3.3 Economic

Life Extension of Existing Twin Gorges Power Station

The existing power generation facility at Twin Gorges is over 40 years old, and the storage structure at Nonacho Lake 38 years old. The latter are likely to need to be replaced in the near future. The Taltson Expansion Project includes, in addition to the expansion requirements, minor and non-material refurbishment of the generation infrastructure at the Twin Gorges plant, as well as the complete replacement of the structure at Nonacho Lake, thereby improving operations and reliability of the existing plant.

Long-Term Infrastructure Development

Both the generation plant and transmission line would have life spans far in excess of the current diamond mine operational lives as estimated by their owners. The reduced operating costs of the mines through the use of hydroelectricity may extend mine lives well beyond the present life-plans.

The additional potential Project capacity coupled with the available energy upon mine closures could be a major economic driver in the development of other industries in proximity to the line route and in the Slave Geologic Province. The infrastructure could be an energy corridor for the Northwest Territories. Power could also be available to Yellowknife or potentially to southern customers, subject to regulatory approvals.

Local and Regional Economics

Construction of the Project would generate considerable employment and business opportunities in the Northwest Territories, both in the economically depressed South Slave region and in all communities around Great Slave Lake.

Although a large construction project, it is considerably smaller than other construction projects in the Northwest Territories. Long-term employment would be minimal with benefits being realized through the ownership structure; therefore, the Project would not bring the acute social and infrastructure ills associated with major development projects.

3.4 Load and Energy Balance Feasibility

The Taltson Expansion Project as currently envisaged is sized to supply the current estimated load profiles, with a provision for additional generation capacity should profiles change or new customers come on-line. The plant design, economic viability and financial considerations are based on the energy requirements of the four diamond mines (existing and imminent). The anticipated capacity and annual energy requirements are compared to expected plant output in Table 3-1.

During the engineering and hydrological assessments conducted as a component of pre-feasibility investigations, it was determined that additional hydrological resources would be available in addition to that required to provide power to the four mines. The Project, therefore, identified the potential to optimize the hydrological resource of the Taltson watershed, should additional power needs be identified in the future. As this potential for additional power is uncertain due to continually changing load profiles of the mines or potential new customers, the load and energy balance used for Project design and costing is based only on the current requirements of the mines, with a provision for increased capacity.

This current design situation represents customer feedback at the time of discussion (2005/2006), and can change as mine expansion programs come into place, as for instance is currently occurring at Diavik. It is likely that additional capacity and energy, potentially available from the Expansion Project, would be marketable.

As of this submission, the Project sizing (existing plant capacity plus new capacity) for the Twin Gorges site at 54 MW meets the current forecast peak loads from the four mine sites. The plant capacity is slightly higher than the anticipated load to account for line losses in the transmission system. The transmission line is designed for a load of 275 MW and is not a capacity limitation. Line losses are discussed in Section 11.8.

Based on the hydrological assessment, it has been determined that optimizing the available resource could generate up to 74 MW of power at an acceptable capacity factor of 77%. This difference between the current forecast peak loads and the available hydrological resource could provide for potential future customer demands.

As shown in Table 3-1, the current annual energy requirements from the four diamond mines combined with the existing customer base is approximately 420 GWh. The planned average annual generation from the Expansion Project as currently designed, allowing for some forced outage, is 420 GWh/year, with a reliability factor (percentage of time that the production target is reached or exceeded) of approximately 90%. This level of delivery reliability is attractive to the mine customers, where normal operations typically require continuous firm power delivery. In actual fact, because of the hydrological uncertainty, the energy delivery from the Project would likely need to be structured in “tiers” representing differing levels of reliability such that expectations on delivery would be met for each customer.

Table 3-1: Annual Generation Load and Energy Summary

Customer	Peak Load (MW)	Annual Energy Requirements (GWh)	Load Available Date	Load Lifetime
Forts Smith, Resolution, Fitzgerald/Hay River	8 – 13	65	Immediate	Indefinite
Ekati Mine	11	100	Immediate	2015
Diavik Mine	9	75	Immediate	2022
Snap Lake Mine	12-14	100	2007	2027
Gahcho Kué Mine	10	80	2011	2030
Other Markets	All Surplus	All surplus	2015	Indefinite
Total Load	**50–57**	**420**		

Note: Mine energy requirements and load profiles subject to change to meet operational needs.

To cover hydrological variability and both scheduled and unscheduled outage periods of the hydropower and transmission system, all mine customers would require backup diesel generation operationally ready in accordance with at least their minimum operational and heating requirements. Shutdowns in the hydropower supply system would trigger diesel start-up and load transfer through an automatic transfer switch.

As the mines close, with Ekati mine currently expected to complete operations first, generation capacity would become available to new customers or new markets. These could be in the form of new mines, additional draw by the remaining customers, or construction of other transmission facilities to link a new market to the Project. The current financial forecast and business case does not depend on further customer base becoming available as the diamond mines close.

3.5 Economic Viability

The mandate of the development team and the Project owners has been to evaluate the viability of the Taltson Expansion Project as a transparent business venture with risk/reward structures comparable to other major private infrastructure projects. The economic viability of the Project is therefore being tested with up-to-date and realistic financial models on financial structure terms that reflect the private finance market. The possibility of a Territorial Government backstop (but no funding) on some aspects of the financial structure remains under review, and no commitment has yet been established on this issue. Ultimately, the economic viability and the need for government backstops would be dependant upon the contract quality of the Power Purchase Agreements negotiated with the diamond mines.

Key to the viability assessment is accurate hard cost estimates for all of the Project components, and a realistic development schedule. These estimates were first completed in 2004 and updated in mid-2006 to account for inflation in commodity prices and labour, and to include the most recent Project technical requirements. Within the hard costs, reasonably significant contingencies are carried (typically in the range of 15% overall) to account for unknowns, delays, and other design and construction risks. This level of contingency is fairly standard for hydropower projects of this nature. The direct or hard cost estimates are exclusive of certain forms of contract-specific costs, which are generally carried in the financial model.

The current financial assessment results are confidential information. However, the most recent modelling clearly indicates that, with the current set of baseline assumptions and expected rates of return, electrical energy delivery from the Taltson Expansion Project can be made to all of the mine sites at prices below their anticipated marginal cost of production through diesel generation. As there is little long-term inflationary risk associated with hydropower generation, these delivery prices are also be expected to be very stable over time, a factor that is extremely attractive to the mine customers.

The difficulty is looking forward to the conditions actually in place as the Project moves into construction. Hard cost estimates are based on current commodity and supply quotations, which have escalated substantially between 2004 and 2006. However, once capital costs are ascertained, little or no volatility would remain in the price of hydroelectricity going forward. This is in stark contrast to the price uncertainty common to North American petroleum markets, and in fact is one of the main commercial selling characteristics of the Expansion Project.

4 COMMUNITY PROFILES

4.1 Demographic Overview

Broadly speaking, the South Slave region of the Northwest Territories consists of the communities of Lutsel K'e, Fort Resolution, Hay River, and Fort Smith. Most of the Aboriginal residents of the region are descendents from the Chipewyan, part of the broader Dene (Northern Athapaskan) linguistic group. As shown in Table 4-1, in 2005 this area had a total population of approximately 7,457 persons of which approximately 60% were Aboriginal (GNWT, 2007). As the age distribution shown in Table 4-2 demonstrates, a large proportion of the population in the South Slave region is clustered around the 25-59 year old cohort, indicating that nearly 51% are either already in, or are currently entering their prime working years (GNWT, 2007).

Table 4-1: South Slave Population by Community

Community	Total Population	Aboriginal	% Aboriginal
Fort Smith	2,385	1,413	59.3
Lutsel K'e	414	389	94.0
Fort Resolution	534	469	87.8
Hay River Reserve	299	299	100.0
Hay River	3,825	1,746	45.7
Total	**7,457**	**4,316**	**57.9**

Table 4-2: South Slave Population Distribution by Age

Community	Population Distribution (%)			
	<10 Yrs	10 – 20 Yrs	25 – 59 Yrs	>60 Yrs
Fort Smith	13.08	24.23	51.99	10.69
Lutsel K'e	19.08	21.98	50.24	8.70
Fort Resolution	12.92	25.84	44.94	16.29
Hay River Reserve	16.05	30.10	44.82	9.03
Hay River	14.43	24.78	51.29	9.49
Average	**14.21**	**24.74**	**50.74**	**10.30**

As illustrated in Figure 4-1, the proportion of the South Slave population holding at least a high school diploma has been trending upward over the past decade. However, despite this, the average still lags behind the both that of the Northwest Territories as well as for Canada as a whole. Moreover, despite the fact that the growth rate in educational attainment rates across Canada have accelerated sharply since 2001, the rate for the South Slave has failed to keep pace. Table 4-3 illustrates the educational attainment levels across all South Slave communities; across the Northwest Territories; and across Canada as a whole. As of 2004, the proportion of South Slave residents who had at least a high school diploma was 55%, compared with a 68% rate for the Northwest Territories and 81% across Canada as a whole (Figure 4-1 or Table 4-3) (GNWT, 2007). Table 4-3 also demonstrates that if the smaller communities are excluded, the level of educational attainment in the larger centers, such as Fort Smith and Hay River, more closely approaches the Canadian average (GNWT, 2007).

Figure 4-1: Educational Attainment Gap

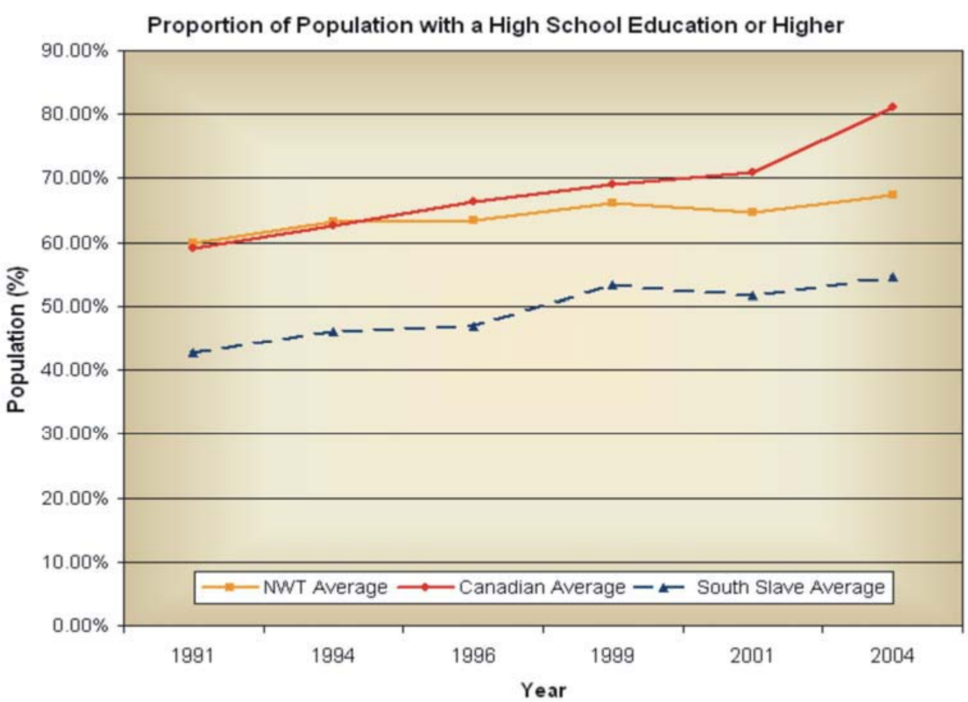


Table 4-3: Proportion of Population holding a High School Diploma or Higher

Community	Year					
	1991	1994	1996	1999	2001	2004
Fort Smith	63.30%	61.60%	66.00%	70.70%	69.30%	74.40%
Lutsel K'e	37.80%	32.70%	28.60%	45.90%	40.00%	38.30%
Fort Resolution	33.80%	34.40%	45.90%	39.30%	44.60%	46.30%
Hay River Reserve	17.90%	36.70%	30.30%	39.00%	37.10%	44.10%
Hay River	61.30%	64.30%	64.00%	71.20%	67.30%	70.00%
South Slave Average	42.82%	45.94%	46.96%	53.22%	51.66%	54.62%
NWT Average	59.90%	63.20%	63.50%	66.10%	64.80%	67.50%
Canadian Average	59.05%	62.72%	66.26%	69.00%	71.00%	81.00%

The South Slave region in general has a traditional economy, valuing sustainable wildlife harvesting such as hunting, fishing and trapping. As shown in Table 4-4, levels of traditional activity in 2004 revealed nearly 50% of the population hunted or fished with 20% also involved in trapping (GNWT, 2007). Higher levels of traditional activity generally tend to be associated with smaller communities such as Lutsel K'e and Fort Resolution.

Table 4-4: Levels of Traditional Activities in 2004

Community	Hunting	Trapping
Fort Smith	33.30%	8.00%
Lutsel K'e	73.60%	36.70%
Fort Resolution	53.30%	36.70%
Hay River Reserve	37.70%	12.70%
Hay River	26.40%	2.20%
South Slave Average	44.86%	19.26%
NWT Average	36.70%	4.90%

4.2 Economic Overview

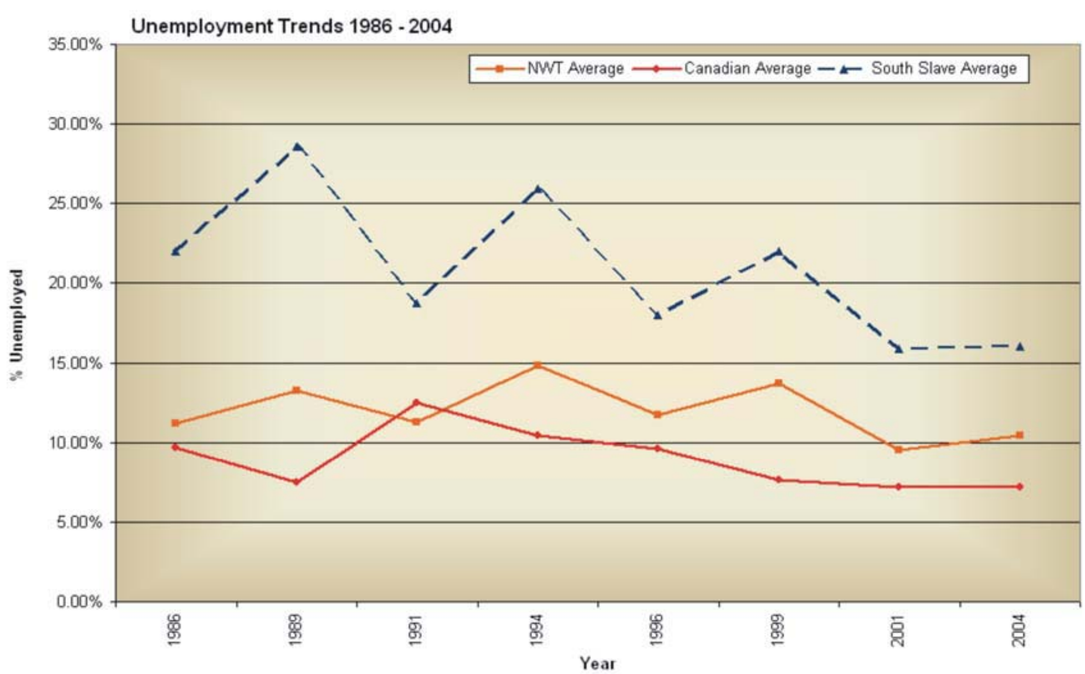
Much like the Northwest Territories as a whole, a large proportion of jobs in the South Slave are concentrated in public sector services such as government, heath, and education. As can be seen in Table 4-5, this pattern is particularly pronounced in the smaller communities in the region, with public sector employment reaching nearly 60% in the community of Lutsel K'e

(GNWT, 2007). Consequently, the South Slave region lacks the economic diversification that enables stable and predictable economic performance. Characterized by this lack of economic diversification and continually struggling with the lack of employment demand, the labour market of the South Slave has consistently under-performed relative to the Northwest Territories and Canada as a whole for at least the past decade (Figure 4-2).

Table 4-5: Employment Composition

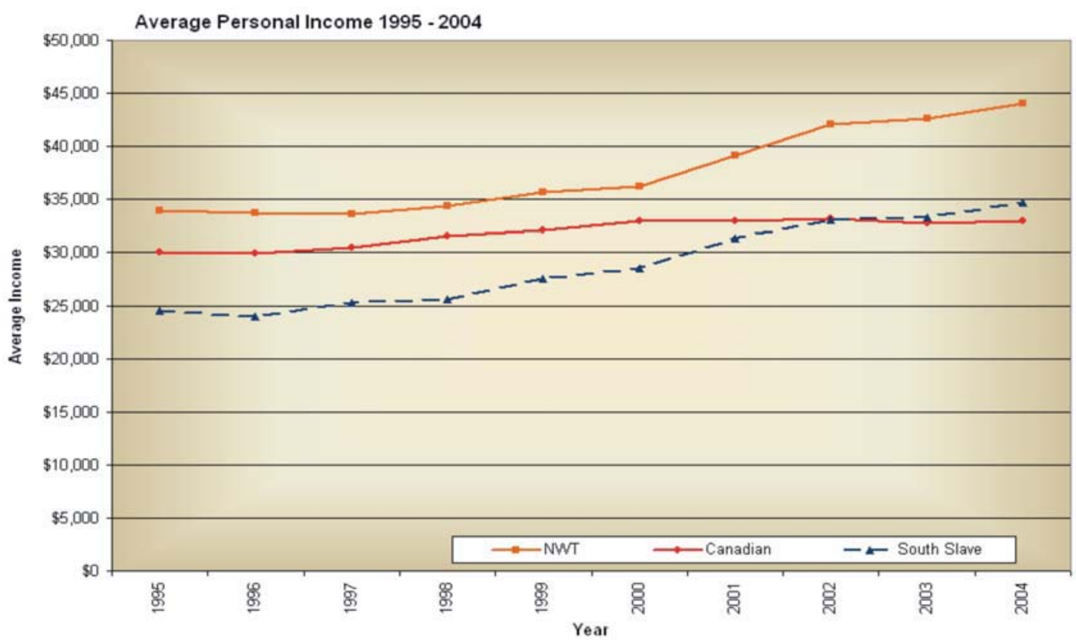
Community	Government, Health, Education (%)	Goods Production (%)	Other Industries (%)
Fort Smith	47.80%	14.50%	35.40%
Lutsel K'e	57.90%	18.30%	16.50%
Fort Resolution	50.30%	16.80%	23.80%
Hay River Reserve	46.80%	10.60%	28.70%
Hay River	34.20%	15.10%	45.50%
South Slave Average	47.40%	15.06%	29.98%
NWT	41.70%	16.30%	37.80%

Figure 4-2: Unemployment Trends – South Slave, NWT and Canada (1986 – 2004)



As illustrated in Figure 4-3, personal income in the South Slave, as well as throughout the Northwest Territories and Canada has generally shown an increasing trend between 1995 and 2004 (GNWT, 2007). Even so, average personal income levels in the South Slave were significantly lower in comparison to levels observed in other localities across the Northwest Territories. This gap likely reflects the lack of private sector job opportunities, which tend to pay higher than equivalent work in the public sector.

Figure 4-3: Average Income Trends NWT, Canada, South Slave



Overall, the data suggests the South Slave region has generally lacked the private sector opportunities required for the development of healthy and sustainable economic growth. Other Northwest Territories communities have benefited from private sector opportunities such as the current diamond mining boom in the north of the Territories; from development opportunities surrounding the proposed Mackenzie Valley Gas Project; and, in prior years, from the economic stimulus of the gold mining industry in the North Slave. Being geographically isolated, and therefore predominantly outside the zone of influence created by these private sector opportunities, the South Slave region has not received the same extent of benefits including increased employment opportunities, sustainable income, and improved services and infrastructure. Other benefits forgone include those that are associated with improved health and well being, community cohesion, and lifestyle.

4.3 Socio-Economic Environment

Although the Taltson Hydro Expansion Project is relatively small by conventional energy sector standards, it is nonetheless a substantial undertaking in the Northwest Territories. The type, amount, and duration of benefits that flow from the Project are therefore contingent on the phase of the Project under consideration. During the three year construction phase, direct benefits would primarily consist of relatively short term employment and business opportunities for local residents of the South Slave region. Once the plant is operational, direct and indirect benefits would arise, as a result of the introduction of a long term sustainable revenue source, into a region that has historically been characterized by a lack of economic diversity as well as economic development and growth.

Perhaps the most significant effects would be from the ownership of the Dezé Energy Corporation. The long-term economic returns of the Project to the Akaitcho and Métis governments would provide considerable opportunity for the Aboriginal communities of the South Slave to advance toward self support and sustainable economic development through increases in employment opportunities, sustainable income, community infrastructure as well as education and training.

Ownership of the Dezé Energy Corporation no only results in direct economic benefits from the Project, but owning the capital asset – the Expansion Project infrastructure – can be used to leverage the development of community infrastructure and initiatives that are cornerstones for building and maintaining sustainable communities. This indirect effect has considerable potential to benefit community health and well-being, enable traditional life-style choices, and strengthen community cohesion.

5 CONSULTATION

5.1 Community Consultation

Local government and community consultation for the Expansion Project commenced in 2002 and 2003 through formal meetings with the leadership of the Akaitcho First Nations (Salt River First Nation, Smith's Landing First Nation and Deninu Kué First Nation) and the Northwest Territories Métis Nation (locals in Fort Smith, Fort Resolution and Hay River). These meetings were followed in 2004 with public information sessions in the communities of Fort Smith, Fort Resolution and Hay River. Although Project dialogue was in progress with Lutsel K'e at that time, a community information session did not materialize. Translation services were offered in all communities.

The communities visited generally supported the Expansion Project, although community specific concerns were raised. Specific concerns included:

- Past impacts or 'wrongs' associated with the original Taltson Twin Gorges project and its operations;
- Increased information regarding current operations' impacts on water levels, ice conditions and trapping;
- The need for censuses among Aboriginal communities and groups with respect to the level of participation and the Project development;
- Potential benefits and business opportunities; and
- Environmental impacts.

With the development of the Dezé Energy Corporation, renewed interest by the mines for hydro power, and advanced development of pre-feasibility design of the Expansion Project, further community consultation, including Lutsel K'e, would re-commence in early 2007 and would continue throughout Project pre-feasibility, environmental assessment, detailed design, and construction. Community interest, Project areas of concerns, and general and specific feedback would be discussed and documented for inclusion in the Project design.

5.2 Aboriginal Government Consultation

The development of the Expansion Project concept began in 2002 with discussions involving the Akaitcho Territory Government, Northwest Territories Métis Nation and the NTEC. These discussions ultimately lead to the signing of the MOU that established a framework to work together to maximize the production of the existing power plant and to potentially further develop hydroelectric resources of the Taltson River. This was a significant step towards a consensus approach with respect to Project participation, development, and benefits.

In October 2006 these partners formalized the first part of the MOU with the formation of a Memorandum of Intent (MOI) followed by the formation of a new corporate entity, the Dezé Energy Corporation. The purpose of the Dezé Energy Corporation is to enable the partners to work together with a common mandate to pursue mutually beneficial interests, including environmental and cultural protection as well as economic benefits, in the development and operation of the Expansion Project. The Dezé Energy Corporation Board of Directors has equal representation from the Akaitcho and Métis governments as well as the NTEC.

5.3 Territorial and Federal Government Consultation

The concept of the Expansion Project has been discussed over the past few years with various Territorial and Federal Government agencies. More recently, in 2005, NTEC met informally with representatives of the Mackenzie Valley Environmental Impact Review Board and Land and Water Board, GNWT departments (Industry, Tourism & Investment-ITI and Energy and Natural Resources-ENR), and Federal government departments (Department of Fisheries and Oceans-DFO and Environment Canada-EC), to reintroduce the Project and to discuss potential interests and issues. The interests put forth by the agencies would be considered in the Project design and assessment studies.

In 2006, representatives of the Project Owners and their design team met with the MVEIRB and presented to the Board an update on the Project development, including the ownership structure, design advances, and anticipated assessment schedule.

Government consultation is anticipated to increase in 2007 with the development of environmental assessment terms of reference and strategic study designs aimed at advancing the Project into the assessment process. The Project owners would develop working relationships with the various agencies that have interests in the Project to incorporate their knowledge and department policies and strategies into the Project development, and to ensure these interests are appropriately addressed.

6 TRADITIONAL KNOWLEDGE

Due to the unique ownership structure of the Expansion Project, and ownership values that include protection of the land, Traditional Knowledge (TK) was identified during the conceptual stage of the Project as an important component to be incorporated into Project design, impact prediction, and impact mitigation. Therefore, in 2003, in consultation with the Aboriginal communities, a method and scope for gathering and incorporating TK into the Project was established. The method involved the participation of an independent third party TK Facilitator, who was designated to work with local Aboriginal governments to establish TK committees and research teams, and to identify potential Elders to consult.

The initial steps of the TK study were undertaken in March 2004 with a meeting of Fort Smith local Dene and Métis leaders. A draft Terms of Reference was discussed that outlined roles, responsibilities, and authorities for the TK study.

Upon completion of the initial meeting and of TK Facilitator consultation with other Aboriginal government representatives, the Aboriginal governments and communities indicated that an alternate method to incorporate TK into the Project would be preferred. Based on this feedback, dialogue was re-initiated with Aboriginal community leaders in regards to the preferred method to gather and incorporate TK into the Project.

Aboriginal leaders proposed a self-directed approach to TK in terms of the method for compilation of information as well as disclosure of TK towards design, impact prediction, and mitigation, as some information would be better maintained in confidence. This approach would enable the communities to design a method that best suited their individual community characteristics and share only TK that they feel is necessary for Project consideration.

To accommodate this proposal, NTEC, prior to the creation of the Dezé Power Corporation, discussed with the Akaitcho and the Métis government representatives their individual planned approaches. In addition, NTEC requested specific topics be included in the TK study, which they felt were potentially relevant to the Project and important for consideration. These included topics such as traditional winter travel routes and specific traditional land use areas.

The communities developed their individual TK study plans in 2005 and 2006, and commenced the plan studies with the community members and elders in 2006. The studies are presently on-going. Once the Akaitcho and Métis advise the Dezé Power Corporation of study completion, meetings would be arranged to discuss the TK that the leaders and communities determine is relevant to the Project. The TK would then be integrated into the Project planning and impact assessment to the fullest extent possible.

7 REGULATORY PROCESS

7.1 Regulatory Process Overview

The Expansion Project is located entirely within the Mackenzie Valley regulatory regime as defined by the *Mackenzie Valley Resource Management Act* (MVRMA). The MVRMA implements provisions of Land Claim Agreements and establishes co-management boards as institutions of public government. Regional Land and Water Boards regulate the use of settlement and Crown land and water use in their respective settlement areas.

Within the unsettled claim areas of the Northwest Territories and for developments that may affect more than one settlement area, or whose effects may extend beyond the Mackenzie Valley, the Mackenzie Valley Land and Water Board (MVLWB) regulates the use of land and water.

The Mackenzie Valley Environmental Impact Review Board (MVEIRB) is established under the authority of the MVRMA to review the potential environmental effects of projects proposed within the Mackenzie Valley area of the Northwest Territories. The Canadian Environmental Assessment Act (CEAA) applies only in Wood Buffalo National Park and the Inuvialuit Settlement Area, both outside of the Project boundaries.

The Taltson Expansion Project involves a number of distinct undertakings and activities, requiring key licences, permits and authorizations from a variety of federal, territorial, and co-management agencies. Table 7-1 provides a preliminary list of potential permits, licenses, and authorizations that may be required.

The application for a Class A Water Licence and Land Use Permit application for the new facility and transmission line are anticipated to initiate a Preliminary Screening by the MVLWB and may be referred to the MVEIRB for an Environmental Assessment. In addition, the changes in flow volumes in Trudel Creek may require an authorization under the Federal Fisheries Act. The Twin Gorges canal, Nonacho Lake control structure, and the spanning of water bodies by the transmission line are expected to require federal Navigable Water Act permits, which also trigger a Preliminary Screening under the MVRMA.

A discussion of three key approvals expected for the Project, namely Land Tenure, Water Use Licence, and Authorization for Harmful Alteration, Disturbance or Destruction of fish habitat are discussed in further detail below.

7.2 Land Tenure

7.2.1 Land Lease and Licence of Occupation

The mandate of the Indian and Northern Affairs Canada (INAC) Land Administration Division is to manage land in the Northwest Territories by virtue of the Territorial Lands Act; in particular the Territorial Land Regulations, the Federal Real Property, and Federal Immovables Act and subsequent regulations. As the Expansion Project would be located entirely on Crown Lands, tenure pursuant to the above-noted legislation would be required.

A Licence of Occupation is usually of short duration and does not allow assignment (transfer) of the licence. The difference between a licence and a lease is that a licence is a personal right, is not an interest in land, and therefore may not be securable by a bank, is not assignable, not exclusive, and is revocable. A lease is an interest in land, is exclusive, is assignable under certain circumstances, and is normally acceptable for security by chartered banks. Portions of the Project, such as the transmission line may be administered under a lease, whereas other components such as the temporary winter roads may be administered under a Licence of Occupation.

7.2.2 MVLWB Land Use Permit

Land use activities are the sole criteria used to determine which type of permit is issued. Threshold limits for Type A (larger developments) and Type B (smaller developments) Land Use Permits are laid out in the Mackenzie Valley Land Use Regulations: Appendix A - Land Use Permit Process Paper. The types of land use activities used to assess permit type include: use of explosives, use of heavy machinery or vehicles, drilling, storage of fuel, use of bulldozer, clearing and grading of trails, campsites, construction and use of hydraulic prospecting equipment. This Project would be considered a larger development based on these land use activities; therefore, a Type “A” Land Use Permit would be required.

7.3 MVLWB Water Use License

The Expansion Project would require an amended Class “A” Water Use Licence from the MVLWB. The amended water licence would supersede the current NTPC Water Licence issued initially by the Northwest Territories Water Board and now residing with the MVLWB. The amended Class A Water License would contain terms and conditions that govern the design, construction and operations of various Project activities and engineered structures including dams and impoundments, drainage systems, surface runoff capture systems, water effluent and water usage.

7.4 DFO Authorization

Section 35 of the Fisheries Act prohibits any person from carrying out a work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat unless the work is authorized by the Minister or under regulations made by the Governor-in-Council under the Act. A Section 35 Authorization is the most common type of authorization issued by DFO with respect to land-use and development impacts on fish and fish habitat.

Project activities that may require authorization under the Fisheries Act include the following.

- Construction of the North Gorge and intake structure;
- Construction of a new instream control structure and maintenance of existing structure at Nonacho Lake; and
- A reduced flow in Trudel Creek.

Transmission line construction, a relatively low risk activity due to the proposed construction methods, may be administered under the existing Operational Statement for Overhead Line Construction.

Table 7-1: Potential Project Permits, Licenses and Authorizations

Permit Approval	Legislation	Activity	Agency
Planning, Design, and Environmental Assessment Phase			
Land Use Permit	*MVRMA*	Site clearing, ROW clearing location of camps, facility locations, all land use operations.	Mackenzie Valley Land and Water Board
Water License	*NWT Waters Act, MVRMA*	Water use and water disposal at camps	Mackenzie Valley Land and Water Board
Archaeological Research Permit	*Heritage Canada* *NWT Archaeological Resources Act*	Archaeological research and investigations	Heritage Canada Prince of Wales Northern Heritage Centre, GNWT
Scientific Research Permit	*NWT Research Act* *NWT Wildlife Act*	Conduct of research and wildlife studies in support of environmental assessment	Aurora Research Institute; GNWT Environment and Natural Resources
Construction Phase			
Land Use Permit	*MVRMA*	Site clearing, quarry access, road construction, all operations involving land use	Mackenzie Valley Land and Water Board
Quarry Permit	*Territorial Lands Act*	Quarrying of materials	DIAND
Authorization or Letter of Advice for Works or Undertakings Affecting Fish Habitat	*Fisheries Act*	Works potentially affecting fish habitat (in water structure construction water storage and flow regulation)	Fisheries and Oceans Canada
Permit for construction within navigable waters	*Navigable Waters Protection Act* *Navigable Waters Works Regulations*	Construction of structures across or over navigable water bodies	Canadian Coast Guard Fisheries and Oceans Canada
Water License	*NWT Waters Act* *MVRMA*	Water use and waste disposal, water storage and flow regulation, construction of instream structures greater than 5 m in length	Mackenzie Valley Land and Water Board
Explosives Magazine Permit Temporary Blasting Permit	*Explosives Act*	Temporary storage of explosives at lay down and work areas	Natural Resources Canada
Timber Permit	*NWT Forest Management Act* *MVRMA*	Cutting of timber clearing, water impoundment areas	GNWT Environment and Natural Resources; Mackenzie Valley Land and Water Board
Operations Phase			
Lease or Title	*Territorial Lands Act*	Land tenure for constructed facility	DIAND
Water License	*NWT Waters Act* *MVRMA*	Water storage and flow regulation	Mackenzie Valley Land and Water Board
Land Use Permit(s)	*MVRMA*	Maintenance activities not covered under lease or title	Mackenzie Valley Land and Water Board

8 TALTSON RIVER BASIN AND EXISTING TWIN GORGES POWER DEVELOPMENT

8.1 Location

The Taltson River basin is a relatively large drainage area of approximately 60,000 km^2 located between Lake Athabaska and Great Slave Lake and west of the Thelon River drainage (Figure 8-1). The basin comprises a relatively complex system of interconnected lakes, draining generally southwest from the higher elevation Canadian Shield area and then northwards along, and eventually into, the Slave River lowland zones. The river enters Great Slave Lake on its southern shore at the western end of the Simpson Island chain. Two main tributaries form the lower Taltson River on which the existing generation facility was developed – the mainstem Taltson River and the Tazin River. The characteristics of the basin are described in more detail in Section 8.3.

8.2 Development History

Along with a number of other rivers in the region, the Taltson River was investigated for power development potential on a number of occasions in the past, and became the focus of the Northern Canada Power Commission (NCPC) in the early 1960's as a means to support the operation of the proposed Pine Point mine near Fort Resolution. In 1952 a flow gauging station was installed on the river immediately below Tsu Lake, although data collection was not consistent. Following that, in 1962, the water level gauging was installed on Nonacho Lake, a large lake in the upper Taltson River mainstem.

The existing power generation facility was constructed in 1964-1965 at what was a natural falls on the river, known as Twin Gorges, located approximately 60 km northeast of Fort Smith, and 30 km upstream of Tsu Lake on the Taltson River. The facility was sized to match the anticipated mine and a small amount of customer load, and were not developed to maximize either the available head or the available flow from the site. The Taltson Twin Gorges facility delivered energy to the mine through a 115 kV single circuit transmission line that connects the existing plant and the former mine site area through Fort Smith. The facility is shown in Figure 8-2.

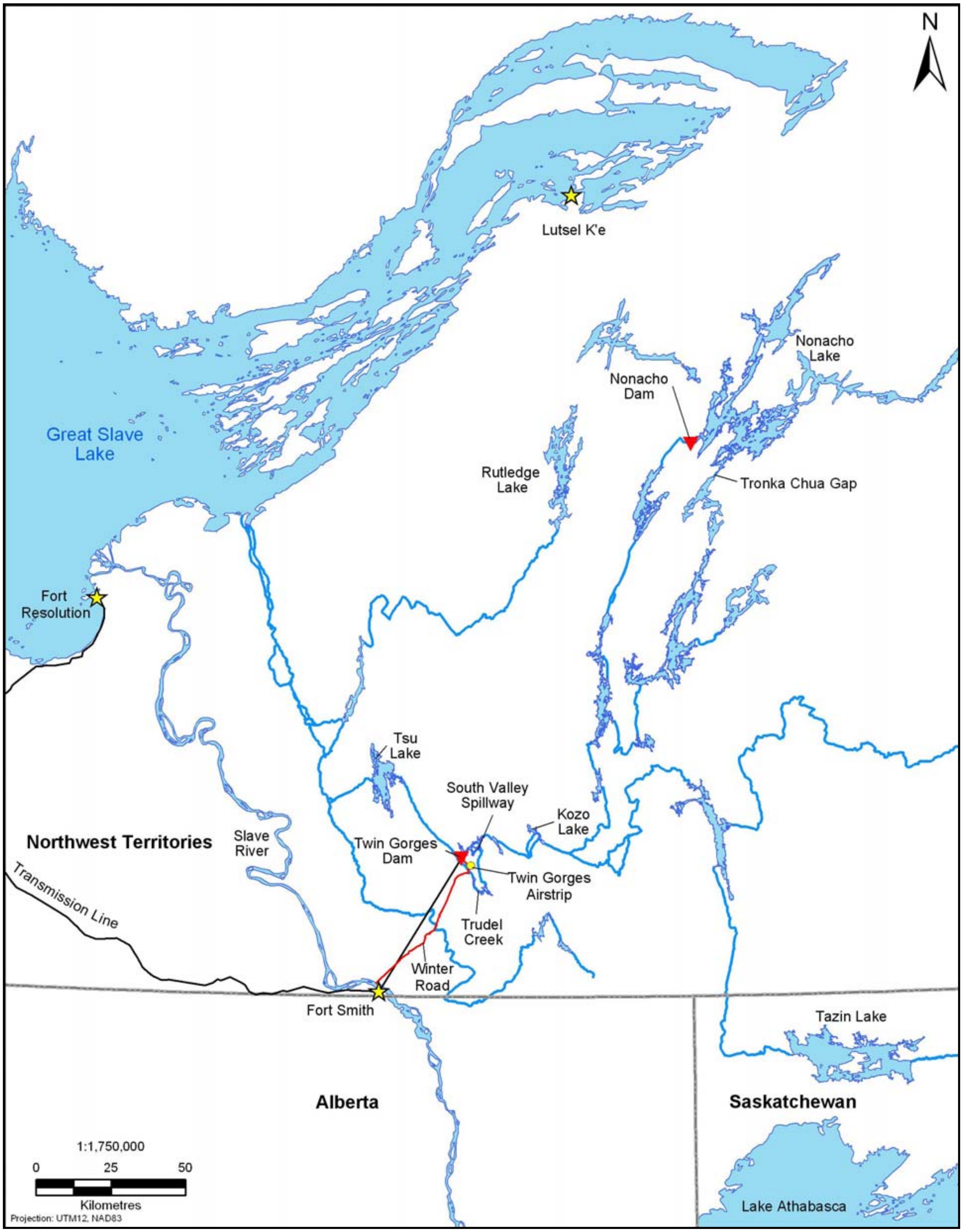
As is typical of mine processing, the power was required on a continuous basis, and the facility was required to run at near capacity output (18 MW) year-round once the mine was in full operation. To support winter generation when natural river lows sometimes tended to decrease below winter generation requirements, a rock dam, gated undersluice, and overflow spillway were constructed at the outlet of Nonacho Lake in 1968. These structures are approximately 150 km northeast (upstream) of Twin Gorges (Figure 8-2). This simple structure helped regulate the flows from Nonacho Lake into the Taltson River system by allowing storage to occur in the summer and additional releases to be made above the natural flow in the winter.

The Twin Gorges dam that impounds water in the Forebay, upstream of the dam, was developed without a spillway. A concrete weir was constructed across a natural saddle between the original Taltson River and a smaller valley, Trudel Creek, approximately 7 km upstream of the dam. Excess flows not used for generation were and continue to be spilled from the Forebay into Trudel Creek. The structure is called the South Valley Spillway (SVS). Trudel Creek reconnects with the Taltson River at the bottom of Elsie Falls. The arrangement is show in Figure 8-3.

The Pine Point mine operated for approximately 20 years, but was permanently closed and the site reclaimed in 1986. More recently, Hay River and other communities were connected to the existing system through additional lower voltage transmission lines. Since 1986, with only the residential and commercial customers as load, the plant has operated at only 40% to 60% capacity and utilizes only about 25% of the available river flows at the Twin Gorges site.

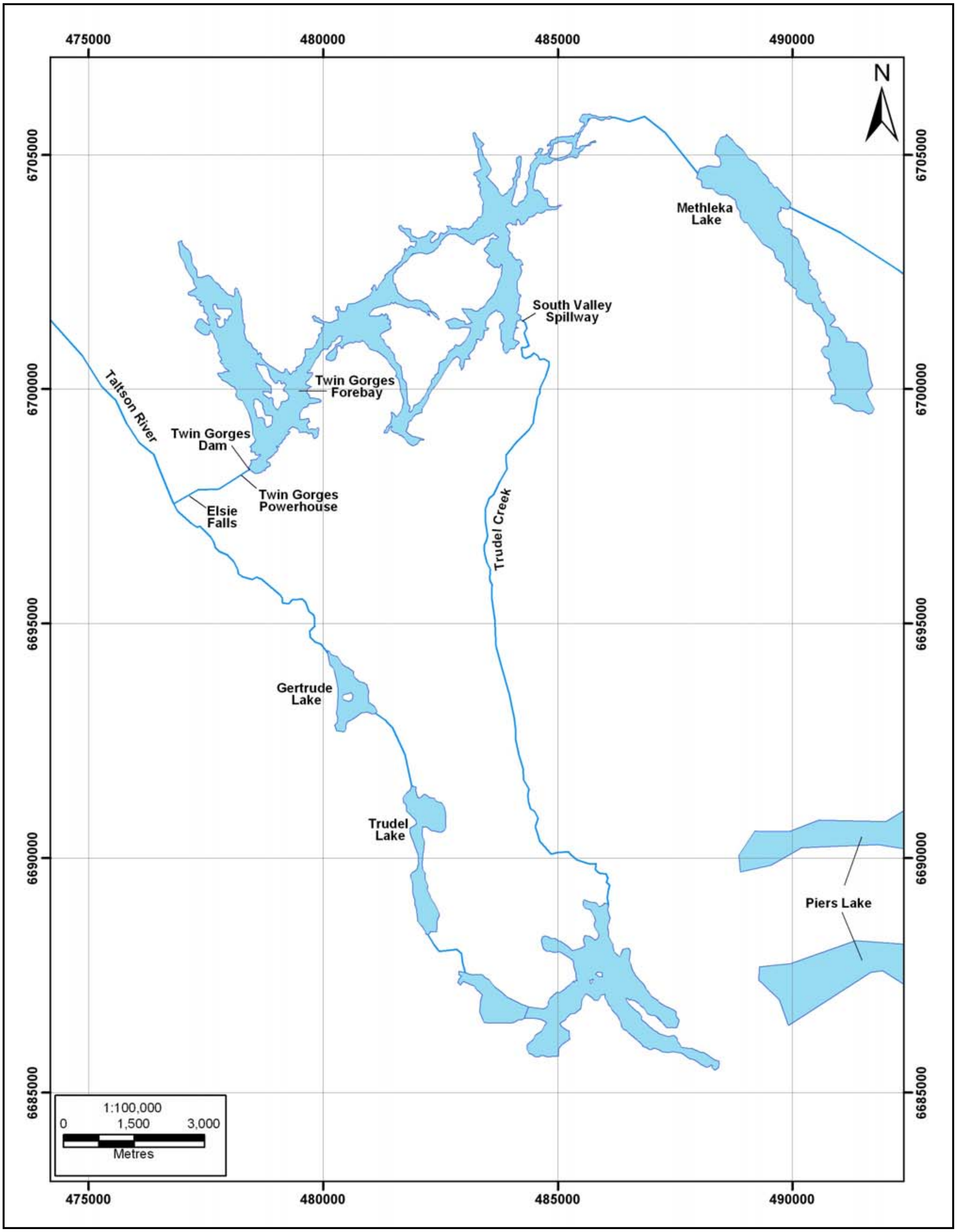
The anticipated electrical load growth in the region currently supplied by Twin Gorges is minimal. This is reflected in the historic load growth across the three communities serviced by the existing plant, which averaged less than 2% per annum.

TALTSON HYDROELECTRIC EXPANSION PROJECT	**PROJECT DESCRIPTION** **MARCH 2007**	**Taltson River Drainage Basin**	**FIGURE** **8 - 1**



Existing Taltson Twin Gorges Hydroelectric Facility Infrastructure

FIGURE 8 - 2



South Valley Spillway and Trudel Creek

FIGURE 8 - 3

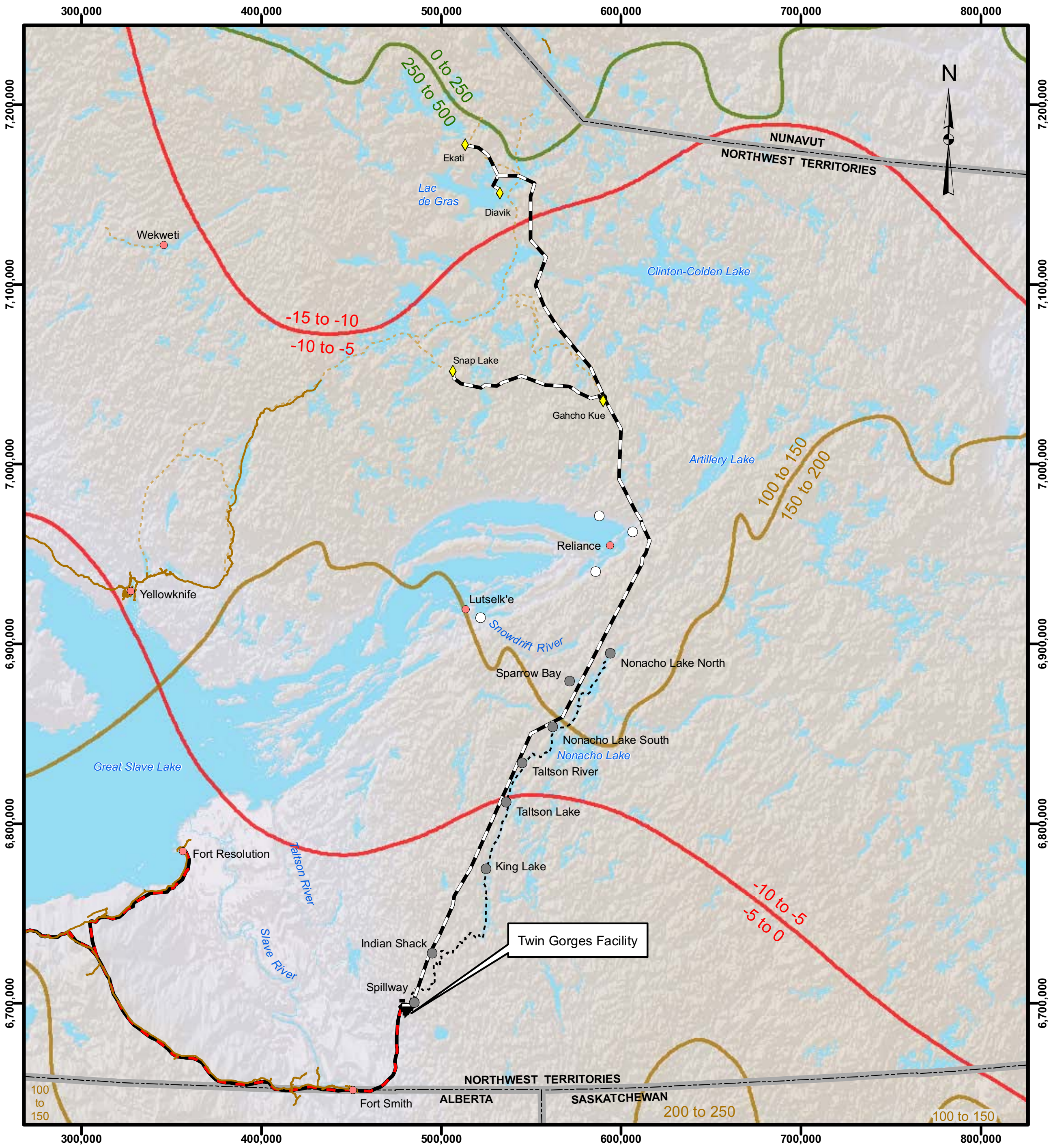
8.3 Current Basin Characteristics

8.3.1 Climate

The closest station with long-term climate records is Fort Smith, 56 km southwest of Twin Gorges. This data is used as representative of climatological conditions in the majority of the Taltson basin, although the basin is further east/northeast and generally higher than Fort Smith. In addition to the Fort Smith station, shorter-term data was used from a number of closer stations although not operating at present.

Annual average precipitation in the basin is likely to vary significantly over the basin area, but is estimated to be on the order of 400 mm. Approximately 50% of the total precipitation occurs as snowfall during the winter season. Wetter months are in the summer, and the driest months are in the winter. Figure 8-4 depicts the annual mean precipitation, snowfall, and temperature for the Project area.

Annual evaporation from open water is estimated at approximately the level of precipitation, or 400 mm. Evaporation plays a significant role in the Taltson Basin due to the large amount of lake surface in the system.



LEGEND

- TOWN
- DIAMOND MINE
- PROPOSED BARGE LOCATION
- PROPOSED LAYDOWN AREA
- PROPOSED WINTER ROAD
- PROPOSED TRANSMISSION LINE
- PROVINCIAL / TERRITORIAL BOUNDARY
- TRANSMISSION LINE
- ALL SEASON ROAD
- WINTER ROAD
- ANNUAL MEAN PRECIPITATION (mm)
- ANNUAL MEAN SNOWFALL (mm)
- ANNUAL MEAN TEMPERATURE (°C)
- HYDROGRAPHY

100 0 100

SCALE 1:3,000,000 KILOMETRES

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Barge, laydown data obtained from Cambria Gordon Ltd, 2006. Hydro data obtained from NTDB, 2005. Climate data obtained from WWF, 2006. Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT

PROPOSED TALTSON EXPANSION PROJECT

BASIN CLIMATE

PROJECT DESCRIPTION
MARCH 2007

FIGURE 8 - 4

Project: I:\2006\06-1328\06-1328-014\Mapping\MXD\Fig_06_Climate.mxd - Plot: I:\2006\06-1328\06-1328-014\Mapping\PDF\Fig_06_Climate.pdf

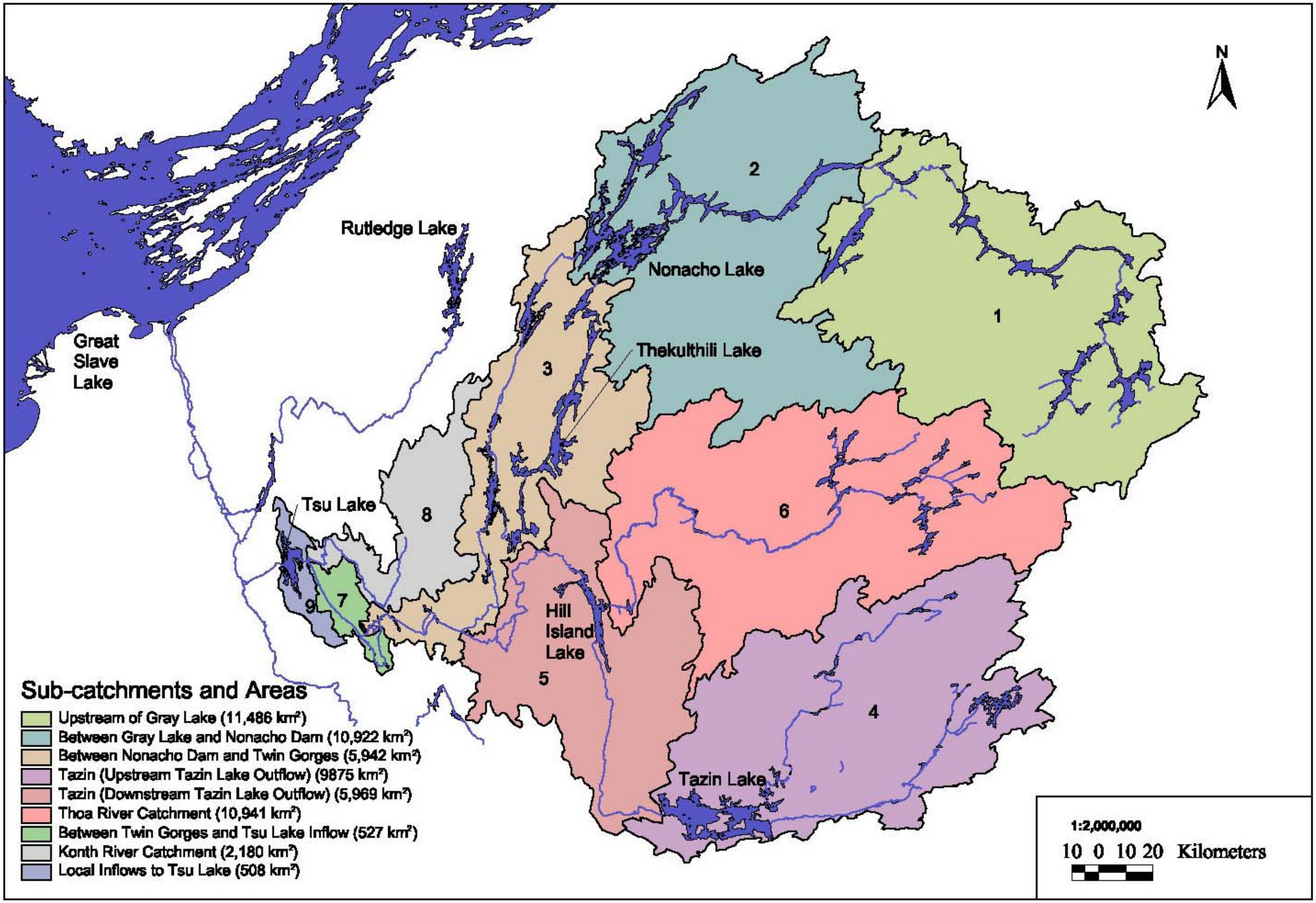
8.3.2 Watershed Description

The Taltson River watershed drains over 58,000 km^2 upstream of Tsu Lake, and has a Mean Annual Discharge of 190 m^3/s at the outlet of Tsu Lake. The watershed area has been divided into major sub-drainages identified in Table 8-1 and shown in Figure 8-5. The headwaters of the mainstem river begin in a series of lakes that drain north and west into Grey Lake, an arm of Nonacho Lake. The Tazin River, a main tributary, drains a large region south of the Taltson River near the Saskatchewan border. The general characteristics of each basin are provided below.

Table 8-1: Areas and Percent Totals of the Nine Major Sub-drainages in the Taltson Watershed

ID	Catchment	Area (km^2)	Percent of Total
1	Catchment upstream of Grey Lake	11,486	23.5%
2	Catchment between Grey Lake and Nonacho Dam	10,922	22.3%
3	Catchment between Nonacho Dam and Twin Gorges Forebay	5,942	12.1%
4	Tazin River Catchment (upstream of Tazin Lake outflow)*	494	1.0%
5	Tazin River Catchment (downstream of Tazin Lake outflow)	5,969	12.2%
6	Thoa River Catchment	10,941	22.3%
7	Local inflows between Twin Gorges and Tsu Lake inflow	527	1.1%
8	Konth River Catchment	2,180	4.5%
9	Local inflows to Tsu Lake	508	1.0%
	Total Catchment (upstream of Tsu Lake - Net)	**48,969**	**100.0%**

* Tazin River Catchment (upstream of Tazin Lake outflow) has an actual catchment area of 9,875 square kilometres, however, approximate 90-95% of the flow from Tazin Lake is diverted south to the Charlotte River (95% assumed for this calculation). Therefore an 'effective' catchment area of 494 square kilometres is being used.



TALTSON HYDROELECTRIC EXPANSION PROJECT	PROJECT DESCRIPTION MARCH 2007	Taltson Basin Watershed Showing Main Sub-Catchments	FIGURE 8 - 5

8.3.2.1 Taltson Mainstem and Nonacho Lake System

The Taltson River mainstem rises in the Thelon/Taltson boundary in a series of lakes in the eastern side of the drainage basin. This system flows generally northwest nearly 170 km before reaching Grey Lake at the eastern end of Nonacho Lake, the largest lake in the basin system. Nonacho Lake has two outlets; the Taltson River and a natural saddle called the Tronka Chua Gap. Discharge from the Tronka Chua Gap flows though a series of moderate size lakes including Thekulthili Lake before draining into Lady Grey Lake and rejoining the Taltson River.

Discharge from Nonacho Lake into the Taltson River flows over 130 km through a complex series of slow-moving, low gradient river-reaches divided by a series of large lakes, short rapids and waterfalls. Plate 8-1 provides a typical view of the Taltson River. Flow dynamics through the system are controlled by lake storage, and flow restrictions (i.e. hydraulic control points) at rapids and lake outflow points.

Plate 8-1: Taltson River downstream of Nonacho Lake

Downstream of Lady Grey Lake, where the Tronka Chua system re-enters, the Taltson River passes through several smaller lakes as it flows the remaining 110 km to the Twin Gorges Forebay. The Tazin River joins the Taltson River within this reach.

8.3.2.2 Tazin River System

The Tazin River rises in the southeast corner of the drainage basin, flowing generally south and then west through northern Saskatchewan before entering Tazin Lake. Flow out of Tazin Lake is controlled by a dam constructed to divert water into the Charlotte River system to operate hydroelectric projects to supply power to the mine at Uranium City. That mine has now been closed, but the three generation plants have been interconnected to the Saskatchewan power grid, and the Tazin Lake water continues to be diverted. It is understood that approximately 90 - 95% of the flow from Tazin Lake is diverted south to the Charlotte River. The diversion effectively removes approximately 9,400 km^2 of area from the Taltson Basin, or about 17% of the total potential drainage area at Twin Gorges.

Except during extreme floods, discharge into the Taltson River basin is therefore limited to the portion of the watershed downstream of Tazin Lake, including the Thoa River.

8.3.2.3 Taltson River Lower Reaches

Water can leave the Twin Gorges Forebay either through the existing Twin Gorges Generating Station, or over the South Valley Spillway, some 7 km east of the generating station. Water passing through the existing generating station flows over Elsie Falls and continues through the Taltson River to Tsu Lake. Flow routed over the South Valley Spillway is diverted through Trudel Creek and flows 33 km in a broad loop to the south before returning to join the Taltson River at the outlet of Elsie Falls.

Downstream of the Twin Gorges facility, the Taltson River enters the Slave Lowland area, and flows a further 33 km from Elsie Falls to Tsu Lake. In this reach, it passes over a number of rapids, through a narrow gorge (Nende Chute), and into Tsu Lake. Tsu Lake receives additional runoff from the Konth River that drains to the northeast. Downstream of Tsu Lake the Taltson flows a further 132 km at low gradient to Great Slave Lake, with tributary flows from Deskenatlata Lake joining the river within this reach.

8.3.2.4 Trudel Creek

Prior to the construction of the dam and South Valley Spillway at the Twin Gorges in 1965, Trudel Creek was normally a small meandering stream interconnecting the three lakes in this reach, with possible connection to the Taltson River mainstem through the natural saddle during periods of higher flows. Since the use of Trudel Creek as the spillway route, additional high flows have been routed into this drainage. In the period when the mine was operating, 1965-1986, and in particular subsequent to the construction of the Nonacho Lake dam in 1968, spill flows were likely minimized, and flows over the South Valley Spillway relatively variable. Since the mine closed in 1986, the flow through the plant has decreased, and approximately 75% of the flow is spilled over the spillway. Trudel Creek has therefore had several distinct flow regimes prior to and since the Twin Gorges project was constructed.

8.4 Existing Power Facility

8.4.1 General

As a result of the Taltson Expansion Project, some of the components of the existing Taltson Twin Gorges facility would experience upgrades. These components with their original development dates are as follows:

- Twin Gorges Site Access (winter road and airstrip) (1964);
- Twin Gorges Dam, Intake, Penstock, Powerhouse and Generation Equipment (1964/65);
- South Valley Spillway (1965);
- Nonacho Lake Dam, Control Gates and Spillway Structure (1968);
- 115 kV Transmission Line to Fort Smith and Fort Resolution (1966); and
- Alterations since original construction (1974/75).

A short description of each of these important components is provided below.

8.4.2 Access to the Taltson Twin Gorges Site

The existing Taltson Twin Gorges site was constructed via the development of two main access components:

- A winter road from Fort Smith overland through a series of interconnected lowlands and lakes from the Slave River to Gertrude Lake; and
- A gravel airstrip located on a large esker approximately 5 km from the Twin Gorges site, immediately above Gertrude Lake.

The winter road has been largely abandoned for over 15 years and the road right-of-way has been extensively altered by beaver and muskrat lodges. The current condition allows only snow machine use in the winter.

The airstrip continues to be a main source of access for the delivery of materials and equipment necessary for operation of the plant. The airstrip is maintained and is open year round. The airstrip can support landing of quite large aircraft (Hercules) but only unloaded takeoff weights for the larger aircraft. In addition to the airstrip, the Taltson Twin Gorges Forebay is used for float plane landings, and a small dock is available for personnel changes and small equipment delivery immediately upstream of the dam.

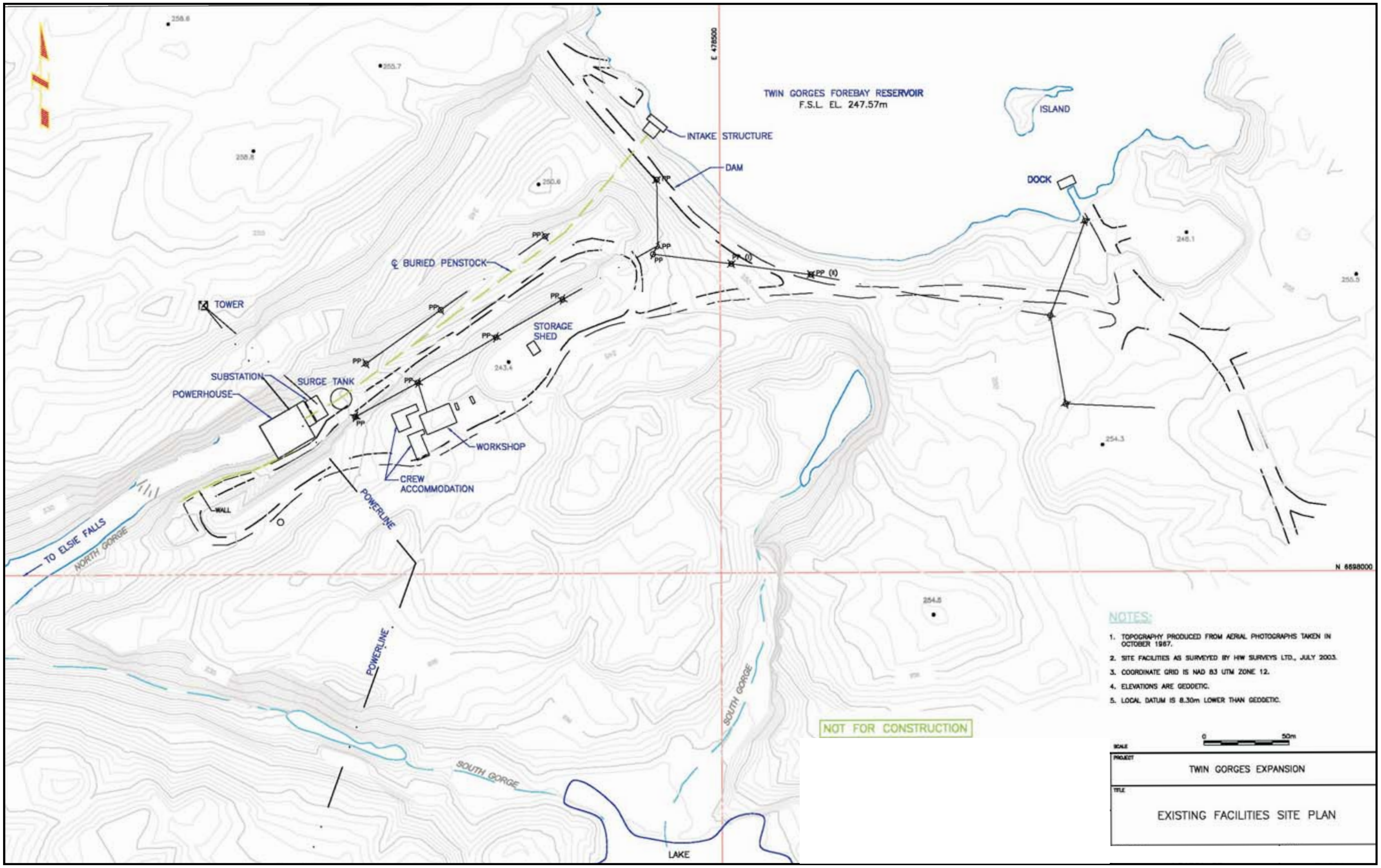
8.4.3 Taltson Twin Gorges Generating Station

The existing Taltson Twin Gorges facility was planned and constructed by the Northern Canada Power Commission and commissioned in 1965 to supply the Pine Point Mine with electrical power. The facility was transferred to NTPC in 1988. The generation facility comprises the following main components:

- 25 m high zoned earth and rock-fill dam across the two gorges in the Taltson River at the Twin Gorges site;
- Gated concrete intake structure on the Twin Gorges dam;
- 375 m long buried steel penstock (4.9 m diameter) to a surge tank;
- Steel surge tower, insulated riser and 12 m diameter tank;
- Single 18 MW vertical axis Francis turbine and 19.6 MVA Generator;
- Concrete/steel superstructure powerhouse with bridge crane and control room; and
- Step-up Substation (6.9/115 kV) and Switchyard.

A layout of the facility at Twin Gorges is shown in Figure 8-6 and in Plate 8-2 and Plate 8-3.

The facility was constructed to conservative design parameters and has generally been maintained and operated within the design range throughout its life. Annual inspections are undertaken on the water conveyance and generation systems, and dam safety reviews are undertaken periodically. A condition assessment of the facility was completed in 2003, a synopsis of which is presented in Section 8.4.8.



Twin Gorges Facility Layout

Figure 8 - 6

Plate 8-2: Twin Gorges Forebay with Taltson River in Background

Plate 8-3: Twin Gorges Facility

8.4.4 South Valley Spillway

No spillway or release structure other than the generation plant intake was developed in the existing dam or dam abutments. Instead, a concrete spillway structure was developed across a moderately narrow saddle feature in the southern side of the Forebay some 7 km upstream of the dam, as shown in Figure 8-3, Plate 8-4 and Plate 8-5. At high Forebay levels, this structure connected the Taltson River mainstem with the upper headwaters of a smaller drainage, known as Trudel Creek (Figure 8-3**,** Plate 8-6 and Plate 8-7). Trudel Creek runs over a distance of 33 km from the South Valley Spillway to a confluence with the Taltson River immediately below Elsie Falls, immediately downstream of the discharge point of the Twin Gorges generation plant.

Taltson Twin Gorges dam raised the water level an estimated 22 m above the original riverbed elevation at the dam axis. However, it is also understood that the natural Twin Gorge feature caused a large backwater effect in this area of the river during summer freshet or flood events prior to the construction of the dam. The height and extent of this original backwater is not known. Current evidence suggests that Trudel Creek received flows from the mainstem Taltson River during periods of high flow, likely through this area, prior to the development of the Twin Gorges facility.

The structure geometry and discharge characteristics of the South Valley Spillway are complicated in that several flow paths develop as the Twin Gorges Forebay level rises. Up to three main discharge sections normally occur during the summer freshet. An approximate rating curve has been established for the spillway based on the subtraction of known plant discharge from the flow gauge site on the Taltson River between Tsu Lake and Elsie Falls.

Plate 8-4: South Valley Spillway looking upstream at the Taltson River

Plate 8-5: South Valley Spillway

Plate 8-6: Trudel Creek Photo #1

Plate 8-7: Trudel Creek Photo #2

8.4.5 Nonacho Lake Structure and Tronka Chua Gap

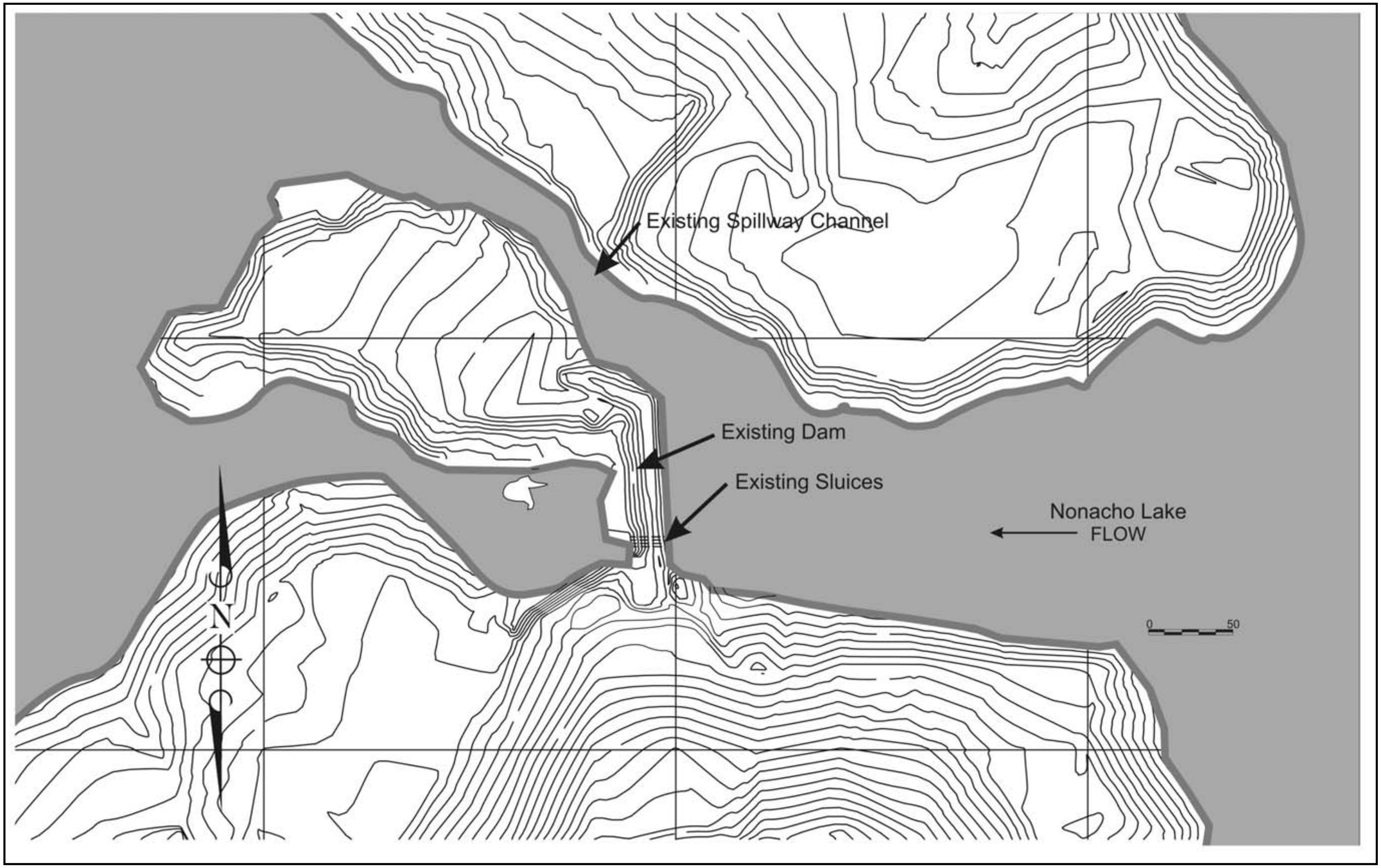
The Nonacho Lake control structure and adjacent spillway channel were constructed in 1968. A rock fill dam with three gated timber sluice passages was installed at the natural outlet of Nonacho Lake in order to better regulate flows to the Twin Gorges plant by storing water in the lake during the high flow period of summer/early fall. The components are as follows:

- A 10 m high, 60 m long rockfill dam across the natural Nonacho Lake outlet;
- A 65 m wide rock cut spillway adjacent to dam;
- Three manually operated sluice gates (6 ft x 6 ft) in timber sluice passages in the rock fill dam.

The rock channel spillway was blasted immediately adjacent to the dam, and served as the main source of dam materials. For construction, necessary equipment, materials and personnel were landed on an ice airstrip on the lake, and a large portion of the work was completed in one winter season. There is no road to the Nonacho Lake infrastructure, and access to the dam and gates was and remains limited to helicopter or float plane. No power is available at the site. The structures are shown in Figure 8-7 and Plate 8-8.

The only inhabitants on Nonacho Lake (the Carter family) operate a fishing lodge seasonally (July – September) on the lake some 10 km up-lake from the control structure. Beachfront of the fishing lodge can be affected by lake levels above 321 masl.

The rise of lake levels introduced by the Nonacho dam causes regular overtopping and release of water through a natural low point between Nonacho Lake and the Tronka Chua Lake. This control feature is known as the Tronka Chua Gap (Figure 8-2, and Plate 8-9). The spill through the Tronka Chua gap varies from zero at the main rock cut spillway crest level (320.2 masl) to over 70 m^3/s at the higher lake levels that typically occur during mid-summer. While the release through Tronka Chua is uncontrolled, this water ultimately flows to the Taltson River through Lady Grey Lake upstream of the Twin Gorges generating facility, and can be fully utilized in generation at the facility.



TALTSON
HYDROELECTRIC EXPANSION PROJECT

PROJECT DESCRIPTION
MARCH 2007

Nonacho Lake Control Structure

FIGURE 8 - 7

Plate 8-8: Nonacho Lake Control Structure

Plate 8-9: Tronka Chua Gap

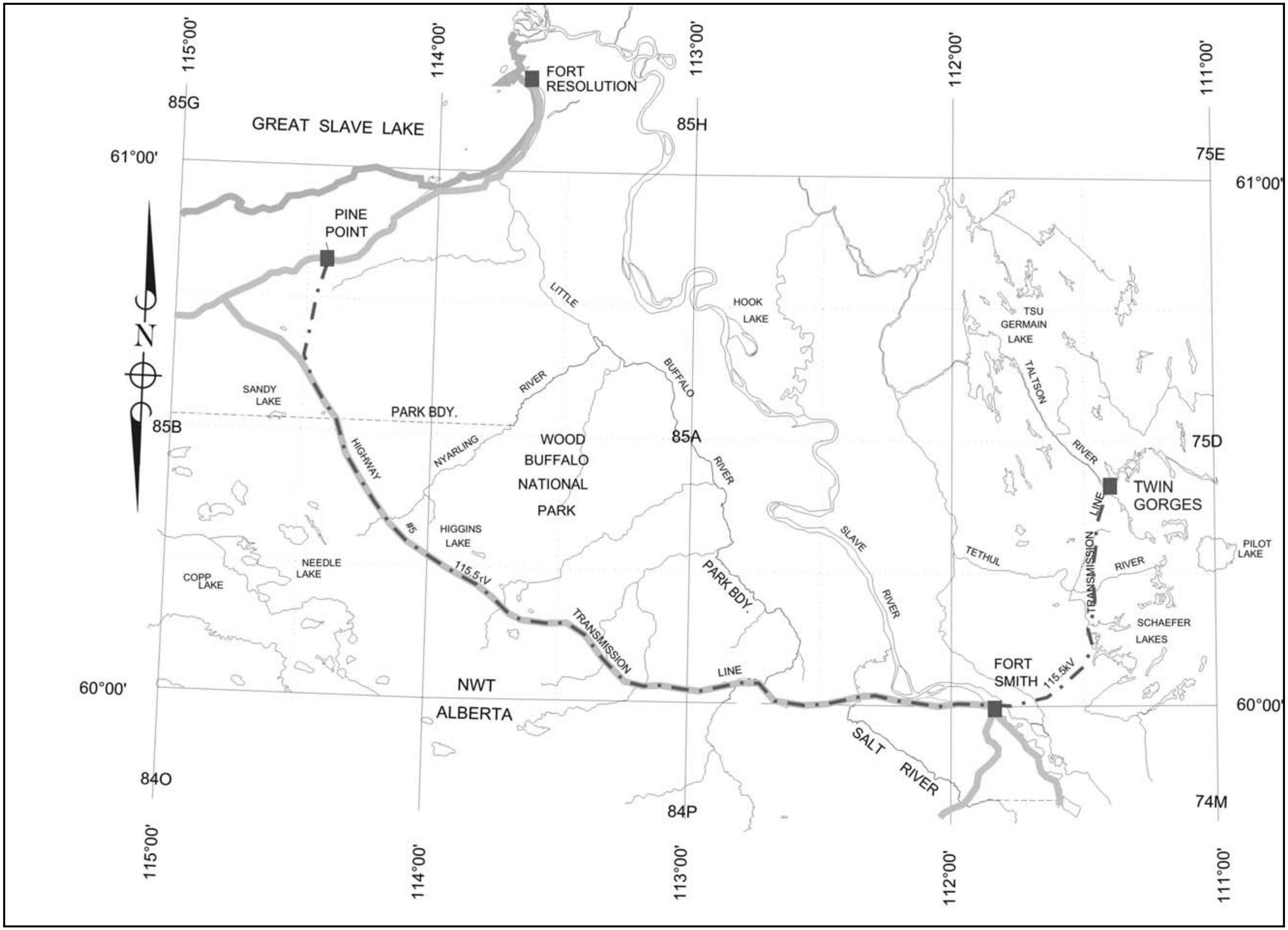
8.4.6 Taltson Twin Gorges Transmission Line Infrastructure

As part of the original installation, a 115 kV transmission line was constructed overland to Fort Smith and through to Pine Point (170 km total) shown in Figure 8-8. Typical line structures are illustrated in Plate 8-10 and Plate 8-11.

After the closure of the Pine Point mine in 1986, the Taltson Twin Gorges facility was also connected to Fort Resolution, and then to Hay River via a 72 kV line, and to Fort Fitzgerald. These communities combined typically utilize approximately 8 MW during the summer and 13 MW peak during the winter months, or in the range of 45% to 65% of the generation capability of the original 18 MW plant.

Plate 8-10: Existing Twin Gorges Transmission Line – Example of River Crossing

Plate 8-11: Existing NWT Transmission Line – Example of Line Corridor



TALTSON HYDROELECTRIC EXPANSION PROJECT	**PROJECT DESCRIPTION** **MARCH 2007**	**Transmission Line from Fort Smith to Pine Point**	**FIGURE** **8 - 8**

8.4.7 Alterations at Twin Gorges since Original Construction

8.4.7.1 Ossberger Generating Units

In 1975, in response to growth in the electrical demand at the Pine Point Mine, a 4 MW expansion of the generation at Twin Gorges was introduced, comprising the following components:

- A branch bifurcation was introduced into the original steel penstock just upstream of the surge tower;
- A 90 m long, 2.13 m diameter steel pipe and associated anchor blocks were buried in the original access road to the generator floor level of the existing plant;
- The original draft tube gate gantries and hoisting equipment were removed, and a steel and concrete floor constructed over the back of the existing powerhouse;
- Four 0.75 MW Ossberger cross-flow turbines, associated inlet valves, horizontal shaft generators, and control equipment were installed on the deck (Plate 8-12); and
- A 4.16/115 kV three phase step-up transformer was installed in the existing switchyard and connected to the 115 kV line.

Plate 8-12: Ossberger Turbines

The Ossberger turbines supplied peaking power on a continuous basis from their installation in 1975 until the closure of the mine in 1986. A number of the Ossberger units continued to be operated for several more years after mine closure; however, these units are now considered non-serviceable and have been abandoned.

8.4.7.2 Removal of Branch Pipeline - 2004

The branch pipeline to the Ossberger units as described above was removed and the bifurcation in the main penstock permanently plugged with a steel bulkhead in 2004. The access to the plant was restored to the original arrangement; however, the Ossberger deck and machine house remains, as no heavy lifting equipment is available on the site to dismantle these structures. The original draft tube gates, which still exist on site, have not been re-installed.

8.4.8 Condition Assessment of Existing Facility

Study work completed during the Expansion Project conceptual phase in 2003 included a condition assessment of the existing generation facility to identify any refurbishment costs and activities that would need to be incorporated into the overall development plan to ensure continued and reliable generation from the existing Taltson Twin Gorges facility. Although the Nonacho dam passed the dam safety inspection conducted in fall 2006, the 2003 condition assessment is considered relevant to the Expansion Project Description, and a synopsis is provided below.

8.4.8.1 Twin Gorges Generating Station

Although nearly 40 years old, the Twin Gorges generating plant continues to be the primary source of power for Fort Smith, Fort Resolution, Fort Fitzgerald and Hay River. The facility, therefore, remains a key component of NTPC generation assets. Operators are continuously stationed at the facility, which is managed through NTPC's regional office at Fort Smith and the Head Office/Engineering Office in Hay River. The facility is typically shut down for about one week for a thorough inspection during September each year. These inspections normally cover the penstock, spiral case, runner and associated components of the plant. In accordance with regulatory requirements, formal dam safety inspections occur on the water retaining and control structures. In 2002, a structural review was undertaken of the powerhouse and associated components, with no major issues identified. Regular maintenance/inspection for the transmission line sections owned by NTPC include flying the line, replacement of cracked conductors, brushing of the line ROW and checking of guy tensions.

In general, the demand on the plant is relatively light and would be classified as having a high reliability in its current operating regime. The transmission line itself is highly reliable.

As part of the Year 2003 Snap Lake Power Supply study program, a portion of which was to consider a life extension of the existing plant, a preliminary Condition Assessment of the plant was completed in conjunction with two scheduled plant shutdowns. The assessment considered the current condition of the plant and likely upgrades/major maintenance items required for a resumption of generation at design capacity (18 MW), and a life extension of the existing plant (design life anticipated to be a minimum of 40 more years).

Key findings of these recent inspections and other external assessments are summarized as follows:

Dam Structures

- Stable, continued monitoring required.

Intake Structures

- Good condition, some stop-log seal maintenance recommended (ongoing as of 2006).

Penstock

- Internal corrosion products beginning to become pronounced in certain areas of the penstock – recommended thorough sandblast cleaning and application of coatings as part of life extension program.

Prime Machinery

- Continued maintenance and upgrades as required.

Generator

- Likely to require rewinding as part of life extension program, but currently in reasonable condition. (Major generator re-wedge occurred in 2004.)

Surge Riser, Tower and Tank

- Not inspected – recommended for thorough inspection.

Branch Penstock

- Significant corrosion due to stagnant water – recommended isolation of the Branch Y within 5 years (as noted, the branch penstock was removed in 2004.)

Ossberger Units

- Recommended removal and re-instatement of original draft tube gates and hoisting equipment as part of life extension.

Powerhouse General/Structural

- Some relatively minor maintenance recommended, including additional ventilation to avoid generator heat trips.

Substation and Switchyard

- Not inspected in detail. Transformers may require upgrade/repair through a life extension program. No possibility of expansion of existing switchyard, and a new substation would be required for any expansion.

8.4.8.2 Nonacho Lake Control Structure

A condition assessment of the existing structure at Nonacho Lake was planned as a part of the Year 2003 Snap Lake Power Supply study program. The assessment was specifically aimed at establishing the condition of the timber sluice passages through the dam. However, at the time of the inspection in early August 2003, combined high leakage flows through the timber structures, the rock fill dam, and in particular the central sluice gate, which cannot be fully closed, prevented access downstream of any of the gates.

The following are observations resulting from the assessment.

- Dam leakage was observed to be in the range of 7 m^3/s to 10 m^3/s, perhaps higher, and may be increasing from historic observations;
- The sluice gates cannot be completely closed, indicating damage to guides or sluiceway, or debris caught in the sluiceway;
- There are no provisions for isolation of the gates or passages by stoplog or other isolation system, therefore inspection or maintenance on the guides and passages is not possible;
- There is a substantial amount of logs and other woody debris in the intake area of the sluice passages;
- The timber structures have operated in a high energy environment now for 36 years, and it would be expected that they are nearing the end of their service life; and
- The rock cut spillway appears in fully satisfactory condition.

8.4.8.3 South Valley Spillway

The spillway was not inspected during this program as continued flows make inspection extremely difficult with inherent safety concern. Inspection is recommended at some point in the future when flows can be decreased to make access safe.

8.4.8.4 Condition Assessment Conclusions

The conclusions from the preliminary Condition Assessment of the existing facility suggest that an operational life extension of the existing Twin Gorges facility for up to another 40 years of operation is feasible. Key life extension upgrades recommended as part of the Taltson Expansion Project are as follows:

- Removal of the Ossberger units and reconstruction of the gantry and draft tube gates on the existing powerhouse;
- Cleaning and coating of the internal surface of the main penstock; and
- Rehabilitation/replacement of the Nonacho Lake release structure.

The Taltson Expansion Project cost model currently includes a capital cost allowance for an upgrade of the existing Twin Gorges facility, and the complete re-development of the Nonacho Lake control structure, in line with the recommendations noted above.

8.4.9 Taltson Twin Gorges Current Operation

Since the closure of the Pine Point Mine in 1986, the annual generation at Twin Gorges typically ranges from 7.5 MW in the summer/early fall, to a peak of 13 MW in the winter, with an energy delivery to the communities of approximately 65 GWh/year. This represents approximately 40 – 65% of the potential capacity of the plant, and use of only 42% of the potential annual energy available, assuming sufficient flows are available year-round for the 18 MW installed capacity. While several dry periods did in fact occur during the period of mine operation where power flow was reduced, no such periods have occurred for over 20 years.

Currently, little requirement exists for regulated releases from Nonacho Lake to support generation at these lower levels, and gate adjustments at the Nonacho Dam are made typically twice or three times per year, mainly to control maximum lake elevations for the fishing lodge. The increased flow from Nonacho Lake, combined with the unregulated discharge from the Tazin River system, generally result in substantial excess water in the Twin Gorges Forebay. This water has been spilled into Trudel Creek more or less continuously since 1986.

9 TALTSON EXPANSION PROJECT HYDROLOGICAL BASIS

9.1 General Approach

To assess the potential for expansion of the existing Twin Gorges facility beyond operation at the currently installed capacity of 18 MW, a number of steps have been undertaken involving both desktop modeling and associated field investigations. The Taltson River watershed is large, and despite the existence of an operating plant within the basin, only a limited amount of data is available for the assessment of key design parameters for an expansion proposal. The design has therefore relied on the development of a number of numerical models of the hydrological characteristics and behaviour of the basin. The phases of work undertaken to support the current Project design have included the following key steps:

- Collection and collation of all relevant meteorological and hydrological data for the watershed to obtain a baseline hydrological database;
- Development of a numerical hydrological model of the basin based on the available data and a limited amount of field observation at key points in the basin;
- Concept design of new control structure at Nonacho Lake to optimize storage and routing of assumed inflow dataset;
- Concept design of the new generation facility to be located at Twin Gorges;
- Site capacity assessment based on the flow database routed through the new control structure and the existing and new generation facility to assess generation reliability for various expansion scenarios; and
- Comparison of expected load demand from the mine customers to the generation capacity range, and specification of installed capacity to match as closely as possible the demand requirements, while still meeting energy delivery reliability requirements and economic criteria.

These steps have been undertaken beginning with the 2003 study to supply the Snap Lake Mine with hydroelectric power from a smaller expansion of the existing site. A brief discussion of these steps is presented below.

9.2 Taltson Watershed Hydrological Database

A major component in the evolution of the Project design has been the development of the hydrological database and associated numerical models of the complete Project to assess critical design requirements, to size components, and to assess generation reliability for various installed capacity plants and synthesized hydrological events such as multi-year dry periods. Typically, two approaches are utilized in the development of a database for a watershed such as Taltson; the synthesis of a set of flow records from a precipitation and watershed model (climate-based approach), or the pro-ration/allocation of a set of measured flow records to the various sub-basins through a set of basin characteristic assumptions. As at least some longer-term flow data is available for the watershed, and virtually no meteorological data exists for most of the basin, the hydrological database has been developed from existing flow records and operational data from the existing plant.

Water Survey Canada (WSC) has historically operated a total of eight gauging stations within the Taltson River system. Only two of these remain active: Nonacho Lake (water level) and the Taltson River (flow) downstream of Elsie Falls, and only two have long-term records (Nonacho Lake and at the outlet of Tsu Lake) suitable for design assessment. Table 9-1 lists the gauge sites and available data sets. Locations of the WSC gauges are shown in Figure 8-1.

As a result of the existing power development, the general analysis of hydrometric data from the Taltson River Basin is usually divided into three time periods:

1. 1943 (when data first became available) to 1967 when Taltson Twin Gorges and the Nonacho Lake dams were constructed, altering natural flows downstream of Nonacho Lake and in Trudel Creek;
2. 1968 – 1986 when Taltson Twin Gorges was operating at capacity and providing power to the Pine Point Mine; and
3. 1987 to present after the closure of the Pine Point Mine, when power demands from Taltson Twin Gorges were significantly lessened.

Table 9-1: Water Survey Canada Flow Gauges on the Taltson River System

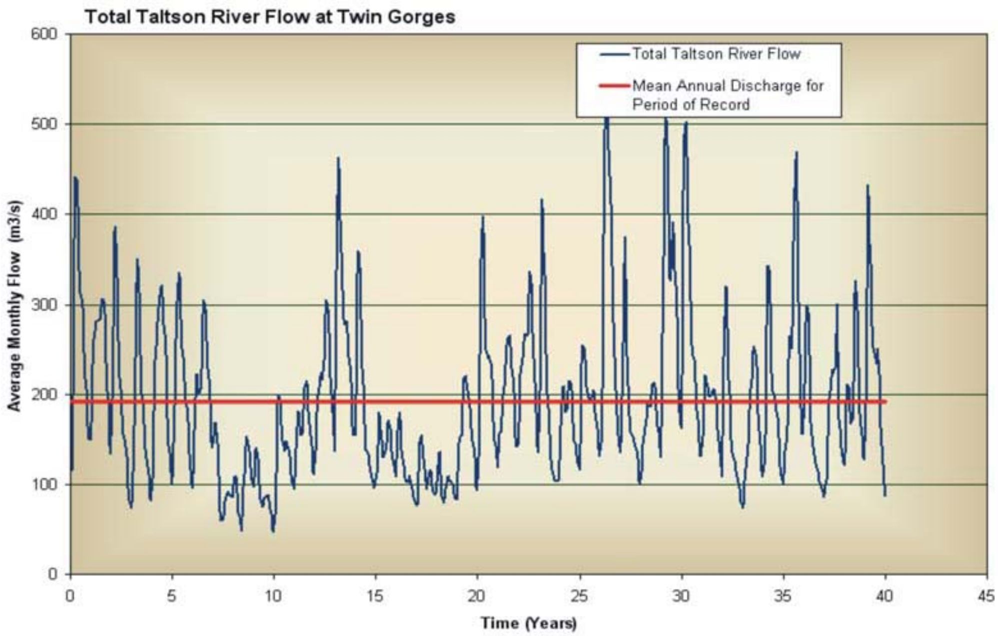
Station ID	Latitude Longitude	Description of Location	Period of Record	Comments
07QA001	60°28'1 N 111°30'46 W	At outlet of Tsu Lake	1952-1997	No data available 1955 to 1961
07QC003	60°30'18 N 109°38'56 W	Near inlet to Hill Island Lake	1968-1995	On Thoa River upstream of Hill Island Lake and Tazin River
07QD002	61°43'50 N 109°40'15 W	Nonacho Lake near Lutselk E (snowdrift)	1962-present	Water level gauge
07QD003	61°39'36 N 109°58'7 W	Near outlet of Nonacho Lake	1975-1977	WSC considers records to be poor. Flows are typically greater than those calculated as outflows from Nonacho Lake from rating equations
07QD004	61°52'32 N 107°40'12 W	Taltson River above Porter Lake Outflow	1977-1990	WSC considers records to be good
07QD005	61°53'0 N 107°41'50 W	Porter Lake Outflow above Taltson River	1971-1981	Intermittent measurements on tributary to Taltson River
07QD006	61°48'57 N 107°52'11 W	Porter Lake outflow	1983-1990	Tributary to Taltson River
07QD007	60°28'1 N 111°30'46 W	Taltson River below hydro dam	1994-present	Reliable data and current data collection

The longest running flow gauge data for the Taltson watershed is at the outlet of Tsu Lake (WSC 07QA001), which was installed well prior to construction of the existing Twin Gorges plant, but not regularly maintained as a data collection site until 1962. As this measurement gauge is relatively close to the Twin Gorges site (from a basin perspective), the Tsu Lake outflow gauge data has been utilized as the starting point for the creation of the baseline flow dataset. The Tsu Lake gauge was replaced by WSC in 1994 with the currently operated gauge downstream of Elsie Falls (07DQ007), with some overlap in records allowing comparison. As these records show good comparative consistency, the new gauge data has been utilized in conjunction with the Tsu Lake record, with the 40 year period 1962 – 2002 (water year basis) utilized for the baseline data set. The availability of a 40 year set of WSC average daily flow records close to Twin Gorges is considered an excellent hydrological record to build from for the Expansion Project generation assessment and preliminary design. The monthly average data set from the Tsu Lake (07QA001) and Taltson River (07QD007) gauge sites is shown in Table 9-2 and Figure 9-1.

Table 9-2: Average Monthly Flow (m^3/s) Data Set: 1962 to 2002

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
1962					115	282	440	433	363	318	297	265	
1963	228	186	151	151	210	252	281	281	284	287	306	299	243
1964	255	215	169	137	242	370	385	293	231	185	163	151	233
1965	132	109	86	74	90	11	280	351	281	213	175	150	163
1966	129	111	92	83	141	221	276	289	305	321	288	244	208
1967	197	152	122	100	125	226	289	335	307	260	228	202	212
1968	170	144	124	96	139	223	219	199	218	265	304	278	198
1969	241	195	161	141	169	168	120	85	61	63	75	85	130
1970	92	88	86	87	109	106	74	60	50	84	135	153	94
1971	145	128	110	97	131	141	114	87	76	84	86	88	107
1972	86	77	59	48	95	168	200	179	153	137	148	146	125
1973	132	117	106	97	127	182	178	155	162	203	215	196	156
1974	167	143	122	112	166	192	220	224	218	265	304	278	201
1975	239	199	162	140	293	458	415	328	294	278	281	251	278
1976	214	181	155	156	287	359	318	247	181	142	137	129	209
1977	114	102	96	100	131	179	170	131	133	142	161	171	136
1978	149	128	116	110	151	181	148	129	114	103	103	110	129
1979	101	89	81	77	86	143	155	129	107	95	108	116	107
1980	105	93	88	93	136	132	90	80	90	109	108	103	102
1981	100	93	86	84	146	155	160	217	220	205	185	170	152
1982	154	131	110	95	166	322	398	323	255	241	242	225	222
1983	187	155	134	119	153	163	190	227	246	262	265	238	195
1984	202	167	142	149	208	232	248	267	265	278	336	296	233
1985	241	190	157	138	257	413	379	283	215	162	142	117	225
1986	107	103	105	110	150	208	209	180	191	215	209	185	164
1987	153	140	127	118	204	253	245	217	202	192	193	205	187
1988	189	171	153	132	174	282	470	539	499	443	379	303	311
1989	212	191	164	135	167	309	374	266	185	161	156	150	206
1990	144	129	113	100	133	153	173	189	187	188	211	211	161
1991	194	171	146	132	221	426	512	441	337	326	391	353	304
1992	287	230	187	165	350	480	501	413	323	266	247	230	307
1993	193	154	134	132	180	221	217	200	197	203	206	203	187
1994	175	148	125	110	212	318	307	233	170	136	127	120	182
1995	109	97	85	74	91	118	144	171	196	237	253	231	151
1996	199	160	130	109	145	202	342	328	248	209	193	187	204
1997	160	130	113	101	128	164	205	265	252	330	409	468	227
1998	339	200	158	156	246	299	273	191	155	134	126	122	200
1999	109	99	92	86	93	125	183	219	228	224	240	299	166
2000	185	148	136	123	163	210	199	168	181	278	327	248	197
2001	187	173	137	129	243	428	387	304	257	240	234	249	247
2002	189	143	107	87	137	230	242	248	282	305	286	221	206
Average	**173**	**144**	**123**	**112**	**169**	**237**	**262**	**242**	**217**	**214**	**219**	**206**	**192**

Figure 9-1: Total Taltson River Flow at Twin Gorges



The flow recorded downstream of Twin Gorges and forming the baseline data set necessarily includes the net contribution from all of the sub-basins upstream of the gauge site. In fact, the division of flows between the Taltson River mainstem above Nonacho Lake, and that entering from the Tazin River system, is critical to the facility design, as only the Nonacho Lake inflows are regulated. This issue has been studied on a number of occasions in the past, but no final conclusion has been made on this flow division, and historic gauging information does not provide any definitive assessment. Current field programs continue to investigate the flow division with spot measurements, but the installation of a gauge on either the Taltson or Tazin River would likely be required for operation of the Expansion Project. On the basis of sub-basin area, it would be expected that approximately 50% of the flow at Twin Gorges would come through Nonacho Lake. In the current hydrological model, a range of flow division from 45% to 55% of the total flow below Twin Gorges can be defined for the Nonacho Lake inflow on a water balance basis.

Once the flow division noted above is established, the baseline data set for all of the modeling is then the inflow to Nonacho Lake, where the flow releases are regulated, and the balancing flow set from the Tazin River, which remains unregulated.

9.3 Hydrological Generation Model

The hydrological generation model utilizes the data sets described above in combination with the concept design of the control and generation facility, and all known and quantifiable characteristics of the Taltson watershed above Twin Gorges that affect flow release and flow routing. Inherent in this assessment is the use of historic data to represent a future flow sequence for design assessment and to forecast operational decision-making. At present, no other reliable means exists to develop a realistic database for potential future natural flow sequences.

To-date the hydrological generation model has been developed to incorporate and assess the impact of the following key basin and Expansion Project characteristics:

Nonacho Lake

- Inflows to Nonacho Lake from data set – variable from 45% to 55% of total;
- Natural regulation and routing through Nonacho Lake (storage curve);
- Uncontrolled release through Tronka Chua Gap into Tronka Chua Lake system as a function of lake level;
- Uncontrolled release over the lake spillway as a function of lake level and spillway sill level;
- Release requirements through the new control structure based on forecast demand at Twin Gorges;
- Maximum release through new control as a function of lake level; and
- Adoption of rule curves and operating criteria consistent with existing Water License, including a minimum release from Nonacho Lake, and minimum water level criterion in the lake.

Twin Gorges Facility

- Generation flow available at Forebay from all upstream contributions;
- Disposition of flows through the two plants (Expansion plant preferred);
- Generation characteristics of new and existing plants;
- Minimum release requirements into Trudel Creek;
- Uncontrolled spill from Twin Gorges Forebay to Trudel Creek;
- Energy generation of both plants;
- Plant Capacity Factor (Generation Reliability over complete flow record); and
- Testing of system for synthetic dry flow sequences.

As the daily variance in Taltson River flows are quite low, a monthly time step is utilized in the model. The model utilizes a number of rule curves and targets for water levels and minimum releases in accordance with the current water licence requirements for both the

Nonacho Lake and Twin Gorges dams. These targets trigger constraints and actions within the model to limit lake and Forebay level and flow excursions to defined limits, and simulate expected operating criteria for the Expansion project.

The assessment of generation and other operations using the hydrological generation model is detailed in Section 11.7. As noted, the model is working from historic data, and can simulate only the manner in which the new project would be optimized and operated for such an historic flow sequence. In reality, the actual set of flows to be encountered after construction would be quite different, and may have led to a slightly different conclusion on project design. The design has therefore been developed with a conservative viewpoint, and allows flexibility in operations to the extent possible. Final design development may also allow additional opportunity to fine tune the project characteristics.

9.4 Project Capacity Assessment

The hydrological generation model provides a means of assessment of a range of design parameters and installed plant capacities (sizes) from the key hydrological perspective. Previous studies have specifically targeted this issue for the Twin Gorges site, and that work concluded that the Twin Gorges site could support a total capacity in the range of 45 MW to 55 MW, with annual generation output reliability consistent with typical commercial requirements for baseload stations (capacity factor above about 90%). This capacity assessment includes the 18 MW capacity of the existing Twin Gorges plant. Since the initial concept studies, further assessments identified that adequate flow exists to support a larger installed capacity at Twin Gorges than in this design, although the flow to run the plant at full capacity is available only periodically. Therefore, the energy generated from flows that do not support a capacity factor of greater than 90% would not be as predictable; however, energy generation is potentially feasible from flows that support a capacity factor greater than approximately 77%. Capacity assessment for the site for the current set of assumptions is shown in Table 9-3.

Once the hydrological limits of capacity are established, the choice of installed capacity at a particular site is influenced by the load to be serviced, the reliability of the power output level that is required, and the benefit/cost of capacity installation. In this case, the generation output was designed with a reasonably high degree of output availability from the new and existing plants and balanced to the current anticipated load from the mines and existing customers. This total capacity of 54 MW provides for a desirable equivalence in machine size, with three relatively equal-size machines and therefore no single unit is more or less critical.

Many hydropower projects install generation output capacity beyond what is deemed “firm” or highly reliable, to service shorter-term, peak loads. For the Expansion Project, installation of additional capacity in the range of 20 MW, could potentially be feasible should a need for increased energy needs arise.

Run-of-river hydro operations with limited storage generally install a larger capacity and operate at this peak capacity only a small to moderate percentage of the year, producing what is known as non-firm energy. This latter scenario could be feasible for Twin Gorges, but the approach is typically utilized where little or no storage is available at the generation site, and excess flows would be spilled. As well, these plants are typically grid-connected and have no limitation on generation output. The Taltson Expansion Project has sufficient storage such that excess flows are generally stored and not spilled, except during higher flow or unusual events.

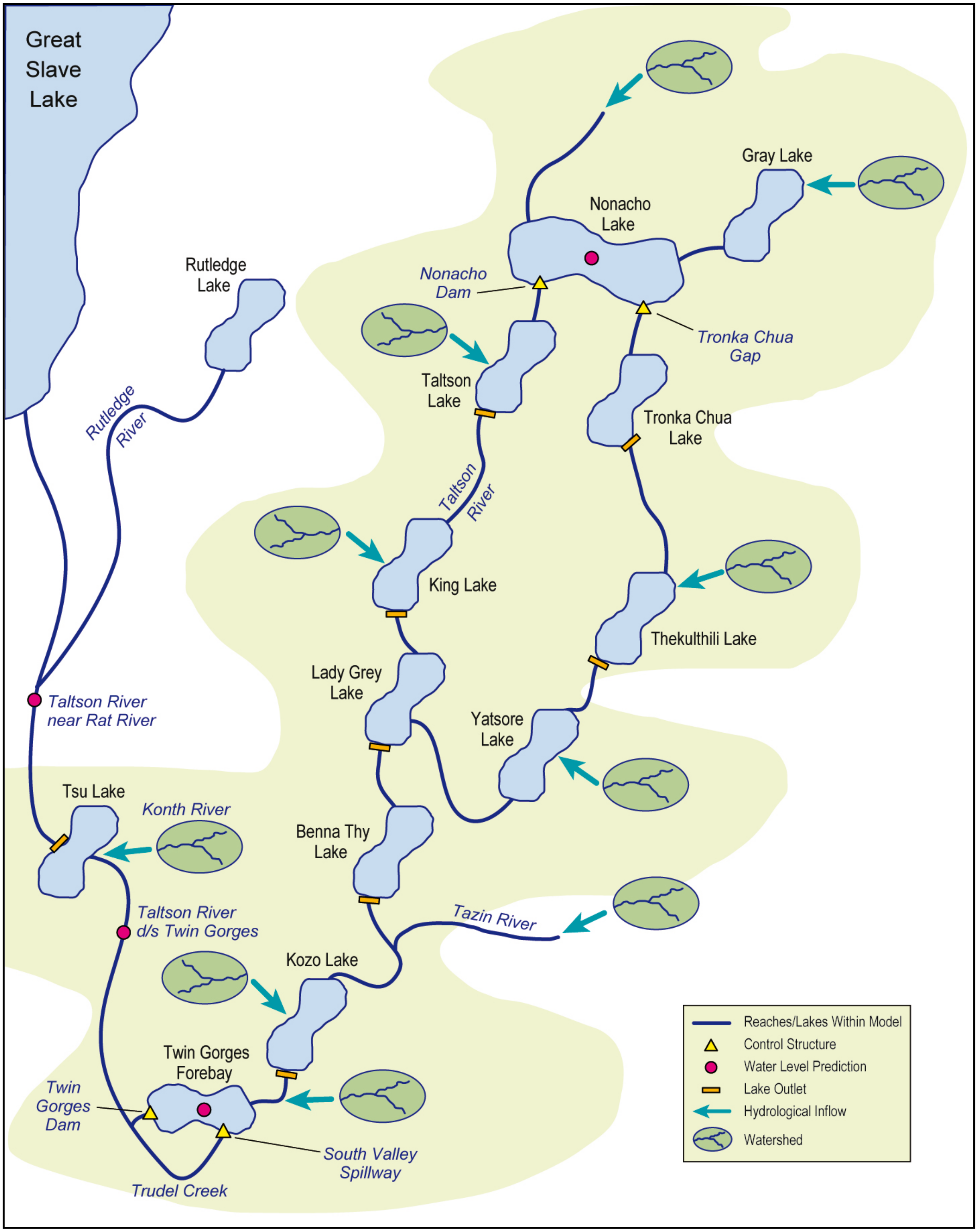
Table 9-3: Installed Capacity versus Energy and Capacity Factor

Total Installed Capacity (MW)	Annual Energy Output (GWh)	Capacity Factor
40	339	0.97
50	407	0.93
54	429	0.91
60	456	0.87
70	490	0.80
74	498	0.77
80	510	0.73

9.5 Taltson River Basin Model

The hydrological generation model discussed above considers only the points in the basin specifically associated with inflow/outflow control or generation. To help quantify the operational effects of the new Project on the basin characteristics as a whole, another numerical model has been developed, the Taltson Basin Flow Model. The specific purpose of the model at this stage is to assess larger scale changes in timing and characteristics of flow conditions, and lake and river levels throughout the basin sub-sectors that would be influenced by the construction and operation of the Taltson Expansion Project. In turn, these results would be used to determine the specific impacts associated with the Project.

Taltson Basin is very large and the actual hydrological system quite complex, necessitating simplification by grouping large sections of the basin with similar characteristics into a single type of system. The model considers the basin from the inflow of Nonacho Lake to the outflow of Tsu Lake as a set of 10 interlinked systems. The model schematic is shown in Figure 9-2**.** The hydraulic controls between the systems have been studied through a large scale field program, with numerous permanent monitoring points established such that continuing observations under differing conditions can be made and used to further calibrate the numerical model. This model continues to be developed and is anticipated to become a valuable forecasting tool for Project operations.



Taltson Basin Flow Model
Schematic Diagram

FIGURE
9 - 2

10 PROJECT CONCEPTS AND ALTERNATIVES

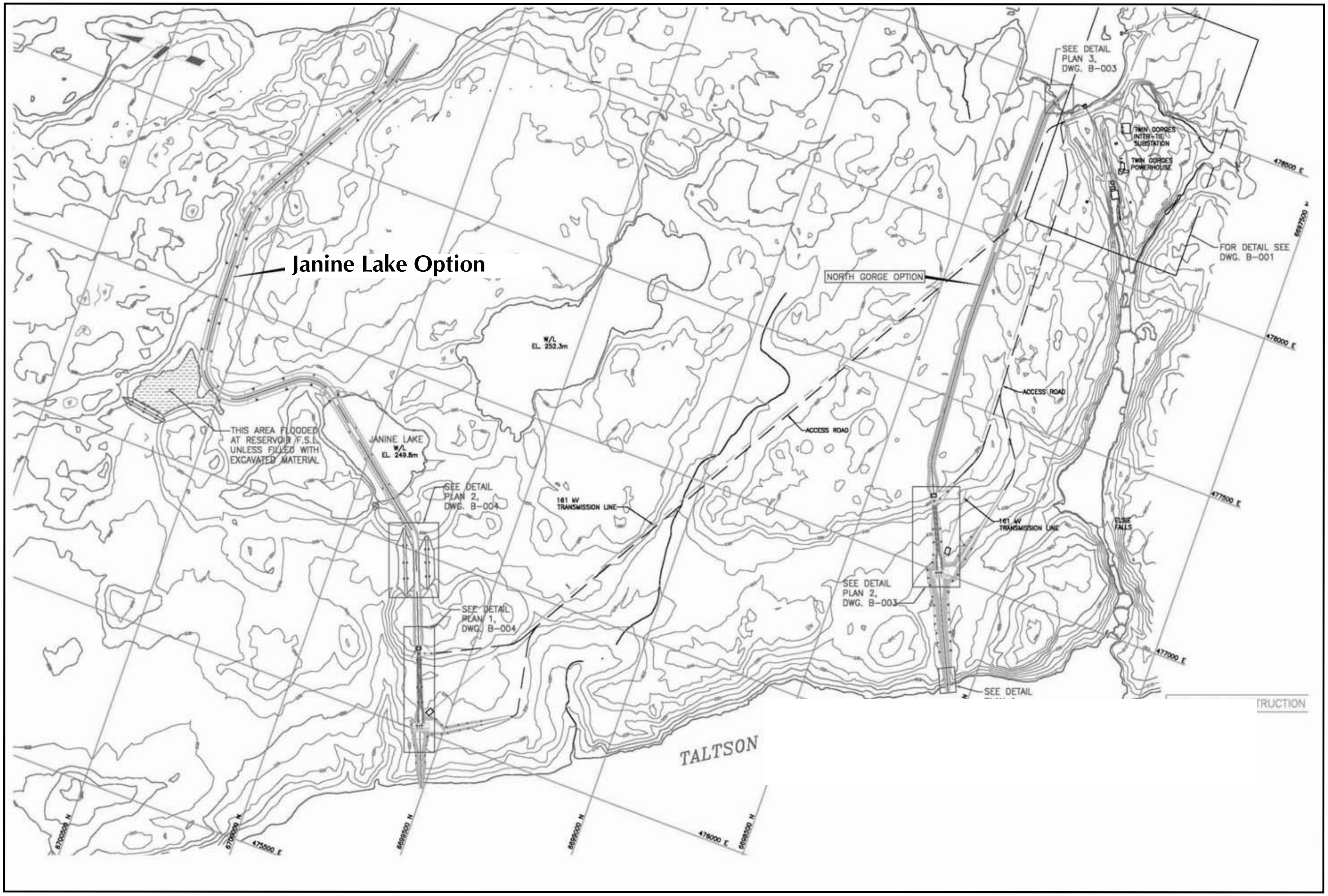
10.1 General

A number of Project development options have been considered during the course of studies and evolution of the current preliminary design for the Taltson Expansion Project. These concepts have included consideration of a new 16 MW plant to be added at Twin Gorges on the South Gorge to supply Snap Lake Mine with power; the addition of another 4 MW generating unit within the existing powerhouse; and, the consideration of two completely different layouts for the larger expansion Project as envisaged herein, one in the North Gorge, and one through Janine Lake, with various installed capacities. In addition, a number of transmission route alternatives have been considered and investigated to a preliminary level of detail. These include a line route crossing Great Slave Lake on the Simpson Islands with an underwater portion through Hearne Channel, and several route options on the northern sector above McLeod Bay on Great Slave Lake. Transmission location optimization work along the current corridor also remains ongoing.

In general, these options have been found to be uneconomic, environmentally less desirable, or significantly more risk-prone than the preferred Project layout described in detail in Section 11. A brief description of several key alternatives studied is presented below.

10.2 Generation Plant Alternative – Janine Lake Option

The main alternative to the preferred design is the development of a new powerhouse and water conveyance system utilizing a series of canals and berms through Janine Lake, a small, shallow lake located approximately 2 km north of the Twin Gorges facility. A general arrangement drawing is provided in Figure 10-1**.** This plant would also utilize the existing Twin Gorges Forebay, and have the same 41 m generation head as the chosen option, so the generation output characteristics would be largely the same. This option was costed at slightly higher than the current design, and was considered to have additional construction cost risk due to unknown ground conditions. Most importantly, the location of the tailrace being much further downstream of Elsie Falls was considered not acceptable from an environmental viewpoint.



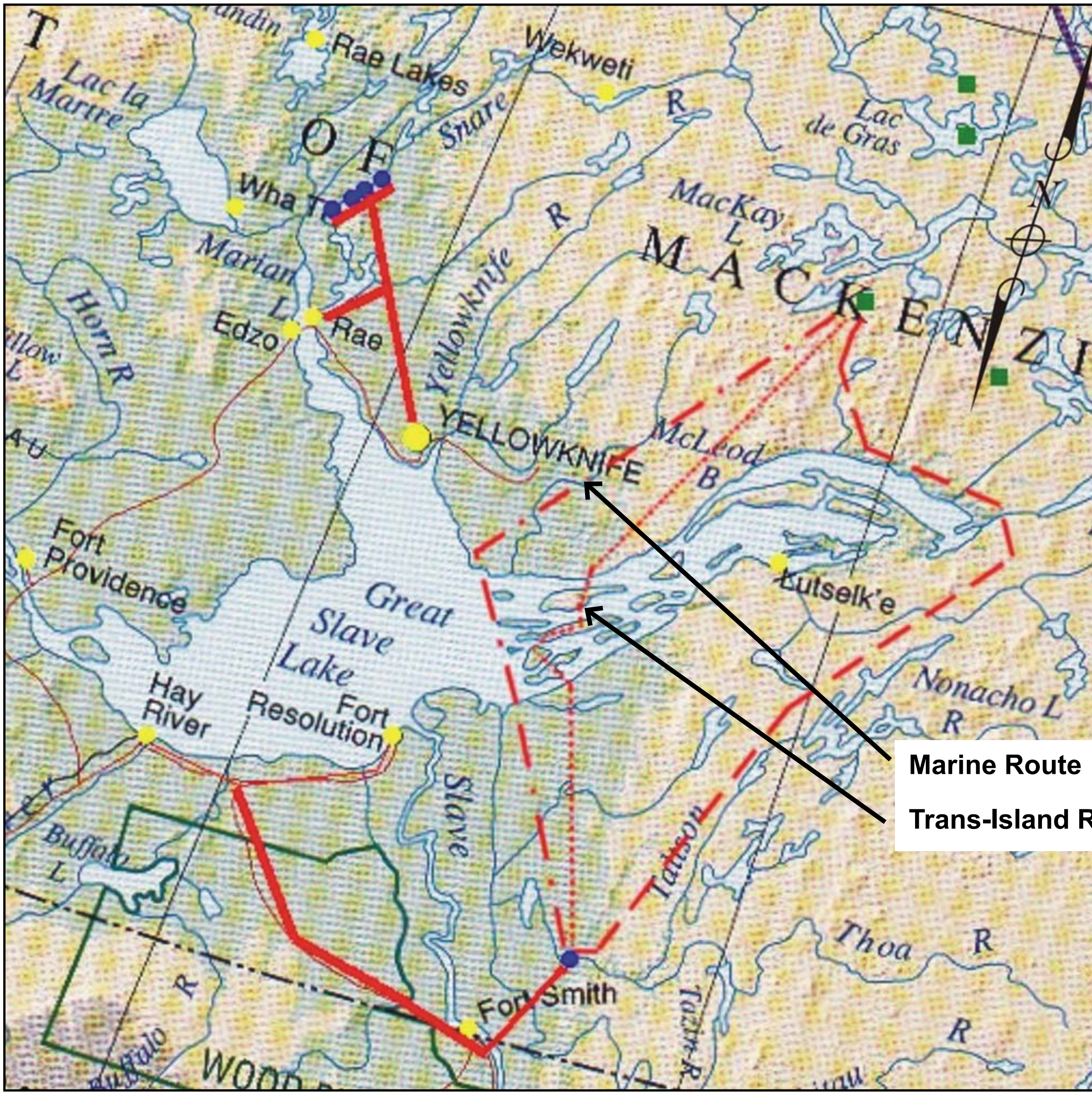
TALTSON Hydroelectric Expansion Project	Project Description March 2007	Generation Plant Alternative Janine Lake Option	Figure 10 - 1

10.3 Transmission Line Alternatives

As a component of the initial stages of the Project concept study, consideration was given to entirely different routing options for the transmission line to the Snap Lake area, the original area of potential line termination. These options were grouped into two general categories based on similar characteristics and locations, and were identified as Great Slave Lake Crossing Alternatives, which included options for crossing Great Slave Lake, and Overland Alternatives, which avoided crossing Great Slave Lake. The alternatives and options are discussed below.

10.3.1 Great Slave Lake Crossing Alternatives

Two lake crossing route options are included in the Great Slave Lake Crossing Alternatives. These are shown on Figure 10-2, along with the southern sector of the Overland Alternative. Both these lake crossing options included overhead structures where the line would traverse overland to and from Great Slave Lake, with considerably different lake crossings.



Great Slave Lake Crossing Alternatives

FIGURE 10.2

10.3.1.1 Marine Cable Option

The Marine Cable Option commenced with 120 km of overhead line from Twin Gorges generally northward to the shore of Great Slave Lake. At this point an entirely submersed marine cable would cross the lake from Taltson Bay area to vicinity of Gros Cap, west of the East Arm of Great Slave Lake and East Arm islands. The line would then continue overland approximately 200 km northeast to Snap Lake mine site. While avoiding the East Arm area entirely, the costs of the marine cable and associated works would be extremely high. The concept study determined that this option would be economically unfeasible for the Project.

10.3.1.2 Trans-Island Option

The Trans-Island Option would also commence with approximately 120 km of overhead line from Twin Gorges north to the shore of Great Slave Lake. From there, the line traversed the East Arm of Great Slave Lake, via the Hornby channel and a series of overhead spans crossing the Simpson Islands to Blanchet Island, followed by a marine cable crossing of Hearn Channel as an overhead span was not considered feasible for this crossing. The option through the East Arm is shown in Figure 10-3.

The line would then continue overland to Snap Lake a distance of approximately 200 km. Although this option was determined to be the shortest option overall, based on a direct mapped routing, the route would be in potential conflict with the environmental and cultural sensitivities of the Simpson Islands, as well as the social values of the East Arm. Avoidance of sensitive areas would increase line length, further compromising the social and aesthetic values of the East Arm.


to Snap Lake
CHANNEL
HEARNE
McKinley Pt
Island
Blanchet
Setop I
Westhead Islands
Inconnu Channel
Island
Islands
Union Island
Channel
15
Simpson
Preble
Island
Hornby
Petitot
Islands
Thubun
Lakes
William Point
Driftwood
Taltson Bay
Trans-Island Route
Keith Island
HC
JC
113°00'
112°00'
113° 62°
112° 62°
24°E
Fl 4 sec
Fl 6 sec

10.3.2 Overland Route Alternatives

One southern overland option and two northern options are included in Overland Route Alternatives. These are shown on Figure 10-4. These options are entirely comprised of overhead structures constructed on land with clear span crossings of rivers and water bodies.

10.3.2.1 Southern Option

Considerable effort was made to locate a southern overland option that was constructible in terms of material staging and access feasibility, while locating transmission towers on comparable ground foundation materials and avoiding waterbodies. Only one such route option was identified, shown as the Southern Option on Figure 10-4. Route optimization, based on environmental and social sensitivities, as well as engineering and constructability restrictions are currently under development. This optimization may include sectional analyses of this route option and result in recommended route shifts to best accommodate interests prior to detailed design.

10.3.2.2 Northern Route Options

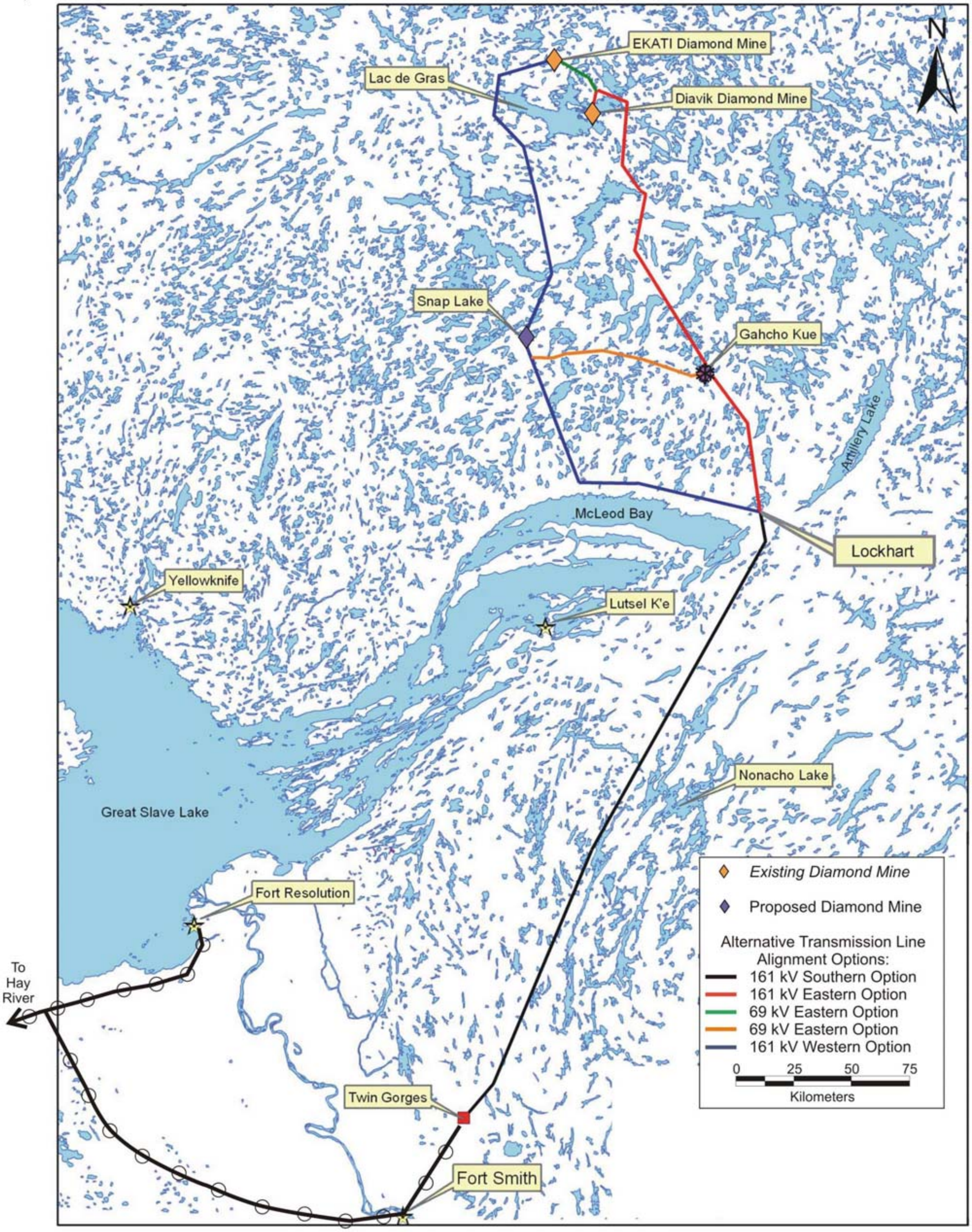
A significant effort was made in the investigation of transmission line routes extending northwards from McLeod Bay on the East Arm of Great Slave Lake. This sector has the most varied and difficult ground conditions along the entire line, poses access difficulties for construction as the line moves away from Great Slave Lake, and enters an area of known caribou migration patterns.

From an engineering and cost perspective, only two viable routes have been found through the maze of lakes, bogs, and fractured ground generally found in this area above tree line. These options are also shown on Figure 10-4.

The option currently preferred is the Eastern Option as described in Section 11. Under this option the 161 kV line would run to Gahcho Kué, then on to Diavik. A 69 kV line would run from Diavik to Ekati, and from Gahcho Kué to Snap Lake mine site.

The Western Option would run the 161 kV line from Twin Gorges to Snap Lake first, paralleling the north shore of the East Arm, and then north around the west side of Lac de Savage to Ekati. This alignment is located much further west than the preferred Eastern Option. A crossing of Mackay Lake is required on the Western Option and the proximity to the north shore of the East Arm potentially increases interactions with wildlife and social values than does the Eastern Option. While possible, the Western Option brings additional risk and complicates construction logistics.

At this time, the Eastern Option transmission line route is preferred due to lower estimated cost, less risk in ground conditions, and preliminary wildlife use studies. However, the line routing options continues to be studied, and a final recommendation may result in some modification of the preferred Eastern Option corridor as proposed in this submission.


EKATI Diamond Mine
Lac de Gras
Diavik Diamond Mine
Snap Lake
Gahcho Kue
Artillery Lake
McLeod Bay
Lockhart
Yellowknife
Lutsel K'e
Nonacho Lake
Great Slave Lake
Fort Resolution
To Hay River
Twin Gorges
Fort Smith
Existing Diamond Mine
Proposed Diamond Mine
Alternative Transmission Line Alignment Options:
161 kV Southern Option
161 kV Eastern Option
69 kV Eastern Option
69 kV Eastern Option
161 kV Western Option
0 25 50 75
Kilometers
N

11 PROJECT DESCRIPTION – PREFERRED CONCEPT

11.1 Generation Facility – North Gorge Site

The generation facility associated with the Taltson Expansion Project is located at the Twin Gorges site, slightly north of the existing plant. A general arrangement of the facility is shown in Figure 11-1. The water conveyance canal to the new powerhouse enters the Forebay near the right abutment of the existing dam and immediately upstream of an old river channel and what is known as the North Gorge. This development scenario has therefore been called the North Gorge site. Other development scenarios are discussed in Section 10.

The water conveyance canal runs a total distance of 1,250 m to a gated concrete intake structure. The canal would be excavated in sound rock, and would be primarily unlined. The concrete intake structure directs the flows into twin steel penstocks that would be buried. The penstocks deliver flow to the two turbines through a steel manifold located in the powerhouse. The powerhouse would be excavated into rock, but would be housed in a surface building (not underground). Once through the turbines, the water rejoins the Taltson River through a rock tailrace canal. A cross-section of the water conveyance and plant is shown in Figure 11-2. This arrangement represents the shortest water conveyance distance for a feasible connection of the existing Forebay and the Taltson River downstream of Elsie Falls. The existing plant has a much shorter water conveyance system, but utilizes only the head available from the dam to the former base of the Twin Gorge rapids.

Access to the new facility would be via the existing dam and new access roads to the canal termination/intake and the powerhouse sites. A 1.5 km section of 161 kV transmission line would connect the new plant substation to the main switchyard to be located near the existing generating plant.

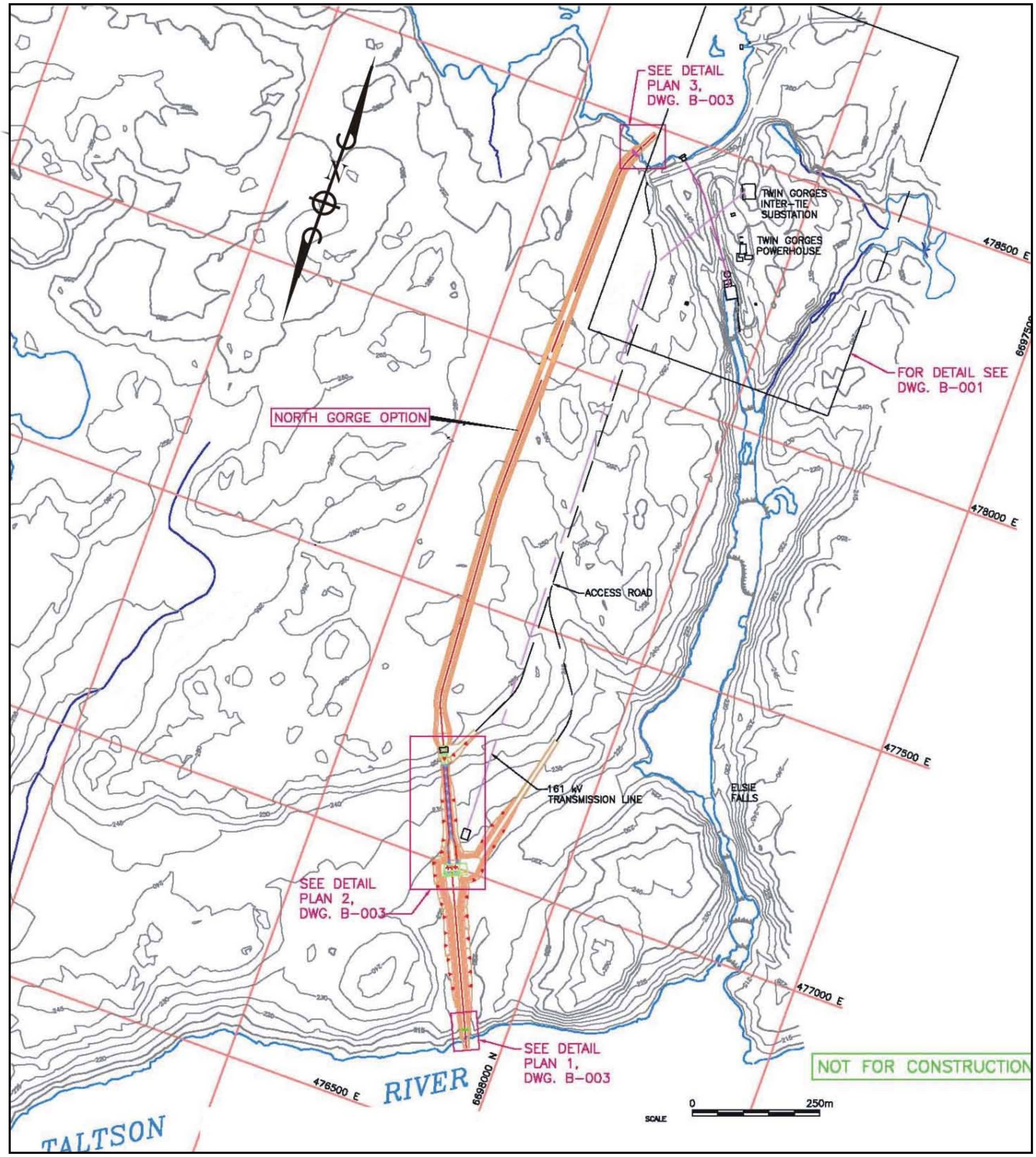
The new powerhouse would house two 18 MW, vertical shaft Francis or Kaplan turbines and associated synchronous generators, for a total installed capacity rated at 36 MW. With the existing facility running at full capacity, the total output of the Taltson Expansion Project would be approximately 54 MW. Basic characteristics of the Project are summarized in Table 11-1.

A construction schedule has been developed for the Project, assuming that a construction contract could be in place for a December Year 1 mobilization to site. The December mobilization would maximize the winter construction season. With this assumption, the schedule indicates commercial operation of the first unit in January Year 3, and the second unit in March Year 3, for a total construction period of approximately 27 months.

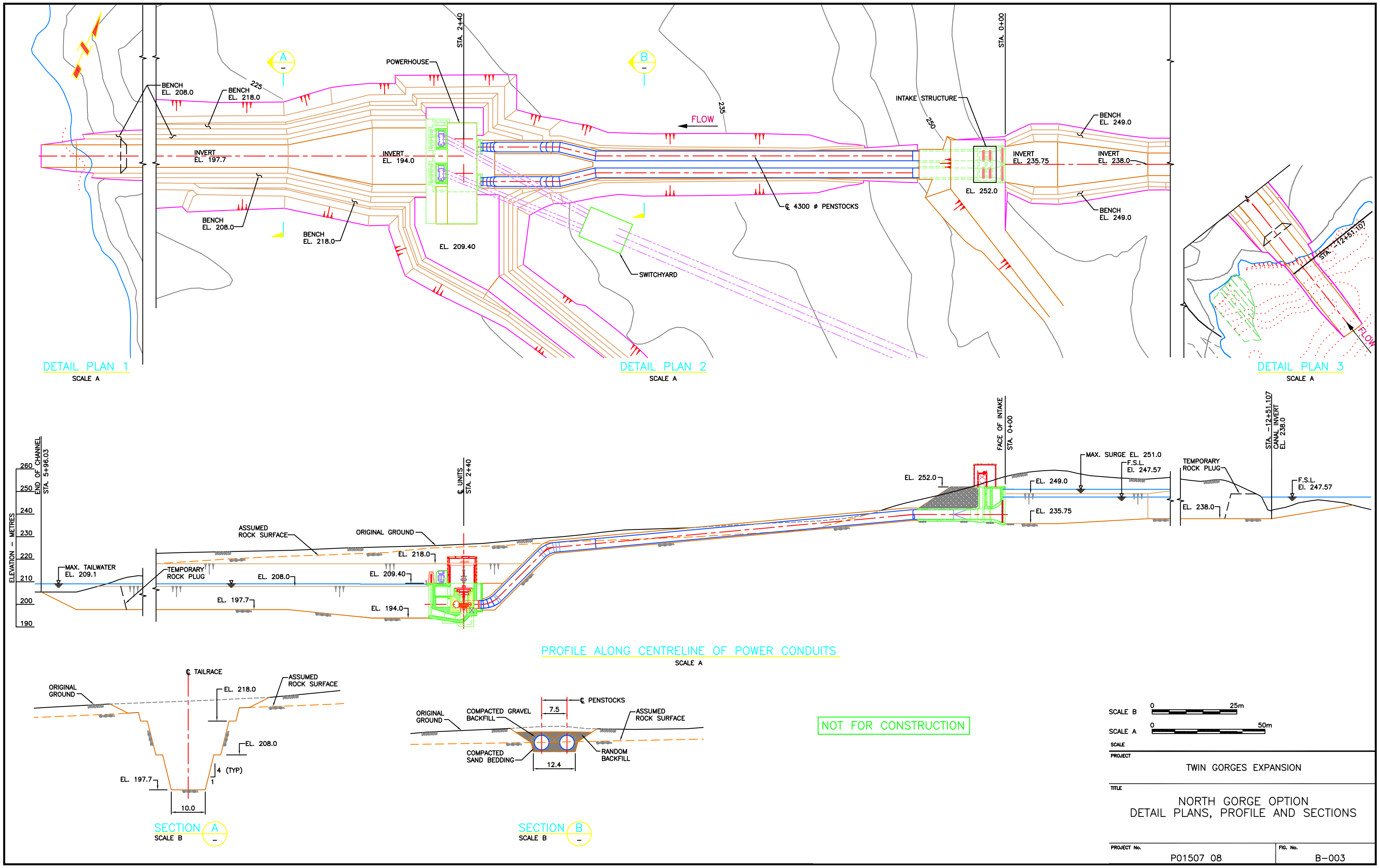
The total plant flow for the Expansion Project operating at capacity is the sum of the two plant flows, or approximately 180 m^3/s. This flow is slightly below the Mean Annual Discharge of the Taltson River at Twin Gorges, estimated at 193 m^3/s. As discussed in following sections, when lower flows are available, the Project would be operated such that the new plant is given water preferentially over the existing plant. The rationale is that the new plant would generate over 45% more energy from the same water in the Forebay than the existing plant, due to the increased operating head and higher efficiencies available from the newer generation equipment.

Table 11-1: Generation Project Characteristics

Characteristic / Option	North Gorge (new)	Twin Gorges Plant (existing)
Water conveyance length:	1,830 m	400 m
▪ Power Canal	1,250 m	-
▪ Penstock	240 m	375 m
▪ Tailrace Canal	340 m	25 m
Gross Head	41.0 m	29.0 m
Design Flow	107.5 m^3/s	74 m^3/s
Installed Capacity	36 MW	18 MW
Number of Units	2	1
Machine Efficiency	94%	89% (estimate)
Plant Capacity Factor over Record	90.5%	83.0%
Average Annual Energy (with maintenance period)	285 GWh	158 GWh
Construction Period	27 months from a December start	NA


SEE DETAIL
PLAN 3,
DWG. B-003
TWIN GORGES
INTER-TIE
SUBSTATION
TWIN GORGES
POWERHOUSE
478500 E
FOR DETAIL SEE
DWG. B-001
NORTH GORGE OPTION
478000 E
ACCESS ROAD
477500 E
161 kV
TRANSMISSION LINE
ELSIE
FALLS
SEE DETAIL
PLAN 2,
DWG. B-003
477000 E
SEE DETAIL
PLAN 1,
DWG. B-003
NOT FOR CONSTRUCTION
476500 E
RIVER
6698000 N
0
250m
SCALE
TALTSON

Dezé Energy Corporation



TALTSON
Hydroelectric Expansion Project

Project Description
March 2007

Water Conveyance and Plant Cross-Section
North Gorge Option

Figure 11 - 2

11.2 Nonacho Lake Control Structures

The existing Nonacho Lake control structures comprise the rock-fill dam and its three timber-lined sluice passages, and the adjacent rock channel spillway, both located at the natural outlet of Nonacho Lake. The dam has a significant leakage issue, and the sluice gates have reached the end of their serviceable life. As the Taltson Expansion Project would require a much larger release from the lake than is currently possible through the timber sluiceway gates, a new control structure has been developed to replace the existing sluice gates. The general layout of the proposed new Nonacho Lake structure is shown in Plate 11-1, Figure 11-3 and Figure 11-4. The new structure would comprise the following key components:

- A short intake canal in rock from the lake at a point upstream of the left abutment of the existing dam;
- A concrete structure housing four gated sluice passages capable of releasing 120 m^3/s at a relatively low lake level (near the current minimum of 319.3 masl), and up to 200 m^3/s at higher lake levels (above 322 masl);
- A rock cut canal downstream of the gates to the existing release channel downstream of the dam;
- A micro-hydro generation plant to supply sufficient power for heating of the gates, equipment operations, lighting and control/communications;
- A backup diesel generator and associated equipment;
- A spillway raise of approximately 0.5 m through installation of a concrete sill across the rock entry sill on the existing rock channel spillway.

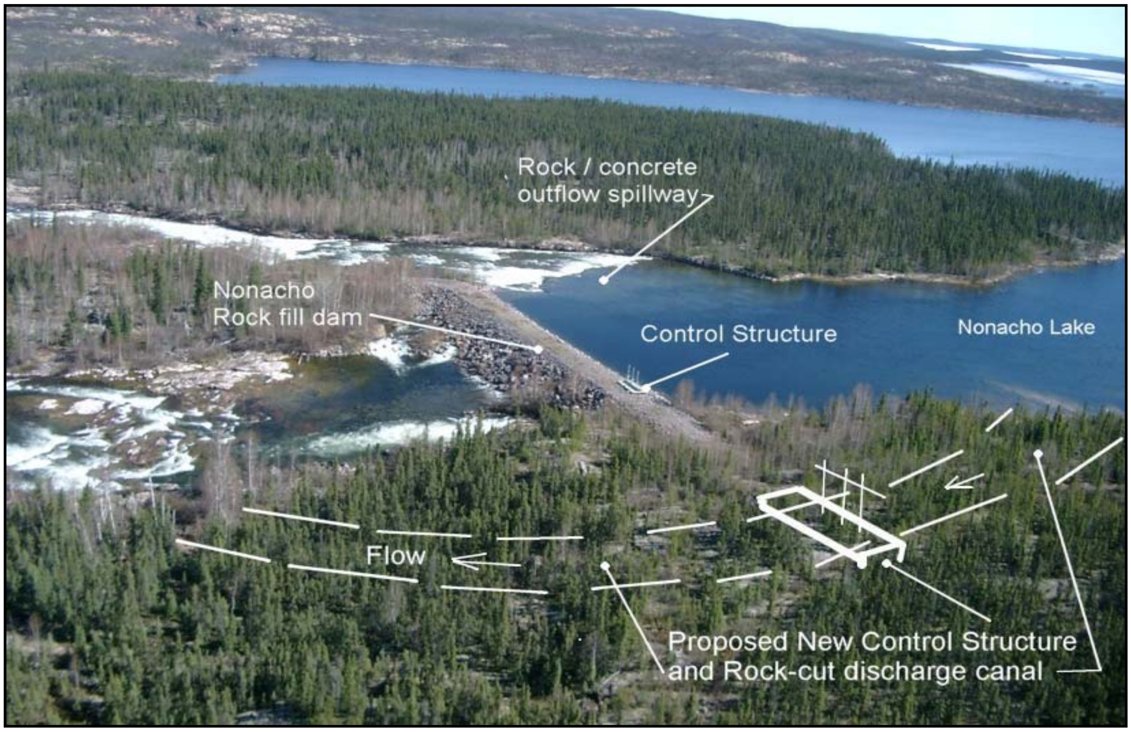
The general characteristics of the new control structure are summarized in Table 11-2.

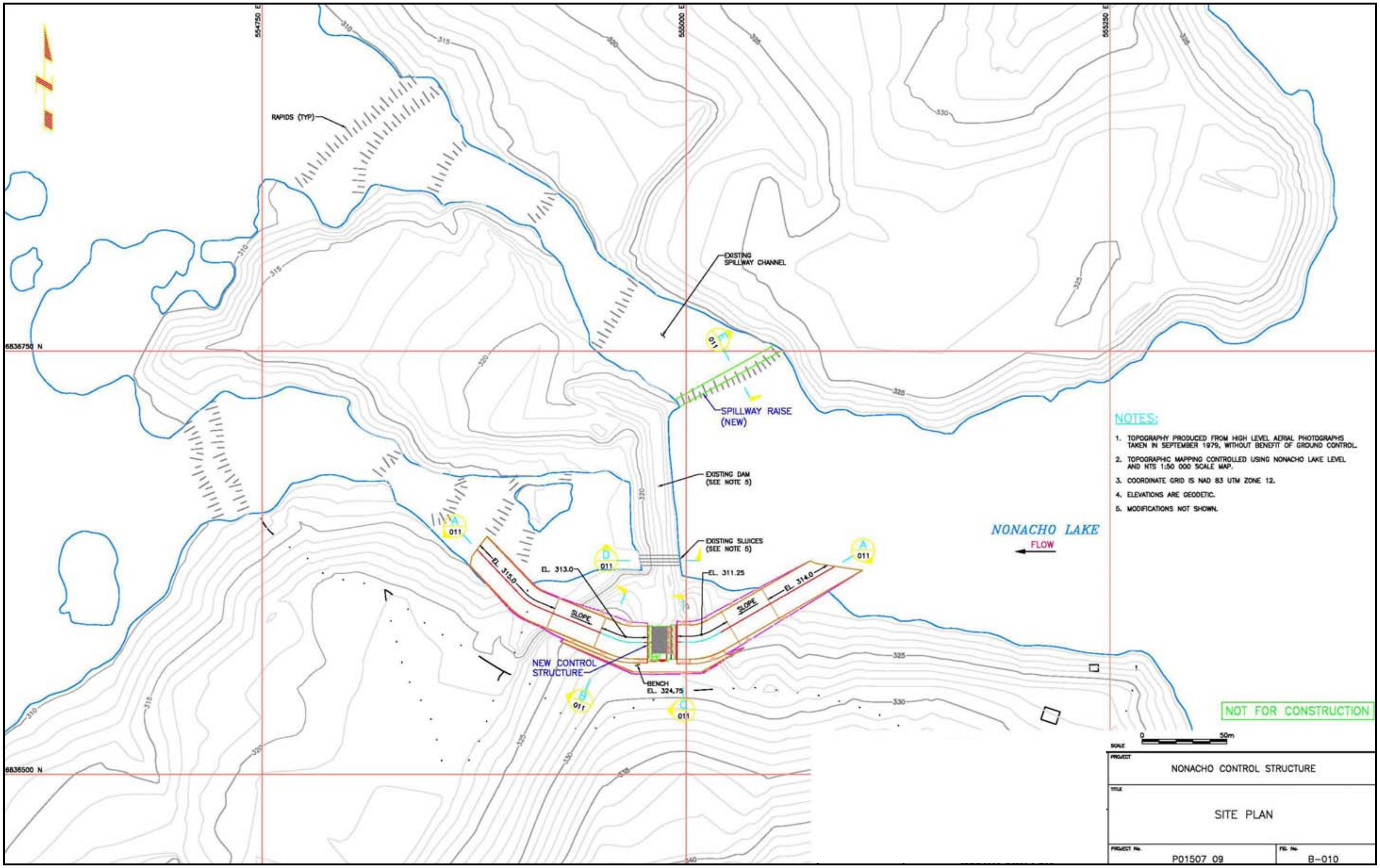
Materials from the canal and gateworks structure excavation would be utilized for both a new upstream blanket and a raise of the existing dam to decrease the leakage through the structure. The existing gates would be permanently closed, and the sluices filled with both fine and coarser materials. Sufficient material would be placed in front of the sluice area such that the continued degradation of the timber structures in the existing structure would not affect the dam performance.

Table 11-2: Nonacho Lake Control Structure Summary

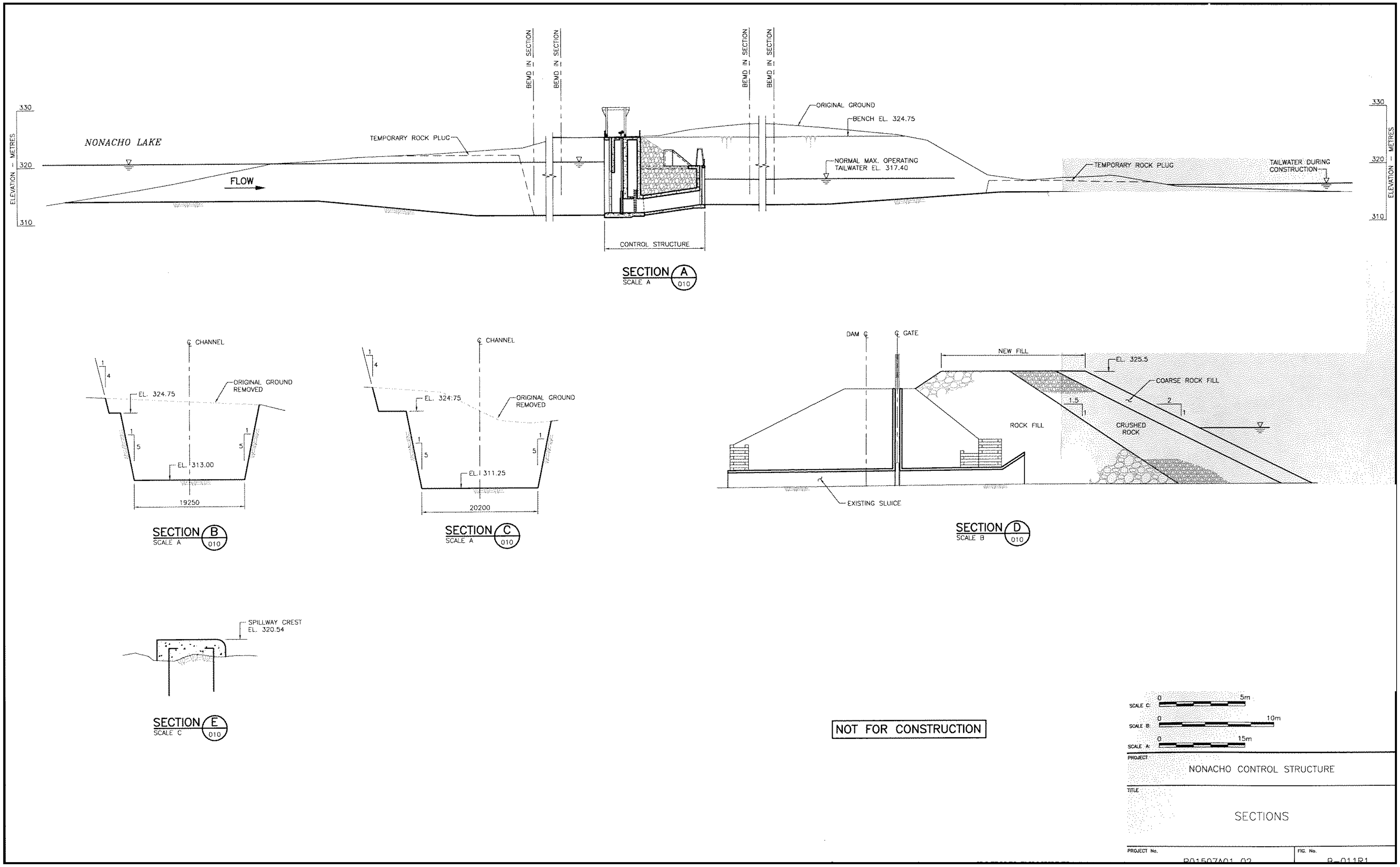
Characteristic	Control Structure
Water conveyance length: • Entrance Canal • Tailrace Canal	220 m 100 m 120 m
Design Flow	120.0 m^3/s
Construction Period	15 months from a December start

Plate 11-1: Proposed Nonacho Lake Structure





TALTSON HYDROELECTRIC EXPANSION PROJECT	PROJECT DESCRIPTION MARCH 2007	General Arrangement of New Control Structure Nonacho Lake	FIGURE 11 - 3



TALTSON
HYDROELECTRIC EXPANSION PROJECT

PROJECT DESCRIPTION
MARCH 2007

Cross-Section of New Control Structure
Nonacho Lake

FIGURE
11 - 4

The current Water Licence for the existing Taltson Twin Gorges facility includes the Nonacho Lake structure and operation, stipulates the minimum operating water level in the lake (319.3 masl), and stipulates a minimum release of 14 m^3/s below the spillway. Anticipating that these requirements would remain in any new arrangement, they have been retained as a part of the design development and included in the hydrological model.

A construction schedule has been prepared on the basis of the preliminary design as discussed above. Assuming a late autumn construction award, early winter mobilization, and the existence of the winter road developed for the transmission line construction in close vicinity to the new lake outlet structure, the schedule indicates construction duration of approximately 15 months. This duration would fit well into the overall Project construction duration anticipated to be approximately 30 months.

As the removal or rehabilitation of the Nonacho Lake control structure is likely to be required in a life extension of the existing generation facility at Twin Gorges, the construction of the new structure within the Expansion Project is of significant benefit to the existing customers of NTPC.

No changes are currently envisaged to the natural flows leaving Nonacho Lake through the Tronka Chua "gap" at high lake levels. These flows, which can be significant in the freshet, flow through the parallel Tronka Chua and Thekulthili Lake system, and re-enter the mainstem Taltson River at Lady Grey Lake, approximately 100 km upstream of Twin Gorges (see Figure 1-2). The hydrological model includes these uncontrolled flow releases.

11.3 South Valley Spillway

The existing Forebay formed by the Taltson Twin Gorges dam and the associated South Valley Spillway into Trudel Creek would not be altered in any significant way within the Taltson Expansion Project. The Project operating Forebay level would continue to be kept within current operational ranges, such that the existing plant sees no changes to generation head.

The Project Operations in Section 12 discusses water volumes which indicate that the spill of substantial volumes of excess water over the South Valley Spillway would likely no longer occur on a regular basis as the new regulating structure on Nonacho Lake would provide increased flow releases into the upper Taltson River, and the new generation plant would utilize significantly more flow from the Forebay. If regulated minimum releases are required from the Forebay, modifications may be required to the spillway structure to facilitate controlled flow releases at operating levels slightly below the current spillway crest level.

11.4 Main Switchyard at Twin Gorges

The Taltson Expansion Project would electrically integrate the existing plant and the new generation facility at Twin Gorges. The existing plant and the new powerhouse would be linked themselves into a new main switchyard. This switchyard would supply the existing 115 kV line to Fort Smith and the new 161 kV line to the mines. A minor re-routing of the existing line would be required in the vicinity of the existing plant.

The integration of the existing and new plants would provide significantly enhanced reliability of generation into the existing 115 kV line and likely allow elimination of the annual service interruption for maintenance of the existing Twin Gorges plant, when diesel generation is required in Fort Smith. The diesel plant would continue to be required for backup support.

11.5 New Transmission Line

To supply the power from Twin Gorges to the mine sites, a new 161 kV and 69 kV transmission system would be constructed running from the Twin Gorges switchyard site northeast around the East Arm of Great Slave Lake and northwards to the diamond mine customer sites. For the route currently preferred, the 161 kV sections would run between Twin Gorges and Gahcho Kué and from Gahcho Kué to Ekati. The branch lines would be 69 kV lines interconnecting substations at Gahcho Kué and Snap Lake mine sites, and between Diavik and Ekati mine sites. A summary of the transmission line characteristics is provided in Table 11-3. The transmission line route is shown in Figure 11-5.

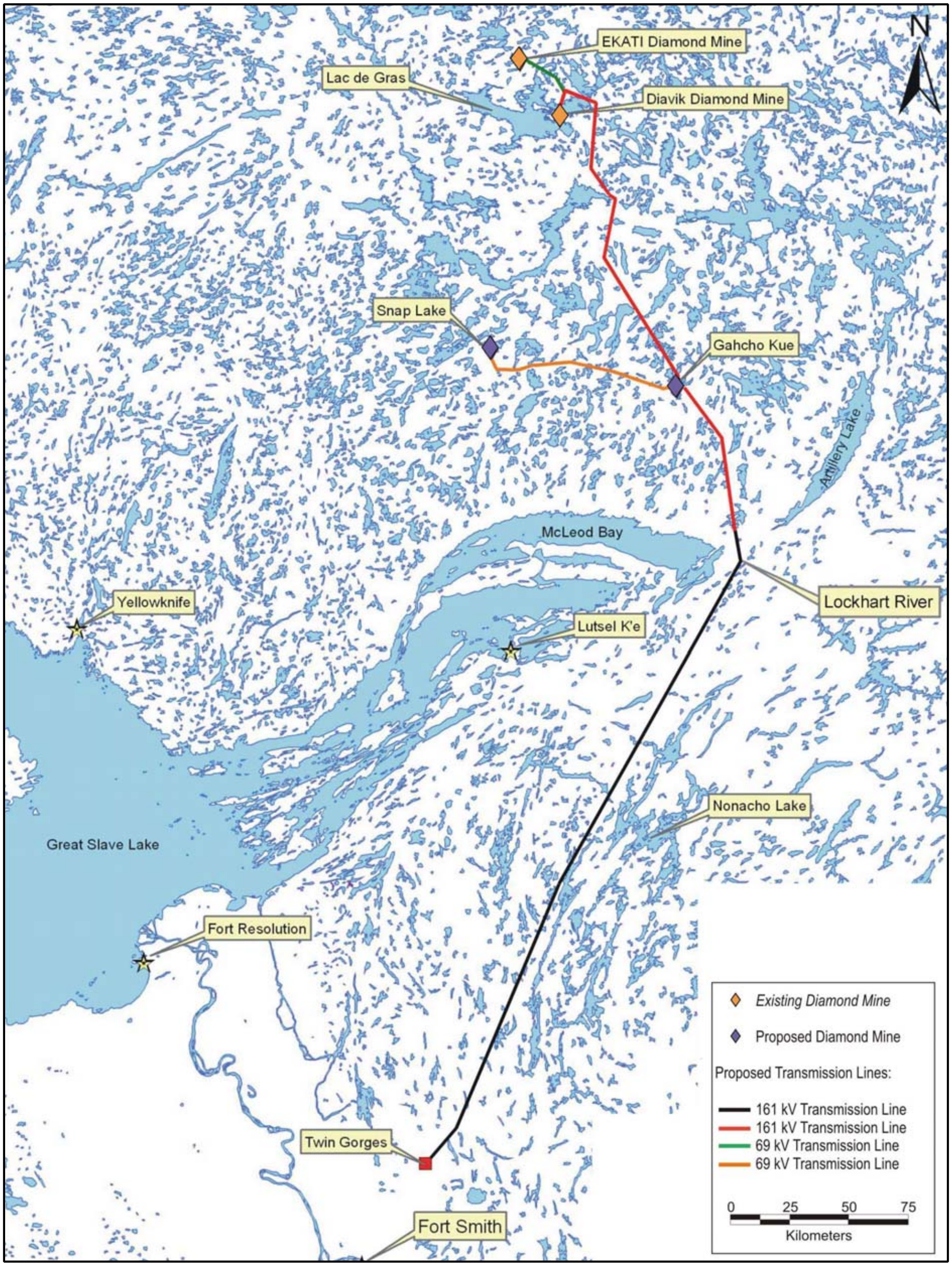
Table 11-3: Summary of Transmission Line Characteristics

Characteristic / Option	Transmission Line
Line Sector at 161 kV • Twin Gorges – Gahcho Kué • Gahcho Kué – Diavik Line Sectors at 69 kV • Gahcho Kué – Snap Lake • Ekati - Diavik	 383 km 171 km 96 km 40 km
Total of 161 kV	554 km
Total of 69 kV	136 km
Total Line Length	690 km
Design Capacity of 161 kV Line	270 MW
Maximum Expected Load for Existing Customers	54 MW
Conductor Size	715 mcm
Number of Circuits	Single Circuit
Type of Tower (161 kV)	Guyed Steel Pole
Type of Tower (69 kV)	Guyed Steel Pole
Communications System	Power Line Carrier
Total number of towers	1,600 (approx)
Right of Way Tenure width Requirement	30 m
Construction Period	30-36 months from a November start

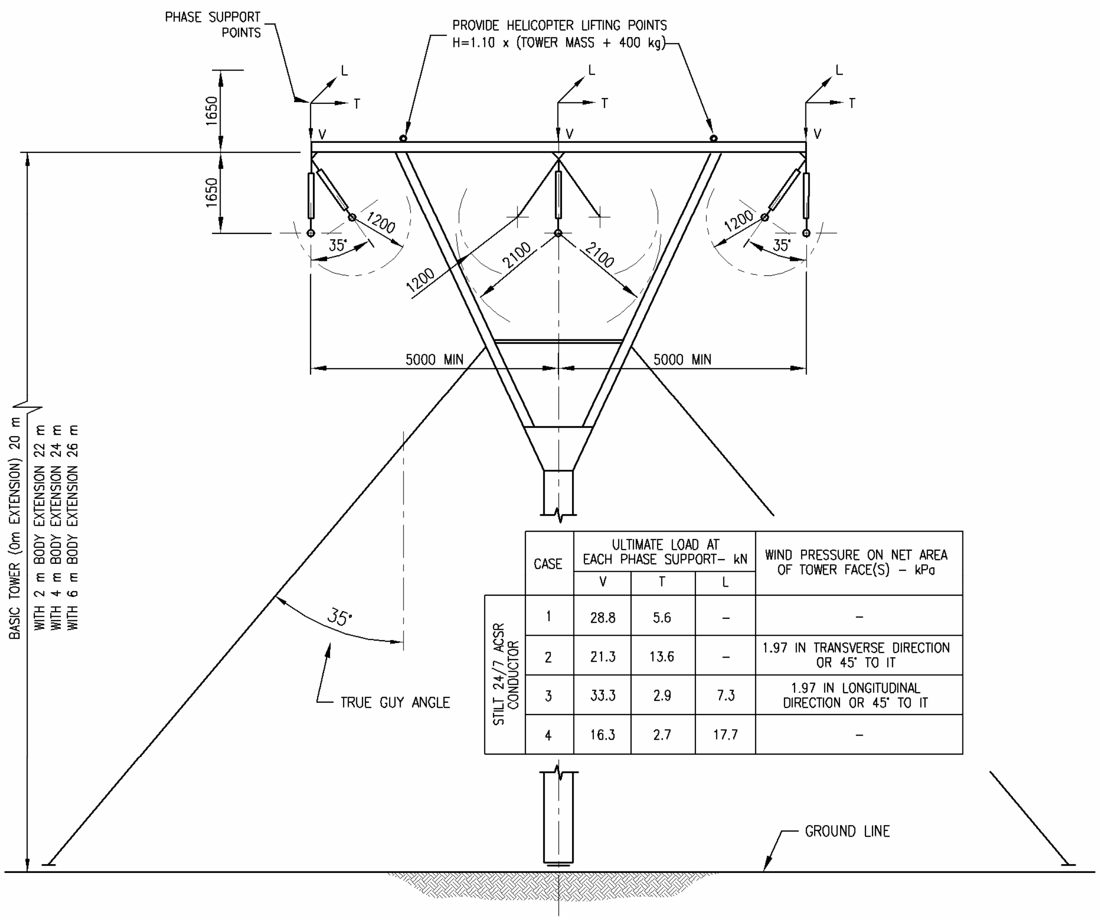
The new transmission line would be constructed on a cleared right-of-way, where necessary, approximately 30 m in width, with allowable maximum brush height of approximately 3 m. The towers would be either lattice steel or pole-type structures, supported on a central foundation pin and four guy wires running from near the cross-arm structure to anchor points in opposing directions from the tower. These structures are virtually identical to those utilized on the existing 115 kV line to Fort Smith and Pine Point. A typical 161 kV transmission structure is shown in Figure 11-6 and a 69 kV structure in Figure 11-7**.**

The average spacing of the towers would be approximately 350 m; however, this would vary depending on the terrain. Typically, towers would be founded on rock outcrops, and guy anchors would be simple grouted anchor bolts. Tower height would depend on terrain and line requirements at the particular station, but would be approximately 22 m. The single circuit line would include three conductors. These conductors are non-insulated, spiral wound aluminium strand over a central steel cable. The conductors would be “sagged” to meet standard electrical clearance requirements above ground, and would present no shock hazard to humans or wildlife on the ground.

The transmission line technical design optimizes the cost of the conductor versus the line loss, which normally decreases as the conductor gets larger in diameter and hence more expensive. As line losses represent very high value for this project, the cost optimization has resulted in a line capacity higher than the anticipated maximum generation potential and customer load projected for the Taltson Expansion Project.


N
EKATI Diamond Mine
Lac de Gras
Diavik Diamond Mine
Snap Lake
Gahcho Kue
Artillery Lake
McLeod Bay
Lockhart River
Yellowknife
Lutsel K'e
Nonacho Lake
Great Slave Lake
Fort Resolution
Twin Gorges
Fort Smith
Existing Diamond Mine
Proposed Diamond Mine
Proposed Transmission Lines:
161 kV Transmission Line
161 kV Transmission Line
69 kV Transmission Line
69 kV Transmission Line
0 25 50 75
Kilometers

Dezé Energy Corporation



	CASE	ULTIMATE LOAD AT EACH PHASE SUPPORT– kN			WIND PRESSURE ON NET AREA OF TOWER FACE(S) – kPa
		V	T	L	
STILT 24/7 ACSR CONDUCTOR	1	28.8	5.6	–	–
	2	21.3	13.6	–	1.97 IN TRANSVERSE DIRECTION OR 45° TO IT
	3	33.3	2.9	7.3	1.97 IN LONGITUDINAL DIRECTION OR 45° TO IT
	4	16.3	2.7	17.7	–

TALTSON EXPANSION PROJECT 161 kV TRANSMISSION LINE
TYPE 'A' 0–3 DEGREE TOWER

PHYSICAL CHARACTERISTICS OF CONDUCTOR	"STILT" 715.5 kcmil, 24/7 ACSR
CONDUCTOR	26.31 mm DIAMETER
RATED TENSILE STRENGTH	113.4 kN
MAXIMUM TENSION WITH 19 mm ICE, 0 WIND @ –25°C	66.7 kN
UNIT MASS OF BARE CONDUCTOR	1.371 kg/m
UNIT MASS OF CONDUCTOR WITH 19 mm ICE	3.850 kg/m
UNIT MASS OF CONDUCTOR WITH 12.7 mm ICE	2.792 kg/m
287 Pa WIND ON CONDUCTOR PLUS 12.7 mm ICE	1.514 kg/m
287 Pa WIND ON BARE CONDUCTOR	0.770 kg/m
WEIGHT SPAN	450 m
WIND SPAN	410 m
LINE ANGLE	3°

NOTES:

1. THE VERTICAL, TRANSVERSE AND LONGITUDINAL CONDUCTOR LOAD IN CASES 1, 2 & 3 ARE TO BE APPLIED AT ANY ONE, ANY TWO OR ALL THREE PHASE SUPPORT POINTS.
2. THE VERTICAL, TRANSVERSE AND LONGITUDINAL CONDUCTOR LOADS IN CASE 4 ARE TO BE APPLIED AT ANY ONE OR ANY TWO PHASE SUPPORT POINTS. WITH THE LOADS OF CASE 1 ON THE REMAINING PHASE SUPPORT POINT(S).
3. THE LOADS OF ALL LOAD CASES MUST BE MULTIPLIED BY 1.2 FOR FOOTING DESIGN.
4. THE SLOPE OF CONDUCTOR TO THE HORIZONTAL WILL BE –5 AND +25 DEGREES.
5. MINIMUM CLEARANCE FROM CENTER LINE OF CONDUCTOR TO THE EDGE OF TOWER STEEL IS 1200 mm FOR VERTICAL STRING INSULATORS.
6. TRANSVERSE AND LONGITUDINAL LOAD SHALL BE CONSIDERED TO ACT IN EITHER THE POSITIVE OR NEGATIVE DIRECTION.
7. TOWER CONFIGURATION SHOWN IS TO ILLUSTRATE REQUIRED DIMENSIONS ONLY.
8. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

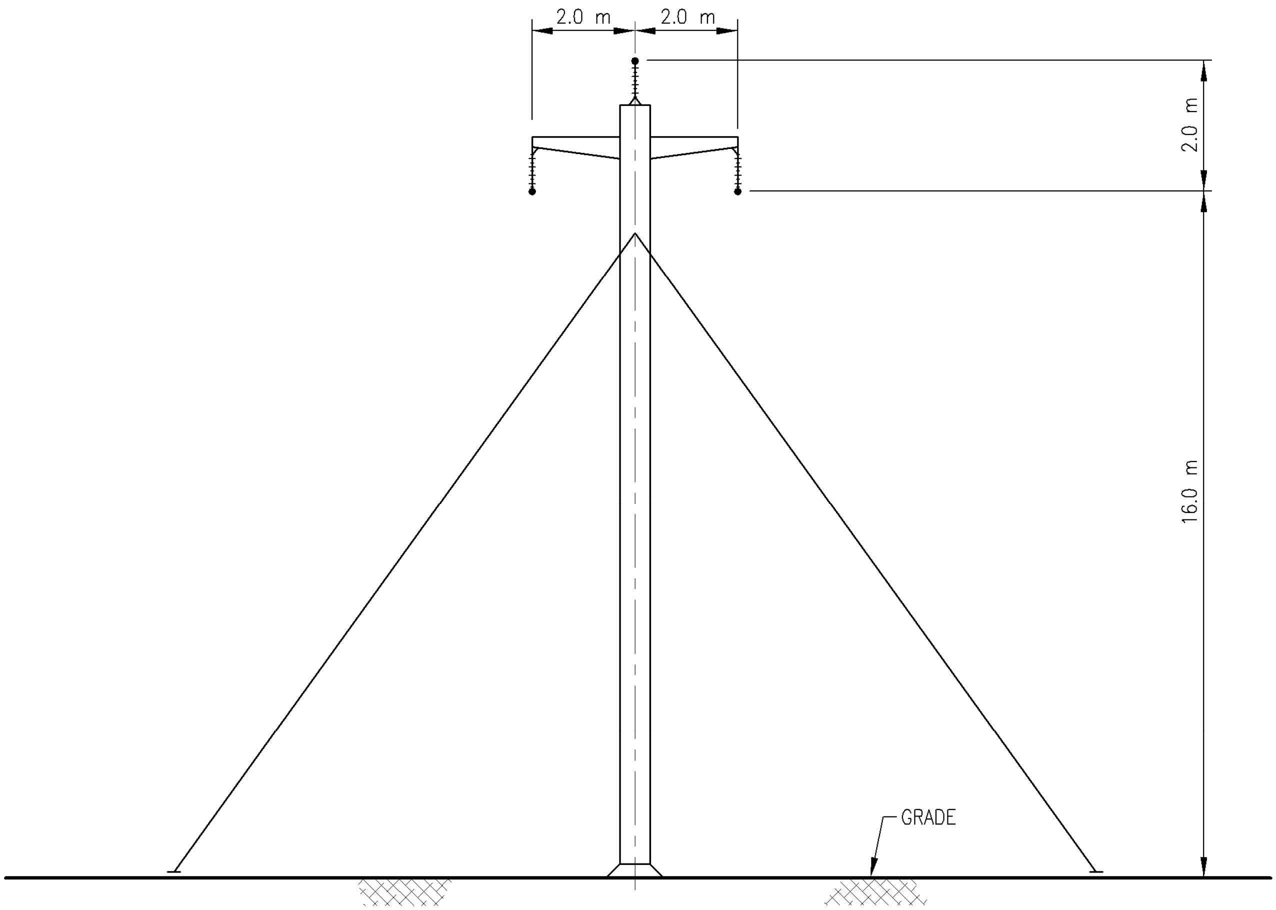
PRELIMINARY
DO NOT USE FOR CONSTRUCTION

Typical 161kV Transmission Structure
Twin Gorges to Diavik

FIGURE 11 - 6

Déze Energy Corporation

REV. #	DESCRIPTION	DATE	BY
A	FEASIBILITY STUDY	MAY/06	M.R.



AVERAGE SPAN 250.0 m
APPROXIMATE MASS = 900 kg
CONDUCTOR "OSTRICH" 26/7 ACSR

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

TALTSON Hydroelectric Expansion Project	**Project Description March 2007**	**Typical 69 kV Transmission Structure Gahcho Kué to Snap Lake**	**Figure 11 - 7**

11.6 Substations

New substations would be required at each of the four mine sites. Substations would contain termination structures for the incoming lines and outgoing lines, voltage step-down transformers, circuit breakers, isolation protection and metering equipment. A small heated building would typically house protection and control equipment in each substation. The transmission line voltage (161 kV or 69 kV) would be stepped down to the operating voltage of the existing mine site substations, typically 13.8 kV, 6.9 kV, or 4.16 kV. Revenue metering equipment would accurately measure electrical power and energy usage of the mines.

Substation land requirements at each mine site are not large, typically 3000 m^2. It is envisaged that substations would be developed adjacent or in close proximity to the existing main mine site diesel generation plants, and would therefore be on mine property.

11.7 Energy Generation Output Assessment at Plant Site

11.7.1 General Approach

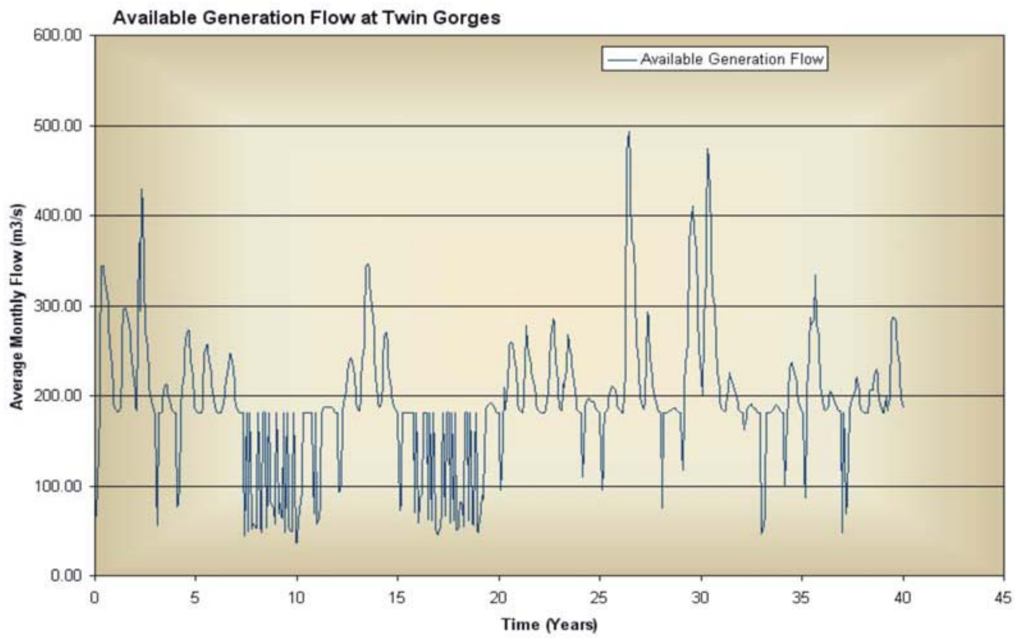
With the concept design developed, a relatively accurate assessment of the facility performance was made in terms of energy generation and reliability with the hydrological generation model. As noted, this model works from a baseline hydrological inflow set, on a monthly time step, and incorporates a set of assumptions on basin characteristics, operating rules for the control structure at Nonacho Lake, and, within the generation module, the water conveyance losses, machine performance, and operations logic for dispatch of the two generating plants. The operating rules for the Nonacho Lake structure were discussed in Section 9.3. A set of available flows at the Twin Gorges site based on the historic 40 year record and routed through the hydrogenation model are shown in Figure 11-8. Ideally, this record would be a relatively flat line at the Twin Gorges full plant flow demand of approximately 180 m^3/s, with small spills occurring occasionally. Because the storage in the system is limited, and the Tazin inflows are unregulated, flows above and below the demand line occur regularly throughout the record. Flows below the demand line mean an energy deficit would occur, as discussed in the following section.

A number of additional operating assumptions are carried in the current model at Twin Gorges, as follows:

- The Forebay level and associated gross head on the plants is assumed constant, though in fact it would vary by a small amount;
- The current fixed head assumption is conservative in terms of energy production; and
- The new plant is operated preferentially over the existing 18 MW plant – that is, as available flows to the Twin Gorges Forebay decrease, the existing plant

output is gradually curtailed to shut down, prior to the new plant output being curtailed. This is a result of the new plant operating with approximately 11 metres more head than the existing plant and significantly higher efficiency generation equipment. Furthermore, same available flow would create a minimum of 40% more energy in the new plant than the existing plant.

Figure 11-8: Set of Available Flows at the Twin Gorges Site – Based on the Historic 40 Year Record and Routed through the Hydrogenation Model



11.7.2 Period of Record Output Projection

For the North Gorge arrangement, the generation output for the new plants is best shown as capacity factors over the period of record, where capacity factor indicates the percentage of full plant output that is achieved during the month. Monthly capacity factors for a new plant up to 36 MW, the existing 18 MW plant, and the combined system totalling 54 MW are shown in Figure 11-9, Figure 11-10, and Figure 11-11 respectively.

While the overall reliability of generation for the 54 MW of generation capacity is quite high at approximately 90%, there are significant short-term deficits when capacity can drop to below 60% of full output. During these periods, diesel generation would be required at the mine sites to meet the specified loads.

Two periods of very significant deficits occurred during multi-year dry periods in 1968-72 and 1978-81 that strongly affect the generation statistics. In these cases the storage at Nonacho Lake cannot provide sufficient flows for continued generation at high levels of output. There have been no events of that duration since the early 1980's in the Taltson Basin.

Figure 11-9: Generation Output for New Plant

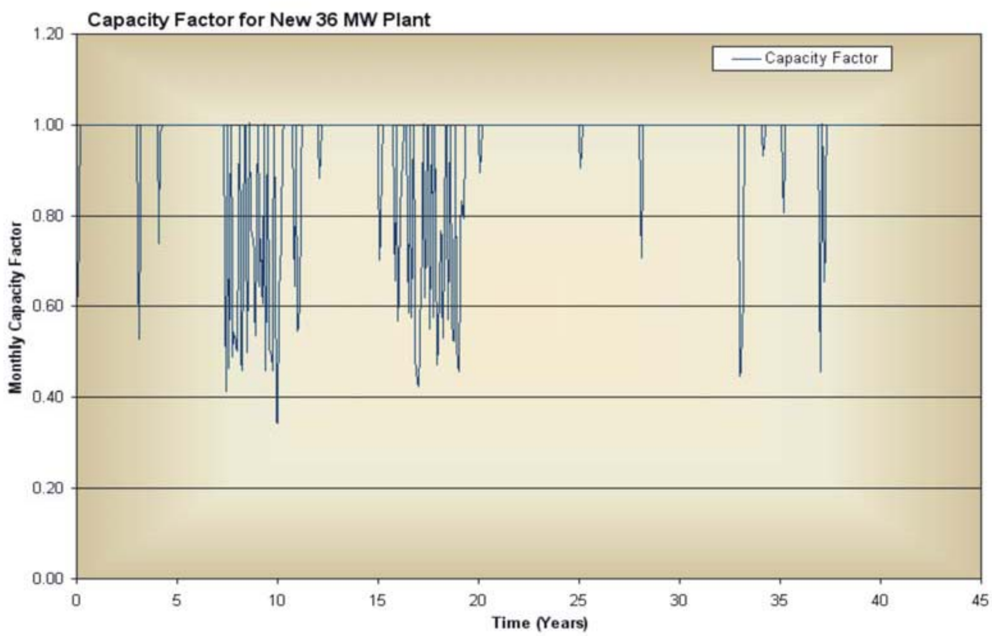


Figure 11-10: Generation Output for Existing Plant

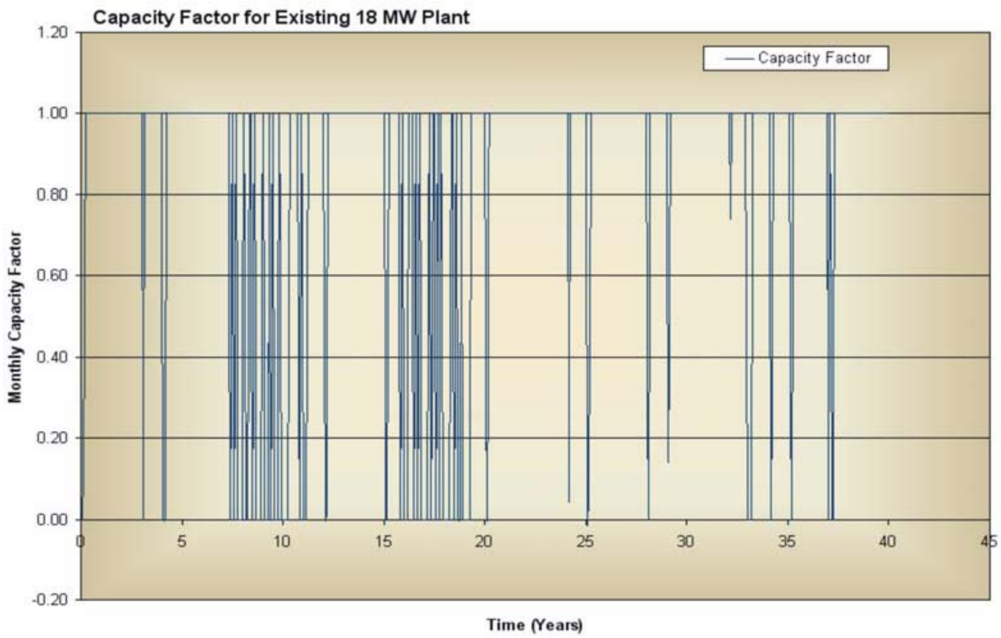
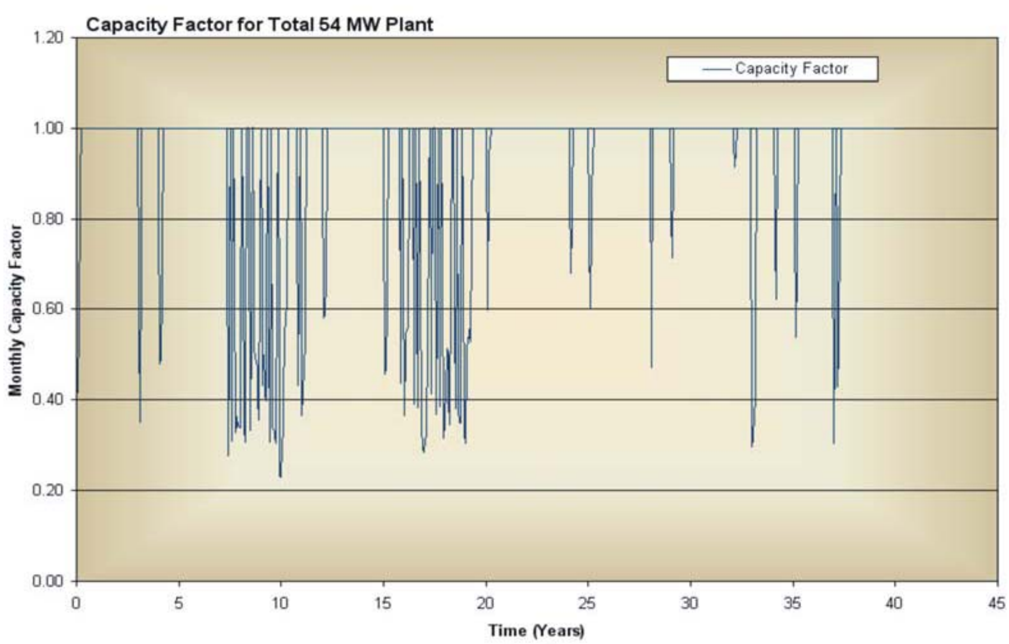


Figure 11-11: Generation Output for New and Existing Plant



11.7.3 Synthetic Dry Period Assessment

The generation model has been tested against multi-year dry scenarios to see the effects of such cycles on the Expansion Project. This testing is typically utilized to assess the financial robustness of the Project and define minimum required debt coverage rations. As Nonacho Lake offers only a single year of storage, the multi-year dry periods have a significant impact on the predicted output. These results are summarized in Table 11-4 as capacity factors for the new 36 MW plant only, for the specific dry period under consideration.

Table 11-4: Generation Model Multi-Year Testing Scenarios

Nonacho Inflow	Lowest Plant Factor for Period of Consideration		
% Assumption	12 Months	24 Months	36 Months
45 %	0.74	0.80	0.82
50 %	0.74	0.80	0.82
55 %	0.75	0.80	0.82

These results arise from the noted dry sequence years occurring prior to 1981. The capacity factors show that through the worst year in the record, the existing plant would basically not be operated, and the new plant would operate to approximately 74% of capacity.

11.8 Load Demand and Delivery

11.8.1 General

The energy output assessment described in Section 11.7 provides the gross generation of the integrated system of the existing and new power plants at Twin Gorges. From the gross generation, net available power and energy must be estimated to allow for scheduled and unscheduled outages of the system, and line losses to various points on the transmission system.

11.8.2 Outages

As discussed further in Section 12, scheduled outages would be defined periods, typically annually, where each of the two plants would be taken out of service and inspected/maintained. Unscheduled outages relate to plant trips due to equipment malfunction (rare), or more commonly, lightning strikes on the transmission line. In the current studies, non-reclosable lightning trips are estimated to occur up to 8 times per year on the line. As the line can be sectioned between load centers, only those trips that occur between Twin Gorges and Gahcho Kué would affect the entire transmission system. Lightning trips can require physical repairs on occasion. An industry standard loss in delivery time of approximately 2%

is assumed, to account for unscheduled outages. Outages do not affect capacity delivery, only energy delivery.

11.8.3 Transmission Line Losses

Transmission voltage and conductor size optimization studies have been undertaken in the line feasibility work to define the most cost effective arrangement for the delivery of the required power to the various mines. The 161 kV voltage has been chosen as the best alternative between 115 kV and 230 kV, the former which has very high transmission losses, and the latter which is significantly more expensive. Conductor sizing has been based on an extensive optimization study and results in a balance of capital and installation costs (cost) and lower line loss costs (benefit). Line losses affect both capacity and energy delivery.

11.8.4 Supply and Demand Summary

Based on the most recent discussions with mine customers and incorporating allowances for transmission losses, a summary of anticipated loads and demands is provided in Table 11-5.

Table 11-5: Annual Generation Capacity and Energy Delivery Summary

Customer	Peak Load at Load Center (MW)	Capacity Delivery Losses (MW)	Total Load at Twin Gorges (MW)	Annual Energy Requirements (GWh)
Forts Smith, Resolution, Fitzgerald/Hay River	8 – 13	Included	8-13	65
Ekati Mine	11	0.1	11.1	100
Diavik Mine	9	2.0	11.0	75
Snap Lake Mine	12-14	0.1	12 – 14.1	100
Gahcho Kué Mine	10	3.0	13.0	80
Other Markets	All Surplus	Unknown	Future	All surplus
Total Load	**50–57**	**5.2**	**55.1 – 62.2**	**420**
Plant Output			**54**	**420**

Note: Mine energy requirements and load profiles subject to change to meet operational needs.

The Load Center demands are quoted peak demands, and therefore it is highly unlikely that all peak demand would occur simultaneously. Typically, sizing a plant to 80% to 90% of this sum would provide sufficient reliability. The 54 MW installed capacity at Twin Gorges is therefore an appropriate plant sizing for the currently defined loads and loss estimates.

The net energy delivery from the Expansion Project, after a 2% outage assumption, and with a long-term reliability factor of approximately 90%, is estimated at 420 GWh. This energy output estimate is highly dependent on the conditions of water release that may be required at Twin Gorges spillway. Under current assumptions, the plant size and output provide an excellent balance with the forecast loads and annual energy demands.

12 PROJECT OPERATIONS

12.1 General

The effective operation of the Expansion Project would ultimately require the combination of a number of sophisticated monitoring and modeling tools with an interface to the plant control system. As well, a reasonable level of operational flexibility within the facility design would be required to deal with unexpected variations in flows. Fieldwork, record collection, analysis and interpretation have been utilized to create a number of numerical models to simulate both past and future operation of the facility within the Taltson River basin. The hydrological and basin models have in turn been utilized to develop the preliminary design of key characteristics of the Expansion Project. Both the models and, to the extent possible, the design, would be updated as required to include any new data or Project requirements such that the Project as constructed would be optimized for the defined operational criteria. Operational experience would ultimately be required to gain a more thorough understanding of the basin – this in itself is not atypical of such developments.

The presentation of general operational predictions as provided below is based on the current design and on the model development undertaken to date. The flows, water levels, releases, and generation output are all based on the use of historic flow records passed through the Taltson Expansion Project system.

12.2 Nonacho Lake Control

The Nonacho Lake control structure is a key component of the Taltson Expansion Project, as it would manage the seasonal reliability of available flows for generation at Twin Gorges through the regulation of the large natural live storage volume available in Nonacho Lake.

The Tazin River has no non-natural regulation structures, but contributes an estimated 45% - 55% of the inflows into the Twin Gorges Forebay. The Taltson River contributes the remaining percentage of flows, with the majority of that emanating from Nonacho Lake. The Nonacho Lake control structure is required to balance the uncontrolled and unpredictable flow variation in the Tazin River system, such that water is effectively made available for generation without excess spill or extended low flow periods at Twin Gorges. Although some regulation currently occurs at Nonacho Lake, the existing structures have no automatic control functions, and are of insufficient capacity to support the Expansion Project.

The current modeling of Expansion Project operations based on a past set of 40 years of hydrological record indicates that the new structure at Nonacho Lake can be operated such that lake level excursions would not exceed historic levels within the same period of record, or move below current Water Licence requirements for minimum levels and minimum downstream releases. With the new structure, it is expected that lake levels would generally show more annual fluctuation than has been the case since the closure of the Pine Point Mine (in 1986), when Nonacho Lake regulation essentially ceased. In particular, lake levels would be drawn down during the winter and spring periods, and recharge from this lower level with the summer freshet. The timing of lake level excursions would also alter to some degree, with maximum lake levels occurring somewhat later in the season than is the case now. The overall range in lake levels would still remain approximately 2.5 m through even relatively extreme inflow events.

A lake level graph for the 40 year period of record utilized in the study, based on modeling of the proposed new structure in operation, is shown in Figure 12-1, and compared with the actual recorded lake levels during this period. As can be seen, the modelled lake level excursions generally stay within the high historic levels, but the draw-down would be larger than has generally occurred in the recent past.

As the natural lake inflows are preferentially stored in the summer and released in the winter, the outflow hydrograph for Nonacho Lake would alter from historic and recent records. Summer flows would be decreased, and winter flows would be increased from those normally occurring without regulation. A typical hydrograph of flow releases required from the proposed control structure during the 40 year period of record utilized in the study is shown in Figure 12-2. The actual flow record downstream of Nonacho Lake for this period was not measured, and is therefore unavailable. The basin model would be utilized in the next phases of study to develop a better comparative estimate for flows below Nonacho Lake.

Figure 12-1: Nonacho Lake Level Based on the Proposed New Structure in Operation

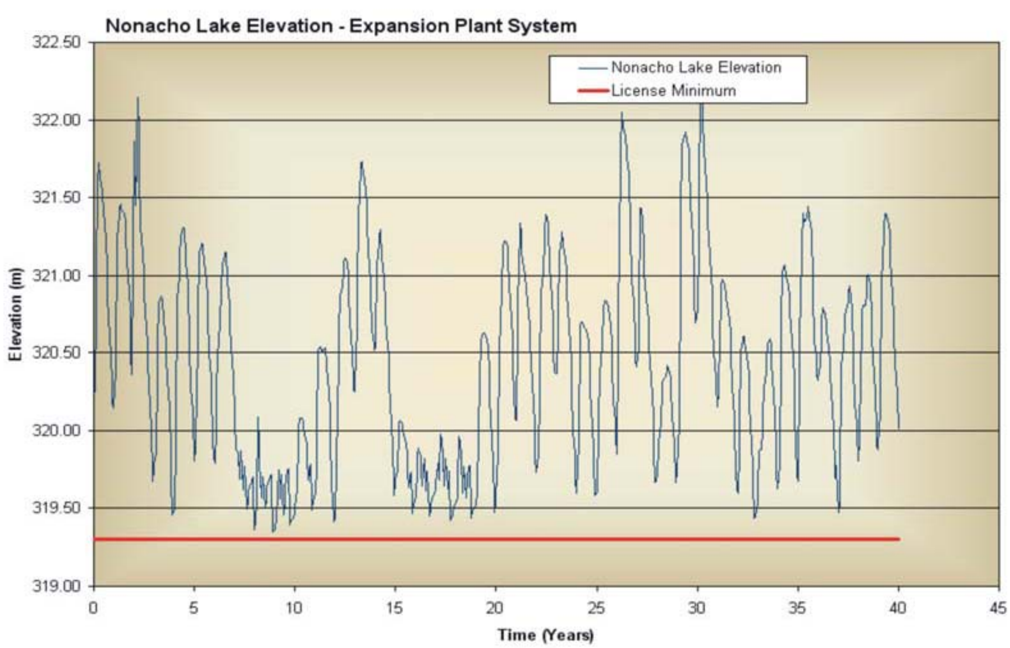
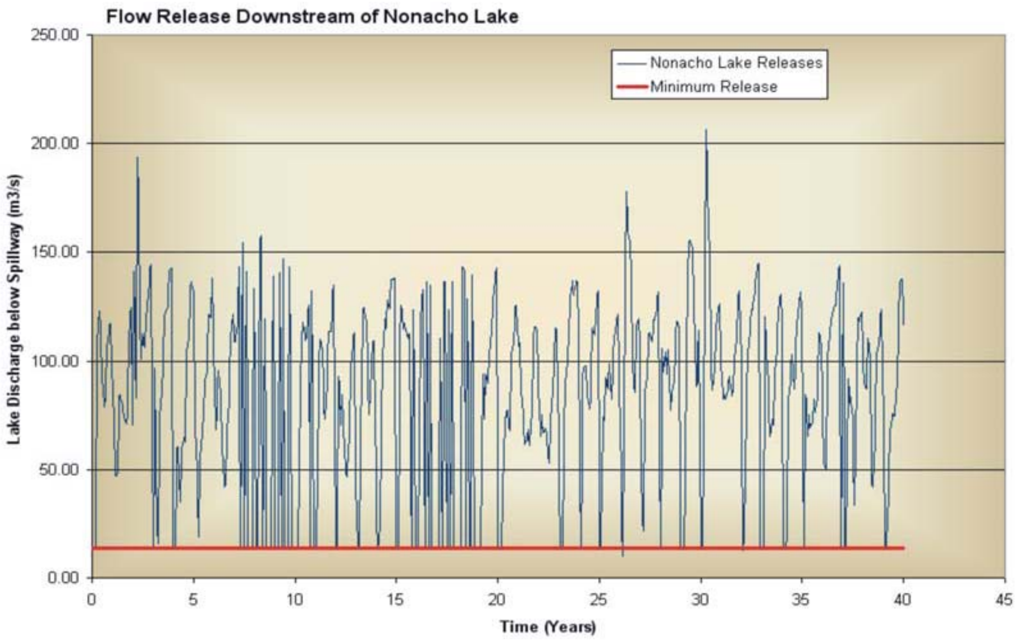


Figure 12-2: Typical Flow Releases Downstream of Nonacho Lake, with Expansion Project



While the numerical modeling provides an optimized solution for a specific record wherein the model projects the Tazin River flows for the next month, in actual operations, the releases from Nonacho Lake would be based on estimates of Tazin River flows during the following month. A gauging station would be required on the Tazin River such that near-term trends in flow can be estimated, and Nonacho Lake releases adjusted accordingly to keep estimated forecast flows within the optimal operating range of the generation Project.

12.3 Twin Gorges Operations

12.3.1 Normal Operations

The Expansion Project would comprise both the existing 18 MW plant and the new 36 MW generating plants at Twin Gorges. Operation of these plants would vary depending on the availability of water, and on the available load to be serviced. Currently, the total plant sizing provides a close match at full power output to the anticipated full electrical load to be serviced; hence continuous operation at or near full output is anticipated as long as sufficient water is available.

The new plant would produce approximately 40% more energy from the same available water in the Forebay than the existing plant, due to the increased available head on the new plant, and the higher efficiency of more modern generation equipment. Optimal operation of the two plants would therefore have the new 36 MW plant running preferentially to the existing 18 MW plant when insufficient water becomes available to run both plants – i.e. as flows drop, the operation of the existing plant would be scaled back first.

Ideally, in normal operations, the flows through the generation plants would balance the inflows into the Forebay, and the Forebay level fluctuation would be quite moderate. However, as the Forebay inflows are about 50% unregulated, and the remaining regulation at Nonacho Lake is some 150 km away (up to a month in flow time), only a modest level of inflow control would actually ever exist on the Twin Gorges Forebay. Ideally, it would be desirable to have the system able to accept load changes due to varying flow availability over periods of several days or weeks.

A number of plant operating control modes (a specific logic used to set the plant output) are typically available in the plant system controls, one being a level control mode whereby power output of the generation machines is automatically linked through the control system to Forebay level, such that as the Forebay level rises, the flows through the machines are increased, and vice versa. This mode of operation is not currently utilized at Twin Gorges, as there is so little electrical load (maximum of about 13 MW) that there is almost always excess water in the Forebay, and this water is naturally released over the South Valley Spillway into Trudel Creek. In the new system, operation on Forebay level control may be feasible, depending on the electrical load variability, and the ability of the overall system to accept gradual changes in output. These issues would be addressed through additional model advancement as the Project progresses through final design.

Irrespective of the operational mode to be employed, the overall goal in normal operations is to minimize the spilling of water from the Twin Gorges Forebay. Therefore, the present operating model Forebay levels are at or slightly below the current South Valley Spillway level through much of the operating period. The level of any continuous flow releases through the South Valley Spillway into Trudel Creek that would be a target for operations of the Expansion Project remains under study. As a number of flow paths currently exist into Trudel Creek other than the overspill on the concrete structure, the relationship between natural release requirement and Forebay elevations to be maintained in the new system would be established through additional fieldwork. Dependant upon the outcome of these studies, a specific release structure may be required.

Due to the limited regulation available in addition to operational conditions noted below, Forebay elevations and consequent spilling of water into the Trudel Creek system would continue to vary significantly in normal operations of the Expansion Project. A projection of spill volumes to occur in the Expansion Project operations for the historic record (without a minimum release flow) is shown in Figure 12-3. These releases are shown in comparison with spill releases estimated to have occurred (utilizing the spillway discharge curve) over most of the same period in Figure 12-4.

Figure 12-3: Spillway Flows – Expansion Project

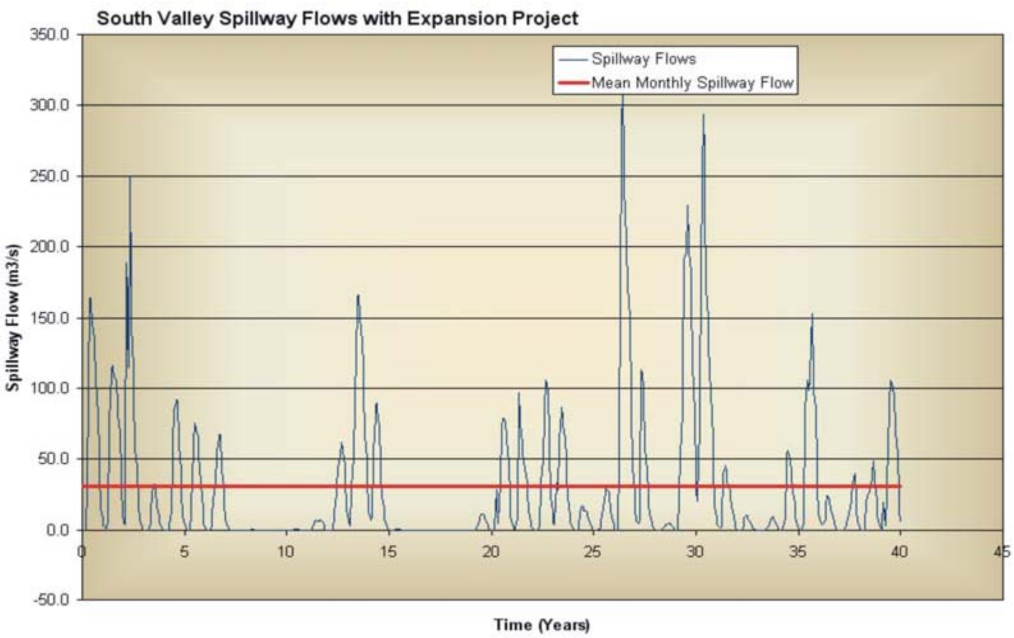
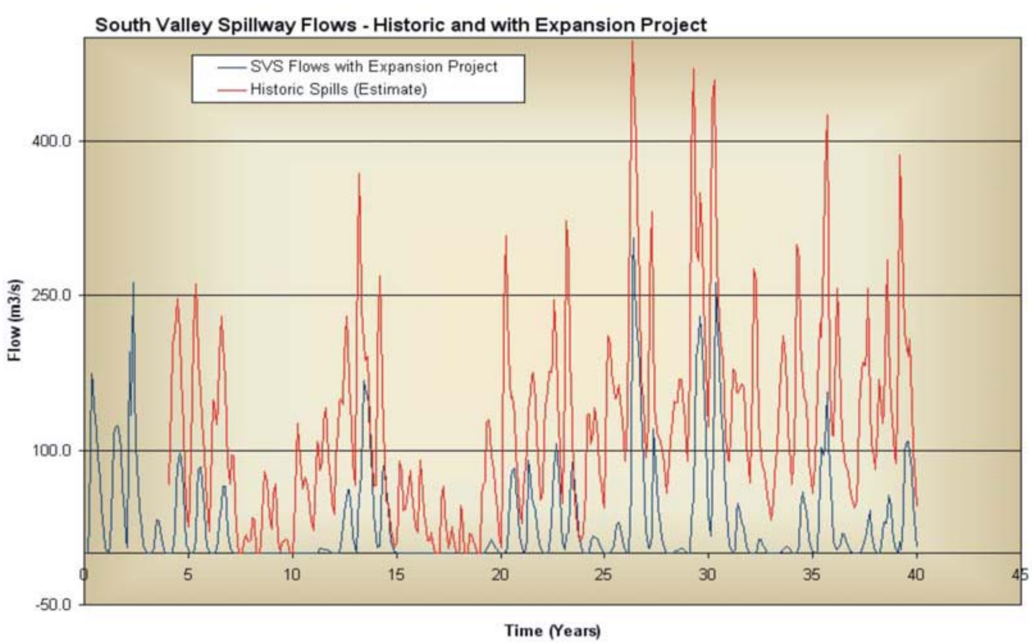


Figure 12-4: Spillway Flows – Historic and Expansion Project



12.3.2 Scheduled Outages

Hydro-generation machinery is proven technology and in general is highly reliable. Scheduled outages for inspection and servicing, however, would be required for the Expansion Project at least on an annual basis. These operations would be scheduled up to a year ahead of time, and typically allow a number of inspection and servicing Projects to be completed in a very specific time window. Currently, the existing Twin Gorges facility undergoes a scheduled shutdown for a period of approximately one week each year around September, to ensure reliable service through the peak winter generation season. It would be envisaged that the scheduled servicing for the new plant would be staggered across the outage for the existing plant and across the two new units, such that only 18 MW of generation would be unavailable at any given time during scheduled maintenance. It is rare, but not unrealistic to expect complete generation outages to also be required over brief periods of time for such things as switchyard or transmission line outages.

During a scheduled outage, it is likely that the water originally used for generation of the out-of-service unit(s) would be spilled naturally over the South Valley Spillway. Due to the anticipated short duration of such maintenance periods, it would be impractical and likely impossible to try to time any change in Nonacho Lake release to reduce flows to balance the scheduled outages. For the new plant, the outage of an 18 MW unit would require the spill of approximately 53 m^3/s of flow through the servicing period. For the existing plant, the outage of the 18 MW unit would require the spill of approximately 74 m^3/s of flow through the servicing period.

The availability of three generation units and two separate plants in the Expansion Project would provide enhanced reliability of hydro-generation for the existing connected customers on the Fort Smith/Hay River distribution system. The annual service interruption that occurs currently should become quite rare.

12.3.3 Unscheduled Outages

Unscheduled outages would occur on occasion through unexpected electrical or mechanical failures, lightning damage to the transmission line or switchyards, or other large electrical fault occurrences. In typical hydroelectric facilities, unscheduled outages take the systems out of service about 2% of the year, though this figure varies depending on the age of equipment and particular site conditions. Typically, outage times are in the range of several hours on manned projects, but much longer outages can occur.

In an unscheduled outage, all pre-existing generation flows would be required to be released over the South Valley Spillway until the system was put back into operation. For the maximum plant output, the release would therefore be approximately 180 m^3/s. As an unscheduled outage is by nature unplanned, the pre-existing spill from the Forebay would likely be close to the minimum, and the Forebay would rise to a natural spill level to balance the inflow over a period of several hours. In many instances, unscheduled outages are corrected within hours, but this would not always be the case. Therefore the extent and timing of generation loss and spill operations from the Forebay is not amenable to accurate prediction.

For both scheduled and unscheduled outages, no adjustment of Nonacho Lake flow releases would be viable in reducing South Valley Spillway volumes unless a very extended outage was forecast. Any adjustment of this release from Nonacho Lake would also need to be in accord with the rule curves for operation of the structure to control lake elevation, and adjustments may not necessarily be possible.

12.3.4 Flow Ramping

It is not currently envisaged that specific output ramping would be required in the Expansion Project to control flow changes occurring downstream of the Project generation facility in the event of outage and start-up. As with the current facility, it is also not planned to fit the new powerhouse with turbine bypass capability to allow ramped flow decrease in the case of an unscheduled or scheduled full outage.

In the case of the most common unscheduled outage, a single unit trip from a full output scenario, approximately two-thirds of the pre-outage flow would continue to be released downstream of the generation facility. Over a period of several hours to a half-day, flows from the spillway overflow would combine to restore the flow to pre-outage conditions.

In the case of a complete system outage, a large and rapid flow reduction would occur downstream of the generation facility. Flows would rebalance over a period of several hours to a half-day through the spillway release coming through Trudel Creek.

13 PROJECT CONSTRUCTION

13.1 General

The Taltson Expansion Project is a major Project to be developed in largely remote areas, and would therefore require a very high level of logistical planning and control during construction. At the feasibility and preliminary design stages, to which the Project definition has been undertaken as of this submission, the construction logistics for each major component have been developed to a level for which a reasonable certainty in feasibility and schedule has been defined for a certain overall construction approach. The construction contractor that would ultimately be engaged would have the appropriate experience and capabilities to undertake this Project. There would likely be several such approaches possible, depending on the construction contractor's particular expertise, environmental constraints, the timing of construction award, the availability of labour and materials, and the formatting of the various construction contracts, among others. Similar to all capital projects of this stature, many of these can only be assumed at this stage. The construction approaches described below have been developed from specific consideration of the site and design by experienced consultants in the field of hydropower and transmission line development.

13.2 Site Access

Site access presents a unique challenge in the construction of the Expansion Project. The generation facility at Twin Gorges is located some 60 km from the nearest all-weather road, and the Nonacho Lake structure is some 150 km beyond Taltson Twin Gorges. The transmission line runs cross-country from Taltson Twin Gorges to the Lockhart River area, has a short section near Great Slave Lake, and then cross-country again to the mine sites. The transmission line and construction access are shown in Figure 13-1. The site access provisions noted below have been utilized for feasibility assessment.

13.2.1 Construction Access for Twin Gorges Site

The Taltson Twin Gorges facility was constructed in 1964-1966 and included the development of a winter road from Fort Smith, crossing the Slave River immediately downstream of the community, and running through lowlands over several small lakes to Gertrude Lake on Trudel Creek. From this point, an all-weather road was constructed to the Twin Gorges site. This route is still visible, although it has not been utilized for operational activities at the site for many years. This road would be re-established to transport supplies to the Twin Gorges site. The alignment is shown on Figure 13-1.

13.2.2 Construction Access for Transmission Line and Nonacho Lake

The transmission line has been separated into four geographic sectors largely reflecting the varying access proposed for each sector, defined as follows:

- Southern Sector (Twin Gorges – Snowdrift River – 220 km);
- Lake Sector (Snowdrift River – North of McLeod Bay – 90 km);
- Gahcho Kué Sector (North of McLeod Bay – Gahcho Kué – Snap Lake – 169 km);
- Northern Sector (Gahcho Kué – Ekati/Diavik – 211 km).

The line construction is almost entirely completed outside of the winter season through the use of large and small helicopters, which would deliver all crews, equipment and construction materials to the tower sites from distribution and assembly points or laydown areas located within the line sectors. The construction access proposed for delivery of materials to the distribution points for each sector is as described below.

13.2.2.1 Southern Sector

The Southern Sector of the line is shown in Figure 13-2 a, b, and c. This sector presents the most difficult construction access for materials distribution. Two alternatives have been investigated through fieldwork and cost comparison. The first approach is to develop an extension of the winter road from Twin Gorges to Lady Grey Lake overland through an interconnected series of lakes, lowlands and low passes, and from Lady Grey Lake to Nonacho Lake on an ice road, with a number of short overland portage sections. The development of a winter road to Nonacho Lake would allow delivery of construction materials to a number of assembly and staging yards located on the lakeshores to facilitate construction of the line during the summer seasons, and facilitate construction of the Nonacho Lake Control Structure.

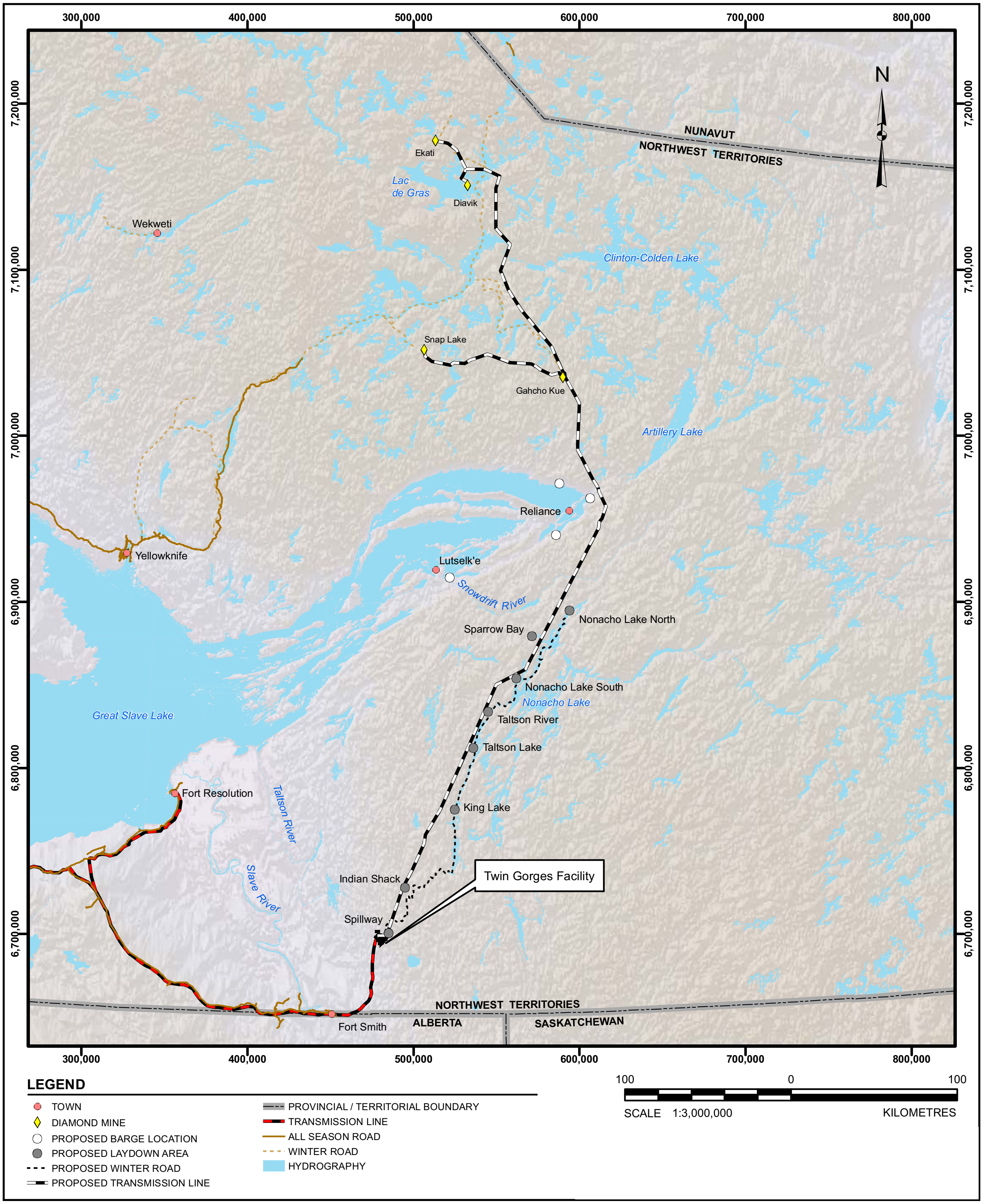
For the transmission line, up to 8 laydown yards are currently being considered between Twin Gorges and the north end of Nonacho Lake. Yards would be approximately 2 hectares (ha) in size. The proposed access system in this sector is shown in Figure 13-1. Ice monitoring work is continuing on the proposed ice road route along this sector to further assess feasibility and refine the routing.

The second approach for distribution point access for the transmission line materials in the southern sector utilizes only Twin Gorges at the southern end of the line, and a number of yards on the shore of Nonacho Lake for the construction of the remainder. This approach is shown in Figure 13-1. This approach would utilize winter delivery of line materials by fixed-wing plane onto Nonacho Lake, and winter road development on Nonacho Lake only over this first season to distribute the materials to the yards for construction the following summer. While depending less on winter road development, this approach does not provide an effective methodology to construct the key control structure at Nonacho Lake, and results in very long flight distances for construction of the transmission line between Twin Gorges and Nonacho Lake.

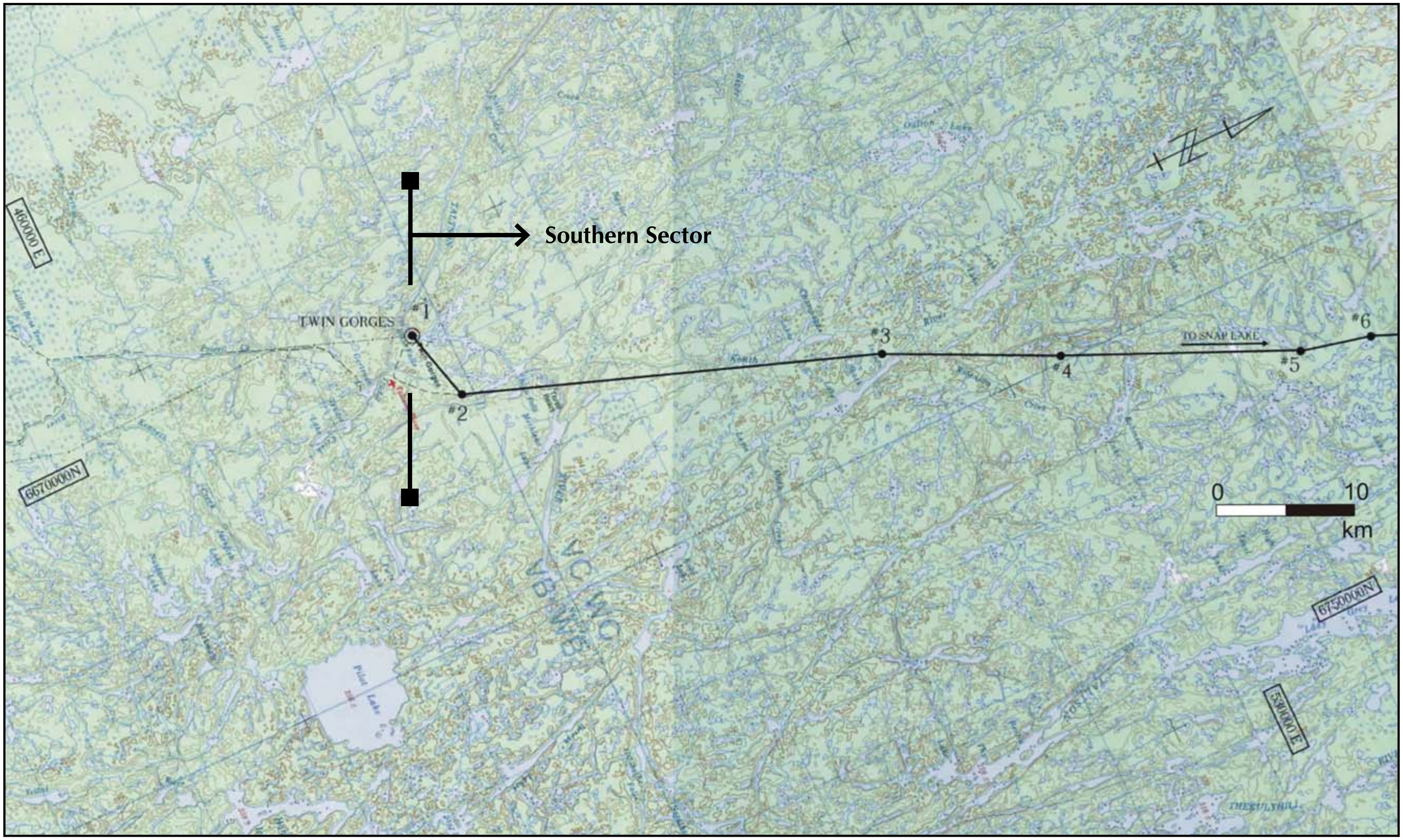
13.2.2.2 Lake Sector

The lake sector of the transmission line is shown in Figure 13-3. It is proposed that this sector be constructed by assembly and helicopter delivery from four barge locations along the shore of the east arm of Great Slave Lake. The barges would be moored to shore, but be largely self-contained in terms of construction requirements. Small yards adjacent to the barges may be required for landing and servicing helicopters.

DÉZE ENERGY CORPORATION

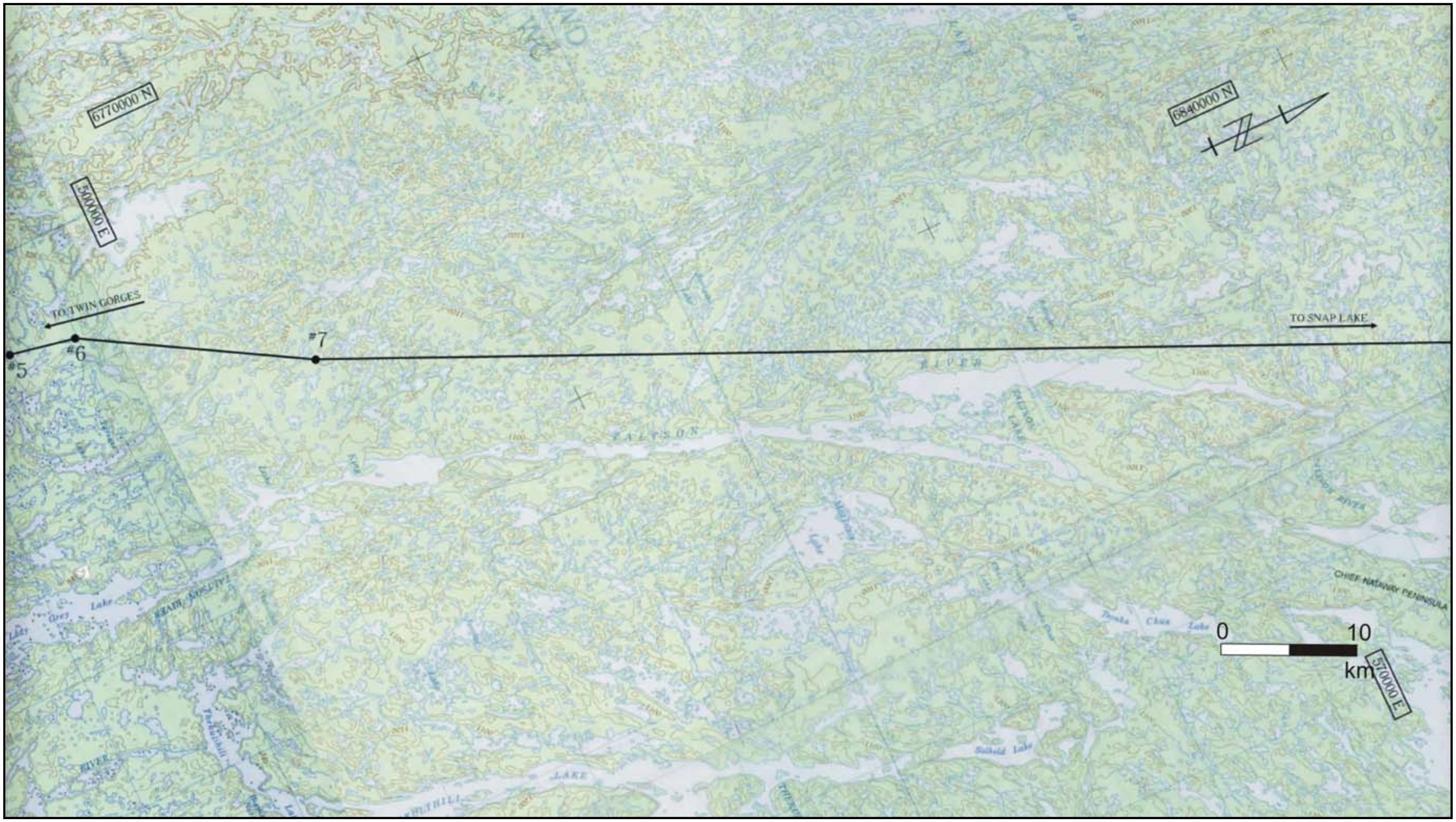


TALTSON HYDROELECTRIC EXPANSION PROJECT	PROJECT DESCRIPTION MARCH 2007	Proposed Access System and Staging Yards	FIGURE 13 - 1

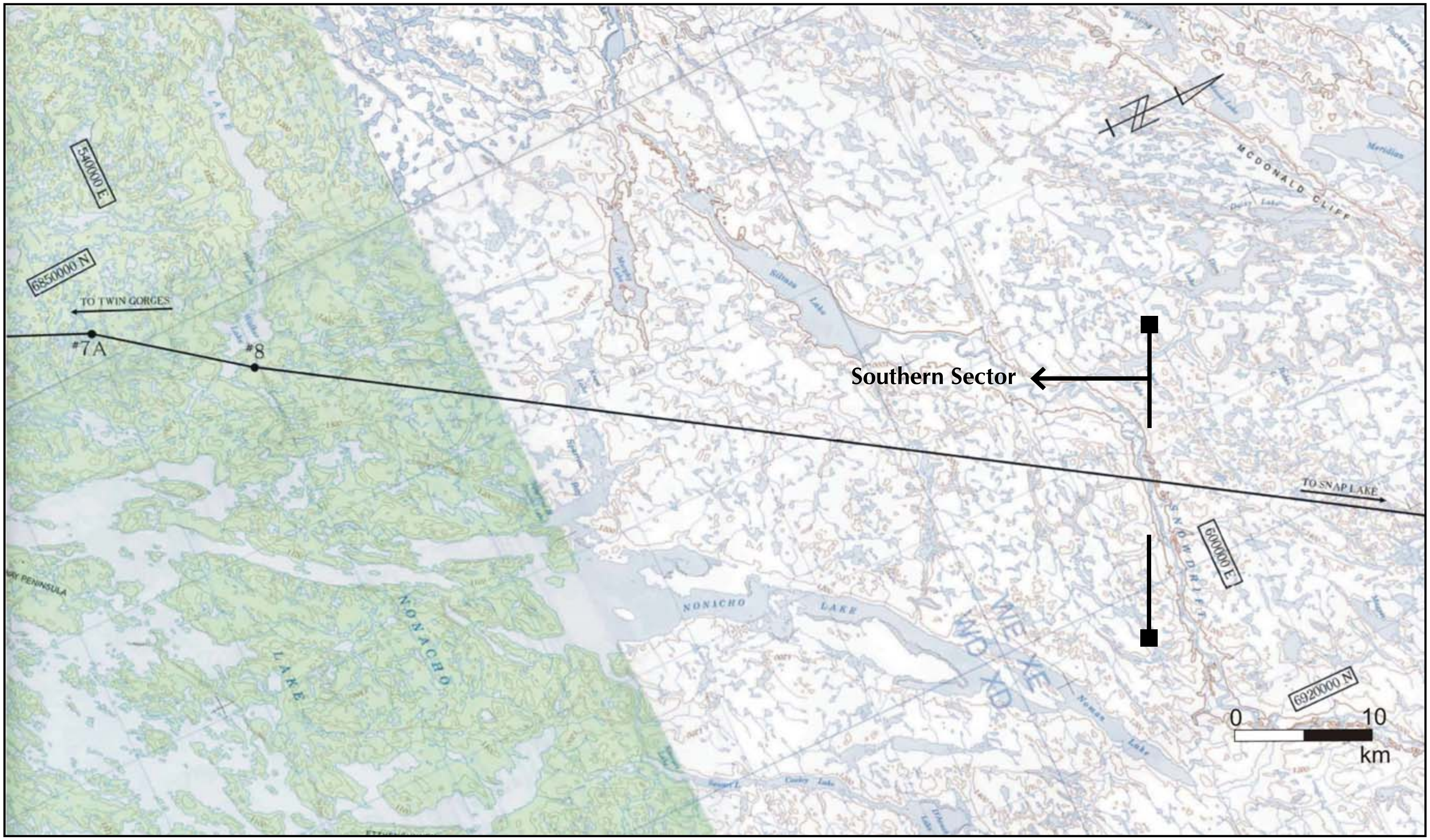


Transmission Line
Southern Sector

Figure
13 - 2a

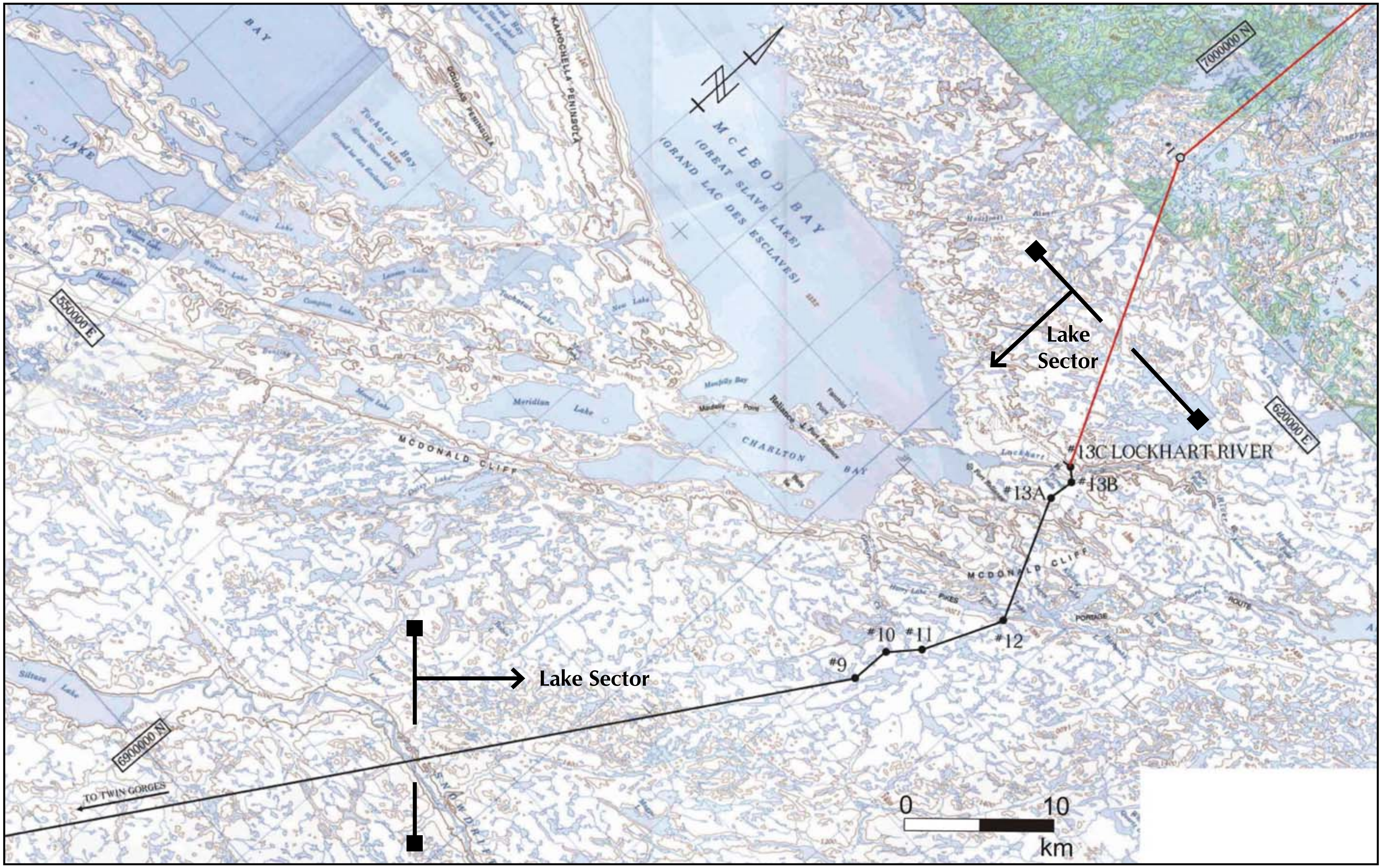


TALTSON HYDROELECTRIC EXPANSION PROJECT	PROJECT DESCRIPTION MARCH 2007	Transmission Line Southern Sector	FIGURE 13 - 2b



Transmission Line
Southern Sector

Figure
13 - 2c



TALTSON Hydroelectric Expansion Project	**Project Description** March 2007	**Transmission Line** Lake Sector	**Figure** 13 - 3

13.2.2.3 Gahcho Kué Sector

The Gahcho Kué sector of the transmission line would be constructed from a combination of winter road access along existing corridors to a limited number of distribution yards, and larger distribution centers at the Gahcho Kué and Snap Lake mine sites (Figure 13-4 a and b). The smaller distribution yards would be approximately 2 ha in size.

13.2.2.4 Northern Sector

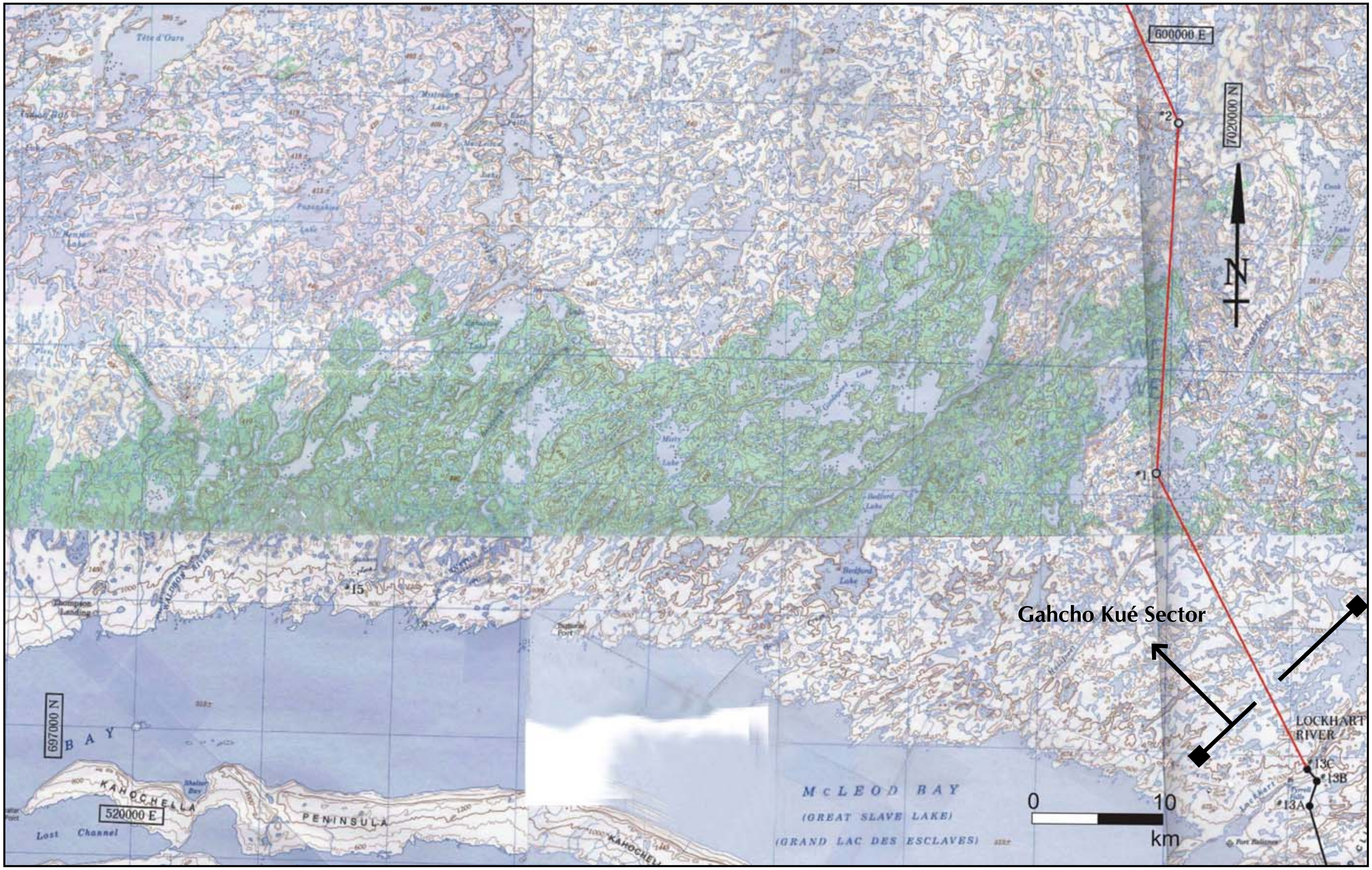
The Northern sector of the transmission line would be constructed from a combination of winter road access along existing corridors to a limited number of distribution yards, and larger distribution centers at the Gahcho Kué, Ekati, and Diavik mine sites (Figure 13-5 a, b, and c). Again, the smaller distribution/laydown yards would be approximately 2 ha in size.

13.3 Construction Accommodations

A significant labour force would be required over a period of approximately 30 months for construction and commissioning of the Expansion Project. While the labour and associated accommodations would need to be distributed over the large site area, the remoteness of much of the site and associated access issues limit practical locations for larger scale accommodations. For the current construction logistics as described in the following Section, construction accommodation is proposed as follows:

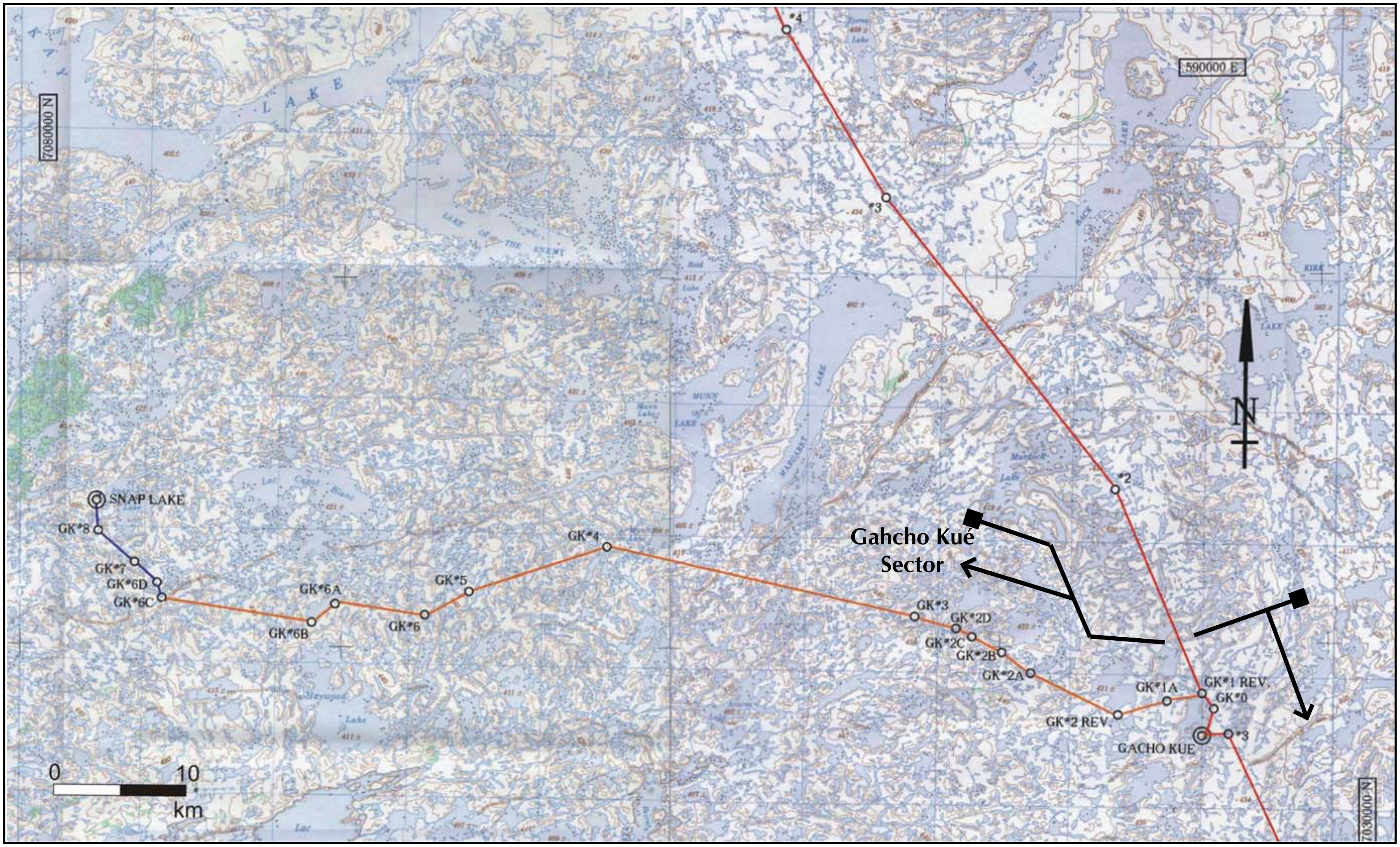
- Twin Gorges 150 person camp
- Nonacho Lake 100 person camp
- Mobile Barges 50 person facility (2 required)
- Gahcho Kué Use existing camp
- Snap Lake Use existing camp
- Ekati or Diavik Use existing

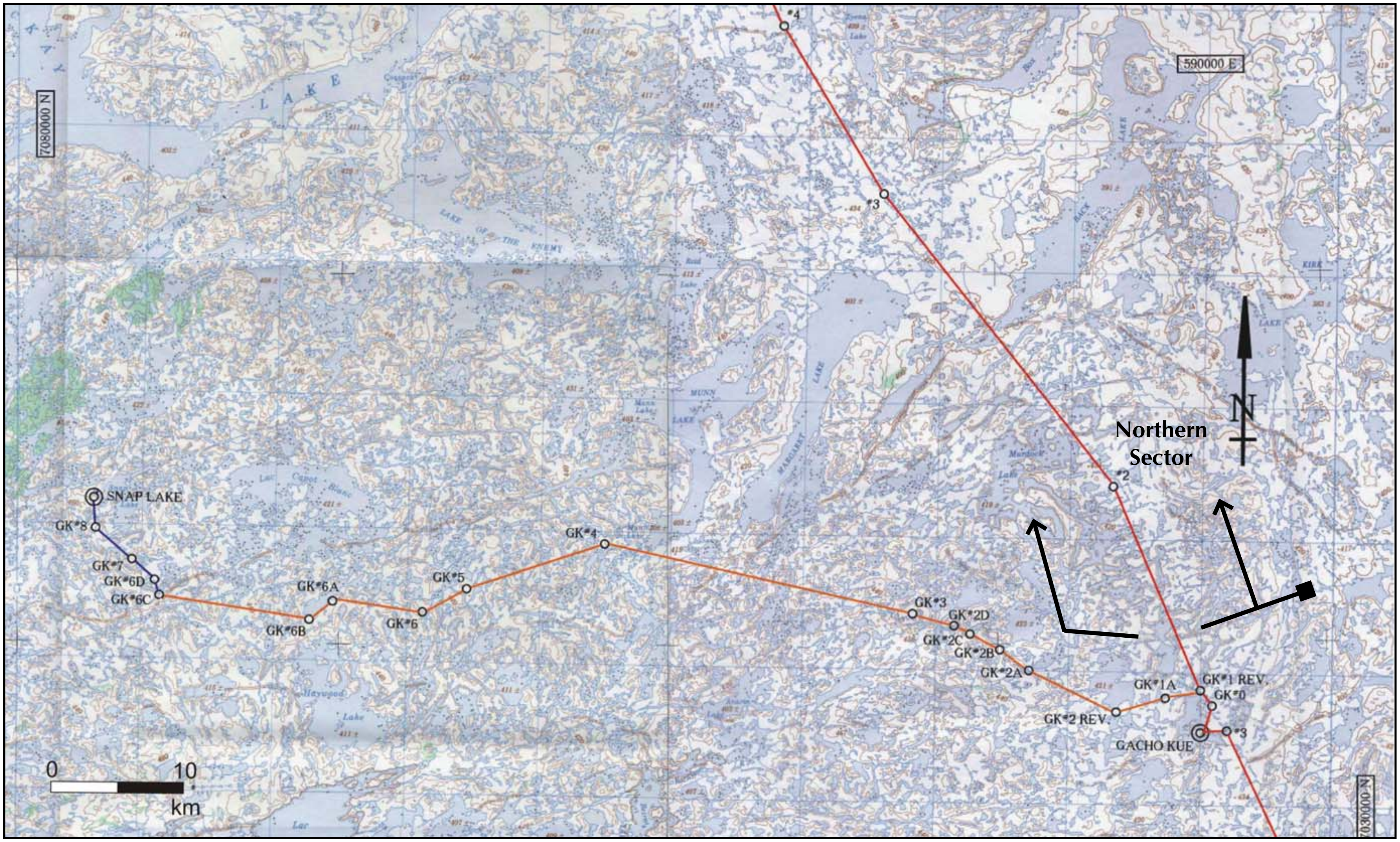
In addition to the main camps, a number of smaller crew accommodations would be required. Currently, it is assumed that these accommodations would be located at existing fishing lodges distributed along the southern sector and the East Arm of Great Slave Lake.



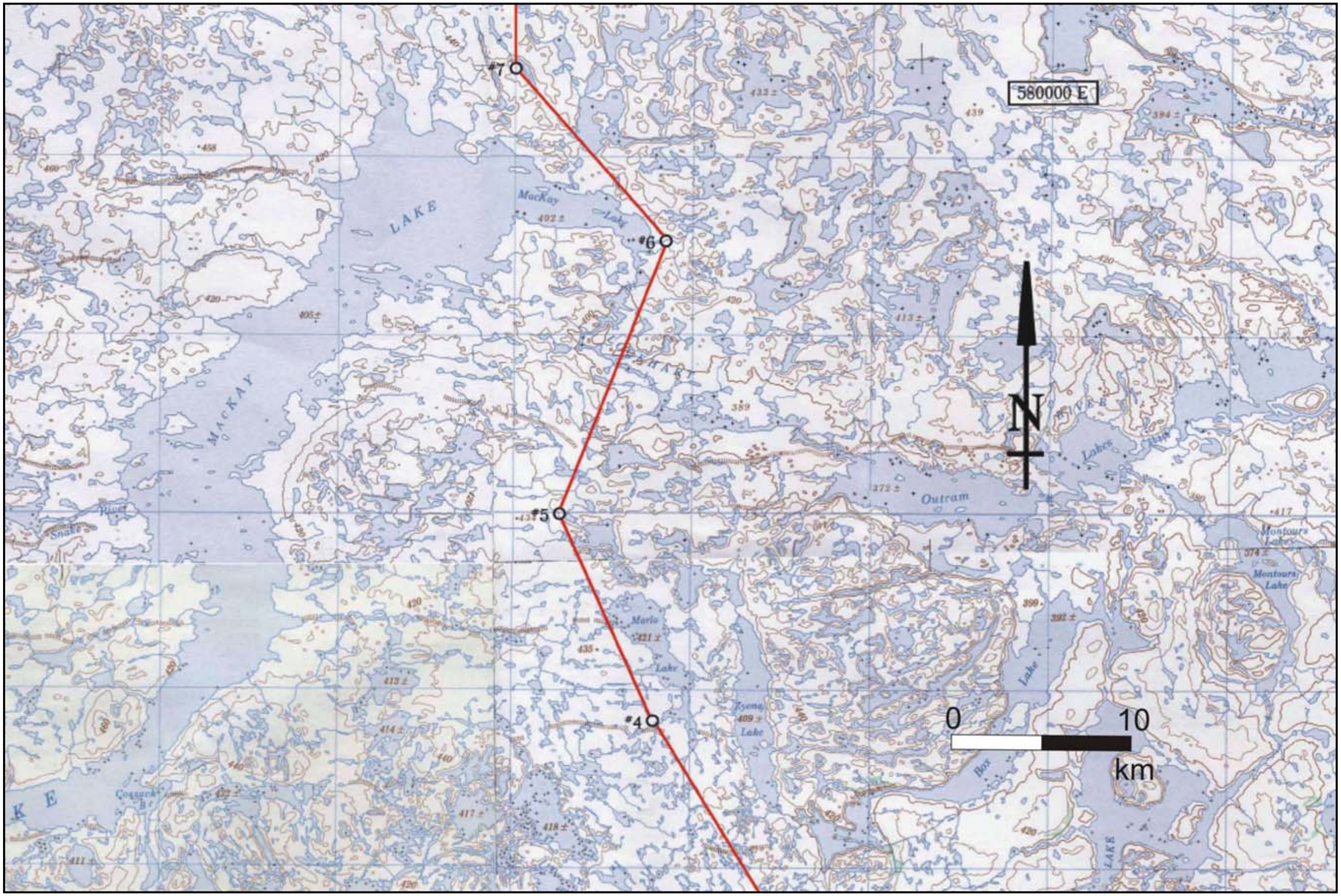
Transmission Line
Gahcho Kué Sector

FIGURE 13 - 4a

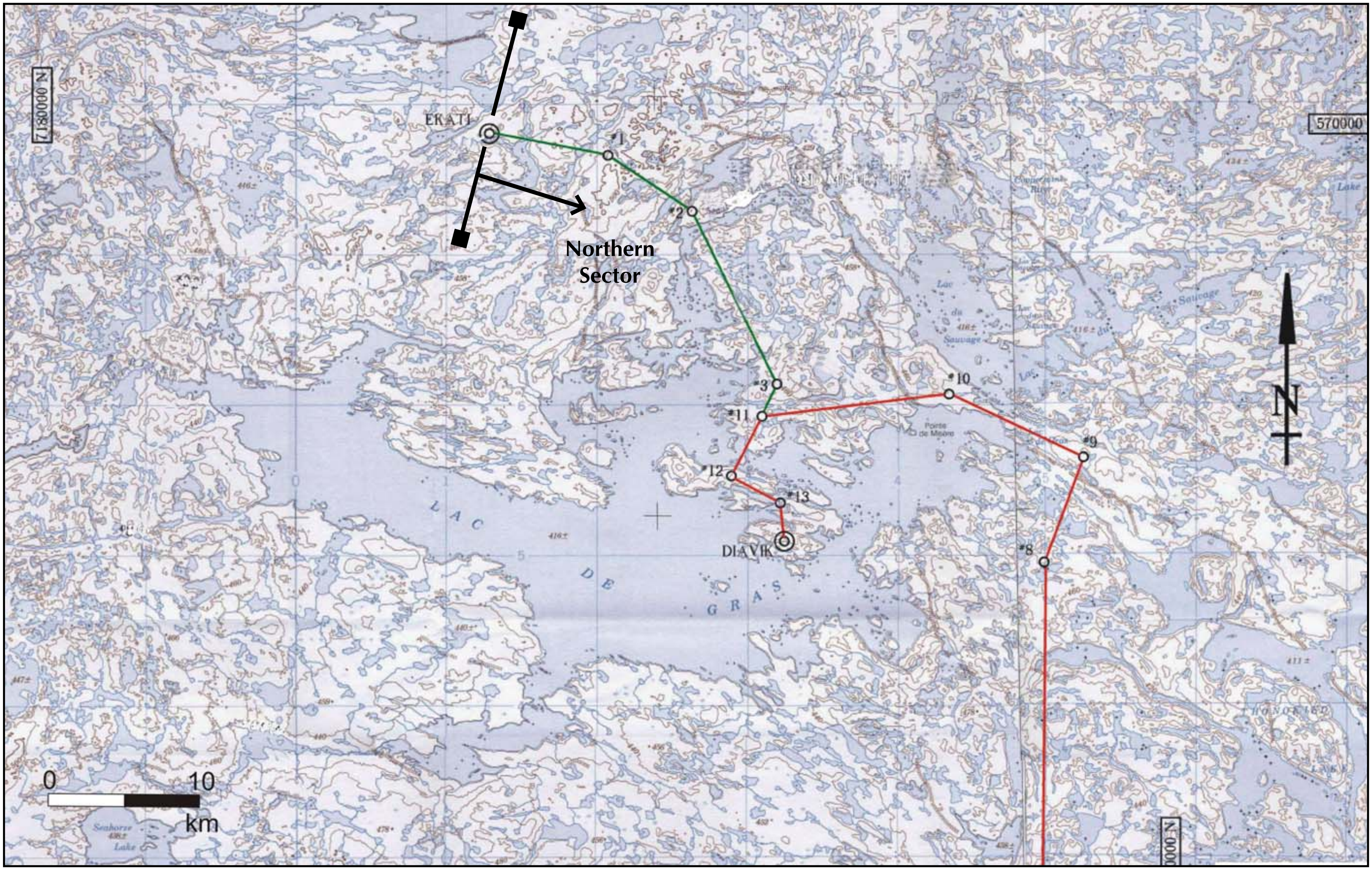

590000 E
7080000 N
7030000 N
SNAP LAKE
GK*8
GK*7
GK*6D
GK*6C
GK*6B
GK*6A
GK*6
GK*5
GK*4
GK*3
GK*2D
GK*2C
GK*2B
GK*2A
GK*2 REV.
GK*1A
GK*1 REV.
GK*0
GACHO KUE
*2
*3
*4
Gahcho Kué Sector
N
0
10
km



TALTSON Hydroelectric Expansion Project	**Project Description** **March 2007**	**Transmission Line** **Northern Sector**	**Figure** **13 - 5a**



TALTSON Hydroelectric Expansion Project	**Project Description** March 2007	**Transmission Line** **Northern Sector**	**Figure** **13 - 5b**



Transmission Line
Northern Sector

Figure
13 - 5c

13.4 Construction Methodology

The construction company(s) awarded the construction contracts would be responsible for their work methods and practices; however, the feasibility assessment done to-date must necessarily develop at least one approach that accords with the site conditions and design in order to arrive at reasonably reliable estimates of construction costs and construction schedule. The approaches for the main components of the Project are outlined below. An overall Project schedule is provided in Figure 13-6.

During construction, the bulk of materials required for the Project would be inert. Materials that may pose environmental and human risks include:

- Fuels and hydrocarbons for operation and maintenance of construction equipment;
- Jet fuel for helicopter supported construction;
- Explosives at the Nonacho Lake control structure and Twin Gorges intake and, where required, along the transmission line to prepare rock for accepting transmission tower foundations; and
- Concrete at Nonacho Lake control structure, and Twin Gorges intake, and at tower foundations.

13.4.1 Site Preparation and Materials Delivery

Southern Sector

Assuming a median timeline for the regulatory process, new winter road development and some hauling would be required in the winter 2008/2009. Redevelopment of the existing winter road from Fort Smith to Twin Gorges and some Twin Gorges site preparation would likely best be carried out one winter before any new construction was commenced. Further details of requirements are provided below.

Year 1 – Winter 2008/2009

The first winter season would largely need to be devoted to upgrading the former winter road corridor from Fort Smith to Taltson Twin Gorges, and construction of any all-weather portions required beyond Twin Gorges (up to 6 km near Metheleka Lake), final routing along the entire road route to Nonacho Lake, and all clearing and site preparation, including several water-edge storage yard locations between Lady Grey Lake and the north end of Nonacho Lake.

Haulage to occur in this season would include the following:

- Delivery of construction equipment, camp infrastructure, diesel fuel and related supplies to Taltson Twin Gorges;

- Delivery of bulk cement and large volumes of explosives to Taltson Twin Gorges;
- Delivery of small construction equipment to the camp site at Nonacho, and possibly to the transmission staging yards; and
- Delivery of tower foundation materials to the staging/laydown yards (grout, cement, steel plates, rock anchors, etc.).

It is not anticipated that heavy loads would be required in this season beyond Twin Gorges.

Year 2 – Winter 2009/2010
In the second winter season, virtually all of the materials for the transmission line would be delivered to the laydown yards located between Twin Gorges and the north end of Nonacho Lake. These materials would include the following:

- Tower structures (currently steel poles approximately 20 m in length with guy wire attached), cross-arms (steel) and line hardware and conductors;
- Large amounts of Jet fuel to the staging yards for helicopter operation the following summer season (probably pumped into bladders);
- Some diesel fuel for small equipment, generators, etc.;
- Staples and other camp-related items at the major camp locations (two anticipated – one at Nonacho Lake, one at Twin Gorges);
- Turbines, generators and transformers/electrical equipment for the plant at Twin Gorges (bulky and some heavy loads requiring special transport); and
- Camp, cement, control gates, construction equipment and other heavy loads to Nonacho Lake control site (outlet of Nonacho Lake).

Year 3 – Winter 2010/2011
In this final winter season, all of the major equipment must be removed as construction winds down. Some conductor stringing may still be required in the following season, but this would be completed by helicopter and require little equipment. Removal of the following would be required:

- Camp equipment and supplies from Nonacho Lake and Twin Gorges;
- Construction equipment from Nonacho Lake, Twin Gorges and all yards; and
- Other related cleanup and decommissioning activities.

Lake Sector

Year 1 – Summer 2009
Commencing as soon as the ice has left Great Slave Lake, barges would leave Hay River for specified points on the East Arm of the Lake. All construction materials, fuels etc. would be delivered via barge.

Year 2 – Summer 2010
Possible limited barge access required for completion of conductor installation.

Gahcho Kué Sector

Year 1 – Winter 2009/2010
Delivery by existing winter road of all line materials and substation equipment to established yards at Gahcho Kué and Snap Lake mine sites, and distribution yards.

Northern Sector

Year 1 – Winter 2009/2010
Delivery by existing winter road of all line materials and substation equipment to established yards at Ekati and Diavik mine sites, and distribution/laydown yards.

13.4.2 Twin Gorges Facility Construction

Assuming the Year 1 road development is the winter of 2008/2009, the new camp and ancillary construction sites (batch plant, aggregate crusher, etc.) would be installed in the spring of 2009 at Twin Gorges. Work would then commence on the access road to the new powerhouse, and the powerhouse excavation itself. By the winter of 2009, the powerhouse would be ready for installation of the generation equipment, the draft tube liners having been installed and the superstructure essentially complete. Excavation of the power canal would continue through the winter.

Extraction rock volumes from the North Gorge canal would be approximately 580,000 m^3, and overburden volumes approximately 100,000 m^3. Spoil areas are proposed in a natural gully immediately southwest of the low point in the ground level along the canal. Drilling and surface mapping indicates a very low level of any mineralization in the shield granites present throughout the Twin Gorges site. No issues related to Acid Rock Drainage (ARD) are anticipated. As a safeguard, drill hole materials would be tested for acid-base accounting.

The generation equipment would arrive in early 2010. The powerhouse would be completed by late 2010, and equipment removed via the winter road during Year 3 (2010/2011).

13.4.3 Nonacho Lake Control Structure Construction

Initial camp and materials for the construction of the Nonacho Lake control structure would be delivered to the construction site on the Year 1 (2008/2009) winter road, and some work would be undertaken in the summer of 2009. Remaining materials would be delivered on the Year 2 (2009/2010) winter road. Construction of this control structure would continue through the following winter, with completion by spring of 2011. Storage of freshet flows of 2011 is a critical milestone for the first full year of winter operation following construction.

Excavations associated with the control structure at Nonacho Lake would be entirely in granitic rock, as there is no overburden on the site. The excavated rock material would be processed and used entirely for either concrete aggregates or as surfacing material for the dam rehabilitation. Again, there is no evidence of mineralization in this material, and a very low risk of any ARD potential. As a safeguard, drill hole materials would be tested.

13.4.4 Transmission Line Construction

Clearing of the line right-of-way and installation of some transmission tower foundations would likely commence in the Year 1 winter season (2008/2009). Materials for the transmission line construction would be delivered to all line sectors in the Year 2 winter road season (2009/2010). The transmission tower erection and conductor stringing operation would occur at the same time along several sectors using helicopter construction from the yards in the southern sector, barges on the lake sector, and mine sites and yards in the northern sector. The line would be largely complete at the end of 2010, with some allowance for additional stringing if required in the spring of 2011.

13.4.5 Substation Construction

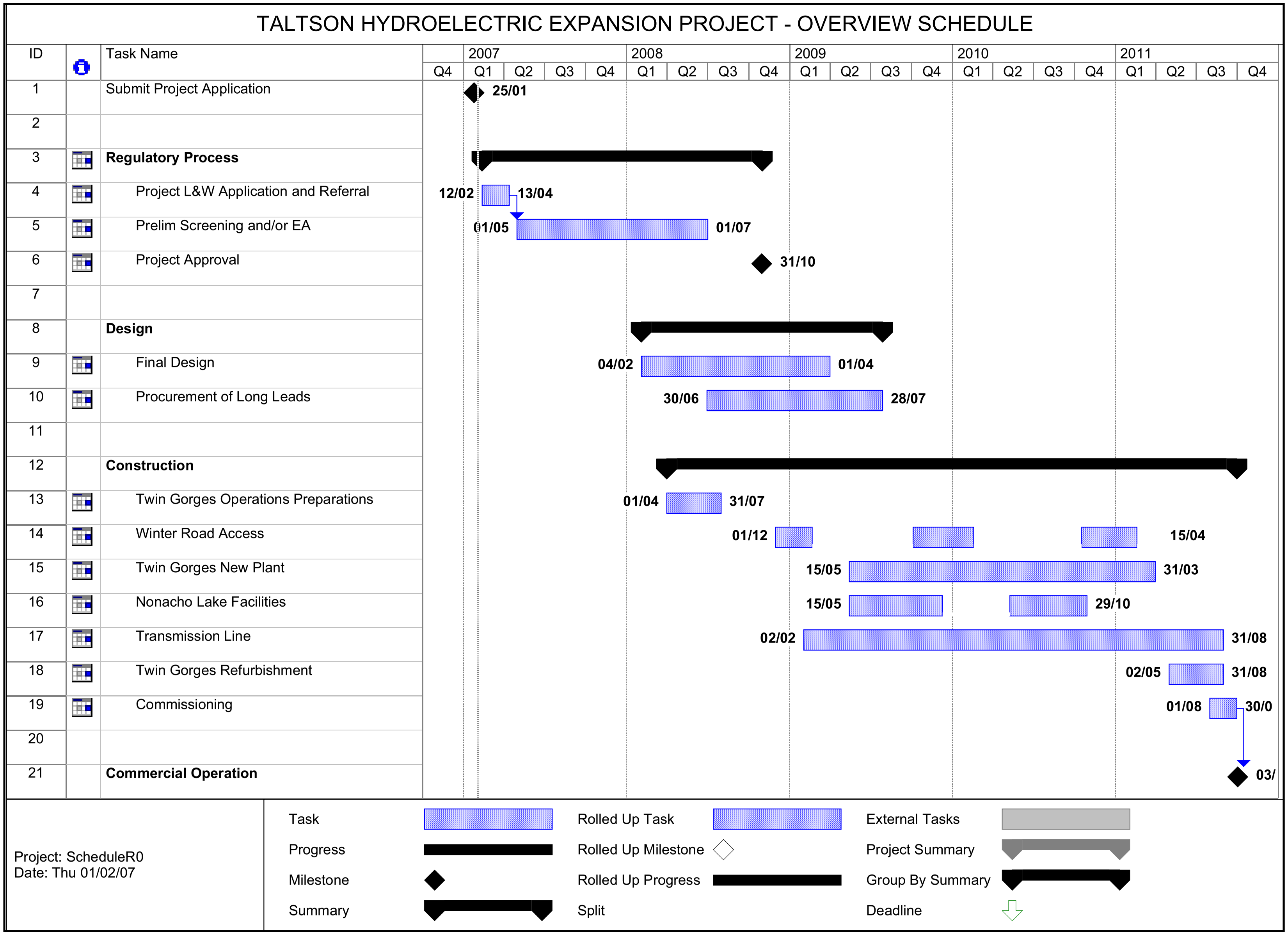
Site development of the substations would occur at Twin Gorges and at each of the mine sites in the summer of 2009. Substation equipment would be delivered to the sites during the winter road season of 2009/2010. Installation of the substations would occur through the summer/fall of 2010, with completion of all work by late 2010.

13.5 Project Closure

The Project is planned to have a minimum lifetime of at least 40 years, with the first 30 defined as servicing the four existing and proposed diamond mines north of the Project. As the mines approach closure and restoration, or care and maintenance, the Project could be interconnected to Yellowknife, to other mines, or to southern markets as the marginal price of electricity in such markets allows. Although the Project would have the capacity to provide power for additional clients as well for a period beyond 40 years, for development and economic viability assessments, the Project has been based on these known criteria.

In the event that power requirements diminish prior to establishing new customers, the Project would enter into a position of temporary power reduction. Power generation would be reduced at the generating plant; however, infrastructure would remain intact to supply the remaining customers. Flows from the Nonacho Reservoir would be adjusted to accommodate the power demands, and excess flows would be spilled through the South Valley Spillway.

In the unlikely event that power demands would cease to exist with no foreseeable future needs, the Project would be put into long-term care and maintenance until a decision is made to decommission the infrastructure. This is highly unlikely given the increasing demands for power. However, in the rare circumstance that this would occur, a plan would be developed in consultation with stakeholders as to the best approach to project decommissioning.



TALTSON HYDROELECTRIC EXPANSION PROJECT	**PROJECT DESCRIPTION** **MARCH 2007**	**Project Schedule**	**FIGURE** **13 - 6**

14 ENVIRONMENTAL MANAGEMENT SYSTEM

An Environmental Management System (EMS) would be developed for the Project to ensure protection of the environment throughout construction and operations. Environmental Management Plans would be a key component of the System and would be implemented to guide the management of various activities or aspects of the Project. These would be developed in conjunction with the environmental assessment process and regulatory requirements. Potential management plans to be developed for the Project include:

- Operational Water Management;
- Material and Waste Management;
- Helicopter Protocols to Protect Wildlife;
- Human-Wildlife Conflict Reduction;
- Vegetation Management;
- Erosion and Sediment Control;
- Health and Safety;
- Spill Contingency; and
- Emergency Response.

15 HUMAN RESOURCES

The construction phase of the Project is anticipated to create 404 seasonal jobs over the three years of construction, resulting in 216 person-years of employment. Both skilled trades and labour force positions would be required on the various project components. Roughly divided on the basis of geographic location, these positions include the following:

Power Plant	150	positions
Nonacho Lake	66	positions
Transmission Line	140	positions
Substations	48	positions

In addition to the direct jobs, indirect jobs associated with supply and service industries in the Northwest Territories would be generated to support a project of this size including all of the freight/fuel trucking, transmission yards and camps, over a three year period, as well as aerial transportation, engineering support, and logistics during construction of the transmission line.

A shortage of skilled and unskilled labour exists in the Northwest Territories due to conditions primarily related to the mining industries. Should the local labour market remain tight at the time of construction, Project labour would be sourced from other Canadian markets.

The operation phase of the Project is anticipated to create up to 10 new direct operations and maintenance positions. These would be located at the existing Twin Gorges site and camp, and possibly at the mine sites depending on the final form of service agreements negotiated with each mine.

16 ENVIRONMENTAL SETTING

16.1 Introduction

The Taltson Expansion Project commenced environmental baseline studies and has collected considerable data to-date. Many baseline studies remain in-progress while additional studies are planned in upcoming field seasons. The environmental setting for the Project and associated baseline studies are described below, in preparation and support of an anticipated environmental assessment.

16.2 Air Quality and Climate

The Northwest Territories has a relatively dry, cold climate, with long winters and mild summers. The Project area is relatively remote, and the only existing anthropogenic air emissions within the Project area are associated with the mines at the northern end of the Project that would be recipients of the hydroelectricity.

Air temperature and precipitation are important since air temperature directly affects freezing and ice break-up, and precipitation affects the volume of flow available for power generation. Air temperature and precipitation associated with the Project are best represented by the meteorological station located at the Fort Smith Airport, slightly southwest of the Project site.

Mean annual air temperatures have warmed approximately +2.2 °C over the recorded 54 year period at the Fort Smith airport. This is consistent with the +1.9 °C trend in air temperatures in the Mackenzie District recorded over the past 53 years by Environment Canada. As well, the Mackenzie District has had six of the 10 warmest years on record, occur in the past 13 years (1993, 1995, 1997, 1998, 1999 and 2000) (Rescan 2001a).

Precipitation has also been recorded at the Fort Smith Airport since 1943. Rainfall comprises 66% of the total annual precipitation with the highest rainfall occurring in July.

Snow-water-equivalent (SWE), a measure of the water content of the snow that is dependent on density and depth, contributes 34% of the annual precipitation in the Taltson area, with the highest snowfall occurring in November.

The existing meteorological stations and data available provide adequate baseline information for the Expansion Project.

16.3 Aquatic Environment and Fisheries Resources

16.3.1 Aquatic Study Plan

In 1999, the Water Effects Monitoring Program (WEMP) was developed by the NTPC in cooperation with regulators and community stakeholders. It was developed with the objective of "providing a means of efficient and effective identification of short-term, long-term and cumulative changes in the water environment resulting from the [Taltson Hydro] Project". It was generated as a result of water license requirements pertaining to the facility.

The WEMP monitors valued ecosystem components (VCs) identified by the communities and regulators. Identified VCs included fish, aquatic plants, beaver, muskrat, water levels and ice regime, ice related water level fluctuations and sedimentation and water level fluctuations. The WEMP report includes two years (2003 and 2004) of intensive biological and hydrological monitoring and data collection, and is referred to as the routine program as they reflect environmental conditions resulting from current operating practices.

Program objectives in 2003 were to collect biological and hydrological information on identified VCs to describe existing conditions and be able to detect changes in the future that may be attributable to the operation of the Taltson Expansion Project. General objectives included:

- Determining fish quality, abundance, size and feeding habitats;
- Examining aquatic plant species for mercury uptake;
- Determining the abundance of active beaver lodges;
- Examining water levels and ice characteristics;
- Analysis of long-term flow records, pre and post development;
- Studying water level fluctuations (Rescan, 2003).

Objectives of the 2004 WEMP program were the same as for the 2003 program with the addition of water chemistry parameters.

Current operating conditions have been relatively consistent over the last 20 years following closure of Pine Point Mine; therefore, it is reasonable to assume that any environmental response to Taltson operations has already occurred and is reflected in the WEMP studies. As such, the 2003/2004 WEMP studies represent "baseline" conditions of the current operating practices

16.3.2 Aquatic Study Areas

16.3.2.1 WEMP Sample Locations

Various aquatic characteristics were sampled as part of the WEMP represented by seven predetermined locations in four general areas that captured the watershed and adjacent systems used as control sites. The three lakes – Sparks, Gagnon and the Twin Gorges Forebay – were added in 2004 to better compare mercury levels and better assess the role of the Twin Gorges Dam on fish populations in the Forebay. These areas and locations are described below:

Reservoir

Nonacho Lake – Represents conditions within the reservoir, as it supports a fishing lodge, is used by residents of Lutsel K'e, and was once used for a commercial fishery. Data was collected from this lake in both 2003 and 2004.

Upstream of the Power Generating Station

Taltson Lake – Represents conditions immediately downstream of the reservoir, and is affected by changes in seasonal discharge from Nonacho Dam. It supports a sport fishery and once supported a commercial fishery. Data was collected from this lake in both 2003 and 2004.

Twin Gorges Forebay – Created and flooded when the Taltson Project was developed and is affected by daily flow changes from the Nonacho dam and the generating station. This site was added as a monitoring site in 2004.

Downstream of the Power Generating Station

Taltson River – Represents conditions downstream of the power generation Project as it is affected by daily flow changes from Twin Gorges and seasonal changes from the Nonacho Dam. It is used for recreation hunting and trapping, and has a sport fishery. Data was collected from the Taltson River in both 2003 and 2004.

Control

Rutledge Lake – Represents a control location in a natural area as these lakes and river are unaffected by both the Twin Gorges generating Station and Nonacho Lake. Rutledge Lake also supports a sport fishery. It was chosen as a control lake based on its similarity to Nonacho Lake in terms of physical and morphological features, shoreline characteristics and species composition. Data was collected from Rutledge Lake in both 2003 and 2004.

Sparks and Gagnon Lakes – Represent conditions in natural areas that are unaffected by the Taltson Project. These two lakes were added in 2004 as reference systems for fish mercury studies. Sparks Lake supports a lodge and a sport fishery and Gagnon

Lake has a few cabins and supports a low-use sport fishery. The addition of more control lakes reduces the possibility of inappropriate or unique ecological conditions and allows more accurate conclusions about the presence or absence of effects.

16.3.2.2 Additional Study Areas

In addition to the WEMP sites, two more study areas were added to the baseline program to adequately capture the spatial boundaries of the Expansion Project. The two sites include:

- Trudel Creek from the South Valley Spillway to the new facility tailrace confluence in the Taltson River, as this system would be affected by changes in flow volumes over the spillway; and
- The transmission line corridor water bodies being traversed by the line, to assist in developing construction mitigation plans.

16.3.3 WEMP Data

16.3.3.1 Aquatic Characteristics

Aquatic characteristics sampled as part of the WEMP are described below. Considerable data exist from the two year study program, which provide baseline aquatic data for the expansion Project.

Limnology is used to develop a water quality database since water quality may be affected by changes in water level and flow rates as a result of the addition of suspended solids, nutrients and changes in water retention time. Limnology data included:

- Transparency;
- Dissolved oxygen;
- Water temperature;
- Conductivity (as an approximation of total dissolved solids); and
- Nutrients (Total Nitrogen, Total Dissolved Phosphate and Total Phosphate, Total Organic Carbon and Dissolved Organic Carbon).

Mercury is released from sediments during flooding, and therefore is an indicator of the historical exposure of fish to mercury contamination. Mercury has also been identified as a concern during consultation. Mercury was analyzed in:

- Sediments; and
- Aquatic plants.

Benthic invertebrates provide a basis for detecting changes in the food supply for fish that may result from future operational changes. Since their lives are relatively short, benthos show the effects of changing water or sediment quality more quickly than fish, which may be able to tolerate greater levels of pollution. Benthic invertebrates were sampled from the lake substrates.

16.3.3.2 Fish and Fish Habitat

The objectives of the WEMP in regards to fish were to develop a fish database with the capacity to identify changes to the fish community over time. Taltson, Rutledge and Nonacho lakes and the Taltson River were chosen for the biological aquatic study as these were also the limnology study areas.

In 2003, lake trout (Salvelinus namaycush), lake whitefish (Coregonus clupeaformis) and walleye (Sander vitreus) were the three species of interest. Lake trout and lake whitefish are most abundant in the system, fished by locals and are an important food source. Walleye is also fished by locals but is only found in the Taltson River. Monitoring lake trout and walleye serves as a measure of the integrity of the aquatic ecosystem as they are at the top of the food chain and thus integrate changes occurring lower in the food web. Data on other species such as northern pike, lake cisco, burbot and suckers were collected when they were captured. In 2004, the focus remained on lake trout and lake whitefish.

Variables selected for study for both years included:

- Fish abundance – provides an opportunity to monitor future fluctuations due to changes in reservoir operation.
- Fish size distribution and condition – robustness of the fish; age and growth data provide information as to whether the population structure is remaining constant and indicate whether certain years are associated with low reproductive success or poor growing conditions that may be related to the Project.
- Feeding habits – stomach content information provides the basis upon which potential diet changes as a result of future change in operation may be assessed; (i.e. inadequate diet can lead to poor fish condition and ultimately a smaller population due to lower survival and growth).
- Fish quality (health, parasite load and mercury contamination) – fish muscle tissue was analyzed for mercury concentrations; parasite levels provided information on current conditions; fish deformities, erosions, lesions and tumours were also monitored.

16.3.3.3 Ongoing Studies

The WEMP program maintained that a special effects monitoring program would be designed and implemented if the routine program concluded that unacceptable effects were detected. The monitoring program would be conducted on a five year cycle to identify any effects, and would be started in 2009. As well, if operating conditions were to change, the baseline WEMP information could be used to complete an effects assessment for the new operating conditions.

16.3.4 Fish and Fish Habitat – Transmission Line

The expansion Project would involve building a transmission line that would span a wide range of fish habitat including lakes, rivers, streams and wetlands. The proposed line passes through a transitional zone between dense coniferous forest and open barrenland tundra including the Taltson Watershed, Great Slave Lake and the tundra area near Snap Lake.

A total of 23 fish species have been found in waters along the transmission line based on previous studies. However, most water bodies would support only a fraction of the species richness due to individual species' habitat requirements for spawning, rearing and over-wintering. For example, arctic grayling use small to medium size streams for spawning in the spring and then migrate back to lakes or large rivers. Their progeny rear in streams until fall, when both fry and adults migrate to lakes to over-winter.

Previous fish studies have been completed for mine projects located near the northern end of the transmission line. Ten species of fish are present in streams and lakes at the extreme northern end of the line. These species as well as seven others have been identified in the Taltson watershed due to its connection with Great Slave Lake (Bogdan, 1977; Envirocon, 1973, 1975; Falk, 1979; Envirocon Pacific, 1986; and Rescan, 2004). An additional five species are present in Great Slave Lake and some of its tributaries (Scott & Crossman, 1973).

For this reason, a reconnaissance survey of the types and number of water crossings along the line was completed in 2003 and provides a basis for the fish and fish habitat protection planning associated with the final route alignment.

The survey was conducted by helicopter, flying at a low altitude and the type and size of 104 crossings was identified based on a 1:250,000 map. Intermittent sites were ground-truthed to confirm aerial observation. The highest density of crossings was located near the northern end of the East Arm of Great Slave Lake. Crossings ranged from dry channels or dry marshes to large rivers. Of the 104 crossing sites, 58 were flowing (10 rivers and 48 creeks), 31 were identified as marshes and 15 were dry channels or dry marshes. The flowing streams are expected to be fish bearing and the marshes could be inhabited by species like ninespine stickleback and slimy sculpin.

16.3.4.1 Ongoing Studies

The transmission line design, presently in progress, attempts to avoid placement of towers, guys, or other infrastructure in, or immediately adjacent to, water bodies. Should the design be unable to avoid placement of infrastructure within or immediately adjacent to water bodies, detailed field assessments of the fish habitat potentially affected would be undertaken. This information would be used to mitigate potential impacts by working with the design team and by developing site specific construction mitigation plans.

16.3.5 Trudel Creek

Trudel Creek is sourced from the Taltson River via the South Valley Spillway (SVS) located approximately 7 km northeast of the Taltson Twin Gorges dam. Trudel Creek flows approximately 33 km to where it rejoins the Taltson River immediately downstream of Elsie Falls and the existing Twin Gorges facility.

In 2006, a study of Trudel Creek hydrology was conducted to better understand the river system under influence from the operating Taltson Twin Gorges facility. The Trudel watershed, excluding the Taltson River spillage, is 134 km^2. The upper reaches of the creek are fairly uniform and low gradient. The lower reaches include lakes connected by a series of rapids. Prior to reaching the confluence of the Taltson River, the creek has several steeper gradient sections. Evidence of bank erosion and sediment deposition are observed at locations along the river, and stream channel configuration is indicative of increased flow conditions.

Seasonal connectivity from the Taltson River to Trudel Creek in the general vicinity of the existing spillway likely occurred prior to construction of the Twin Gorges facility. Water flows through the SVS into Trudel Creek, since construction of the Twin Gorges facility, have varied throughout operational history. Low flows have ranged from zero or near zero flows in the late 1960's and early 1970's to between 25 to 45 m^3/s in more recent years. Spillage is presently at its highest level since operations commenced, peaking at approximately 400 m^3/s in an average year.

16.3.5.1 Ongoing Studies

At present, two studies are in progress to better understand the Trudel Creek hydrology and physical characteristics, including the Basin Model for the Taltson system and a Trudel Creek biological and physical baseline characteristics assessment.

The biological baseline assessment would acquire information on species and abundance information in the Trudel system, while a habitat assessment would concentrate on channel widths, gradient, bank stability and riparian habitat characteristics. This information would be used to comment on the productivity of the system.

The need for, and potential scope of, further hydrological and physical characteristics baseline data on Trudel Creek would be dependent on the outcome of these studies and on the potential minimum low flow releases for Expansion Project feasibility. A study of flow releases and impacts on project feasibility is presently underway. This would be used in conjunction with the Trudel hydrology and baseline characteristics to identify and define any additional information needs and study scopes. Should additional information be required, the scope is anticipated to focus on further detailing the physical characteristics of the system as it pertains to and supports aquatic resources, and in particular, productive fish habitat.

16.4 Soil and Vegetation

16.4.1 General Landscape

Ecological land classification, which involves the integration of site, soil, and vegetation for the purposes of classification, provides an overview of the ecological composition of an area. The Project area lies in three Ecoregions: the Tazin Lake Upland, the Coppermine River Upland and the Takijug Lake Upland, shown in Figure 16-1. The Twin Gorges facility and the majority of the proposed transmission line corridor up to and along the north shore of Great Slave Lake lies within the Tazin Lake Upland Ecoregion. The area north of Great Slave Lake, including the Snap Lake Project site and Gahcho Kué mine site lies within the Coppermine River Upland Ecoregion. The northern extent of the proposed transmission corridor to the Diavik and Ekati mine sites are within the Takijug Lake Upland Ecoregion. The general characteristics of these three Ecoregions supplemented with detailed baseline study information are used to describe the Project area.

The landscape contains numerous small lakes, ponds and wetlands often linked by a network of streams. Broadly rolling terrain composed of a mosaic of uplands and associated wetlands are dominated by bedrock outcrops and long sinuous eskers. Eskers are sand/gravel ridges, where the relief may be as much as 20 to 40 meters. This creates different microclimates supporting several different plant associations depending on the slope orientation. An overview of the predominant terrain features are depicted in Figure 16-2. Permafrost is extensive and discontinuous with low to moderate ice content and sparse ice wedges. The surface expression consists of gentle undulating slopes with rounded rocky hills rising to less than 500 meters above sea level. (Environment Canada, 2005)

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Barge, laydown, winter road data obtained from Cambria Gordon Ltd, 2006. Hydro data obtained from NTDB, 2005. Ecoregion data obtained from WWF, 2006.
Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT

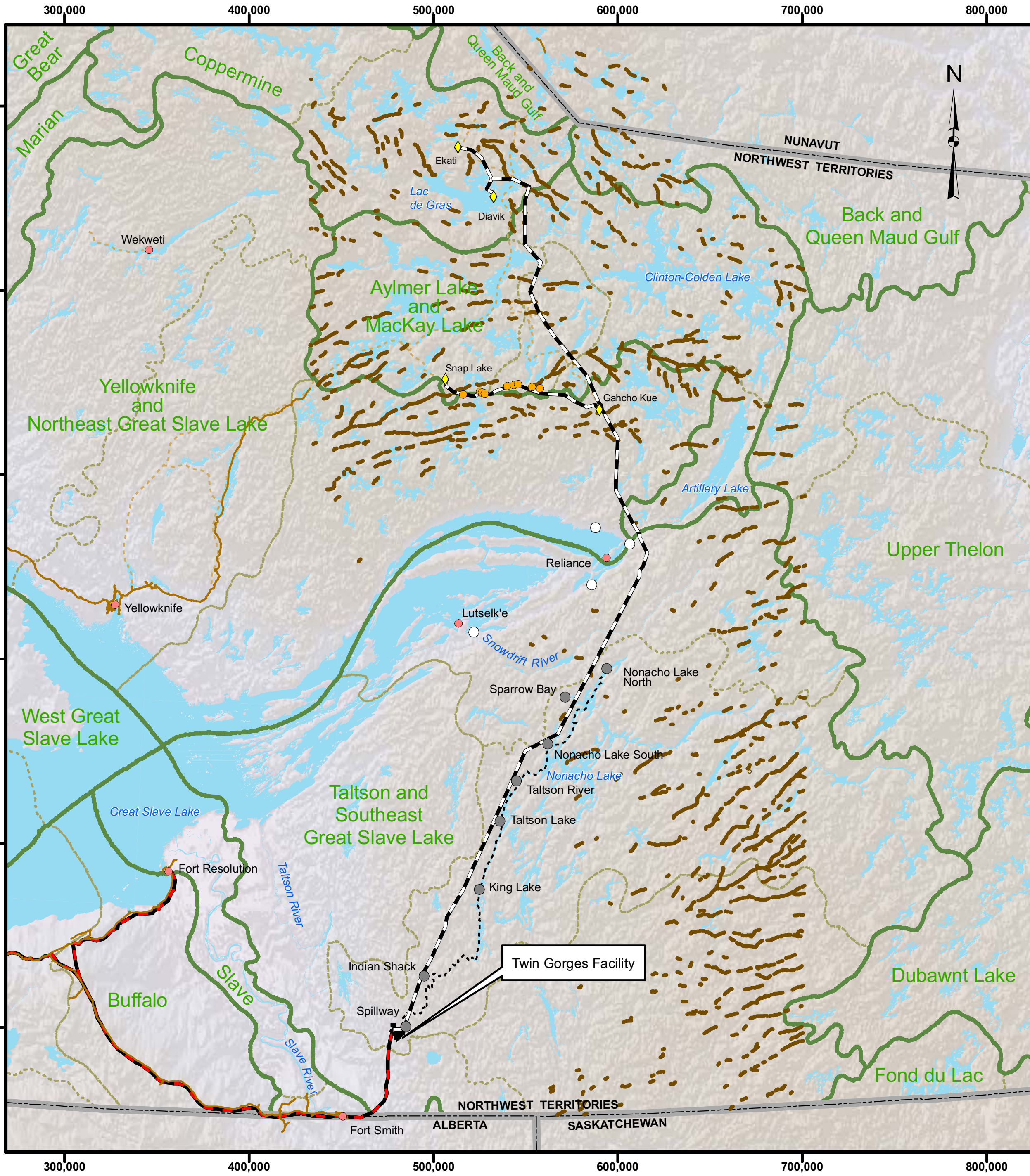
PROPOSED TALTSON EXPANSION PROJECT

ECOREGIONS IN PROJECT AREA

PROJECT DESCRIPTION
MARCH 2007

FIGURE 16 - 1

DÉZE ENERGY CORPORATION



LEGEND

- TOWN
- CLIFF
- DIAMOND MINE
- PROPOSED BARGE LOCATION
- PROPOSED LAYDOWN AREA
- PROPOSED WINTER ROAD
- PROPOSED TRANSMISSION LINE
- PROVINCIAL / TERRITORIAL BOUNDARY
- TRANSMISSION LINE
- ALL SEASON ROAD
- WINTER ROAD
- ESKER
- HYDROGRAPHY
- WATERSHED SUBDIVISION
- WATERSHED SUB-SUBDIVISION

100 0 100

SCALE 1:3,000,000 KILOMETRES

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Barge, laydown data obtained from Cambria Gordon Ltd, 2006.
Hydro data obtained from NTDB, 2005. Watershed data obtained from WWF, 2006.
Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT

PROPOSED TALTSON EXPANSION PROJECT

TITLE

PREDOMINANT TERRAIN FEATURES

PROJECT DESCRIPTION
MARCH 2007

FIGURE 16 - 2

16.4.2 Soils

The majority of the Project area is characterized by glaciated rock outcrops and soils that lack a well-defined mineral-organic surface horizon or layer. Consistent with the composition of the landscape, these soils have formed on discontinuous, thin, unconsolidated blankets of hummocky to rolling morainal, glaciofluvial, and organic deposits. Also affecting the soil characteristics of the area is a discontinuous permafrost layer.

From the Twin Gorges area to the East Arm of Great Slave Lake (with the exception of the Snowdrift Valley) the glacial drift lies over undulating bedrock with varied degrees of exposed bedrock (Plate 16-1). Organic matter accumulates in lowlands and depressions. The topography and geomorphology of the Snowdrift River is unique compared to the rest of the proposed route. There are larger sediment deposits with a series of large esker complexes (both crest and slope) observed on both northern and southern banks of the river. Plate 16-2 provides an example of a typical esker complex. The Snowdrift channel is characterized by a wide, relatively shallow channel containing numerous sandbars and islands. Due to the exposed nature of the channel and surrounding eskers, this landscape is more susceptible to wind blown and eolian processes.

North and along the shore of Great Slave Lake the topography tends to be higher in relief and contains a greater variance in slope gradients and exposed bedrock. The surface materials are slightly more variable, containing more widespread colluvium and glacial drift. The tree line boundary is north of McLeod Bay and all the mine sites are located above this line. The area in and around Snap Lake consists primarily of low relief undulating bedrock, with two extensive multi-ridged eskers noted. Along the northern section of the transmission line the bedrock topography is undulating with limited bedrock outcrops. Moist sites and poorly drained soil contributes to the development of patterned ground with thicker sediment making the influence of permafrost more evident. This area also contains a number of discrete eskers.

16.4.2.1 Ongoing Studies

Sensitive sites identification mapping for the transmission line corridor and potential winter roads is currently in progress. Based on the outcome of this study, site specific locations along the corridor may be identified for detailed soil field assessments and/or ecological mapping. In addition, rock in the vicinity of the Twin Gorges canal and the Nonacho Lake extraction sites would be sampled to further detail the geochemical characterization.

Plate 16-1: Terrain North of the Snowdrift River

Plate 16-2: Example of an Esker Complex

16.4.3 Vegetation

Vegetation in the Tazin Lake Upland Ecoregion is characterized by medium to tall, closed stands of trembling aspen and balsam poplar with white spruce, balsam fir and black spruce occurring in late successional stages. Poorly drained fens and bogs are covered with low open stands of tamarack and black spruce and have localized permafrost.

The predominant vegetation within the Coppermine River Upland Ecoregion consists of open, stunted stands of black spruce and tamarack with secondary qualities of white spruce and a ground cover of dwarf birch, willow, ericaceous shrubs (i.e. belonging to the heath family), lichen and moss. Poorly drained sites typically support tussocks of sedge, cottongrass and sphagnum moss.

The Takijuq Lake Upland Ecoregion is characterized by shrub tundra, consisting of dwarf birch, willow, northern heath and lichen species, *Vaccinium* spp. (blueberries, cranberries and huckleberries), with scattered stands of spruce. Depressional sites are dominated by willow, sphagnum moss and sedge tussocks.

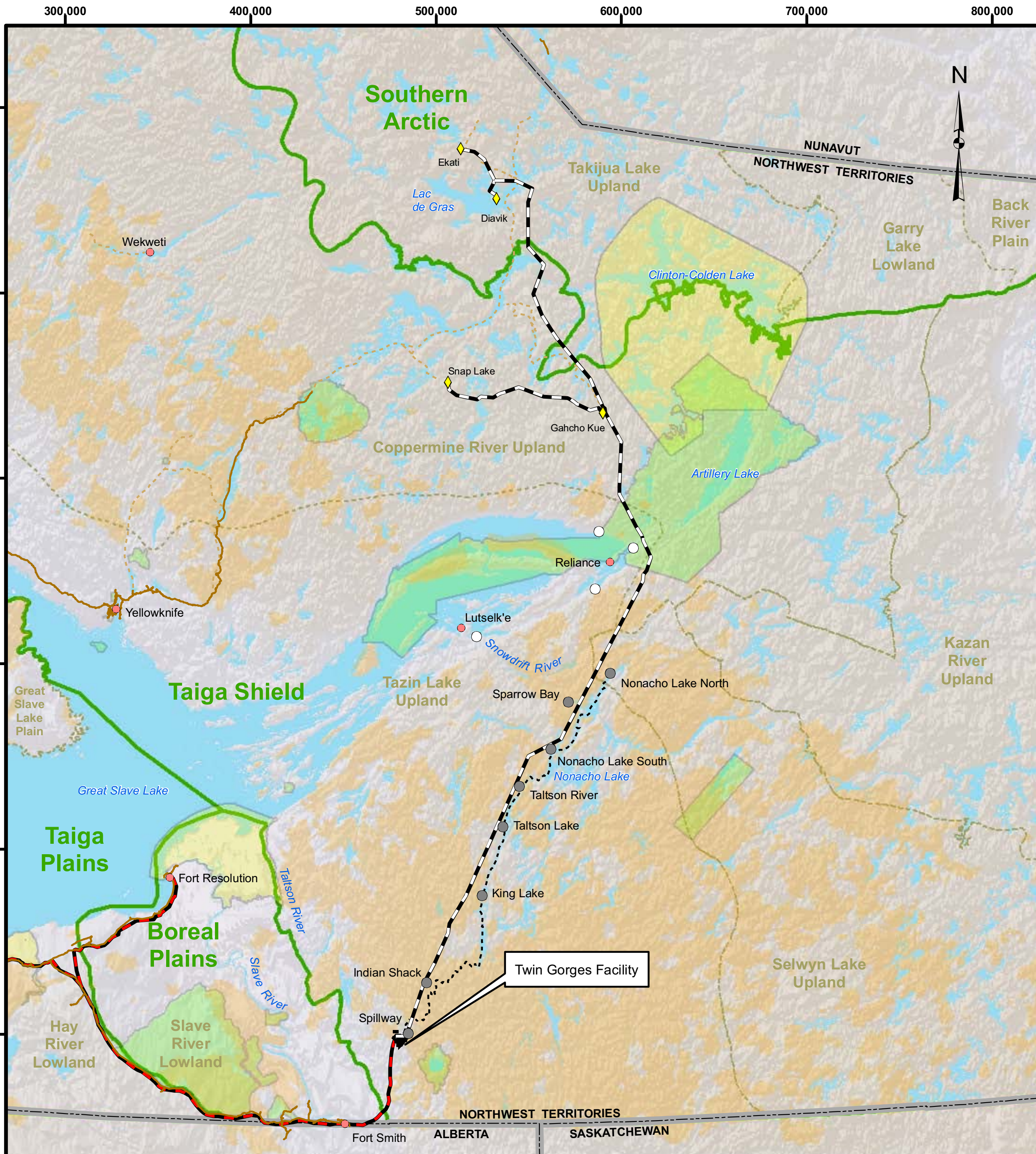
Baseline studies conducted along the proposed transmission corridor route identified plant associations. Plant associations are broadly defined as a unit of vegetation with uniform composition of plant species and physical structure and distinguished primarily by their geographic location with respect to the tree line.

Adjacent to and north of the Twin Gorges facility, Jack pine and aspen forest communities intermix with muskeg fen habitat. Farther north around Taltson Lake, the aspen forest gives way to birch shrub land plant communities along the lake shoreline. Roughly half of the proposed transmission line between Twin Gorges and the Lockhart River would overlie the spruce-lichen boreal forest or the tall shrub land open/immature deciduous forest and/or immature conifers open land cover habitat. Plate 16-3 illustrates the open spruce forest type near the mouth of the Lockhart River. A large section would also overlie an area of water and burned forest. Plate 16-4 depicts a typical burned forest landscape while Figure 16-3 illustrates the regions previously burned by forest fires throughout the Project area.

Plate 16-3: Open Spruce Forest near the Mouth of the Lockhart River

Plate 16-4: Typical Burned Forest Landscape along the Southern Line Sector

Déze Energy Corporation



LEGEND

- TOWN
- DIAMOND MINE
- PROPOSED BARGE LOCATION
- PROPOSED LAYDOWN AREA
- PROPOSED WINTER ROAD
- PROPOSED TRANSMISSION LINE
- PROVINCIAL / TERRITORIAL BOUNDARY
- TRANSMISSION LINE
- ALL SEASON ROAD
- WINTER ROAD
- HYDROGRAPHY
- INTERNATIONAL BIOLOGICAL SITE PROGRAMME
- CANDIDATE PROTECTED AREA
- FOREST FIRE AREA
- ECOZONE
- ECOREGION

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Barge, laydown data obtained from Cambria Gordon Ltd, 2006. Hydro data obtained from NTDB, 2005. Ecozone, ecoregion, biological site, protected area, forest fire data obtained from WWF, 2006.
Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT

PROPOSED TALTSON EXPANSION PROJECT

Vegetation Depicting Forest Fire Areas

Project Description
March 2007

Figure 16 - 3

Project: I:\2006\06-1328\06-1328-014\Mapping\MXD\Fig_05_Vegetation.mxd - Plot: I:\2006\06-1328\06-1328-014\Mapping\PDF\Fig_05_Vegetation.pdf

The section between the Lockhart River, Snap Lake and Gahcho Kué spans the tree line. A large proportion of the proposed transmission line would lie over low shrub land, smaller areas of spruce-lichen boreal forest, and fire regeneration. Water would account for a portion of the land cover, although the wetland portion would be minimal.

North of Snap Lake the dominant vegetation habitat types over 3 meters in height include spruce forest, mixed forest, and tall shrub (containing birch, willow and alder). Spruce forest and tall shrub were identified along the proposed transmission line route, but mixed forest was not present.

The land cover types from the Snap Lake to Ekati section consist of heath tundra and heath/boulder. Water and wetland accounts for a quarter of the land cover along this proposed route. Vegetation types that may require clearing include spruce forest and tall shrub, only constituted 2.5% of this section.

The section from Gahcho Kué to Diavik is predominantly heath tundra, heath/boulder and water intermixed with spruce forest and tall shrub vegetation. The Gahcho Kué to Snap Lake section has land cover consisting of water, heath tundra and heath/boulder. A large proportion of lichen veneer were also identified throughout this section. Less than 1% of the area of this section contains spruce forest, which may require some clearing.

The habitat cover from the Diavik to Ekati section is primarily heath/boulder, heath tundra and heath bedrock, with the remainder being water. Based on the land cover classification, no clearing of vegetation is expected along this section.

16.4.3.1 Ongoing Studies

Identification mapping of sensitive sites for the transmission line corridor and winter road is currently in progress. This study utilizes existing mapping available through the GNWT and the World Wildlife Fund to identify areas of potential sensitivity based on identified ecosystem components. Dependant on the outcome of this mapping study, site-specific locations along the corridor may be identified for detailed vegetation field assessments and mapping.

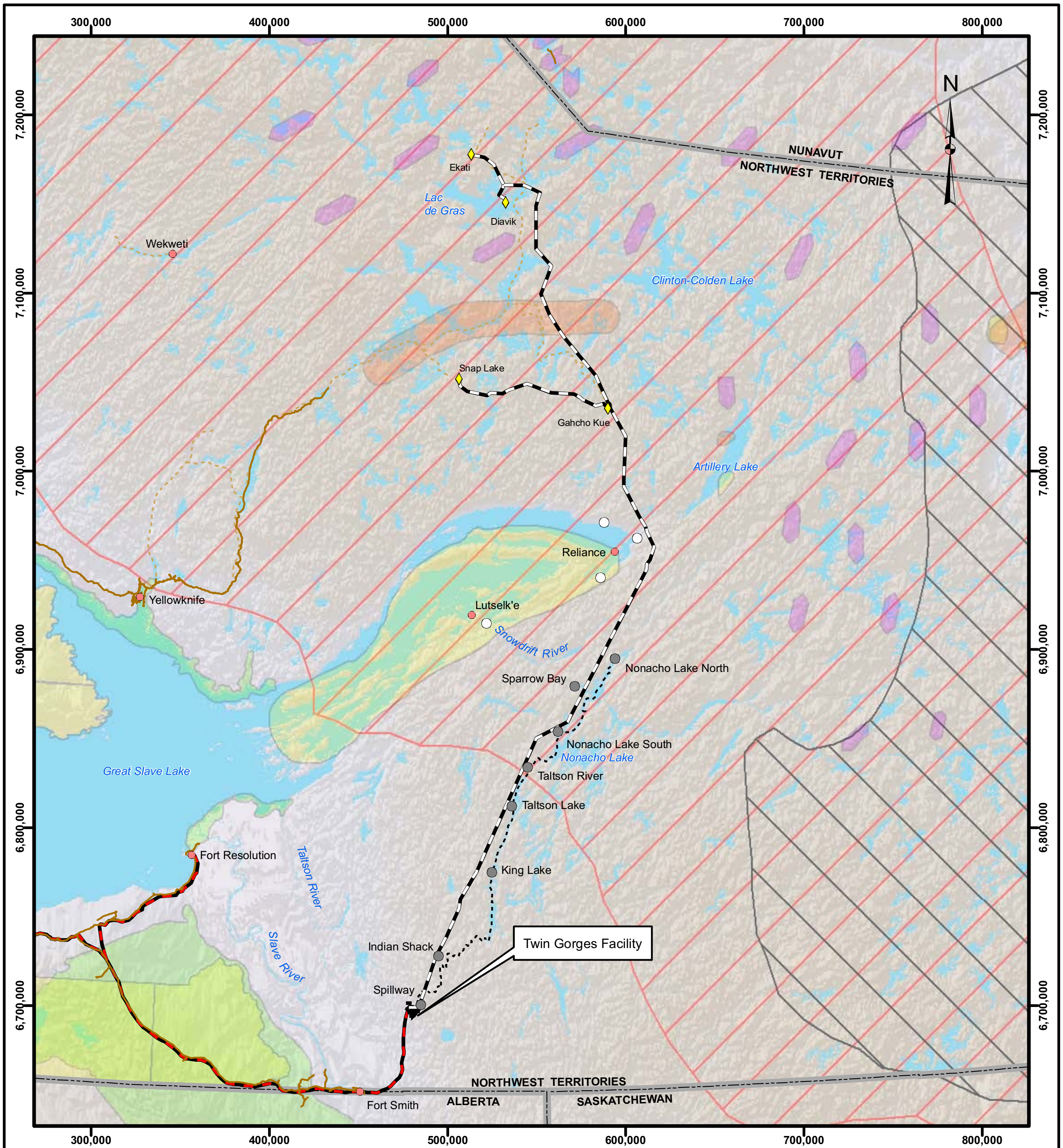
16.5 Wildlife and Habitat

Characteristic wildlife found in and around the Project area include caribou, moose, grizzly and black bear, wolf, beaver, muskrat, snowshoe hare, and spruce grouse, fox, raptors, osprey, raven, and waterfowl. Figure 16-4 depicts critical wildlife areas, including those for wolf and caribou. Species less common but present in the Project area include muskoxen.

Wildlife and especially caribou have been extensively studied over the years by government (e.g. GNWT caribou collared studies), non-profit organizations (such as the World Wildlife Fund), private industry (e.g. operating and proposed mines), First Nations (e.g. West

Kitkimeot Slave Study Society), and collective planning communities representing all stakeholders such as the Bathurst Caribou Management Planning Committee.

Wildlife and wildlife habitat baseline studies for this Project began in 2003, to identify Valued Ecosystem Component species. These are discussed below.



LEGEND

- TOWN
- DIAMOND MINE
- PROPOSED BARGE LOCATION
- PROPOSED LAYDOWN AREA
- PROPOSED WINTER ROAD
- PROPOSED TRANSMISSION LINE
- PROVINCIAL / TERRITORIAL BOUNDARY
- TRANSMISSION LINE
- ALL SEASON ROAD
- WINTER ROAD
- HYDROGRAPHY
- KEY MIGRATORY BIRD HABITAT
- CRITICAL WILDLIFE AREA
- CRITICAL WOLF AREA
- CRITICAL CARIBOU AREA
- BEVERLY CARIBOU AREA
- BATHHURST CARIBOU AREA

100 0 100

SCALE 1:3,000,000 KILOMETRES

PROJECT

PROPOSED TALTSON EXPANSION PROJECT

TITLE

CRITICAL WILDLIFE AREAS

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Caribou, barge, laydown data obtained from Cambria Gordon Ltd, 2006. Hydro data obtained from NTDB, 2005. Critical wildlife, migratory bird data obtained from WWF, 2006. Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT DESCRIPTION
MARCH 2007

FIGURE
16 - 4

16.5.1 Species at Risk

Terrestrial wildlife species present in the Project area were compared against three species at risk lists:

1. Species At Risk Act (SARA, Government of Canada 2005) Schedule 1,
2. Committee on the Status of Endangered Wildlife in Canada (COSEWIC, Government of Canada 2005), and
3. NWT Species Infobase (ENR 2006).

The purpose of these lists is to highlight species that may be at risk of extinction or extirpation. The proposed Taltson Expansion Project falls within, or adjacent to, the habitat ranges of 39 species named under at least one of these three lists (Appendix A).

Species with SARA protection and with ranges that overlap the proposed transmission line are the Eskimo curlew, the anatum (boreal) peregrine falcon, and the whooping crane. Other species of note include the tundra peregrine falcon (listed as vulnerable under COSEWIC).

16.5.2 Beaver

One of the components of the WEMP was to periodically monitor beaver (*Castor canadensis*) populations in water bodies associated with the dam and related components. Aerial surveys of the abundance and distribution of beaver lodges, using the WEMP data as a foundation, were conducted in 2000 and 2003 (Rescan, 2000 and 2003). The sample survey areas included water bodies in the vicinity of the Twin Gorges facility, the Nonacho Lake reservoir and the Hanging Ice Lake System southeast of Project area. The survey area included the South Valley Spillway and Trudel Creek watershed. The survey observations concluded that there was little change in the beaver population size during the three year period.

Beaver and muskrat were also studied in anticipation of reopening the winter road to Twin Gorges. Lodges and populations along the road corridor were assessed.

16.5.3 Muskrat

Muskrat (*Ondatia zibethicus*) was a species identified in the WEMP to periodically monitor populations in water bodies associated with the dam and related components. Suitable muskrat (*Ondatia zibethicus*) habitat is characterized by a gentle shoreline, shallow water, and emergent vegetation. Such conditions are not typically found in large lakes and rivers.

Aerial survey conducted by Rescan in 2001 supported these habitat characteristics with their observations. The larger fast flowing rivers such as Taltson River and Trudel Creek did not show much evidence of muskrat activity. The smaller, shallower and marshier water bodies near Nonacho Lake and Hanging Ice River and Lake contained a higher proportion of muskrat activity, whereas regions around the Forebay Reservoir and the South Valley Spillway contained limited activity.

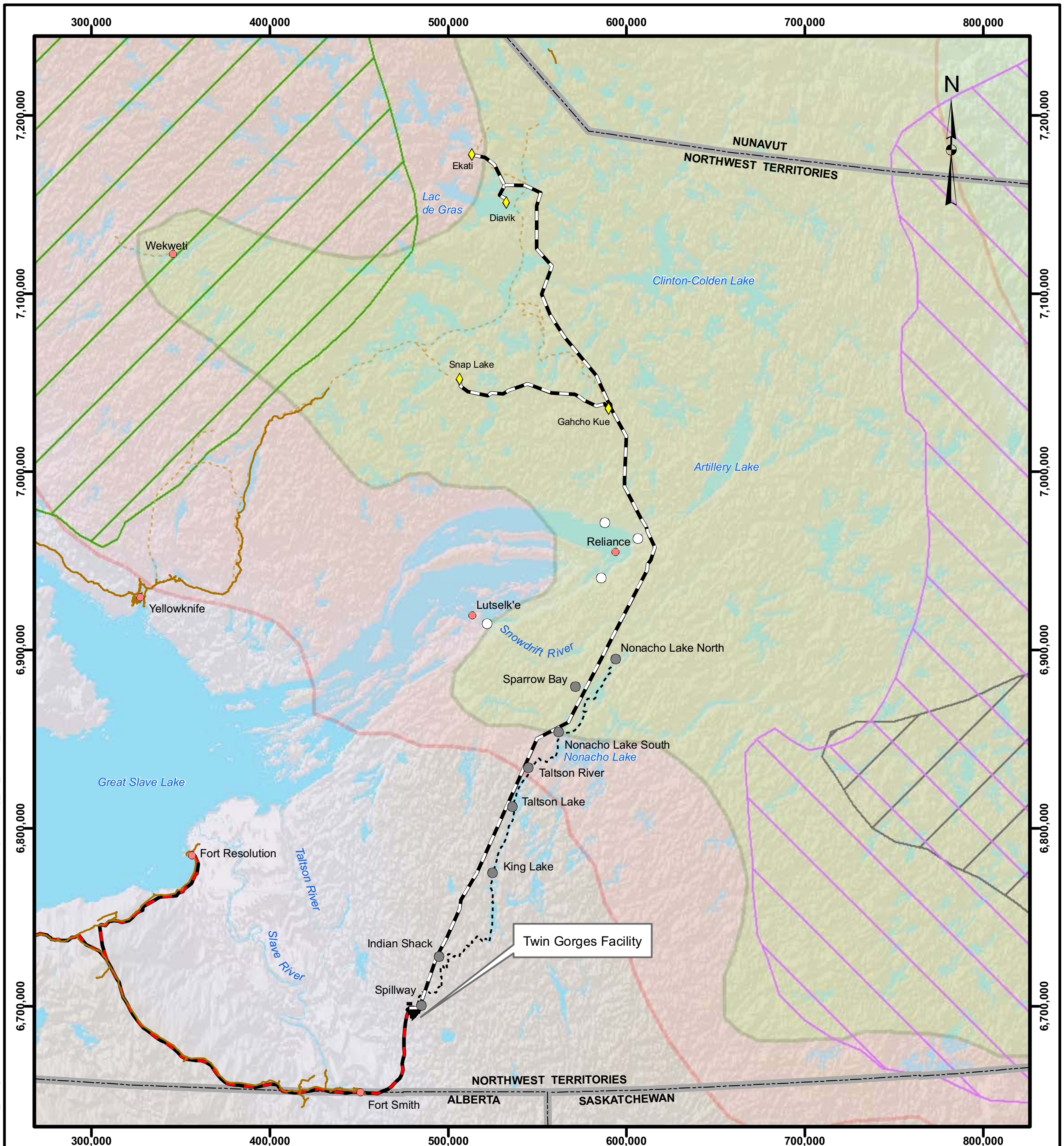
16.5.4 Caribou

Four subspecies of caribou (*Rangifer tarandus*) occur in Canada. Of these subspecies only the barren-ground caribou (subspecies *groenlandicus)* are found in the vicinity of the Project area (Plate 16-5). Barren-ground caribou range over the taiga forests and tundra of the Northwest Territories mainland. In winter, caribou tend to favour uplands, bogs and south facing slopes where the snow is not too deep. Their winter diet consists of up to 80% ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows that provide the fresh green growth of flowering plants and grasses. Caribou avoid areas where forest fires have occurred, both as a feeding area and as a migratory route. When the caribou do migrate through burned areas, they apparently do not stop to feed. Caribou are also noted to avoid rocky areas and boulder fields, some of which are found along sections of the proposed transmission line alignment north of the tree line (Kendrick et al., 2005).

Plate 16-5: Photo of Barren-Ground Caribou taken from under Snare Transmission Line

Caribou herds are migratory and the use of the Project area by the herds varies spatially and seasonally. In 1996, the Government of Nunavut and the Government of the Northwest Territories initiated a satellite collared program of female caribou for the purposes of monitoring migratory movements. The documented ranges based on the satellite collared research indicate that the Bathurst and Ahiak (Queen Maud Gulf) herds have been found in or near the Project area, as shown in Figure 16-5. Surveys conducted in 2003 (Rescan) and 2006 (Golder) have observed caribou along the transmission line route, north of Nonacho Lake area.

DÉZE ENERGY CORPORATION



LEGEND

- TOWN
- DIAMOND MINE
- PROPOSED BARGE LOCATION
- PROPOSED LAYDOWN AREA
- PROPOSED WINTER ROAD
- PROPOSED TRANSMISSION LINE
- PROVINCIAL / TERRITORIAL BOUNDARY
- TRANSMISSION LINE
- ALL SEASON ROAD
- WINTER ROAD
- HYDROGRAPHY

CARIBOU AREA

- BATHHURST
- AHIAK
- BLUENOSE EAST
- BEVERLY
- QAMANIRJUAQ

100 0 100

SCALE 1:3,000,000 KILOMETRES

DRAFT

REFERENCE

Project data obtained from NTEC, 2006. Caribou, barge, laydown, winter road data obtained from Cambria Gordon Ltd, 2006. Hydro data obtained from NTDB, 2005.
Projection: UTM Zone 12 Datum: NAD 83. All boundaries on this map are projected on Nad 83.

PROJECT

PROPOSED TALTSON EXPANSION PROJECT

TITLE

ANNUAL BARREN CARIBOU HERD RANGES

PROJECT DESCRIPTION
MARCH 2007

FIGURE
16 - 5

Caribou movement with respect to their biological seasons is summarized in Table 16-1.

Table 16-1: Calendar Dates for the Caribou Biological Seasons

Season	Calendar Dates	Duration (days)
Calving	June 1 – June 15	15
Post-Calving	June 16 – August 31	77
Fall Rut	September 1 – October 31	61
Winter	November 1 – April 14	165
Northern Migration	April 15 – May 31	47

Calving grounds are vital to the well being of all caribou populations and generally cows would return to the same relative area to calve. There are no calving grounds in the Project area.

During the 2003 (Rescan) study, few caribou were observed during the months of July and August, with numbers increasing from October through early January. In early winter, most caribou were observed between Snap Lake and the East Arm of Great Slave Lake, with another concentration of animals observed southeast to southwest of Reliance. As winter progressed, fewer caribou were observed with the bulk concentrated in three areas: just north of McLeod Bay, surrounding the east end of McLeod Bay, and near the north end of Nonacho Lake.

During the 2006 study conducted in February and early March, caribou were predominantly located along the Lockhart River and Snap Lake section, along the north shore of McLeod Bay, Lockhart River, and up to 40 kilometers south of the Lockhart River. The habitat types occupied by the caribou groups observed included frozen lakes (68%), open mixed forest (28%) and open spruce forest (4%). The behavioural observations noted that in open spruce habitat the caribou were primarily resting and feeding, in lake habitat resting was the primary activity and the preferred avenue for travelling was within the open mixed wood habitat.

Traditional Knowledge (TK) has identified that caribou are predominantly in the Snap Lake area and around the Ekati mine during their northern and post-calving migrations. Group size tends to be small, and during the post-calving migration caribou are less common in the portion of the study area to the east of Snap Lake. This is to avoid boulder fields and rocky tundra common to that area. Other important caribou migration routes documented by the Lutsel K'e Dene Elders (2001) and the Weledeh Yellowknives Dene (1997) include the north and south shorelines of McLeod Bay, the Lockhart River, from Artillery Lake to Lutesel K'e and between Lac de Gras and MacKay Lake.

16.5.5 Moose

Moose (*Alces alces*) are generally closely associated with river systems and wetlands, but they are also found in regenerating habitat such as young forest, recent burns and logged areas. Moose commonly populate deciduous habitats, but make greater use of dense conifer stands during periods of cold temperatures and deep snow.

Moose were observed within open spruce, closed pine, mixed forests, bedrock and frozen lakes. Moose were observed to be fairly evenly distributed from the Twin Gorges station to the eastern tip of McLeod Bay throughout the seasons. From the winter surveys, moose were most abundant south of Lockhart River and on the north shore of McLeod Bay. A positive correlation was suggested between moose sign and the distribution of burns.

16.5.6 Muskoxen

Muskoxen (*Ovibos moschatus*) are most commonly found on the tundra, but have also been observed below tree line, particularly on non-forested slopes.

Muskoxen were observed in low numbers during the summer surveys of the transmission line route. There were three groups observed during the early winter surveys, two groups near the eastern tip of the east arm of Great Slave Lake, and the other south of Snowdrift River. Muskoxen have also been observed on occasion at Snap Lake. Muskoxen occur in low numbers south of the Lockhart River, however they appear to be expanding in distribution and numbers in the recent years, with sightings near Snowdrift River and Nonacho Lake Lodge reported by local residents.

16.5.7 Carnivores

Carnivores inhabiting the Taltson watershed and the transmission line corridor include grizzly bears, black bears, wolves, wolverines, lynx and foxes. Smaller carnivores include river otter, marten, fisher and mink. Denning habitat for the carnivore species are typically found on eskers, glacio-fluvial deposits and along river and lake banks.

16.5.7.1 Grizzly and Black Bear

Grizzlies (*Ursus arctos*) are omnivores and feed primarily on a variety of plants, berries and fish with larger bears being known to prey on other large mammals such as moose, and caribou. Grizzly bear dens may be located within eskers but are also often located in other glacio-fluvial deposits and along river and lake banks. Due to the low density of grizzly bears and large home ranges in the Arctic, dens would be sparsely located (Rescan, 2004a).

Black bears (*Ursus americanus*) are also omnivores and feed on a wide variety of foods, relying heavily on grasses, herbs and berries but would also feed on carrion, insects and sometimes small rodents and ungulate fawns. Black bears prefer forested and shrubby habitat but use wet meadows, ridgetops, burned areas, riparian areas, and avalanche chutes. Black bears build dens in tree cavities, under logs or rocks, in banks, caves, or culverts, and in shallow depressions. Bear dens are generally not used for more than one season.

A study conducted on behalf of the World Wildlife Fund (Cizek, 2004) mapped evidence of grizzly bear in and around Artillery Lake northeast of Lockhart River. During the Rescan (2004a) and Golder (2006) wildlife studies no grizzly or black bear sightings or tracks were observed in the Project area. However, grizzly bears were sighted farther north in the Lac de Gras region, as confirmed by the Ekati and Diavik mine wildlife monitoring programs.

16.5.7.2 Wolves and Wolverines

Wolves are the predominant predators of caribou and they play a pivotal role in all levels of the food chain within the Arctic ecosystem. These species are either resident to particular areas within the tree line or they follow migrating caribou herds, denning in the spring.

Wolverines are solitary carnivores with low population densities that range over large areas. They are scavengers and predators, relying on a diversity of foods including birds, small mammals and large prey, such as ungulates to offset the uncertainty of food availability in the harsh northern environment.

Wolves and wolverines are found above and below the tree line and the distribution of these two species corresponds to similar findings of Banfield (1974). Both species had a high incidence of tracks observed along all sections of the transmission line surveyed. Wolf tracks were in higher abundance with the observation of caribou tracks.

Wolverine tracks appeared to be most prevalent near McLeod Bay and the Lockhart River. Wolverines are known to be active around Diavik and Ekati, as they are detected throughout the wildlife study areas annually conducted by the mines. Wolverine dens have been identified within 4 km of the Lac de Gras and Lac du Sauvage narrows and within 1 km of the Ekati to Misery road. Wolves are also present in the area; 10 historic wolf dens have been identified within the Ekati wildlife study area, of which up to three have been occupied in any one year.

16.5.7.3 Arctic and Red Fox and Lynx

Arctic fox (*Alopex lagopus*) and red foxes (*Vulpes vulpes)* are year-round residents of the Project area. Arctic fox numbers fluctuate widely, following changes in lemming population, their primary food source. Red fox are common in boreal forest habitat and feed on small rodents, insects, fruits, worms, eggs, mice, birds, and other small animals. During the baseline studies neither species were observed above tree line. The distributions of arctic and red fox overlap along the Lockhart River to Snap Lake, and the Lockhart River to Gahcho Kué mine site proposed transmission corridors.

The Lynx is usually solitary, although a group of cats can travel and hunt together. It feeds on birds and mammals, but its main prey is the Snowshoe Hare. Baseline observations found lynx tracks only within boreal areas with a larger presence in areas south of Nonacho Lake.

16.5.7.4 Fisher, Marten and River Otter

Fishers (*Martes pennanti)* are solitary hunters, feeding mainly on small herbivores and omnivores such as mice, porcupines (they are the only predator to consistently hunt this quilled animal), squirrels, shrews and possibly deer. Fisher tracks were identified along the southern end of the Twin Gorges to within approximately 60 kilometres southeast of the Lockhart River.

Marten (*Martes americana*) are an abundant species. Tracks were observed along the Lockhart River to Snap Lake and the Gahcho Kué area, with the highest density immediately north of McLeod Bay. A heavy concentration of marten tracks was observed along transects from Twin Gorges to the Reliance area, and around the eastern end of the East Arm of Great Slave Lake.

The River Otter (*Lontra Canadensis*) eats a variety of fish and shellfish, as well as small land mammals and birds. Otter tracks were observed along the lower 180 km section of the proposed transmission route from Twin Gorges to the Lockhart River section, although a lone otter track was observed along the Lockhart River to the Snap Lake section immediately north of McLeod Bay.

16.5.8 Raptors

The Project area supports a number of bird species. Species of note include golden eagles, bald eagles, osprey, peregrine falcons, gyrfalcons and rough-legged hawks. Other common species included owls, northern harriers and ravens. Raptors typically breed in areas with suitable cliff or hill habitat.

Studies of raptor nest sites and incidental sites were conducted late in July 2003 and 2006. All the mentioned raptor species were observed except for gyrfalcons. There were a limited number of suitable nest trees for osprey and bald eagles and although suitable nest cliff sites were observed, these nest sites were also few in number.

16.5.9 Waterfowl

Approximately one-fifth of the North American population of ducks, geese, and swans nest in the Northwest Territories and Nunavut. During the spring, summer, and fall, numerous species of waterfowl (e.g. loons, swans, geese, and ducks) occur throughout the lakes and wetland areas of the corridor. Although not present in the area during the winter, waterfowl are common throughout the proposed corridor during the spring and fall migration. A number of species remain in the area to breed and nest in the many ponds and lakes. Waterfowl return to the area as soon as the ice begins to melt, using the shore leads and ice-free wetlands.

The highest concentrations of waterfowl were observed in the southern portions of the transmission line, but no unusually large concentrations were observed anywhere along the proposed transmission line route. The majority of the waterfowl observed consisted of diving duck (primarily scaup and scooters). Loons were numerous on the lakes and large groups of Canadian Geese were observed (Rescan, 2003).

16.5.9.1 Ongoing Studies

Based on the findings following the WEMP studies with reference to beaver and muskrat, the survey observations concluded that there was little change in the beaver population size during the three year observation period and recommended that monitoring of beaver populations need only be repeated every five years.

Caribou, moose, muskox, and carnivores continue to be studied along the transmission line and winter road corridors. At present, studies consist of aerial observations within a minimum 20 km distance on either side of the proposed corridor centreline. Thirty kilometres, a conservative approach to data collection, was selected as the study area as this is the maximum distance caribou travel in one day. At Diavik and Ekati, wolverine, wolves and grizzly bears are monitored under the wildlife effects monitoring programs. Waterfowl and raptors would be included in future observations as the design of the corridors progresses.

The sensitive sites identification mapping for the transmission line corridor and winter road would be used to identify areas of potential wildlife sensitivity. Based on the outcome of this study, site-specific locations along the corridors may be identified for detailed field assessments, such as track and pellets studies.

16.6 Heritage and Archaeological Resources

16.6.1 Heritage

Around the Taltson facility and near Lutsel K’e and the proposed East Arm National Park, the inherited cultural influence and traditions center around the Chipewyan people. Most of the Aboriginal residents of Fort Smith and Fort Resolution are descendants of the Chipewyan. The Chipewyan are part of the broader Dene (Northern Athabaskan) linguistic group.

Among Dene, the Chipewyan have been longest in continuous contact with Europeans. Socio-cultural change came earlier to Chipewyan who moved into the full boreal forest near trading posts such as Fort Smith and Fort Resolution where they adapted to hunting moose and woodland caribou.

The Chipewyan signed Treaty No. 8 in 1899-1900 but later filed a “caveat” in 1973 following opposition to the Federal government’s attempt to abolish Indian status. In court, Judge Morrow ruled in favour of the Dene Chiefs thus beginning the process of settling land claims.

The Inuvialuit (defined as Inuit people who live in the western Canadian Arctic region) began land claim negotiations with the federal government in the mid-1970's, and the “Inuvialuit Final Agreement” was signed in 1984. However, attempts to reach a single land claim agreement for all the Dene and Métis of the Northwest Territories broke down in 1990. Claims negotiations then shifted to a regional basis. The Gwich'in signed a land claim agreement in 1992, and the Sahtu Dene and Métis in 1994. The Dogrib negotiated an agreement-in-principle to settle their land claim and provide for self-government in 1999. The Akaitcho Treaty 8 area is an unsettled land claim area. There is an interim land withdrawal and an Interim Measures Agreement (IMA) in place. The Treaty 8 Tribal Council and its representative economic apparatus have been integral to the development of the prefeasibility, and feasibility work on the Expansion Project. In addition, the representative communities of Dettah, Ndilo, Fort Resolution, Fort Smith and the Salt Plains Reserve are included in the stakeholder agreements that have governed the development of the Proposed Project.

Dene, primarily Dogrib, Inuit and Métis, use the northern part of the study area. Generally, these different groups live elsewhere and travel into the area to hunt, trap and fish. Species hunted are primarily the barren-land caribou and moose. Species trapped include the martin, muskrat, mink, beaver, fox, wolf and wolverine.

16.6.2 Archaeological Resources

A preliminary archaeological assessment was conducted 2003 to identify areas of greater risk of disturbance and to assess possible important archaeological areas associated with the Expansion Project. The proposed transmission line corridor and surrounding areas were assessed for archaeological potential through background research and map review, supported by a preliminary field reconnaissance.

The review indicated that the Great Slave Lake area was particularly important during the exploration and fur trading periods, and that one or more Aboriginal groups utilized all portions of the Project area prior to the exploration and fur trading periods.

Rescan (2003) reports that “Although evidence from the last 2,600 years is likely the best represented, there are sites associated with the Arctic Small Tool tradition (approximately 2,500 to 3,500 years before present on or near the proposed corridor. In addition, there is the suggestion of earlier Shield Archaic and Plano sites east of Great Slave Lake and such sites could be encountered. The archaeological database has revealed that these sites are located on a variety of landform types, the majority of which would be assigned moderate or high archaeological potential."

16.6.2.1 Ongoing Studies

An archaeological and heritage sites assessment for the transmission line corridor and Project footprint would be undertaken to identify and rank potentially sensitive sites. The archaeological assessment would include review of existing data, consultation with communities, and field assessments with local representation at pre-determined locations of interest to identify and record potential sites. Where confidentiality concerns exist, potential sites would only be identified to the extent required for avoidance consideration in the detailed Project designs or for development of impact mitigation plans and measures

16.7 Socio-Economics

The South Slave region of the Northwest Territories consists of the communities of Lutsel K'e, Fort Resolution, Hay River, and Fort Smith. Most of the Aboriginal residents of these communities are descendents from the Chipewyan, part of the broader Dene (Northern Athapaskan) linguistic group.

This region historically has had a traditional economy, valuing sustainable wildlife harvesting such as hunting, fishing and trapping. Levels of traditional activity in 2004 revealed nearly 50% of the population hunted or fished with 20% also involved in trapping (GNWT, 2007).

Although the proportion of the population receiving at least a high school diploma has generally been increasing over the past decade, the average level of educational attainment across the South Slave region continues to consistently lag behind both the Northwest Territories average as well as the Canadian average.

This trend is also apparent for average personal income levels. Income levels in the South Slave have been shown to be significantly lower in comparison to levels observed in other localities across the Northwest Territories. This may in part be due to the lack of private sector jobs that tend to pay more than the public sector.

As a large proportion of jobs in the South Slave are concentrated in the public sector, this region is characterized by a lack of economic diversification and is continually struggling with a lack of employment demand. The labour market for the South Slave has consistently underperformed relative to the Northwest Territories and Canada as a whole for at least the past decade. Private sector opportunities in other reaches of the Northwest Territories, mainly in the mining and logging industry, have provided communities with both direct and indirect benefits of increased employment opportunities. Due to geographic isolation, however, the South Slave region has felt few of these benefits.

The Taltson Expansion Project has the potential to influence many valued socio-economic components of the South Slave region. The type, amount and duration of benefits that flow from the project, however, are contingent on the phase of the project under consideration. There are likely to be both direct and indirect benefits arising from both the construction and the completion of this project.

During the three-year construction phase, local as well as regional residents would benefit from the short-term employment and business opportunities. Once operational, further long-term economic returns of the Project to the Akaitcho and Métis owners would provide considerable opportunity for the Aboriginal communities of the South Slave to advance toward self support and sustainable economic development through increases in employment opportunities, sustainable income, community infrastructure as well as through increased education, training, and career development. Other valued socio-economic components, such as improved health and well being, community cohesion, and lifestyle also have the potential to be affected in a positive manner.

16.7.1.1 Ongoing studies

As the potential socio-economic and cultural impacts of a proposed development can have impacts on the lives and circumstances of people, their families and their communities, the scope of Valued Components are currently being explored. In addition, input-output modeling is being considered to understand and quantify the benefits that would result in the South Slave region from the Project.

16.8 Land and Resources

16.8.1 Land and Resource Use

Near the Taltson facility, primarily defined as the areas of Fort Resolution and Fort Smith, as well as in the vicinity of Lutsel K'e and the proposed East Arm National Park, land and resources are primarily used for hunting, trapping, fishing and to a lesser extent plant and berry gathering and forestry.

The area north of the proposed East Arm National Park up to the diamond mines is primarily used for hunting and fishing, more so by persons living in Yellowknife and those visiting the Northwest Territories for recreational purposes. Less forestry and logging occurs in this area because it is a northern transitional zone between the boreal forest and the tundra or barren lands to the north.

Table 16-2 shows that the highest level of each activity occurred in Lutsel K'e. As expected, the percent of households consuming country food was also highest in Lutsel K'e.

Table 16-2: Number of People (%) 15 Years of Age or Older Who Engaged in Traditional Activities in 2004

Community	Hunting & Fishing	Trapping	Households consuming Country Food (most or all of meat consumed)
Fort Smith	33.3	8.0	11.0
Fort Resolution	53.3	19.5	43.8
Lutsel K'e	73.6	24.1	68.0

Further evidence of the importance of hunting and trapping is found in the harvest statistics from the three communities as shown in Table 16-3. More pelts are taken by license holders from Fort Resolution than from the other two communities.

Table 16-3: Pelts Harvested by Type and Community During 2005-06

Species	Fort Smith	Fort Resolution	Lutsel K'e	Totals
Marten	120	250	185	555
Mink	25	50	19	94
Muskrat	300	500	28	828
Lynx	25	200	4	229
Wolverine	15	8	11	34
Beaver	200	150	4	354
Black bear	1	0	3	4
Wolf	5	6	140	151
Squirrel	40	100	1	141
Weasel	30	150	0	180
Totals	**761**	**1,414**	**395**	**2,570**

Table 16-4 demonstrates the importance of traditional harvesting activities in the South Slave region relative to harvesting activities in the Northwest Territories as a whole. Of the approximately $2,000,000 in income generated attributable to trapping actively across the Northwest Territories in 2005-06, approximately 27% originated in the South Slave region.

Table 16-4: Revenue from Trapping Comparing South Slave Region to Entire NWT 2005 – 2006

Area	Total Value Sold	Fur Bonus	Grubstake	Total Income
South Slave Region	$344,962	$99,215	$35,950	$480,127
Northwest Territories	$1,400,604	$252,577	$94,670	$1,747,852

Within the study area, the structure of the land use population has been altered by the presence of an increasing number of people seeking recreational pursuits. Other evolving characteristics of the area include an increase in forestry and logging activity, and a rise in the level of mineral exploration experienced in the Northern part of the study area.

16.8.2 Parks and Protected Areas – Proposed East Arm National Park

The only existing or proposed park or protected area within the immediate Project area is the Proposed East Arm of Great Slave Lake National Park. The transmission line preferred route would traverse the proposed park. In consideration of the park and the park objectives, the transmission line routing would be developed around the interests of the park stakeholders. Plate 16-6 shows a view of the Lockhart River in the area of the proposed East Arm National Park.

In the 1970's, an area of approximately 7,400 km^2 in the East Arm of Great Slave Lake was set aside for national park purposes by a federal Order-in-Council. Over the next three decades, a series of negotiations took place with the Lutsel K'e Dene First Nation to define a national park located in East Arm. In 2005, the Lutsel K'e Dene First Nation delineated an area it calls 'Thaydene Nene', a part of their traditional territory that they propose to protect and conserve through the establishment of a national park and other conservation measures. They also urged Parks Canada to reassess the boundaries of the 1970 East Arm National Park proposal.

In response to this request, Parks Canada identified a preliminary 'area of interest' for a national park in the East Arm area that meets representation, ecological integrity and visitor enjoyment/understanding objectives. The preliminary 'area of interest' covers a total surface area of 33,525 km^2 (29,560 km^2 is land, 3,965 km^2 is water). The proposed park will be the forth largest in Canada (Wood Buffalo is Canada's largest) and is covers almost 3% of the Northwest Territories.

Parks Canada and the Lutsel K'e Dene First Nation have negotiated a Memorandum of Understanding (MOU) that provides for a process of consultation with the First Nation on the feasibility of park establishment.

A national park in this area would protect an outstanding example of the Northwestern Boreal Uplands and an area where the change from boreal forest to tundra is greatly pronounced. The area is an important wintering area for several herds of barren-ground caribou, and supports viable populations of native species such as wolf, moose, wolverine, great-horned owl, American marten, and other fur-bearers.

The 'area of interest' includes sacred places and cultural heritage of the Lutsel K'e Dene First Nation, and includes the traditional hunting and fishing areas as well as the remnants of historic Fort Reliance and Pike's Portage linking Great Slave and Artillery Lake.

Plate 16-6: Lockhart River – Area of Proposed East Arm National Park

16.8.2.1 Order in Council Land Withdrawal

With Lutsel K'e's support, the Government of Canada, pursuant to the Territorial Lands Act and through an Order In Council, has withdrawn from the proposed East Arm National Park, an area of land and water required for the construction, operation, and maintenance of the Expansion Project transmission line and future ancillary components, substations, and associated infrastructure, if required.

16.8.2.2 Ongoing Studies

To ensure the transmission line route selection through the proposed park considers the interests of all stakeholders and upholds the objectives of the park, the Dezé Energy Corporation plans to establish a committee that consists of all key proposed park stakeholders, to identify the preferred transmission line routing through the park. The committee would provide a recommendation to the Dezé Energy Corporation for one or more park crossing locations that the committee feels accommodates and protects the objectives of the park.

16.8.3 Winter Land Access

There are few public roads in the area, the closest at the southern end of Great Slave Lake. Highways #5 and #6 connect Fort Resolution and Hay River. Highway #5 also connects Hay

River with Fort Smith, travelling through Wood Buffalo National Park. In summer, access to much of the land, including the Project, is by float plane, helicopter or boat. In winter, access is by plane, helicopter or snow mobile. Overland travel for hunting and fishing during winter months utilize river and lake ice for crossings and travel routes.

Surface waters of lakes in the Taltson Basin typically freeze in October and break-up in May of the following year. The northern portion of the basin freezes two to three weeks earlier than the southern portion. Observations as late as mid-June of 1985 revealed ice on Nonacho, Taltson, King and Lady Grey Lakes (Rescan, 2001). Between rapids, flow is generally slow moving, quickly developing ice cover. In narrow Sections and shallower reaches where the velocities are higher, reaches would stay open longer. In the early stages of freeze-up in particular, the ice covers in the high velocity reaches would be thin compared to low velocity sections.

The first formal survey of ice formation in the system was undertaken in 2003 (Rescan 2004b) under the WEMP program. The survey consisted of a visual overflight of the Taltson River from Nonacho Lake to Great Slave Lake during November 25-27, 2003. The timing was selected to correspond with 200-300 freezing degree-days and air temperatures of -10 °C, as these conditions have been found to lead to freeze up in northern rivers. The overflight was recorded on video and still photographs taken at key locations. At key points along the survey, the crew landed and measurements of ice thickness and water temperature were taken.

In December 2006, a formal overflight was conducted that repeated the November 2003 flight line, as well as the proposed winter road alignment. Ice thickness measurements were also taken. The timing was selected to capture the seasonal ice formation and is documented in still photography.

16.8.3.1 Ongoing Studies

As the icing process varies considerably based on weather and climatic conditions, climate change, and other natural conditions and events, on-going studies would focus on identifying the winter road route and traditional crossing locations. This would include ice cores along the proposed route and a photo-record of the Taltson and Trudel systems at select locations to capture the ice formations during early and late winter.

In addition to the ice cores and photo-records, attempts would be made through consultation with local users to identify present-day ice crossing locations and ice surface travel routes, so to focus study efforts. Consultation would also be used to gather information regarding land use of the Project area.

17 ENVIRONMENTAL ASSESSMENT OVERVIEW

17.1 Introduction

The Taltson Hydroelectric Expansion Project may affect various Valued Ecosystem and Social Components (VCs) during the construction and operational phases of the Project. The Project would be subject to the Environmental Impact Assessment process under the *Mackenzie Valley Resource Management Act*, at a minimum of a Preliminary Screening step.

To assist with scoping the Project within the Environmental Impact Assessment Process, baseline environmental and social components and characteristics, as well as planned and ongoing Project environmental and social baseline studies are presented at an overview level.

Many Valued and Social and Ecosystem Components have been identified to date, through community consultation and stakeholder input; database listings of valued, sensitive or critical components; and biological and social baseline studies completed to date.

Conceptual interactions between the Project components, key environmental and social components, and identified Valued Components are presented and discussed at an overview level to assist in scoping the various potential effects and potential mitigation strategies.

A preliminary overview of potential interactions is shown in Table 17-1.

Table 17-1: Potential Project and Environmental Interactions

Project Component	Air and Climate	Aquatic and Fisheries Resources			Soils	Vegetation	Wildlife & Habitat	Archaeological	Parks	Land Use	Winter Land Access	Social Economics
		Taltson	Trudel Creek	T/L Area								
CONSTRUCTION												
New Powerhouse, Canal & Intake Structure												
Site clearing		♦			♦	♦	♦	♦	♦	♦	♦	♦
Canal blasting	♦	♦			♦		♦			♦		♦
Waste rock disposal	♦				♦	♦	♦	♦		♦		♦
Intake structure construction		♦					♦					♦
Powerhouse construction							♦					♦
Construction noise							♦			♦		
Twin Gorges Winter Road Re-commission												
Corridor clearing		♦				♦	♦			♦	♦	♦
Transportation	♦						♦			♦	♦	♦
Temporary Winter Road to Nonacho Lake												
Blasting	♦				♦		♦			♦		♦
Corridor clearing						♦	♦	♦		♦	♦	♦
Transportation	♦						♦			♦	♦	♦
Nonacho Control Structure												
Construction camp and lay down					♦	♦	♦	♦				♦
Site clearing					♦	♦	♦	♦		♦		♦
Blasting	♦				♦		♦			♦		♦
Existing structure decommissioning		♦					♦					♦
New facility construction		♦					♦					♦
Construction noise							♦					
Transmission Line												
Corridor clearing				♦	♦	♦	♦	♦	♦	♦	♦	♦
Helicopter use	♦						♦			♦		♦
Barge landings				♦		♦	♦	♦				♦
Construction noise							♦					
Construction camps and lay downs					♦	♦	♦	♦		♦		♦
Sub-stations and switchyards												♦
OPERATIONS & MAINTENANCE												
New Powerhouse, Canal & Intake Structure		♦	♦			♦	♦			♦	♦	♦
Powerhouse Shutdown		♦	♦								♦	♦
Nonacho Control Structure - operations	♦	♦									♦	♦
Nonacho Control Structure - maintenance		♦										♦
Transmission Line – operations						♦	♦		♦	♦		♦
Transmission Line – maintenance	♦			♦		♦	♦		♦	♦		♦
Substation / switchyard operations												♦
Substation / switchyard maintenance												♦

17.2 Air Quality and Climate

A major positive effect on air quality and potential positive effect on climate would be the reduction of airborne particulate matter and approximately 255,000 tonnes of CO_2 equivalent from replacement of diesel fuel by hydroelectricity at four existing and proposed mines sites in the Northwest Territories. The positive air quality effect would be realized immediately upon connection of the hydroelectric power to the various mines and would remain in effect for the life of the mines. The reduction of greenhouse gasses would reduce the anthropogenic effects associated with global and regional climate change.

Minor or short-term air emissions can be expected from the Project. These would likely result from a small emergency back-up diesel powered electrical generating plant (for emergency operation only) to operate the Nonacho control structure, airborne dust particles from blasting activities, and exhaust from construction equipment and helicopters.

As blasting activities would only occur during the construction phase and do not involve substantial re-handling of material – which tends to increase the fines content and thus the available particulate matter to become airborne – dust mitigation plans would not be effective in reducing available particulate matter. To minimize equipment exhaust emissions, best management practices would be employed. These include actions such as shutting off ignitions during extended periods of down-time.

The Project is anticipated to have a substantial long-term positive net effect on regional and global air quality.

17.3 Aquatic Environment and Fisheries Resources

17.3.1 Taltson River

The Project would affect the aquatic environment and fisheries resources in the Taltson River, due to:

- Operational changes in seasonal flow patterns and water elevation fluctuation frequency; and
- Controlled and uncontrolled temporary power plant shutdown flow pattern changes.

The Project would affect the existing hydrology regime that has been in place since the 1986 reduction in power generation due to the closure of the Pine Point Mine. The Taltson River would experience reduced summer flows and increased winter flows. This flow regulation is required to generate a consistent power supply for the projected customers.

Under existing operations, plant shutdowns dewater the section of river from the tailrace to the Trudel Creek confluence immediately downstream of Elsie Falls and cause temporary flow reductions downstream of Elsie Falls. This same operating scenario would exist with the shutdowns of the expanded Project facility. The shutdown would temporarily affect the new flow regime until the resulting increase in spillage over the South Valley Spillway and into Trudel Creek appears at the Taltson River. The estimated time for shutdown flows to reroute through Trudel Creek is a few hours to half a day.

Uncontrolled shutdowns cannot be accurately predicted; however, based on existing operations, uncontrolled shutdowns are anticipated to occur approximately 2% of the year.

Hydrology studies in progress are designed to assess the construction and operation effects of the Taltson Expansion Project on changes in timing and characteristics of flow conditions, and lake and river levels throughout the basin sectors. In turn, these results would be utilized to assess specific impacts associated with the Project.

Effects and mitigation plans to avoid or minimize impacts, and/or habitat compensation plans, are still under assessment and would be contingent on the minimum release flow in Trudel Creek.

On hydroelectric projects where the intake velocity is higher than the swimming speed of resident fish, entrainment can potentially cause mortality due to effects of passing through turbines. On projects where the velocities exceed swimming speeds, data indicates that the survival rate of fish that pass through turbines is relatively high (>70%). Fish that reside in pool environments, such as the intake area of the Project, have a natural tendency to avoid intake velocities. Intake velocities at the Expansion Project would be in the 1 to 3 m/s range; however, these may be reduced through further engineering to mitigate potential for entrainment.

Increased water temperature in tailrace flows is an effect from some hydroelectric generating facilities. The Project would have minimal temperature increases due to the use of a canal, which allows water to maintain its intake temperature, as opposed to withdrawal at depths, which brings warmer water through the plant. As the ambient water temperature remains cold year-round, minor temperature increases are not anticipated to produce a negative effect.

Flows from the new tailrace may cause permanent scour at the confluence with the Taltson River. Reduced flows in Trudel Creek are anticipated to decrease bank erosion and downstream sediment deposition in the Taltson River. Effects on fish habitat, both positive and negative would be identified and discussed further with DFO.

The in-stream construction and maintenance of the Nonacho Lake control structure would temporarily affect fish habitat during in-stream construction. Best management practices, such as isolation and fish salvage prior to construction are anticipated to mitigate any negative effects. As design and construction planning progresses, should the potential for a harmful alteration disruption or destruction of fish habitat be unavoidable, habitat compensation plans would be developed in consultation with DFO.

Clearing of vegetation for winter roads, the Nonacho Lake camp, shoreline staging areas, or accidental discharge of sediment or wastes from construction activities, such as hydrocarbons or concrete would have potential to cause negative effects on water quality. Best management practices during clearing and construction, however, coupled with the Waste Management Plan and Sediment and Erosion Management Plan would be critical to avoiding erosion resulting in sedimentation and/or accidental discharges of construction wastes.

17.3.2 Transmission Line

Aquatic habitat impact mitigation has been incorporated into the line design by avoiding tower placements in and around water bodies. Construction practices would follow the DFO Operational Statement for Construction of Overhead Lines (OS). If the practices of the OS cannot be maintained, site specific mitigation plans would be developed and discussed with DFO.

Aquatic effects of the transmission line would include selective clearing of riparian zones where the line does not span above standing timber and potential accidental discharge of sediment or wastes into water bodies. Cover within streams above tree line is provided by cutbanks, instream vegetation and boulders, which would not be affected by the transmission lines. Placement of towers near stream banks would be minimized, and wet substrate would be avoided. Riparian zone clearing impact mitigation measures would include selective clearing and retention of shrub vegetation at a height of up to 3 m. Plate 17-1 shows an example of a transmission line in the Northwest Territories near a riparian zone.

Plate 17-1: Existing NWT Transmission Line – Example of Line near Riparian Zone

Clearing and construction would occur predominantly by helicopter; therefore, minimal or no soil disturbances and thus sedimentation, generally associated with road construction, are required. Best management practices during construction and the Waste Management Plan and the Erosion and Sediment Control Plan would be critical to avoiding accidental discharges to water bodies.

17.3.3 Trudel

The Project would reduce average daily flows through the South Valley Spillway and into Trudel Creek. During shutdowns, flows that would normally pass through the generating plant would spill into Trudel Creek. Under the current operating conditions, flows in Trudel Creek vary throughout the year, as they reflect the combination of controlled flows from Nonacho Lake and seasonal flow regimes from Taltson River tributaries. Plant shutdowns also affect the flows in Trudel Creek. Prior to 1986 when Pine Point Mine closed, flows in Trudel Creek were at or near zero during low flow periods when water was directed to the Twin Gorges generating facility.

A proposed minimum flow release for Trudel Creek is currently under assessment. Many factors are being considered in the low flow assessment, including the present and historic aquatic habitat and fish populations in Trudel Creek, as well as Project feasibility and economic viability.

The proposed minimum flow release would reduce flows in Trudel Creek from current flow volumes, potentially affect fish habitat as well as reducing the present bank erosion. An assessment of fish habitat and productivity in Trudel Creek is currently on-going, and would be critical in developing a proposed minimum flow release and associated potential effects.

Mitigation plans would be developed to reduce or avoid negative effects on fish habitat. In addition, should harmful alteration, disruption or destruction of productive fish habitat be unavoidable, compensation plans would be developed in consultation with DFO and other stakeholders.

17.4 Soil and Vegetation

17.4.1 Soil

Project effects on soils would be associated with rock extraction from the Twin Gorges canal and the Nonacho Control Structure and potentially at transmission line tower locations and from camps and staging areas.

Based on the rock characteristics, extraction rock is anticipated to be non-acid generating. To confirm the geological characteristics, surface samples of exposed rock would be tested for net neutral potential. Rock sampling would continue during excavation activities. Assuming rock is non acid generating, it would be deposited in low profile waste piles within one kilometre of the canal.

Soil disturbances associated with the transmission line towers, camps and staging areas would be minimal. Towers design avoids wetlands and marshes with high soil contents. Generally towers would be located on rock outcrops or eskers and would have minimal site disturbances. Camps and staging areas would be levelled prior to use, and reclaimed, as practical, after use. To mitigate effects on soils, area disturbances would be minimized.

17.4.2 Vegetation

Project effects on vegetation would result from clearing activities to support the transmission line, winter roads, lay down areas, intake areas and canal construction activities and camps.

The transmission line corridor would be 30 m wide. Corridor clearing is required to minimize fire hazard from timber fuel sources under the line and maintain an electrical clearance zone around the line. Mitigation measures applied during line design to minimize clearing requirements include assessing route locations in accordance with VC sensitivities, such as locating poles on high elevation rock outcrops and spanning lowlands, locating the line in previously burned areas, and avoiding wetlands and riparian zones. In addition, vegetation of up to 3 m in height can be retained under the line while achieving the electrical clearance zone. As a result, little existing vegetation would be directly disturbed by the transmission line, similar to the existing lines in the Northwest Territories shown in Plate 8-10 and Plate 8-11. Refinement in the locations of the transmission line, road corridors, and lay down areas continues to be incorporated as additional baseline land cover mapping is produced.

Based on the preliminary transmission line design a total of approximately 200 km of transmission line corridor segments would require hand clearing of standing timer. Between Twin Gorges to Lockhart River, approximately 50% of the line would require timber clearing as it overlies the spruce-lichen boreal forest (24%) or the tall shrub land open/immature deciduous forest and/or immature conifers open (25%) land cover categories. Between the Lockhart River and Gahcho Kué approximately 20% to 50% requires clearing, Gahcho Kué to Ekati requires approximately 1% clearing, and Gahcho Kué to Snap Lake requires approximately 1% clearing.

Clearing for winter roads, camps, and lay down areas would be minimized to only those areas necessary to support the construction activities. The new road corridor would maximize use of lake and wetland complexes; where portage clearing would be required, the corridor would be single lane width.

17.5 Wildlife and Habitat

Wildlife species identified as VCs for the Project area include caribou, ungulates, carnivores, beaver, muskrat, waterfowl and raptors. Caribou are a keystone species, an organism in the ecosystem that many other species depend upon for continued survival and support. The major animal hunted by Chipewyan is the Barren Ground caribou. Barren Ground caribou are of overwhelming importance to the Chipewyan and are the focus of their religious beliefs and oral history. Therefore, the potential effect of the transmission corridor and associated activities on caribou habitat has been given special consideration.

The Project may also affect wide-ranging, low-density species such as grizzly bears and wolverines, species sensitive to disturbance such as raptors and waterfowl, species sensitive to water level fluctuations like beaver and muskrat, and important habitats such as standing timber, wetlands, riparian areas, cliffs and eskers.

17.5.1 Habitat

The Project would have temporary and long-term effects on wildlife habitat, which include habitat losses and habitat transformations.

Temporary habitat losses would result from:

- Clearing of the new winter road at portage;
- Reactivation of the existing Twin Gorges winter road (beaver and muskrat lodges); and

- Footprint disturbances of camps and lay down areas.

Long term losses would result from:

- Footprint disturbances of the North Gorges canal and habitat isolation between the canal and the Taltson River; and
- Footprint disturbances of the powerhouse, intake structure, and Nonacho Control Structure.

Habitat alterations would result from:

- Transmission line corridor sections where vegetation clearing is required;
- Waste rock piles; and
- Shoreline habitat potentially affected by a new hydrological regime.

Mitigation measures to minimize habitat impacts include minimizing the footprint of lay down areas and camps, designing the transmission line to minimize clearing, retaining vegetation up to 3 m in height within the line corridor, and maximizing use of lakes and river systems for the winter road. Landscape mapping used to refine line and road alignments to minimize clearing areas and avoid sensitive habitat is currently in progress.

The greatest effect on habitat from the Project would be associated with the cleared sections of the transmission line corridor. Within these sections, land cover including standing timber, tall shrubs, low shrubs and open areas would be altered. This alteration may affect the behaviour of wildlife, specifically caribou that depend on specific habitat values during their seasonal life-stages.

17.5.2 Wildlife

The Project may have temporary and long-term effects on wildlife, including:

- Temporary behaviour effects such as disturbance and avoidance due to road use, helicopters, blasting, and construction noise and activities;
- Potential long term behaviour effects such as avoidance of cleared transmission line corridor sections and tower structures, increased use of cleared line corridor sections, or use of towers for nests or perches; and
- Potential mortality from human-wildlife interaction at camps and construction areas and the Twin Gorges facility, and from changes to predatory-prey interactions.

Habitat alterations would likely have the greatest effect on caribou, which use different sections of the transmission line area during winter, spring migration, post-calving, and fall migration and rut. Documented effects associated with transmission lines include an increased tendency to follow linear corridors that do not deviate significantly from their intended course and increased mortality from predators. Some effects would be partially mitigated by maximizing vegetation retention through selectively clearing tall vegetation and retaining vegetation up to 3 m to decrease corridor openings and retain cover.

Use of transmission line towers by raptors and ravens as nesting platforms and perches has been well documented. Raptors are attracted to transmission towers by the wide field of view for hunting and easy takeoff. The span between the lines is greater than the wingspan of raptors, eliminating the threat of electrocution that occurs when two lines are touched simultaneously.

Other mitigation measures would include avoidance of construction around active nest and denning sites, if possible, and the development and implementation of a Human-Wildlife Conflict Reduction Plan.

17.6 Heritage and Archaeological Resources

The Project has potential to affect archaeological and heritage resources that may be located within areas of footprint disturbances and within the sections of the transmission line corridor where clearing of standing timber is required. Where potential heritage or archaeological sites and specific characteristics have been identified, the Dezé Energy Corporation would work with the stakeholders to identify and develop site-specific mitigation measures to protect the individual values of each site. A range of mitigation measures could be employed, including avoidance measures whereby temporary disturbances such as roads, camps, and yards, are relocated to alternate sites, or modifications of standard designs or construction techniques to protect sites.

17.7 Socio Economics

The Project has the potential to affect both positively and negatively a number of socio-economic components, the extent of which is contingent on the stages of development. Effects include overall increased economic stability and growth through increased private sector employment and business opportunities, community infrastructure, as well as education and training. The project may also benefit individual and/or community lifestyle in addition to individual health and well being and community or cultural group cohesion.

A distinct concern is the potential for adverse lifestyle changes such as increased gambling, crime and substance abuse that can occur as a result of rapid income increases. Direct employment opportunities, many of which require trades-people, are mostly associated with the 3-year construction season. Long-term operational employment is minimal, setting the Project apart from other major developments in the Northwest Territories. It is anticipated that potential negative lifestyle effects would not be as pronounced as with other projects, and would be of short duration associated with the Project construction, as the direct long-term economic benefits are realized through the ownership structure. In this way the negative effects associated with a sudden influx of direct income are mitigated. Additional measures to mitigate potentially adverse lifestyle change would include proactive and collaborative efforts with the community leaders to address the issues prior to the construction of the Project.

17.8 Land & Resources

17.8.1 Land and Resource Use

The Project may have temporary or long-term effects on land use resources and associated activities. Hunting, fishing, and gathering may be affected, both positively and negatively by vegetation and wildlife changes or disturbances. Improved winter access may be viewed by hunters and trappers as a positive attribute, increasing land access and bettering winter travel. Habitat changes and wildlife disturbances may result in negative short or long-term effects on the land resources used by hunters and gatherers. Lodges along Nonacho Lake and the Taltson River may be affected by water elevation changes.

17.8.2 Parks and Protected Areas

The land withdrawal for the transmission line and associated infrastructure through the proposed East Arm National Park would provide for a corridor specifically for the infrastructure associated with the Expansion Project. The withdrawal is supported by Lutsel K'e, the closest community to the proposed park and whose specific cultural and heritage values are to be protected by the park.

The Project may affect the proposed park through the need to cut vegetation greater than 3 m in height. The existence of the overhead transmission line may also affect the aesthetic value.

The Dezé Energy Corporation plans to establish a committee that consists of all key park stakeholders, to identify a preferred park crossing location for the transmission line. The committee would provide a recommendation to the Dezé Energy Corporation for one or more crossing locations that the committee feels accommodates and protects the objectives of the park.

In addition to identifying the stakeholder preferred line routing, mitigation measures for construction, operations and maintenance would be established to ensure initial and ongoing protection of proposed park. Potential mitigation measures may include site avoidances designed in support of park objectives, vegetation retention or partial cutting to retain the aesthetic value associated with specific ground or water perspectives, and clearing techniques to selectively remove only those trees identified as posing a real and immediate threat to the line or to worker safety.

17.8.3 Winter Land Access

River ice has historically provided winter crossing of rivers for local land users. Natural meteorological patterns, which demonstrate a warming trend in the recent past, are the primary controlling forces in the formation and condition of river ice. Changes in the flow regimes from the Project, especially that of Trudel Creek, may contribute to the development of winter icing conditions. The extent that the Project operations may potentially affect ice formation cannot be isolated from the naturally occurring conditions. Through Traditional Knowledge and consultation, traditional crossing locations and periods of use may be identified and a communication protocol between users and the Project developed.

Winter land access from temporary winter roads and within cleared sections of the transmission line corridor may provide easier access by snowmobile to previously difficult to access areas, increasing winter motorized traffic and exposure to anthropogenic effects. This also improves the hunting opportunities and enables Aboriginal hunters better access to the land and reduces their costs and risks.

The improved access from the winter roads would be limited to the winter months when the winter road is operational and only for the two to three year construction period, after which time it is not expected to be maintained. The transmission line would only provide limited increase in access as vegetation up to 3 m would be retained within many sections where tall vegetation currently exists.

17.9 Cumulative Effects

The potential for cumulative effects of the Project in combination with effects of past, present and likely proposed projects would be assessed. Within the Project area, environmental and social effects to date are primarily associated with the mineral resource extraction industry. From a preliminary review of existing and proposed development project reports and cumulative effects reports for the Northwest Territories (Johnson et al., 2005), local cumulative effects associated with the Project area are anticipated to be both positive and potentially negative, and focus on wildlife and socio-economics. Issues may include:

- Direct and indirect habitat losses;
- Increased development; and
- Community and resident well-being.

In addition, cumulative effects of the Project may be realized on a regional and global scale. These may include:

- Increased longevity of winter roads due to reduced truck use;
- Reduced impact on wildlife and habitat from reduced truck use on winter mine road corridors;

- Reduced fossil fuel use and resource depletion;
- Reduced toxin and particulate matter accumulation in the Arctic “sink”;
- Reduced bioaccumulation of toxins in the food chain; and
- Reduced anthropogenic contribution to global and regional climate change.

18 REFERENCES

Agriculture and Agri-Food Canada. 2002. A National Ecological Framework for Canada – Overview. The National Land and Water Information Service. URL: http://sis.agr.gc.ca/cansis/nsdb/ecostat/intro.html.

Agriculture and Agri-Food Canada. 2005. Canadian Soil Information System. The National Land and Water Information Service. URL: http://sis.agr.gc.ca/cansis/intro.html.

Akaitcho Territorial Government, Métis Energy Company Ltd., Northwest Territories Energy Corporation. 2005. Taltson Hydroelectric Expansion Project. Pre-feasibility Assessment Volume 1, Summary Report.

Banfield. A.W.F. 1974. The Mammals of Canada. University of Toronto Press.

Bathurst Caribou Management Planning Committee. 2004. A Management Plan for the Bathurst Caribou Herd.

BHPB. 2004. 2003 Wildlife Effects Monitoring Program. Ekati Diamond Mine. Prepared for BHP Billiton Diamond Inc. by Golder Associates Ltd, Yellowknife, Northwest Territories.

Bodden, Kenneth R. 1981. The Economic Use by Native People of the Resources of the Slave River Delta. M.A. Thesis, Department of Geography, University of Alberta.

Bogdan, G. F. 1977. Report on a Stream Survey of the Taltson River, Northwest Territories in 1972. Department of the Environment, Fisheries and Marine Service, Research and Development Directorate, Technical Report.

Canadian Association of Petroleum Producers. 2003. Guide: Calculating Greenhouse Gas Emissions. Calgary, Nova Scotia and St. John's Newfoundland.

Cizek, Peter. September 2004. Conservation Suitability Analysis of the Northwest Territories: An Exploratory Approach – Final Report. Prepared for the World Wildlife Fund Canada, Toronto, ON.

Diavik. 2005. Environmental Assessment Review and Revised Effects Assessment. Prepared for Diavik Diamond Mines Inc. by Golder Associates Ltd, Yellowknife, Northwest Territories.

Envirocon. 1973. Taltson River Hydro Extension Fisheries Study: Interim Data Summary and Partial Baseline Summary, 22 June – 12 August 1973. Prepared for the Northern Canada Power Commission by Envirocon Ltd., Pearse-Bowden Economic Consultants Ltd. And Doran Associates, Vancouver, BC.

Envirocon. 1975. Environmental Implications of Proporsals to Increase Hydro-Electric Generation on the Taltson River System, Northwest Territories. Prepared for the Northern Canada Power Commission by Envirocon Ltd., Pearse-Bowden Economic Consultants Ltd. and Doran Associates, Vancouver, BC.

Envirocon Pacific Ltd. 1986. Taltson Basin Hydroelectric Facilities: Projected Impact of Taltson Basin Hydroelectric Facilities on Fish Populations. Volume 1 – Report, and Volume 2 – Data Report. Prepared for the Northern Canada Power Commission, Edmonton, Alberta, by Envirocon Pacific Ltd., Burnaby, BC.

Environment Canada. 2004. Canadian Wildlife Service. Species at Risk. URL: http://www.speciesatrisk.gc.ca/default_e.cfm.

Environment Canada. 2005. State of Environment Infobase, Narrative Descriptions of Terrestrial Ecozones and Ecoregions of Canada. URL: http://www.ec.gc.ca/soer-ree/English/Framework/Nardesc/taishdwe.cfm.

Falk, M. R. 1979. Biological and Limnological Data on Ten Lakes Surveyed in the Northwest Territories, 1971-1972. Canadian Fisheries and Marine Service Data Report, 129.

Ferguson Simek Clark Engineers and Architects in association with Clearstone Engineering. 1998. Greenhouse Gas Emission. Forecast for NWT. Yellowknife, NT.

Ferguson Simek Clark, North/South Consultants Inc., and Trillium Engineering and Hydrographics. 1999. Water Effects Monitoring Program – Taltson Hydro Project Northwest Territories. Yellowknife, Winnipeg, Edmonton.

Fisheries and Oceans Canada. 1996. Annual Summary of Fish and Marine Mammal Harvest Data for the Northwest Territories, Volume 7, 1994-95. Freshwater Institute, Winnipeg.

Golder Associated Ltd. May 2006. Wildlife and Wildlife Habitat Studies Along the Taltson Expansion Project. Final Report submitted to Northwest Territories Energy Corporation. Yellowknife, Northwest Territories.

GNWT, 2003. NWT Energy Strategy. Government of the Northwest Territories, Resources, Wildlife and Economic Development.

GNWT, 2006. Energy for the Future. Government of the Northwest Territories. 30 pp.

GNWT 2007. NWT Bureau of Statistics. NWT Community Profiles. URL: http://www.stats.gov.nt.ca/Profile/Profile.html.

GNWT, Resources, Wildlife, and Economic Development. 1997c. Timber Harvest Information. Personal Communication, David Purchase, Forest Management Officer, Fort Smith.

Gunn, A., J. Dragon and J. Boulanger. 2002. Seasonal Movements of Satellite-Collared Caribou from the Bathurst Herd. Final Report to the West Kitikmeot Slave Study Society. Yellowknife, Northwest Territories.

Ian Hayward International Ltd. 2005. Northwest Territories Power Corporation, Taltson Expansion Project Feasibility Study, 161kV Transmission System & Associated Substations. Surrey, BC.

Jakimchuk, R.D., L.G. Sopuck and D.R. Carruthers. 1983. A Preliminary Assessment of the Effects of Linear Development Corridors on Barren-ground Caribou in Northern Saskatchewan. Renewable Resources Consulting Services, Sidney, BC.

Johnson, C., Boyce, M., Case, R., Cluff, D., Gau, R., Gunn, A., Mulders, R. 2005. Wildlife Monographs, Cumulative Effects of Human Developments on Arctic Wildlife. A Publication of the Wildlife Society.

Kendrick, A., P. Lyver and Lutsel Ke Dene First Nation. 2005. Denesoline (Chipewyan) Knowledge of Barren-Ground Caribou Movements. Arctic 58: 175-191.

Klohn Crippen, 2005. Pre-feasibility Assessment Volume 3, Twin Gorges Expansion Consolidated Summary Report. Vancouver, B.C.

Marshall, I.B. and P.H. Schut. 1999. A National Ecological Framework for Canada – Overview, Agriculture and Agri-Food Canada.

Matthews, S., H. Epp and G. Smith. 2001. Vegetation Classification for the West Kitikmeot/Slave Study Region. Submitted to the West Kitikmeot/Slave Study Society. Yellowknife, Northwest Territories.

Northwest Territories Energy Corporation. 2003. Snap Lake Power Supply From Taltson River, Interim Report No.1. Concepts, Costs and Preliminary Valuations.

Northwest Territories Environment and Natural Resources. 2006. A Barren-ground Caribou Management Strategy for the Northwest Territories 2006 – 2010.

Northwest Territories Power Corporation. 1988. Methods for forecasting: i) the Nonacho Dam Releases Required to Maintain Power Generation at the Twin Gorges Plant and: ii) the Effects of these Releases on the Hydraulic Regime of the Downstream Water Courses. Taltson Hydroelectric System (Water Licence #NIL5-0154).

Pienitz, R. J. P. Smol and d. R. S. Lean. 1997. Physical and chemical limnology of 24 lakes located between Yellowknife and Contwoyto Lake, Northwest Territories (Canada). Canadian Journal of Fisheries and Aquatic Sciences. 54: 347-358.

Receveur, O. 1997. Unpublished bison consumption data. Centre for Indigenous Peoples' Nutrititon and Environment, McGill University, Montreal.

Rescan Environmental Services Ltd. 2000. Taltson Hydro Project: Water Effects Monitoring Program Aerial Beaver Survey. Prepared for the Northwest Territories Power Corporation, Yellowknife, Northwest Territories.

Rescan Environmental Services Ltd. 2001a. Taltson Hydro Project Meteorology and Hydrology Compilation Data Report. Produced for Northwest Territories Power Corporation, Yellowknife, Northwest Territories. April 2001.

Rescan Environmental Services Ltd. 2001b. Taltson Hydro Project: Water Effects Monitoring Program Aerial Muskrat Survey. Prepared for the Northwest Territories Power Corporation, Yellowknife, Northwest Territories.

Rescan Environmental Services Ltd. 2001c. Biological Characterization of the Snare River System. Prepared for Northwest Territories Power Corporation.

Rescan Environmental Services Ltd. 2003. Taltson Hydro Expansion Project: Work Plan for Environmental Services in 2003-2004. Prepared for Northwest Territories Power Corporation, Yellowknife, Northwest Territories. July 2003.

Rescan Environmental Services Ltd. 2004a. Taltson Hydro Expansion Project: 2003 Baseline Report, Yellowknife, Northwest Territories. April 2004.

Rescan Environmental Services Ltd. 2004b. Taltson Hydro Project: 2003 Water Effects Monitoring Program. Prepared for Northwest Territories Power Corporation, Yellowknife, Northwest Territories. March 2004.

Rescan Environmental Services Ltd. 2005. Taltson Hydro Project: 2004 Water Effects Monitoring Program. Produced for Northwest Territories Power Corporation, Yellowknife, Northwest Territories.

Scott, W. B. and E. J. Crossman. 1973. Freshwater fishes of Canada. Bulletin of the Fisheries Research Board of Canada No.184.

Tobias, T.N. and J. Kay. 1994. The Bush Harvest in Pinehouse, Saskatchewan, Canada. Arctic Vol. 47, No. 3.

United States Department of Agriculture. 1999. Natural Resources Conservation Service, Soil Taxonomy – A Basic System of Soil Classification for Making and Interpreting Soil Surveys: Second Edition.

Wikipedia On-line Encyclopedia. URL: http://en.wikipedia.org.

APPENDIX A

Species at Risk

Species at Risk with Potential to exist in the Project Area

Common Name	Scientific Name	COSEWIC 2005 Status	SARA Status	NWT Species 2005 Status
Fisher	*Martes pennanti*	-	-	Sensitive
Grizzly Bear	*Ursus arctos*	Special Concern	-	Sensitive
Wolverine	*Gulo gulo*	Special Concern	-	Secure
Little Brown Myotis (bat)	*Myotis lucifugus*	-	-	Sensitive
Red-sided Garter Snake	*Thamnophis sirtalis*	-	-	May be at Risk
Western Toad	*Bufo boreas*	Special Concern	-	May Be At Risk
Northern Leopard Frog	*Rana pipiens*	Special Concern	-	Sensitive
Canadian Toad	*Bufo hemiophrys*	Not at Risk	-	May Be At Risk
Northern Pintail	*Anas acuta*	-	-	Sensitive
Long-tailed duck (Oldsquaw)	*Clangula hyemalis*	-	-	Sensitive
White-winged Scoter	*Melanitta fusca*	-	-	Sensitive
Surf Scoter	*Melanitta perspicillata*	-	-	Sensitive
Lesser Scaup	*Aythya affinis*	-	-	Sensitive
Lesser Yellowlegs	*Tringa flavipes*	-	-	Sensitive
American Golden-Plover	*Pluvialis dominica*	-	-	Sensitive
Caspian Tern	*Sterna caspia*	Not at Risk	-	Sensitive
Hudsonian Godwit	*Limosa haemastica*	-	-	Sensitive
Red-necked Phalarope	*Phalaropus lobatus*	-	-	Sensitive
Black Tern	*Chlidonias niger*	Not At Risk	-	Sensitive
Eskimo Curlew	*Numenius borealis*	Endangered	Schedule 1 Endangered	At Risk
Least Sandpiper	*Calidris minutilla*	-	-	Sensitive
Semipalmated Sandpiper	*Calidris pusilla*	-	-	Sensitive
American Bittern	*Botaurus lentiginosus*	-	-	Sensitive
Tundra Peregrine Falcon	*Falco peregrinus tundrius*	Vulnerable	Schedule 3 Special Concern	Sensitive
Anatum Peregrine Falcon	*Falco peregrinus anatum*	Threatened	Schedule 1 Threatened	Sensitive
Whooping Crane	*Grus americana*	Endangered	Schedule 1 Endangered	At Risk
Yellow Rail	*Coturnicops noveboracensis*	Special Concern	-	May Be At Risk
Harris's Sparrow	*Zonotrichia querula*	-	-	Sensitive
White-throated Sparrow	*Zonotrichia albicollis*	-	-	Sensitive
Barn Swallow	*Hirundo rustica*	-	-	Sensitive
American Tree Sparrow	*Spizella arborea*	-	-	Sensitive

Common Name	Scientific Name	COSEWIC 2005 Status	SARA Status	NWT Species 2005 Status
Boreal Chickadee	*Poecile hudsonica*	-	-	Sensitive
Rusty Blackbird	*Euphagus carolinus*	-	-	May Be At Risk
Blackpoll Warbler	*Dendroica striata*	-	-	Sensitive
Olive-sided Flycatcher	*Contopus cooperi*	-	-	Sensitive
American Pipit (Water Pipit)	*Anthus rubescens*	-	-	Sensitive
American White Pelican	*Pelecanus erythrorhynchos*	Delisted	-	May Be At Risk
Pied-billed Grebe	*Podilymbus podiceps*	-	-	Sensitive
Short-eared Owl	*Asio flammeus*	Special Concern	-	Sensitive