

**SOCIO-ECONOMIC ASSESSMENT OF
DINÀGÀ WEK'ÈHODÌ CANDIDATE
PROTECTED AREA**

**VOLUME 2: SOCIO-ECONOMIC
ASSESSMENT OF BOUNDARY
OPTIONS**

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EXECUTIVE SUMMARY

As part of the process for establishing a protected area in the Northwest Territories (NWT), an assessment of the potential socio-economic effects is required. The Canadian Wildlife Service has sponsored Dinàgà Wek'èhodi, a 593 square kilometre (km²) area consisting of the northern portion of the North Arm of Great Slave Lake in the Tłı̄ch̄q Region, as a candidate National Wildlife Area (NWA). This area was originally known as the Kwets'ootł'àà Candidate Protected Area (CPA). Dinàgà means big island, in reference to Waite Island, and Wek'èhodi means to protect.

This report was commissioned to assess the potential social and economic impacts on the surrounding communities of Behchokq, Edzo, N'Dilo and Yellowknife. This study is presented in two volumes. Volume 1 provided an overview of current socio economic conditions in the study area. This volume, Volume 2, describes the potential social and economic effects of development options for the Dinàgà Wek'èhodi CPA, ranging from the status quo (no permanent protection for any of the area) to full protection of the entire area.

Current Use and Value of the Dinàgà Wek'èhodi Candidate Protected Area

Residents of Behchokq are highly reliant on country food and wood for fuel. It is estimated that residents of Behchokq annually harvest between 298,250 and 319,875 kilograms (kg) of meat and fish and use 918 cords of wood each year for heating. The country food harvested by Behchokq residents is estimated to have an annual value of between \$3.80 million and \$4.07 million, based on its store-bought replacement value. The value of firewood, measured in terms of the costs of the next best fuel (fuel oil), is estimated to be about \$263,000 per year. There is no information on the extent to which residents of Behchokq use the Dinàgà Wek'èhodi CPA for harvesting of fuel but anecdotal information based on interviews with six Tłı̄ch̄q elders suggests that the CPA provides country foods valued at between \$113,900 and \$122,200 per year.

The extent to which residents of Behchokq and Yellowknife use the Dinàgà Wek'èhodi CPA for recreational purposes is not known. However, an average of 45 days of duck hunting occurs in the CPA each year, along the northern shore. Resident hunters are estimated to have spent about \$2,070 to participate in these activities and enjoyed non-market benefits of about \$940.

There are 389 trappers in the study region with annual earnings of about \$180,900, including 166 trappers in Behchokq who are estimated to have harvested furs valued at \$77,210. Similarly, 174 residents of Behchokq reported producing northern arts and crafts worth \$51,300 per year. However, the extent to which these activities are dependent on using raw materials taken from the Dinàgà Wek'èhodi CPA is unknown. There is no commercial fishing or logging in the CPA.

The most important use of the Dinàgà Wek'èhodi CPA in terms of quantifiable economic benefits is for tourism. Four companies operate within the CPA, providing guided fishing and hunting trips, voyageur canoe trips, and opportunities for parties to be on the land. Total revenues from these operators directly related to the Dinàgà Wek'èhodi CPA are estimated to be about \$245,000 per year. Use of the CPA is critical to the continued operations of these companies either because they are no longer able to earn large incomes from guided caribou hunting or because there are no other nearby areas that are suitable for the activities they offer.

Overall, it is estimated that the Dinàgà Wek'èhodi CPA generates quantifiable economic benefits in the range of \$361,900 to \$370,200 per year, with the majority of these benefits being associated with tourism.

Based on these amounts, the CPA appears to account for about 3% of all renewable resource uses by residents of Behchokò, Yellowknife and other residents of the NWT. This estimate is known to be conservative, however, because it does not include potential benefits associated with the cultural values associated with the Dinàgà Wek'èhodi CPA. The current uses and associated values are considered to be sustainable in that they can continue without damaging the productive capacity of the area. It is believed that the area could support additional use of the renewable resource base, including traditional harvesting, recreation and tourism.

The Dinàgà Wek'èhodi CPA has some significant ecological features. The area supports a number of Species at Risk, is partially situated within a BirdLife International Important Bird Areas (IBA) Program site, has been internationally recognized as an area important to migrating and breeding birds, and has been identified as a “Key Migratory Bird Terrestrial Habitat Site” that supports over 1% of the national populations of a number of migratory bird populations. Map interpretations of field surveys conducted along the north shore of the North Arm suggests that 144 km² of the CPA (24%) is of high importance for migratory waterbirds. Studies of the types of ecological goods and services being provided by the area concluded that wetlands are important because they provide services such as water filtration (improves water quality), flood prevention and nursery habitat. There were determined to be 15.3 km² of wetlands in the CPA, and this represents 2.5% of the total area or 9.1% of the land area of the CPA.

Potential Non-Renewable Resource Development Opportunities

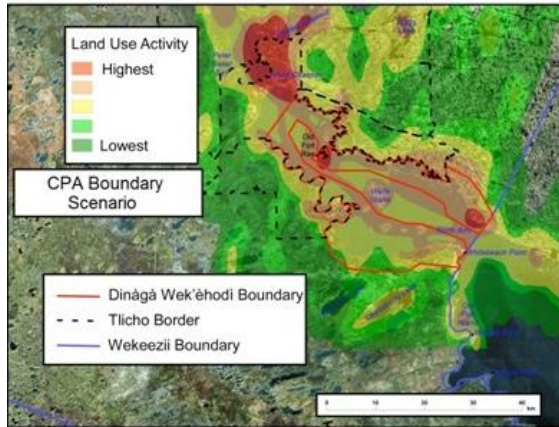
The Dinàgà Wek'èhodi CPA was determined to have low potential for finding mineral resources. Exploration efforts to date have failed to find mineralization in economic amounts. Granitic rocks located west of the CPA hold some promise as sources of dimension stone but are located outside the CPA. Silica sand deposits along the shores of North Arm have some potential for use by the oil and gas industry for fracking. Even though parts of the CPA are subject to pending mineral claims, development of silica sand resources in the CPA is considered to be highly unlikely in the near future because the exact chemical and physical characteristics of these deposits have not yet been determined and this site has no economic advantages compared to other silica sand sites in the NWT that are located closer to oil and gas fields in the NWT and northern British Columbia.

Baseline Economic Development Scenario

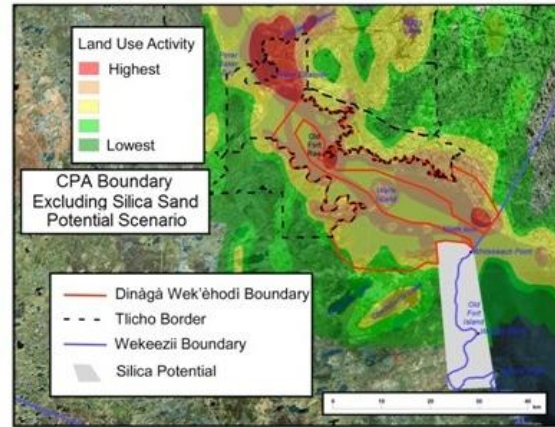
With no formal designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area, it is assumed that there would be no non-renewable resource development in the NWA and current use of the area by residents of Behchokò and the Tìchò Region would continue. It is expected that there would be a slow increase in the benefits being generated by the area due to factors like population growth and increased tourism. In the absence of economic development, it is assumed that the area would continue to provide important ecological goods and service values related to migratory birds, species at risk, and wetlands. The quantified future economic benefits generated under the baseline development scenario are estimated to have a present value of \$7.1 million when discounted using a rate of 8.0%.

Summary of Boundary Scenarios for a Proposed Dinàgà Wek'èhodi National Wildlife Area

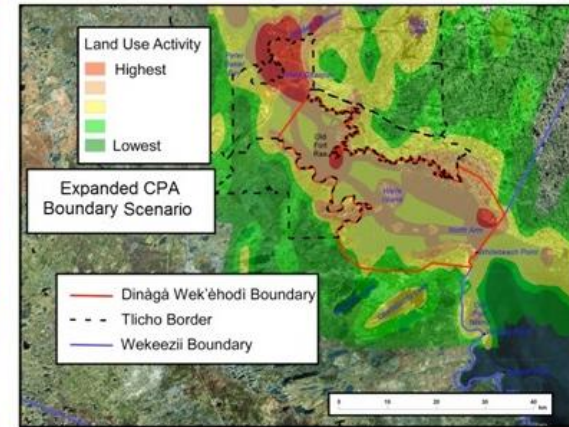
Candidate Protected Area Boundary Scenario



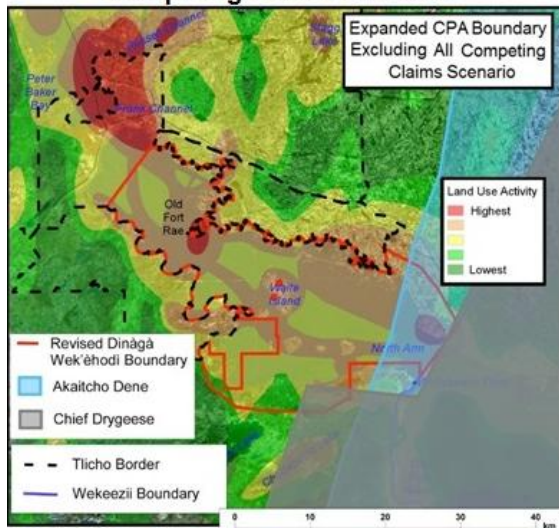
CPA Boundary Excluding Silica Sand Potential Scenario



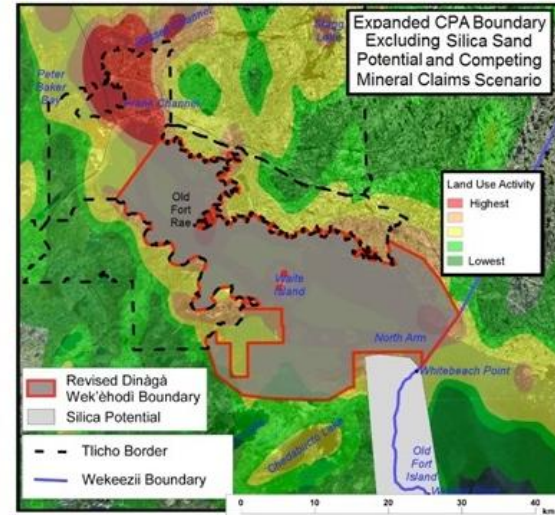
Expanded CPA Boundary Scenario



Expanded CPA Boundary Excluding Competing Claims Scenario



Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario



Potential Effects Associated with Various Boundary Scenarios for a Proposed Dinàgà Wek'èhodi National Wildlife Area

Evaluation Criteria	No Protection	Candidate Protected Area Boundary	Boundary Scenarios			
			CPA Boundary Excluding Silica Sand Potential	Expanded CPA Boundary	Expanded CPA Boundary Excluding All Competing Claims	Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims
Non-Renewable Resource Development Potential						
Silica Sand	Possible but unlikely	Prohibited	Possible but unlikely	Prohibited	Possible but unlikely	Possible but unlikely
Protection of Migratory Waterbird Habitat (km²)						
Highest	0.0	4.6	4.6	4.6	4.4	4.6
High	0.0	12.8	12.8	12.8	9.5	12.8
Medium	0.0	25.5	25.5	25.5	16.2	25.5
Low	0.0	53.4	53.4	53.4	40.3	53.4
Lowest	0.0	91.5	91.5	101.3	79.5	101.3
Not quantified	0.0	405.6	375.4	595.7	456.4	506.4
TOTAL	0.0	593.2	563.1	793.1	606.3	703.8
Protection of Wetlands (km²)						
Area protected	0.0	15.3	14.4	15.8	7.6	13.8
Protection of Areas of Importance to Behchokq (km²)						
Highest	0.0	20.7	20.7	22.0	8.7	22.0
High	0.0	332.9	318.8	448.7	351.4	412.8
Medium	0.0	208.5	192.2	291.3	219.5	238.2
Low	0.0	31.1	31.1	31.1	26.6	30.8
Lowest	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	593.2	563.1	793.1	606.3	703.8
Present Value of Economic Benefits from the Area (\$millions discounted at 8%)						
Economic Benefits	\$7.1	\$50.4	\$50.4	\$50.4	\$50.4	\$50.4

Establishment of a National Wildlife Area

There are numerous options for establishing an NWA in the North Arm of Great Slave Lake that could involve protecting all or parts of the Dinàgà Wek'èhodi CPA. The CPA Boundary Scenario would see the NWA boundary based on the CPA boundary. Other scenarios include expanding the NWA to include all the land and water within the CPA, excluding areas with silica sand potential, excluding areas of competing land and mineral claims, and a boundary that would exclude areas with silica sand and competing mineral claims. These scenarios are described on the following pages and are discussed below.

1. CPA Boundary Scenario

The CPA Boundary Scenario would involve designating all of the Dinàgà Wek'èhodi CPA (593 km²) as an NWA. Residents of Behchokq and the Tłı̄chq Region could continue to use the area for traditional purposes. However, formal recognition of the area as an NWA would raise the awareness and interests of Canadians who currently do not use the area and may result in increased recreational and tourism interest and activity in the area. The quantifiable economic benefits of establishing an NWA with boundaries based on the CPA boundary are estimated to have a present value of \$50.4 million. This scenario would result in formal protection of 15.3 km² of wetlands, 42.9 km² of known moderate or higher migratory waterbird habitat, and 353.6 km² of areas of high or highest importance to Behchokq.

2. CPA Boundary Excluding Silica Sand Potential Scenario

This scenario would be similar to the CPA Boundary Scenario, but would exclude the areas having silica sand potential. The resulting NWA would be slightly smaller (563 km²), would protect less wetland area (14.4 km²) and less areas of high or highest importance to Behchokq (339.6 km²). The amount of known medium to highest migratory waterbird habitat being protected would be the same, and the NWA would generate the same economic benefits (\$50.4 million) as the CPA Boundary Scenario.

3. Expanded CPA Boundary

This scenario would see the boundaries of the NWA expanded to include the all the land and water in the centre of the North Arm of Great Slave, resulting in protection of 793 km². This scenario would increase the amount of wetlands being protected (15.8 km²) and protect more areas of high or highest importance to Behchokq (470.7 km²), but would protect the same amounts of moderate to highest migratory waterbird habitat and generate the same economic benefits (\$50.4 million).

4. Expanded CPA Boundary Excluding All Competing Claims Scenario

This scenario would involve expanding the NWA to include the all the land and water in the centre of the North Arm of Great Slave but would exclude lands within the Chief Drygeese boundary or the Akaitcho Interim Measures Area and lands that are the subject of existing mineral claims. The resulting NWA would be 606 km² in area, but would exclude some important wetland areas (7.6 km² would be protected) as well as some areas having medium to highest known migratory waterbird potential (30.1 km² would be protected). This scenario would also protect less area of highest importance to the community (8.7 km² of the 20.7 km² that would be protected under the CPA Boundary Scenario) although the quantifiable economic benefits (\$50.4 million) would be the same.

5. Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario

This boundary would see the NWA boundaries expanded to include all the land and water in the centre of the North Arm of Great Slave but would exclude areas having silica sand deposits and lands that are the subject of existing mineral claims. This NWA would be 704 km² in area. While these boundaries would protect more areas of high or highest importance to Behchokq (434.8 km²) and the same amounts of known migratory waterbird habitat of medium to highest importance (42.9 km²), it would protect less wetland area (13.8 km²). The value of future quantifiable economic benefits (\$50.4 million) would be the same as for the other NWA scenarios.

Evaluation of Boundary Scenarios

The five boundary scenarios were compared with the Baseline Development Scenario using five criteria:

- the possibility of non-renewable resource (silica sand) development
- the extent to which important migratory waterbird habitat would be protected
- the extent to which wetland areas would be protected
- the extent to which areas of importance to the community of Behchokq would be protected
- the economic value of present and future quantified benefits that would be generated by the area

Each boundary scenario was ranked in terms of how well it addressed each of the five criteria, with a ranking of “5” being given to the scenario that best achieved the criterion and a “0” if the boundary scenario completely failed to address the criterion. Total scores were calculated for each boundary scenario by adding the scores (to a maximum of 25 points), on the assumption that each criterion was given equal weight. The boundary scenario with the highest score was the Expanded CPA Boundary Scenario (20 points), which would protect the largest area. The Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario had the second highest score (19 points), indicating that expansion of the NWA beyond the CPA boundaries would generate benefits that would more than offset the land area that would be excluded as a result of potential silica sand or other mineral development. The other scenarios received smaller scores because they afforded less protection for areas of importance to the community, wetland areas, and/or important migratory waterbird habitat.

General Observations

The five boundary scenarios evaluated in this report represent just some of the possible options for the boundaries of an NWA that could be established on the North Arm of Great Slave Lake. However, based on the analysis, two general conclusions can be drawn from the analysis:

1. Larger protected areas will best achieve the five criteria. The boundary scenarios that would protect the largest areas of land and water tend to do a better job of protecting areas of importance to Behchokq and protecting wetlands and migratory waterbird habitat. In addition, the losses in values that might be occur as a result of adopting boundaries that exclude areas with silica sand potential could be more than offset by expanding the NWA boundaries to include Waite Island and the entire water within the North Arm of Great Slave Lake.
2. If the NWA boundary is not expanded beyond the CPA boundaries, there is no clear conclusion about whether areas having silica sand deposits should be excluded from the NWA. While

excluding areas with silica sands would potentially allow development of these resources to occur, this option ranks lowest in terms of protecting areas of importance to Behchokq. Conversely, the best option for protecting areas of importance to Behchokq would be to establish NWA boundaries that would preclude development of the silica sands, thereby losing any potential benefits that might arise if silica sand development were to ultimately prove viable. Thus, if expansion of the NWA beyond the CPA boundaries does not occur, the selection of an appropriate boundary will ultimately depend on whether silica sand development will ever occur. Available information suggests such development is unlikely.

Regional Socio-Economic Effects

None of the boundary scenarios or even the Baseline Development Scenario (no protection) will result in significant changes in regional or local socio-economic conditions. Given the lack of non-renewable resource development potential for the CPA, it is unlikely that land or resource uses in the area would change regardless of whether all or parts of the CPA are designated as an NWA. The greatest potential for changes in socio-economic effects relates to potential increases in employment opportunities and income that could result from increased tourist interest in the area following formal designation of the area as an NWA. These incremental employment and income benefits are expected to be relatively small, however, and are not likely to improve economic conditions in the community. However, formal designation of the area as an NWA will continue to allow residents of Behchokq to use the area as a source of country foods, trapping and the production of Northern arts and crafts.

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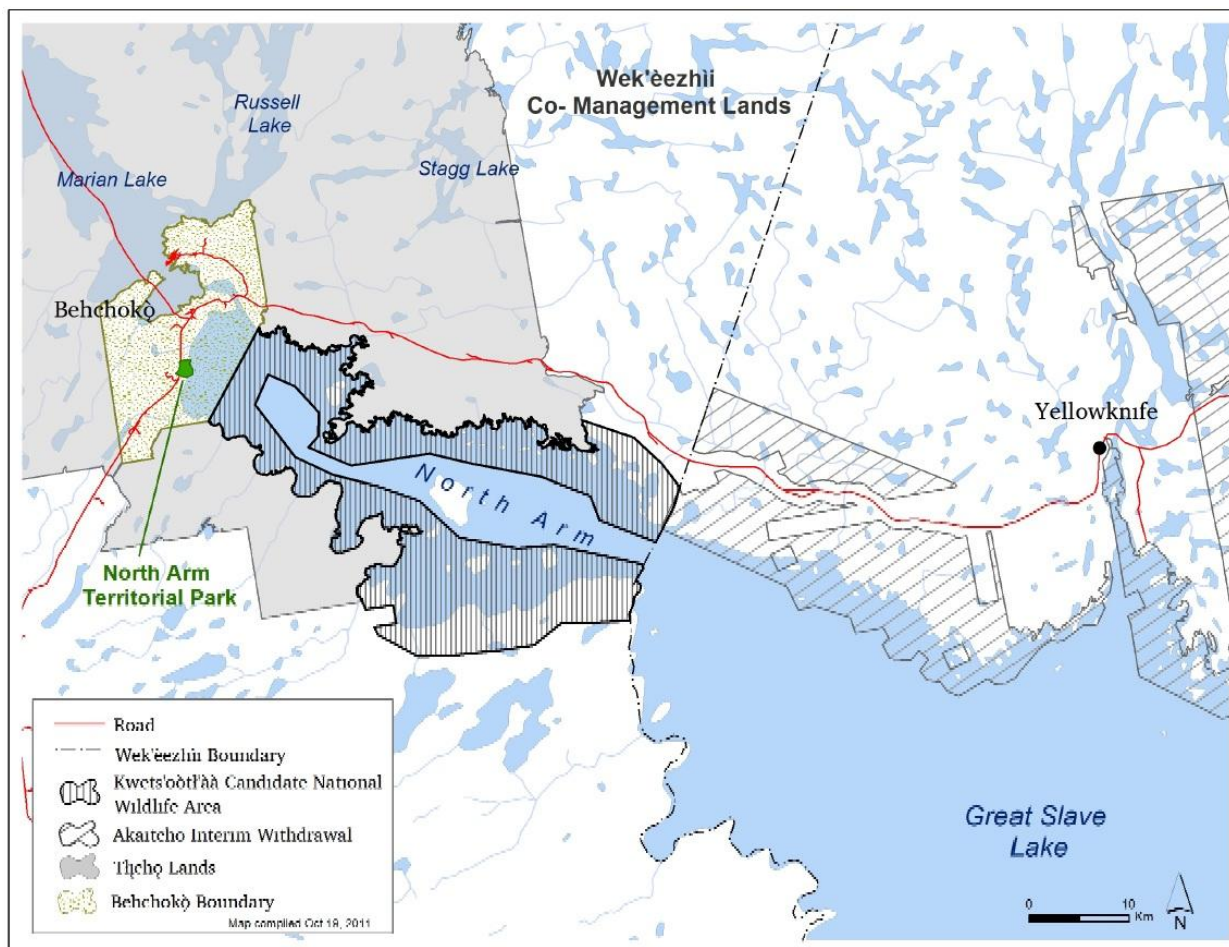
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1.0 INTRODUCTION

In 2010, the Tłı̨chǫ Government proposed to the Canadian Wildlife Service (CWS) that the Kwets'oot'làà area in the Northwest Territories (NWT) be designated as a National Wildlife Area (NWA) as part of the NWT Protected Areas Strategy. The Kwets'oot'làà area (see Figure 1-1) is about 593 square kilometres (km²) in area and is located on the northern portion of the North Arm of Great Slave Lake. About 72% of the area consists of open water (426 km²) while the remainder consists of the mainland shoreline and numerous islands.

Figure 1-1: Proposed Dinàgà Wek'èhodi Candidate Protected Area



Source: NWT PAS (2011).

The North Arm of Great Slave Lake is an Important Bird Area in Canada, being a key migratory site for swans, geese and other waterfowl. It is home to 12 species at risk: four of these (Boreal Woodland Caribou, Wood Bison, Wolverine, and Shortjaw Cisco) inhabit the area year-round and eight are migratory bird species. The proposed protected area has historically been used for trapping, fishing hunting and camping by both the Dene and Métis people and has many historical and cultural resources.

Based on these features and the importance of the area to the Tłìchq̓ people, in 2010 the CWS sponsored the area for formal designation as a National Wildlife Area. In 2011, Environment Canada applied for a five-year interim withdrawal of these lands (including surface and sub-surface rights but excluding existing leases and third party lands) to hold the land until completion of the planning process for protected area in the NWT. AANDC is considering a two year withdrawal.

In 2013, Tłìchq̓ Elders proposed that the name of the proposed protected area be changed. During the assessment of cultural values for the area (Legat, 2012), discussions with the Elders revealed that the word “Kwets'ootl'àà” is only the name for the bay at the north end of the North Arm and not the entire North Arm. A new name for the area, Dinàgà Wek'èhodi, was proposed and, although this new name has not been officially approved by the Working Group, it has informally been adopted. Dinàgà means big island, in reference to Waite Island, and Wek'èhodi means to protect. This new name has been used in this report.

The Northwest Territories Protected Areas Strategy (PAS) was developed as a community-based approach for establishing a network of protected areas. The PAS is a partnership consisting of communities, Aboriginal governments and/or land claim bodies, federal and territorial governments, and industry stakeholders. Its purpose is to “collaborate to identify and protect the ecological quality and integrity of special areas of land and water” (NWT PAS, 2007). The PAS uses an eight step process to identify, designate and manage protected areas:

1. Identify areas in need of protection, and get community support for protecting the area.
2. Gather existing traditional and scientific information about the ecological, cultural and economic values in the area. Use this information to prepare a proposal to protect the area. Get support for this proposal at the regional level.
3. Submit a proposal to a potential sponsoring agency for their review and approval.
4. The sponsoring agency applies for interim (short-term) protection for the area, if needed.
5. Collect additional traditional and scientific information about the candidate area's ecological, cultural and economic values, consult with communities and all affected parties, and make recommendations on the area's designation, boundaries and management.
6. Formally ask the sponsoring agency to protect the area using its legislation.
7. Approve and establish the protected area.
8. Manage, monitor and review

As part of the PAS process for Kwets'ootl'àà (Dinàgà Wek'èhodi), a Working Group was established. This group consists of representatives from CWS, the Tłìchq̓ Government, Wek'èezhìi Renewable Resource Board, Community of Behchokq̓, Yellowknives Dene First Nation, Rabesca's Resources, Enodah Wilderness Travel Ltd., North Slave Métis Alliance (NSMA), NARWAL Northern Adventures, True North Safaris, Northwest Territories Métis Nation, Government of the NWT, Tłìchq̓ Elders and NSMA Elders, and Aboriginal Affairs and Northern Development Canada.

As part of Step 5 of the PAS process, the Working Group issued the terms of reference for a socio-economic assessment of the Kwets'ootl'àà (Dinàgà Wek'èhodi) Candidate Protected Area in 2011. This report was prepared in response to these terms of reference.

1.1 Objectives

The terms of reference for the socio-economic assessment of the Kwets'ootl'àà (Dinàgà Wek'èhodi) are as follows:

1. Develop socio-economic profiles using indicator statistics for each of the surrounding communities
 1. Develop consistent data baselines
 2. Describe information specific to the Kwets'ootl'àà (Dinàgà Wek'èhodi) Candidate Protected Area
2. Identify socio-economic data gaps and develop a strategy to address these gaps
3. Assess socio-economic effects for the surrounding communities, the Wek'èezhii (resource management) area, the entire NWT and for Canada of three scenarios:
 - a. Designation of Kwets'ootl'àà (Dinàgà Wek'èhodi) as a National Wildlife Areas with current boundaries
 - b. Designation of Kwets'ootl'àà (Dinàgà Wek'èhodi) as a National Wildlife Area with modified boundaries
 - c. No formal protection of the Kwets'ootl'àà (Dinàgà Wek'èhodi) area
4. Produce a plain language report and present information to stakeholders, communities and First Nations

Items 1 and 2 were provided in Volume 1 of the final report (AMEC. 2012). This volume, Volume 2, addresses Item 3.

1.2 Methodology

The overall objective of this study was to assess the potential socio-economic effects of creating a protected area in terms of impacts on Behchokq, the Tlìchq Region, the entire NWT and Canada for various boundary scenarios. The general methodology used for this assessment is similar to that of a socio-economic assessment prepared as part of an environmental assessment of a proposed development project. Impact assessments consist of three tasks:

1. Assess current social and economic conditions in the communities that may be affected by the development using a series of selected indicators (baseline).
2. Use the project description to estimate potential demands on the communities in terms of employment, incomes, population, housing, infrastructure and services, and general well-being.
3. Compare these potential demands with baseline conditions to determine the significance of proposed changes and identify strategies for enhancing benefits and minimizing negative effects.

In terms of current economic and social conditions in Behchokq, this study builds on Phase 1 of the socio-economic assessment which was undertaken by AMEC (2012).

Phase 2 of the study examines the potential for non-renewable resource development that could occur under various boundary scenarios and describes the socio-economic effects that could result from that development. It should be noted that, although a number of pending mineral claims have been staked in part of the CPA, there are no specific proposals for resource development in and around the Dinàgà Wek'èhodi CPA, so this assessment speculates on what development might occur, based on what is known about the resources of the area. While there is some danger in using this approach, because the

nature of development that ultimately may occur in the area could be quite different from what is stated in this assessment, it is useful in demonstrating the potential advantages and disadvantages of establishing an NWA and assessing the potential implications of some of the various boundary scenarios being considered for an NWA.

1.2.1 Overall Approach

This study was conducted in accordance with the NWT PAS Socio-Economic Assessment Guidelines (the Guidelines). Phase 2 of the Guidelines call for the identification of potential protection options by the Working Group. These include the no protection option (status quo), the full protection option, and one or more other boundary options. Phase 3 of the Guidelines identify some of the requirements for assessing the potential socio-economic impacts of the various boundary options. These requirements were addressed using the six-step process described below.

1.2.1.1 *Determination of Current Use of the Area*

The first step involved describing current use of the Dinàgà Wek'èhodi CPA based on the Phase 1 socio-economic assessment, as well as other published information. One of the challenges in assessing the implications of various boundary scenarios is the current lack of information about the location and extent of current use of the area by residents of Behchokò and the surrounding region. To assist in describing spatial patterns of use, available information on land types and land uses in the CPA was processed using Geographic Information Systems (GIS) to develop “heat” maps that show the relative intensity of current activities in and importance of different parts of the CPA and surrounding area. The results of this analysis are provided in Section 2.0 of this report.

1.2.1.2 *Determination of Non-Renewable Resource Potential*

The second step involved describing the location and extent of potential non-renewable resource development that might be expected to occur in the near future. This assessment was based primarily on the results of the Non-Renewable Resource Assessment (Minerals) that was recently undertaken for the area (Watson, 2013), but also involved making some assumptions about the scale and location of potential development and the timing, scale, cost, and revenues associated with such development. These assumptions are described in Section 3.0.

1.2.1.3 *Potential Socio-Economic Impacts without Formal Protection*

The third step consisted of developing a baseline socio-economic projection for the Dinàgà Wek'èhodi CPA that assumes no formal protection would occur. This baseline assumes that all of the potential non-renewable resource development identified in Section 3.0 will proceed as described, and examines how social and economic conditions in the community and region will change over time. This baseline assessment is presented in Section 4.0.

1.2.1.4 *Potential Socio-Economic Impacts with Formal Protection*

The fourth step examines the social and economic effects of formal designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area with boundaries as currently proposed and precluding non-renewable resource development in the NWA. Social and economic conditions in the community and region are

predicted using key indicators like employment and income and reliance on country foods and resources. The effects of the CPA Boundary Scenario are assessed in Section 5.0.

1.2.1.5 Potential Socio-Economic Impacts of Alternate Boundaries

The Terms of Reference call for the assessment and evaluation of various boundary scenarios to be developed by the Working Group. The fifth step involves examining the potential effects of these alternate boundary options. The economic and social implications of allowing non-renewable resource development to proceed in parts of the proposed CPA that would not be formally protected as an NWA are evaluated, including the potential implications for wildlife and habitat protection and the ability of the area to supply the community and region with country foods and income. This assessment is provided in Section 6.0.

1.2.1.6 Comparative Evaluation of All Boundary Scenarios

A summary of the social and economic implications of all possible boundary scenarios, including full protection and no protection, is provided in Section 7.0.

1.2.2 Assessment Methods

The boundary scenarios were assessed using two evaluation methods. These are described below.

1.2.2.1 Assessment of Economic Benefits and Costs

This study examined the potential economic benefits and costs associated with the various boundary scenarios using the techniques associated with social benefit/cost analysis. This involved:

1. Describing each of the boundary scenarios in terms of the magnitude and timing of regional and local employment and income created by current and traditional land and resource uses, as well as for non-renewable resource development that could occur.
2. Estimating annual benefits and costs from current and traditional land and resource uses and from non-renewable resource development for each boundary scenario, factoring in the probability (or uncertainty) that such development is likely to occur.
3. Calculating the present value of future benefits and costs for each boundary scenario using discount rates. Discount rates are used to estimate what the value of future benefits or costs would be in terms of current dollars, based on the realization that a dollar today is worth more than a dollar at some point in the future. The current Canadian Cost-Benefit Analysis Guide suggests using an 8% discount rate based on the real rate of return to capital, which would mean that \$1.00 to be received one year from now would be valued at \$0.92 today. The Guide also indicates that discount rates of 3.0% and 0.0% be used for sensitivity analysis. A brief discussion of discount rates and their use in benefit/cost analysis is provided as Appendix A.
4. Examining how potential the benefits and costs associated with traditional land and resource uses and from non-renewable resource development will be distributed among local communities and the territorial and federal governments.

The use of benefit/cost analysis is consistent with the current decision making process related to establishing protected areas. Under this process, Environment Canada makes a recommendation to Cabinet Committee, and the Treasury Board Secretariat requires an evaluation of the costs and benefits.

1.2.2.2 *Assessment of Socio-Economic Impacts*

The second assessment method involves describing how the economic benefits and costs associated with each boundary scenario would affect social and economic conditions in Behchokò, the Tłìchò Region, the entire NWT and Canada. This method involves assessing how the various boundary scenarios would affect current and future traditional harvesting activities, recreation and commercial activities and then determining how changes in these activities would affect social and economic conditions. This type of assessment is more subjective than benefit/cost analysis and has been undertaken based on previous experience with impact assessments of non-renewable resource development in Alberta and British Columbia.

2.0 CURRENT USE OF THE DINÀGÀ WEK'ÈHODÌ CPA

A number of recent studies undertaken as part of the Northwest Territories Protected Areas Strategy have attempted to describe the current use of the Dinàgà Wek'èhodi CPA. These include:

- Phase 1 Socio-Economic Assessment of the Kwets'ootl'àà Candidate Protected Area (AMEC, 2012)
- Documentation of North Slave Métis Culturally Important Areas within the North Arm of Great Slave Lake (North Slave Métis Alliance, 2012)
- Renewable Resource Assessment for the Kwets'ootl'àà (North Arm of Great Slave Lake) Candidate Protected Area (SENEC Consultants Limited, 2011)
- Phase II Ecological Assessment of the Kwets'ootl'àà Candidate Protected Area (Canadian Wildlife Services, 2011)

The following sections summarize what is currently known about use of the Dinàgà Wek'èhodi CPA by residents of Behchokq and the NWT and the estimated value of this use.

In addition, a draft Ecological Goods and Services Assessment for Kwets'ootl'àà Candidate Protected Area was recently completed for Environment Canada by the Pembina Institute (2013) and information from this report has been used to describe some other types of ecological goods and services being provided by this area.

2.1 *Traditional Resource Use and Values*

Residents of Behchokq are highly reliant on country food. While moose and caribou are the primary large game harvested for subsistence purposes, residents also harvest migratory waterfowl and fish for food. There are no records of the numbers of animals, birds or fish harvested by residents of Behchokq. However, based on harvest data for other northern communities, it is estimated that residents of Behchokq annually harvest between 298,250 and 319,875 kilograms (kg) of meat and fish. The value of this food, based on the local price of purchased food and adjusting for income differentials, is estimated to have an annual value of between \$3.80 million and \$4.07 million. There is no information on the extent to which residents of Behchokq harvest animals, birds or fish from within the Dinàgà Wek'èhodi CPA. Based on interviews conducted in 2012 with six Tłı̄chq elders representing four families, it is assumed that 3% of the total harvest comes from within the Kwets'ootl'àà CPA. This suggests an annual benefit of between \$113,900 and \$122,200 per year.

The Tłı̄chq people use various plants such as spruce roots and gum, birch bark and sap, cranberries, cloudberries, rat root, baby moss and Labrador tea for medicinal or other purposes. However, there is not enough information about the amounts of plants and berries being harvested or the locations of harvesting activities to be able to estimate the economic value associated with these activities.

Many households in Behchokq use wood as their primary or secondary heating source and it is estimated that about 918 cords of wood are consumed each year. The value of this firewood, measured in terms of the costs of the next least cost alternative fuel (fuel oil), is estimated about \$263,000 per year. There is no information on the extent to which residents of Behchokq use the Dinàgà Wek'èhodi CPA for harvesting fuel.

2.2 Recreation and Tourism

Residents of Behchokq and Yellowknife are known to use the Dinàgà Wek'èhodi CPA for recreational purposes. While some of these activities for residents of Behchokq were undoubtedly related to harvesting of country food, it is believed that participants in these activities enjoy benefits over and above the value of the food they harvested, and these are treated as recreational benefits. Based on information from a 1996 survey of the importance of nature to Canadians, it is estimated that residents of Behchokq and Yellowknife enjoyed about 1.11 million days of recreation and spent between \$6.8 million and \$17.1 million to participate in these activities. The non-market benefits that they enjoyed over and above actual expenses, was in the range of \$2.5 million to \$4.1 million per year. The extent to which residents of Behchokq and Yellowknife actually use the Dinàgà Wek'èhodi CPA for recreational purposes is not known. However, information from NWT resident hunter surveys conducted between 2001 and 2009 indicate an average of 45 days of duck hunting occurs in the CPA each year, along the eastern shore. Resident hunters are estimated to have spent about \$2,070 to participate in these activities and enjoyed non-market benefits of about \$940. Assuming that residents of Behchokq spend 1% of their nature-based recreation activities in the Dinàgà Wek'èhodi CPA and residents of Yellowknife spent 0.1% of their time in the area, then the total spending related to participate in recreational activities in the Dinàgà Wek'èhodi CPA is estimated to be between \$11,650 and \$29,300 per year, based on 1,915 days of recreational activity. The non-market benefits associated with this activity would range between \$4,250 and \$7,100 per year.

Based on available information, the Dinàgà Wek'èhodi CPA is important for tourism. There are four companies that operate within the CPA. They provide guided fishing and hunting trips, voyageur canoe trips, and opportunities for parties to be on the land. Total revenues from these operators directly related to the Dinàgà Wek'èhodi CPA are estimated to be about \$245,000 per year. Use of the CPA is critical to the continued operations of these companies either because they are no longer able to earn large incomes from guided caribou hunting or because no other nearby areas are suitable for the activities they offer.

2.3 Commercial Resource Use and Values

Some residents of Behchokq are believed to use the Dinàgà Wek'èhodi CPA for trapping and/or as a source of raw materials for producing northern arts and crafts. The 389 trappers in the region are estimated to have annual earnings of about \$180,900, including 166 trappers in Behchokq who are estimated to have harvested furs values at \$77,210. Similarly, 174 residents of Behchokq reported producing northern arts and crafts worth \$51,300 per year. There is no information on the extent to which these activities are dependent on the use of raw materials taken from the Dinàgà Wek'èhodi CPA. There is no commercial fishing or logging in the CPA.

2.4 Cultural Values

The Dinàgà Wek'èhodi CPA is known to be of significant cultural importance for the Tłı̨chq people and the North Slave Métis. While the area has been and continues to be used for trading, trapping, hunting, fishing and harvesting plants, these activities bring humans together with non-human entities, resulting in the creation of a cultural landscape (Legat, 2012).

To document the cultural landscape, Tłı̨chq Elders developed a research process and then participated in a three-day field trip along the north shore of the North Arm during the summer of 2011 to visit and

document places identified in oral narratives for the area. The results of this process were then verified in follow-up meetings. The resulting maps and stories were documented in a report that was submitted to the NWT PAS, along with recommendations regarding naming of the area, the boundaries of the proposed protected area, and descriptions of how each place should be respected (Legat, 2012).

The North Slave Métis Alliance (NSMA) undertook its own assessment of the Dinàgà Wek'èhodi CPA. An Executive Summary of its investigations was submitted to the NWT PAS (NSMA 2011). The cultural values identified included Old Fort Rae, Old Fort Island, heritage trails used for harvesting, guiding, transportation and trading, an underground river, Trout Rock, and the Cliffs on the west side of the North Arm which are landmarks.

2.5 Ecological Goods and Services

The Dinàgà Wek'èhodi CPA has some significant ecological features. The Canadian Wildlife Service (2011) has listed these as being:

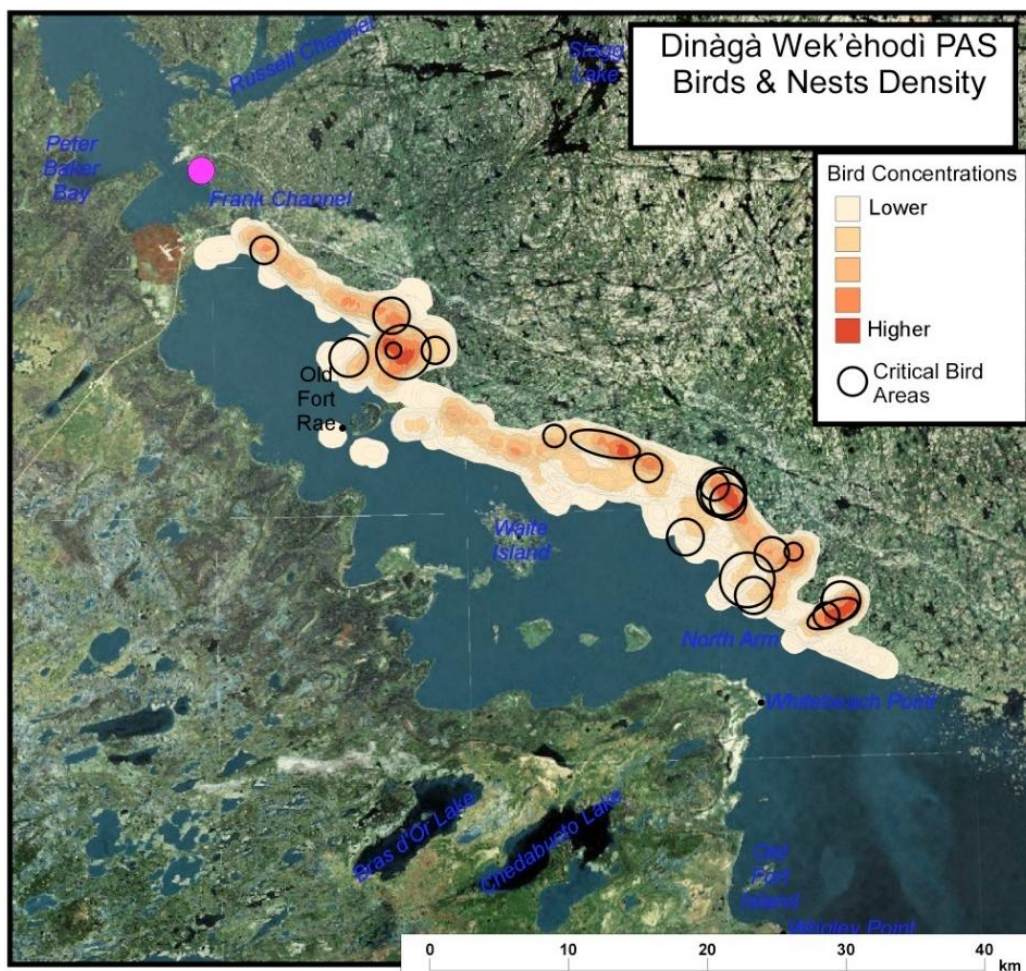
- The area supports a number of Species at Risk listed under the federal *Species At Risk Act* (SARA) or assessed as being at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). These species include Boreal Woodland Caribou, Wood Bison, Wolverine, Shortjaw Cisco, Common Nighthawk, Yellow Rail, Rusty Blackbird, Olive-sided Flycatcher, Peregrine Falcon, Short-eared Owl, Horned Grebe, and Barn Swallow.
- It is partially situated within a BirdLife International Important Bird Areas (IBA) Program site and has been internationally recognized as an area important to migrating and breeding birds.
- The North Arm has been identified as a “Key Migratory Bird Terrestrial Habitat Site” that supports over 1% of the national populations of a number of migratory bird populations including Canada and Cackling geese, Tundra Swans and breeding Caspian Terns. The area is also important for numerous other migratory birds including many species of ducks, gulls and terns, marsh birds and birds of prey.

The Canadian Wildlife Service (2011) concluded that the Dinàgà Wek'èhodi CPA contains abundant ecologically significant features including wetlands, marsh and lake habitats, rare species, species at risk, pristine waters and landscapes, and high wildlife richness.

2.5.1 Waterbird Habitat

In its ecological assessment of the CPA, the Canadian Wildlife Service (2011) mapped important waterbird habitat based on the results of aerial surveys conducted in the spring and fall of 2010. These surveys focused on the north shore of the North Arm and the transects flown in 2010 were selected to be consistent with previous CWS surveys of key migratory bird terrestrial habitat. Spring populations and nest densities were mapped for larid species (Herring Gull, Mew Gull, Ring-billed Gull, Common Tern, Arctic Tern and Caspian Tern). The density and distribution of geese, swans, dabbling ducks, and diving ducks were also mapped for the spring and fall migration periods. Based on the information from the CWS, a composite waterbird density map has been created to identify the most important migratory waterbird areas with the Dinàgà Wek'èhodi CPA. This map is shown in Figure 2-1.

Figure 2-1: Important Migratory Waterbird Areas in the Dinàgà Wek'èhodi Candidate Protected Area



Source: Based on interpretation of information provided by CWS (2011)

Table 2-1: Important Waterbird Areas in the Dinàgà Wek'èhodi Candidate Protected Area

Activity	Area (km ²)	Percent of Total
Highest	4.6	0.8%
High	12.8	2.2%
Medium	25.5	4.3%
Lower	53.4	9.0%
Low	91.5	15.4%
Not quantified	405.6	68.4%
TOTAL	593.2	100.0%

Analysis of the results (see Table 2-1) indicates that 7.2% of the CPA (42.8 km²) is considered to have medium or higher importance for migratory waterbirds and 15% of the area (91.5 km²) is considered to have low importance. However, there are two important qualifications to this conclusion. One, it should be noted that this information is known to be not entirely complete because migratory bird surveys were only conducted along the north shore of the North Arm. While previous work determined that the south

shore does not have much suitable habitat for waterbirds, the extent of this potential has not been quantified. As a result, there is only quantifiable waterbird habitat information for 31.6% of the CPA. Second, the ratings of low to high are relative to the CPA and not the entire NWT. An area on the north shore of the North Arm that is described as being of lower importance within the CPA is likely to be of higher importance as waterbird habitat than many areas within the NWT.

2.5.2 Wetlands

As part of work undertaken for Environment Canada, the Pembina Institute undertook a study to assess the economic value of the ecological goods and services being provided by the Dinàgà Wek'èhodi CPA. In addition to the goods and services described above in Sections 2.1 to 2.3, the Pembina Institute (2013) noted that the CPA provides benefits in terms of its ability to sequester carbon, which benefits the atmosphere, and that wetlands in the CPA are important because they provide services such as water filtration (improves water quality), flood prevention and nursery habitat. In its assessment, the wetland areas within the CPA were found to generate the highest annual ecological goods and services values per unit of land area.

The extent of wetland areas within the Dinàgà Wek'èhodi CPA was mapped by CWS (2011) as part of the vegetation classification analysis conducted as part of its ecological assessment. This assessment was based on data from Earth Observation for Sustainable Development of Forests, 2006. According to CWS (2011), there were 15.3 km² of wetlands in the CPA, and this represents 2.5% of the total area of the CPA and 9.1% of the land area within the CPA. There were 5.9 km² of treed wetlands, 5.0 km² of herb wetlands and 4.4 km² of shrub wetlands. The location of these wetland areas is shown in Figure 2-2.

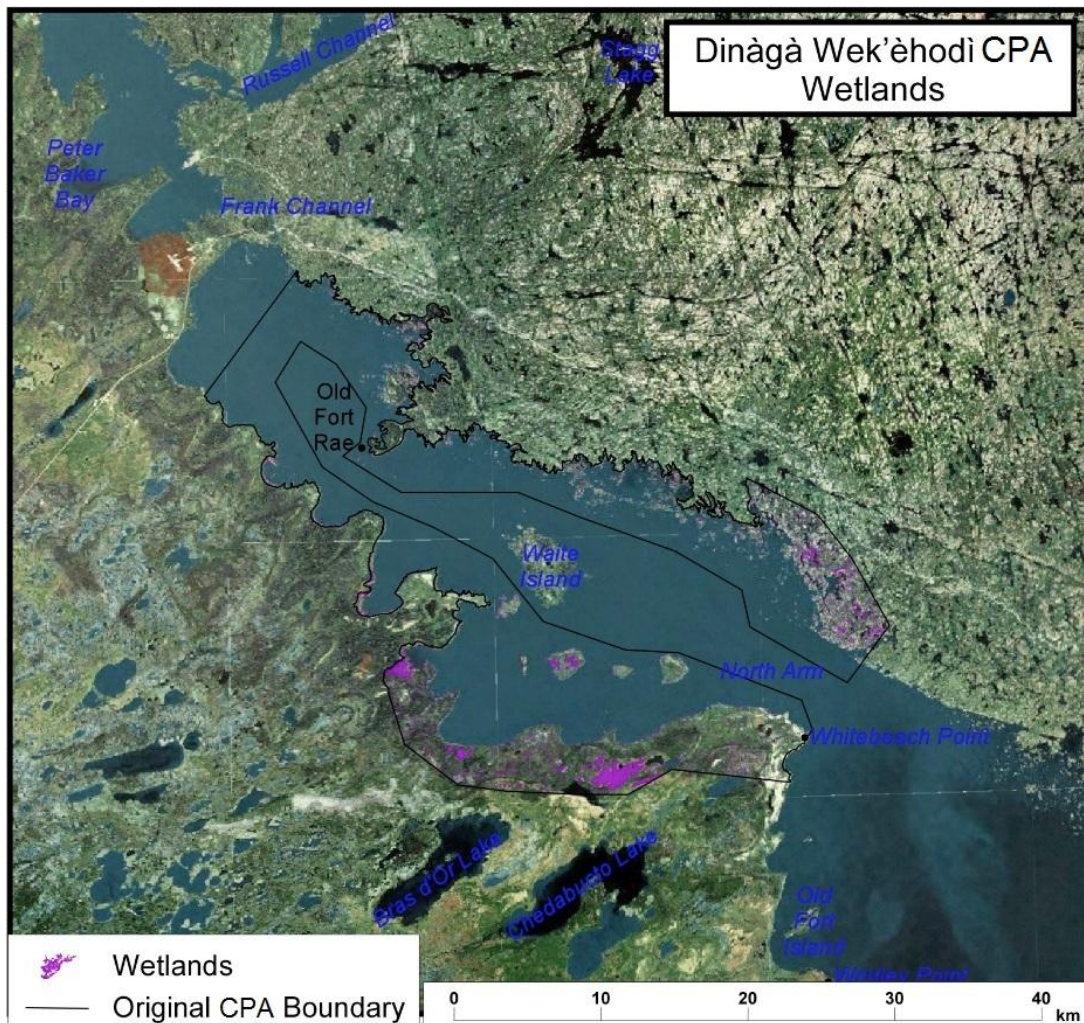
2.6 Summary

Overall, it is estimated that the Dinàgà Wek'èhodi CPA provides socio-economic benefits for the residents of Behchokq and the NWT that are in the range of \$389,500 to \$437,400 per year, with the majority of these benefits being associated with tourism. These values are itemized in Table 2-2.

Table 2-2: Current Resource Use Values in Dinàgà Wek'èhodi Candidate Protected Area

Activity	Nature of Benefit	Regional Estimate	Dinàgà Wek'èhodi CPA
Subsistence	Country food (Behchokq)	\$3.80 million to \$4.07 million	\$113,900 to \$122,200
	Fuel (Behchokq)	\$263,000	Unknown
Recreation	Expenditures	\$539,300 to \$1.36 million	\$22,400 to \$56,500
	Extra-market benefits	\$196,700 to \$328,700	\$8,200 to \$13,700
Economic	Trapping	\$77,200	Unknown
	Commercial Fishing	None	None
	Tourism Spending	\$5,813,500	\$245,000
	Arts and Crafts	\$51,300	Unknown
	Commercial Logging	None	None
	Renewable Energy	None	None
TOTAL		\$10,741,000 to \$11,963,700	\$389,500 to \$437,400

Figure 2-2: Location of Wetland Areas in the Dinàgà Wek'èhodi Candidate Protected Area



Based on these amounts, the CPA appears to account for about 3% of all renewable resource uses by residents of Behchoko, Yellowknife and other residents of the NWT. This estimate of the value of resource use in the CPA is known to be conservative, however, because it does not include potential benefits associated with the cultural values associated with the Dinàgà Wek'èhodi CPA or the ecological goods and services being provided by the area.

2.7 Areas of Importance

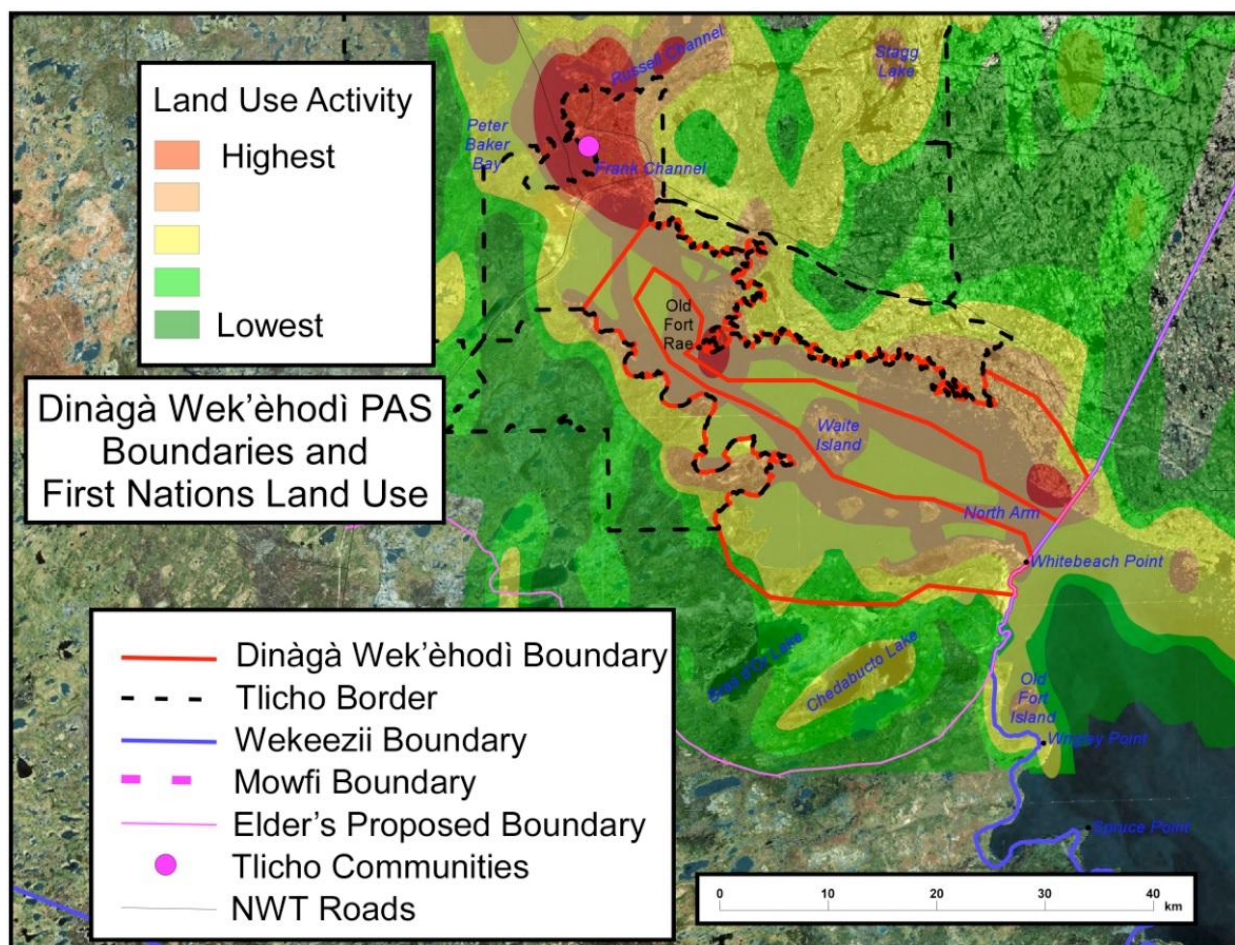
It is important to note that, although all the economic benefits listed in Table 2-2 can be attributed to the Dinàgà Wek'èhodi CPA, not all areas within the CPA are of equal importance or value. While there is limited information on the spatial distribution of all types of resource uses by all users, efforts were made to identify the areas that are currently or historically been used by the Tłı̄ch̄o and Métis people and/or are of cultural importance. This was done through the preparation of a “heat” map. This map was developed by using GIS to combine available information on trails and archaeological information with information

provided by members of the Working Group to identify which areas are of greatest importance. The process of developing this heat map is described below.

2.7.1 Initial Draft of the Heat Map

An initial draft of the heat map was prepared in cooperation with the Tłìchq Lands Protection Department¹ and combines the Department's spatial information related to trails and other important sites, as determined through traditional land use studies, with archaeological data obtained from the Prince of Wales Museum in Yellowknife. The resulting map (see Figure 2-3) shows areas with the highest land use or importance in red, while the areas with the lowest land use or importance are shown in green.

Figure 2-3: Initial Heat Map Showing Intensity of First Nations Land Use and Importance in and Around the Dinàgà Wek'èhodi Candidate Protected Area



This map was included in the Phase 1 Socio-Economic Assessment of the Kwets'oòtl'àà Candidate Protected Area (AMEC, 2012), but had not been verified by the Tłìchq Elders or other members of the Working Group at the time that Volume 1 was finalized.

¹ The analysis was undertaken in cooperation with Ryan Chenkie, GIS Specialist, Tłìchq Lands Protection Department

2.7.2 Verification of the Heat Map

Verification of the initial heat map was done at a meeting of the Working Group held in Behchokq on March 12, 2013. Members of the Working Group who attended the meeting were as follows:

Kerri Garner- Tłı̄cho Government	Cathy Allooloo- NARWAL Northern Adventures
Robert Mackenzie- Tłı̄cho Elder	Harry Apple- Tłı̄cho Elder
Gord Bohnet- GNWT (Alternate)	Eric Binion - North Slave Métis Alliance
Moise Rabesca- Rabesca Resources	Francis Williah- Tłı̄cho Elder
Trudy King- Northwest Territory Métis Nation	Jody Snortland-Pellissey- Wek'èezhii Renewable Resources Board

There was general agreement on the overall approach and acceptance that the initial heat map was a good start. However, the Elders and others in attendance made suggestions for how the map could be improved. These suggestions are as follows:

- Four areas that were used for fishing were identified, three along the north shore between Waite Island and the point across from Whitebeach Point and one between the eastern most of the three islands southeast of Waite Island and the mainland.
- There are two main boating corridors through the North Arm. The one most used by boaters, especially those that don't know the area well, goes south of Old Fort Rae and just south of Waite Island. Experienced boaters can travel from Frank Channel along the north shore of the Arm.
- The north shore of the North Arm east of Waite Island has been used extensively because it provides shelter for boaters and is good for fishing and hunting ducks. There are numerous old campsites along the shore in this area, including on Chimney Island.
- There is a point NNE of Whitebeach Point that has been and is still used by boaters as a layover spot when conditions on the North Arm are too rough to travel. This area has lots of old artifacts and is probably of archaeological importance site.
- Another holdover site for current boaters is on the island immediately north of Old Fort Rae.
- The shore west of Old Fort Rae is also of historic importance because fur traders had created trading sites on each of the various points.
- There are a couple of little lakes/inlets on the north shore that are of key importance for north migrating waterfowl because they thaw early and are heavily used until more open water areas open up farther north.
- There are two important areas for berries. These include the shore west of Whitebeach Point, where there are also many bears) and on the three islands west of Whitebeach Point.
- Chedabucto Lake is used for fishing, and the area around it was important for moose and caribou hunting and for trapping.
- Another important moose area was west of a bay on the south shore, west of Waite Island.
- Waite Island itself is of spiritual importance because someone was killed there. Waite Island is also used as part of a travel corridor from the south shore to the north shore.

- The island south of Waite Island is quite elevated and is an important lookout site when hunting.

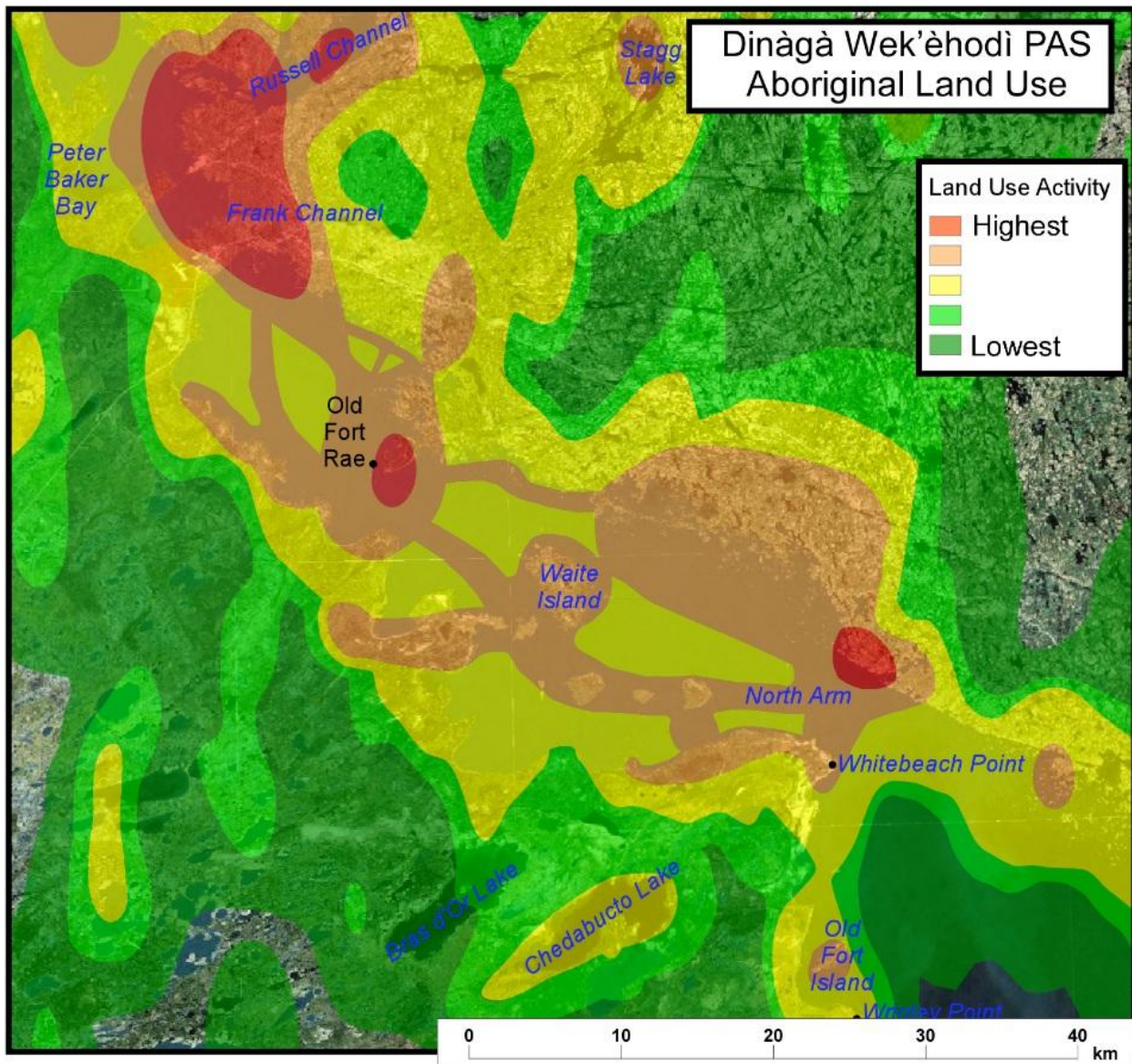
In general it was noted that:

- Many sites are not listed in data contained in the Prince of Wales museum because they are of spiritual importance and are not meant to be shared, or because the sites have not yet been documented.
- This assessment is based on consultations with some Elders and is considered incomplete because other Elders have better knowledge of other parts of the area.
- There are many plants and trees of cultural importance and/or are used for medicinal purposes (root rat and birch bark). These plants are located throughout the area but are found along the north shore which was most used for travel between Rae/Edzo and Yellowknife.

2.7.3 Production of the Revised Heat Map

Following the verification process, the heat map was revised to address the comments listed above. The resulting final version of the heat map is provided as Figure 2-4. This map will be used as one means of assessing the extent to which various boundary options for the CPA will be effective in protecting the values and high use areas that are of importance to the Aboriginal residents and other users of the area.

Figure 2-4: Final Heat Map Showing Intensity of Aboriginal Land Use and Importance in and Around the Dinàgà Wek'èhodi CPA



3.0 POTENTIAL DEVELOPMENT OPPORTUNITIES

For purposes of identifying potential development scenarios for the Dinàgà Wek'èhodi CPA, it is necessary to describe potential mineral and other development in the region. These descriptions were developed by using existing information to answer the following questions:

- What is the resource potential and where is this potential located?
- When will exploration, development and production of this resource potential be expected to occur and what factors will affect the timing?
- What will be the costs of developing these resources?
- What will be the territorial and regional impacts of developing these resources?
- What opportunities will be available for the local economy?
- What are the potential environmental concerns associated with development?
- What are the potential socio-economic concerns associated with development?

The following sections attempt to answer these questions for mineral and other development based on available information.

3.1 *Mineral Development*

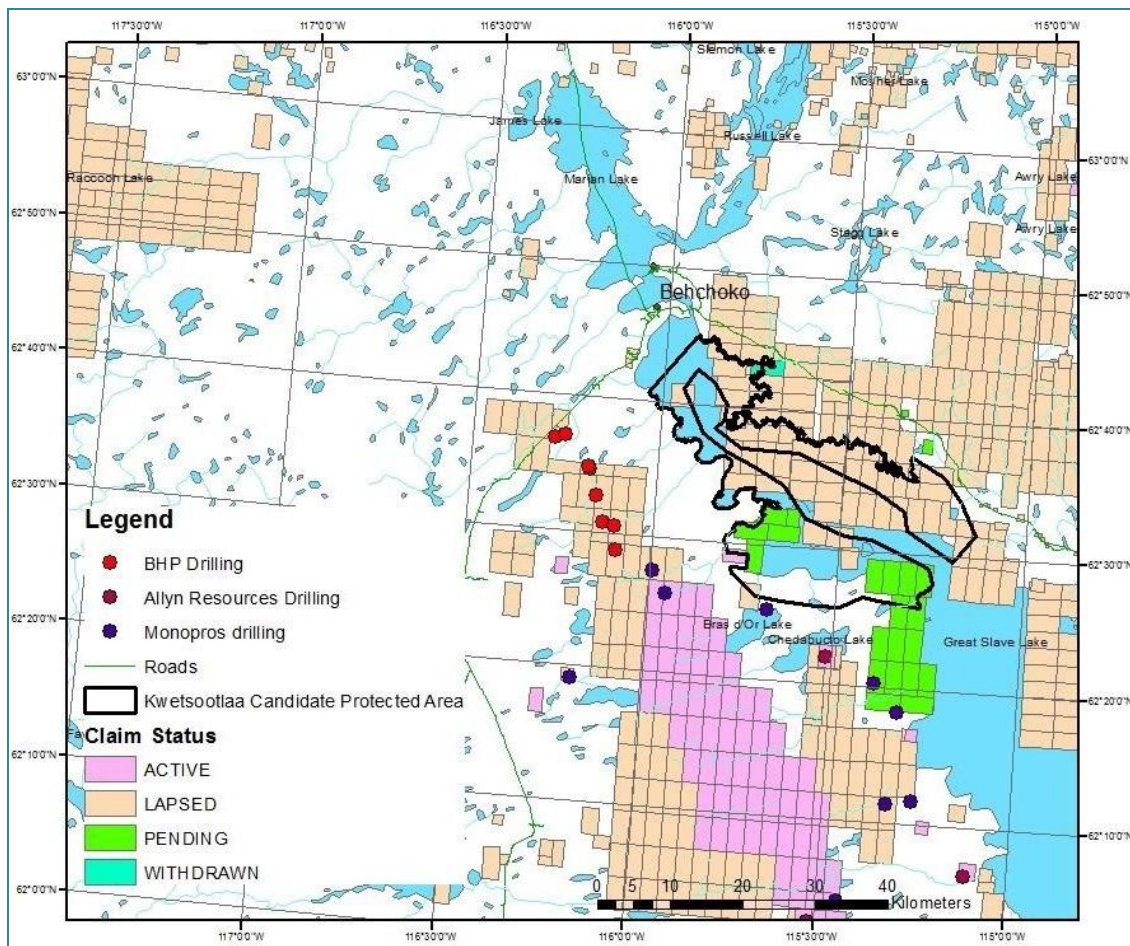
3.1.1 **Mineral Claims**

Watson (2013) provided a map that shows the status and location of mineral claims in and around the Dinàgà Wek'èhodi CPA. This information is provided in Figure 3-1. It shows that there are currently no active claims within the CPA boundaries, although there was a mineral claim along the northern edge of the CPA that has been withdrawn. There are, however, a number of pending mineral claims. These are located on the southeast shore of the North Arm and include parts of Whitebeach Point. Figure 3-1 also shows that nearly all of the CPA was, at one time, subject to mineral claims but these have since lapsed. The only active mining claims in the general vicinity of the CPA are located south and west of the southern end of the CPA.

3.1.2 **Mineral Potential**

An assessment of the mineral potential of the Dinàgà Wek'èhodi CPA was completed by Watson (2013) for the Northwest Territories GeoScience Office. According to this study, there has been little mineral exploration within study area but considerable exploration has occurred in areas around the boundaries of the CPA. Past exploration activities have attempted to identify the potential for six types of mineral deposits and Watson summarized available information on these deposits. Watson (2013) undertook some field surveys to further assess the mineral potential of the area. These activities included some geological reconnaissance and sampling in 2010 along exposed shorelines and outcrops accessible from roads on the north and east sides of the CPA. An airborne geophysical survey was conducted in 2011. A summary of the general observations on the mineral potential of the area is provided below.

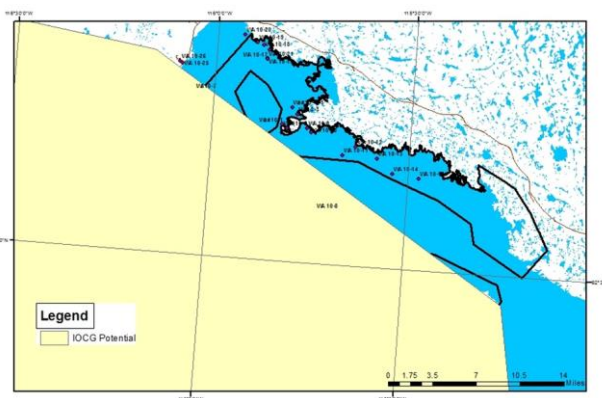
Figure 3-1: Status and location of Mineral Claims in and Around the Dinàgà Wek'èhodi CPA



Source: Watson (2013)

3.1.2.1 Iron Oxide Copper Gold Deposits

Iron oxide copper gold ore (IOCG) deposits containing copper, gold and rare earth minerals are found in the western part of the area in the Great Bear Magmatic Zone. Magnetic and gravity surveys have been completed in the Chedabukdo Lake area. While IOCG mineralization has been found in rocks at various properties located north of the study area, Watson (2013) notes that no ore grade intersections have been identified from drill holes in the CPA. Thus, there is some potential for IOCG deposits in western portion of the study area and the potential for this type of mineralization is considered to be low to moderate.



3.1.2.2 Unconformity Related Uranium

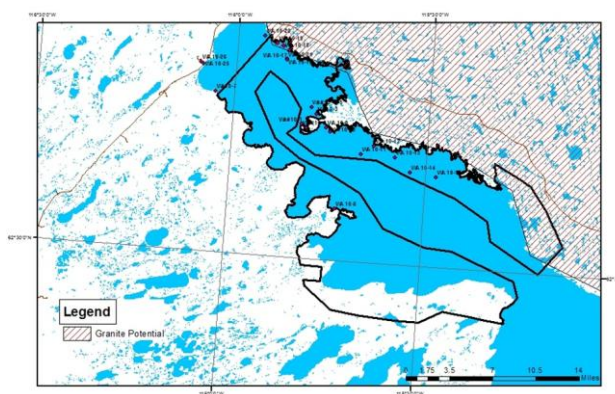
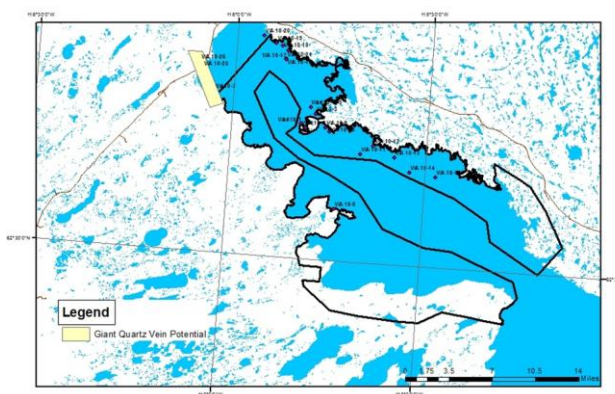
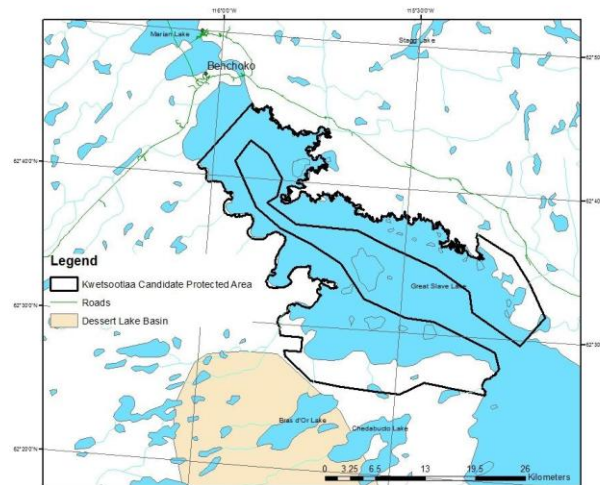
The geology of the “Dessert Lake Basin” is favourable for the occurrence of unconformity type uranium deposits. Drilling has confirmed the existence of “red beds” beneath the basin that may contain uranium. However, the basin is located southwest of the CPA and drilling has yet to discover any uranium in these red beds. Watson concluded the potential for unconformity related uranium deposits within the CPA to be low to medium.

3.1.2.3 Giant Quartz Veins

Giant quartz veins are found in the southern part of the Great Bear Magmatic Zone. These veins are sources of uranium, such as at the abandoned Rayrock mine 74 km north of Behchokq and in the Stagg River area east of the CPA. Watson (2013) observed one example of a giant quartz vein on the shore of the North Arm and a second vein north of the CPA was sampled. None of the samples carried visible mineralization. The highest potential for giant quartz veins was identified in the northwest corner of CPA, outside the CPA boundary, but Watson considered this potential to be low.

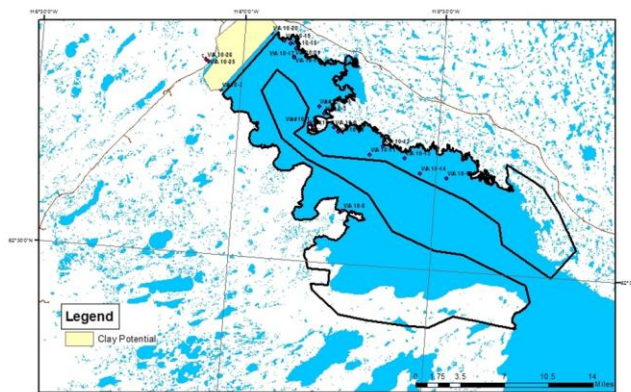
3.1.2.4 Dimension Stone

Granitic rocks suitable for dimension stone purposes were found in the eastern portion of the study area. Deposits from the Stagg River area were found capable of cost-effectively producing large blocks of unfractured stone that could take an acceptable polish. Watson (2013) notes that Awry and Stagg granites are found in large deposits that extend outside the CPA boundaries, including some that are close to transportation routes. Consequently, it was concluded that the potential likelihood of developing granitic resources within the CPA is very low.



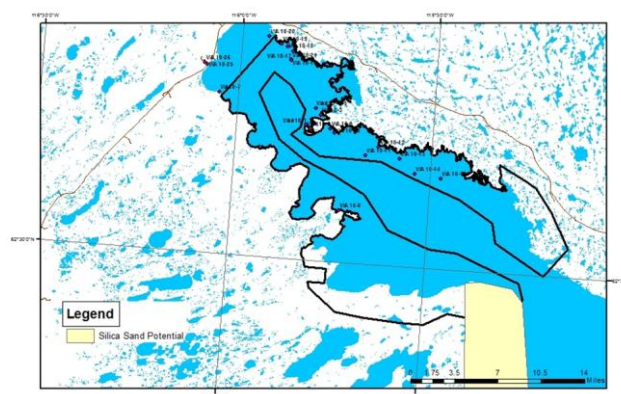
3.1.2.5 Clay Minerals

Clay minerals are found in the northern part of the North Arm of Great Slave Lake. Watson (2013) reports that clay from the lake bed in the North Arm has been used locally for pottery purposes and as a mud pack in a local spa. He notes that the scale of such operations has been small but could be expanded. However, the area being used to obtain clay is outside the CPA boundary. While there is high potential for additional clay deposits within the CPA, the potential likelihood of such resources in CPA is considered to be low.



3.1.2.6 Silica Sand

Silica sand is found as surface deposits on the southwestern shore of the North Arm of Great Slave Lake, notably at Whitebeach Point. Drilling has also identified sandstone of the Old Fort Island Formation. Watson (2013) suggests that, because of their location corresponds to expected sandstone outcrops, the beach sands are disaggregated sandstone 'in place'. Preliminary investigations have determined that this sand has the roundness, size and quality to meet the requirements for sand used for fracking purposes by the oil and gas industry. The exact nature of these silica sand resources has not been investigated, but much of the deposit occurs outside the CPA boundary. The CPA is considered to have a high potential for silica sand deposits.



3.1.2.7 Overall Conclusions

Overall, Watson (2013) concluded that the overall potential for finding mineral resources within the CPA can be summarized as low. While the geology of the area is favourable for the occurrence of IOCG, unconformity related uranium, giant quartz vein and kimberlite (diamond) deposits, exploration efforts to date have failed to find mineralization in economic amounts. Silica sand is observed along the shores of North Arm while clay from the bottom of the lake has been used locally in the past. Both commodities need further evaluation, but fall outside the proposed CPA. The granites to the west of the proposed protected area hold some promise as sources of dimension stone but are located outside the CPA.

3.1.3 Silica Sand Development Potential

Based on the assessment by Watson (2013), it appears that the silica sand deposits in and adjacent to the CPA represent the greatest potential for mineral development in the region. This section examines the various factors that would determine whether this potential would prove economically viable in the near future.

3.1.3.1 Demand for Silica Sand

Silica sand is used for a variety of purposes. Uses include water filtration; golf course bunkers, greens and top dressing; equine indoor and outdoor arenas; blasting sands; and traction sand for railways. However, the greatest potential demand is for hydraulic fracturing (fracking) by the oil and gas industry. Frac sands are injected into oil and gas formations to keep fractures open and this allows oil and gas to flow more freely and increases total production. Particularly large amounts of frac sand are required for gas production from shale formations: 3,000 metric tonnes or more of frac sand are required for horizontal gas wells drilled in the Horn River Basin in northeast British Columbia (BC) (Levson et al., 2012).

A detailed study of the potential for silica sand development in the NWT was undertaken in 2012 by Levson et al. This study predicted that the demand for frac sand will increase rapidly as a result of increased shale gas and oil drilling and production throughout North America, and especially in Montney and Horn plays in Northeast BC and southwestern NWT. A separate study by NWT GeoScience Office (Hayes, 2011) examined shale gas and oil potential in NWT and found good potential in three areas:

- Muskwa-Horn River-Klua, Besa River shale,
- the Fort St. John plays in the Liard–Great Slave Lake area, and
- the Horn River group in the Peel-Mackenzie area.

The overall conclusion by Levson et al. (2012) was that there will be significant requirements for silica sand for fracking in NWT, Northeast BC and Alberta.

3.1.3.2 Silica Sand Supplies

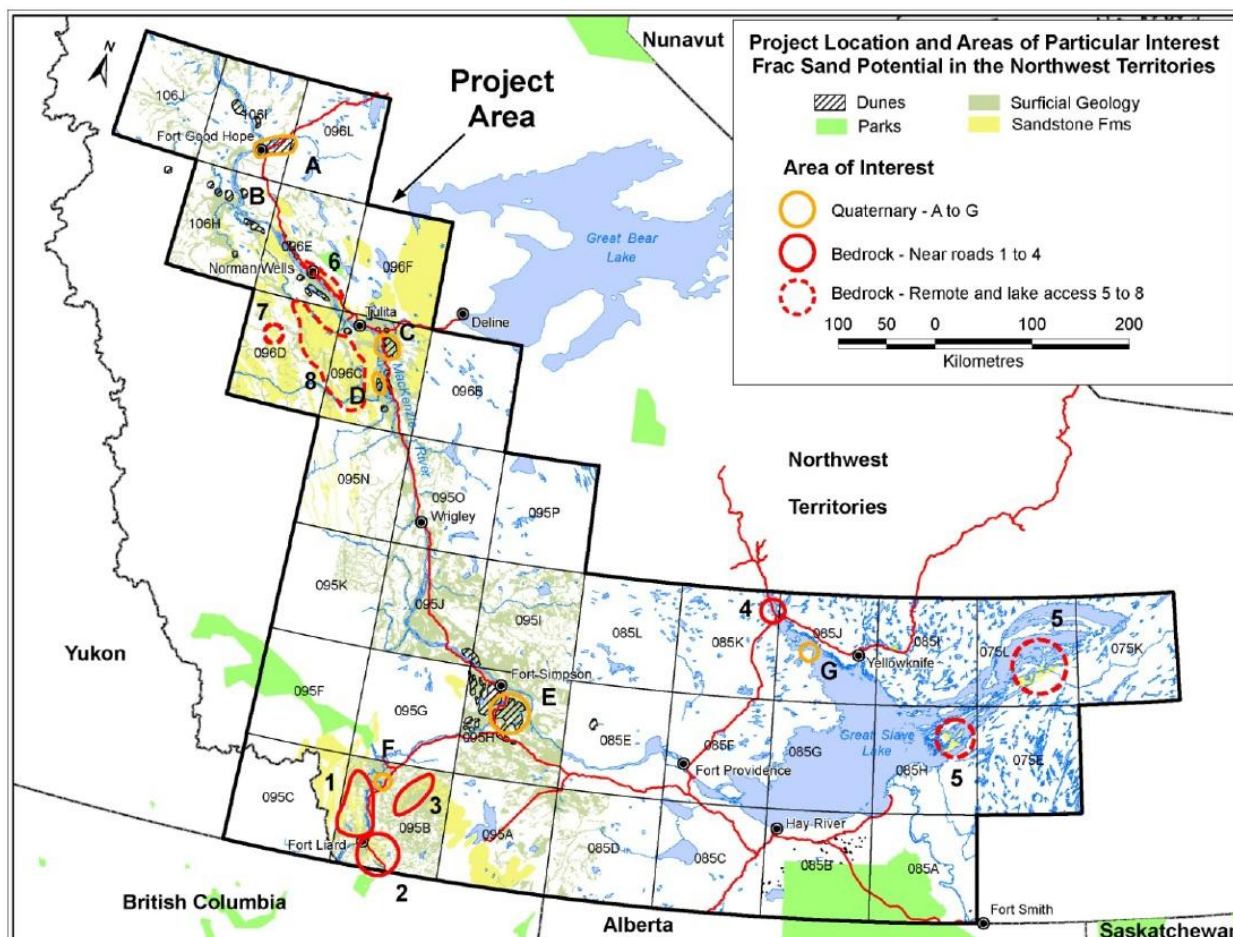
The Levson et al. study (2012) also identified various sources of silica sand in Canada and the United States (US). The study found that most established silica sand production operations are in the US. In Canada, there are existing silica sand operations in Alberta (at Peace River, Bruderheim, and Fort McMurray), Saskatchewan, and Manitoba. Two new silica sand mining projects have been proposed by Stikine Energy Corp. in Northeast BC. These include the Nonda Project (Wardrop, 2011a) and the Angus Project (Wardrop, 2011b), both of which are near the Montney and Horn shale gas plays. Silica North Resources Ltd. (2011) has proposed developing silica sand resources in the NWT north of Fort Liard, near the Horn shale gas play.

Levson et al. (2012) identified 15 sources of silica sand in the NWT. Eight of these are bedrock sources and seven are surficial sources:

<u>Bedrock Sources</u>		<u>Quaternary (Surficial) Sources</u>	
1	North of Fort Liard	A	North and east of Fort Good Hope
2	Southeast of Fort Liard	B	Lower Mountain and Carcajou rivers
3	Northeast of Fort Liard	C	South of Tulita
4	Northwest of Yellowknife	D	Lower Keele River
5	Eastern Great Slave Lake	E	Confluence of Liard and Mackenzie rivers
6	East of Mackenzie River	F	North of Fort Liard
7	West of Mackenzie River	G	North Arm Great Slave Lake
8	West of Mackenzie River		

The locations of these sources of silica sand are shown in Figure 3-2. One of these sources is on the North Arm of Great Slave Lake at Whitebeach Point. While the locations of silica sand deposits are known, most have not been evaluated by a geologist. The only source that has been evaluated is near Fort Liard at the Pointed Mountain location being developed by of Silica North Resources Ltd. The NWT Geoscience Office is conducting field work in the summer of 2013 to assess the silica sand resources at Whitebeach Point.

Figure 3-2: Locations and Areas of Frac Sand Potential in the NWT



Source: Levson et al. (2012)

3.1.3.3 Production Economics

Transportation costs are the biggest factor affecting production economics because of the high weight of the product and its relatively low value. According to Levson et al. (2012), transportation costs account for 50% to 80% of the delivered cost of silica sand. Thus, silica sand deposits near shale gas deposits and close to existing transportation routes are the most likely to be developed.

Different sources of silica sands have advantages and disadvantages. Bedrock resources have to be mined and are more costly to produce than surficial resources. The estimated capital costs for the proposed Nondo and Angus projects, which would mine silica from bedrock sources, are \$188 to \$398 per tonne of

production capacity, with operating costs of \$23-\$24 per tonne milled (Wardrop 2011a, 2011b). On the other hand, bedrock resources can be mined year round while surficial resources can only be mined seasonally (when the ground is not frozen).

3.1.3.4 Environmental Issues

Silica mining has a number of environmental issues. These were summarized in the decision report issued by the Alberta Natural Resources Conservation Board in its review of the application by United Industrial Services to construct and operate a silica sand quarry at a location 10 km north of the Town of Peace River in Alberta. First, crystalline quartz silica is classified as a controlled product under the Canadian *Hazardous Product Act* and *Controlled Products Regulations*. Certain crystalline forms of silica, such as quartz, are known to cause adverse human health effects via inhalation of airborne dust. Second, the mined silica sand must be washed to remove impurities and then dried before packaging. Driers at some operations can generate noise levels of 105 dBA at 100 metres and may exceed ambient sound standards, especially at night. Third, mining of surficial sand deposits can affect groundwater, necessitating groundwater monitoring and management plans. Fourth, process water used during washing may be discharged to surface water sources, necessitating monitoring and management plans. The extent to which these issues might arise with silica sand mining operations in the NWT is not known and will depend on the nature of the deposits to be mined, their location, and the mining technology being used.

3.1.3.5 Potential Development of Silica Sands in the CPA

There are some major constraints to developing the silica sand resources in the Dinàgà Wek'èhodi CPA. The primary constraint is location. The deposits in the CPA are not located near shale gas deposits and are not located on an existing road transportation route. As shown in Figure 3-2, there are other deposits of silica sand located much closer to the shale oil and gas plays in the NWT and BC, although the suitability of these resources has not yet been determined. And, although the silica sands in the CPA could be accessed by barge, there are other barge-accessible deposits that are closer. A second constraint is that it would be expensive to process silica sands on site because there are no utilities (gas or power) close to Whitebeach Point. The third constraint is that, although there are both surface and subsurface deposits of silica sand at Whitebeach Point, these deposits would likely be mined surficially and seasonally, although processing could occur year round. Such an operation would be at competitive disadvantage if silica sand mining operations nearer the oil and gas plays could occur year round. A fourth constraint is that processing of the sands at the Whitebeach Point site could adversely affect nearby recreational and traditional harvesting activities because of adverse effects related to noise and water quality and the potential effects these could have on wildlife and fish. The only advantage of developing the silica sand resources at Whitebeach Point is that surficial mining is less expensive than mining of bedrock deposits.

The cost of developing a silica mining operation at the deposits in the Dinàgà Wek'èhodi CPA is unknown and cannot be readily estimated. The Canadian Silica Products (2011) operation (formerly United Industrial Services) at Peace River is the only existing example of a surface mining operation, and there is no information on the capital or operating costs for this operation. Available information for the Canadian Silica Products operation shows that it is capable of mining 150 tonnes of silica sand per hour and processing 75 tonnes per hour. According to the original application for this project (NRCB, 2000),

it provides seasonal employment for 15 people, year-round employment for 3 or 4 people involved in processing, and purchases \$3 million in goods and services in order to operate.

Based on the best information currently available, the development of the silica sands deposits in or adjacent to the Dinàgà Wek'èhodi CPA is considered to be highly unlikely in the near future. At this time, the exact chemical and physical characteristics of these deposits have not yet been determined. More importantly, this site has no economic advantages compared to other silica sand sites in the NWT. Transportation costs to shale gas operations would be comparably prohibitive, mining operations would be seasonal, and there would be high costs involved in providing transportation and other infrastructure (power) to this site.

However, these conclusions about the likelihood of silica sand development could change if new information on the resource is collected and the deposits are found to be cost-effective to produce. If development of the silica sand deposits were to occur, the timing for such development is unknown and will depend on the future NWT demand for and supply of frac sand in the oil and gas industry. The Whitebeach Point site would only become of interest when all other silica sand deposits closer to the shale oil and gas fields have been mined out, and this is likely more than 40 years in the future.

Based on this analysis it is concluded that, although the Dinàgà Wek'èhodi CPA may have high potential for deposits of silica sands, these deposits are not economic to develop, at least within the next 40 years. Thus, designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area, which would prevent any silica sand or other non-renewable resources in the area from being developed, is not anticipated to have any adverse negative consequences in terms of mineral development.

4.0 BASELINE DEVELOPMENT SCENARIO

Under the baseline development scenario, all of the lands in the Dinàgà Wek'èhodi CPA that would otherwise be protected under the interim land withdrawal application would be unprotected. This means that, although current traditional land use practices, recreation and tourism would continue to occur, non-renewable resource development would also be allowed to occur. There would be no formal protection of the land, water or biological resources in the area. If non-renewable resource development were to occur, it is expected that, as part of the approvals process, developers would be required to implement various environmental management strategies to minimize any potential adverse effects of that development.

4.1 *Non-Renewable Resources Development*

As reported in Section 3.0, the potential for non-renewable resource development in the Dinàgà Wek'èhodi CPA is low, with the exception of the silica sand deposits in and around Whitebeach Point. However, based on the demand for and supply of silica sand resources in the NWT and the comparative economic disadvantages of the Whitebeach Point deposits, it is unlikely that these resources will be developed in the near future. Consequently, if the lands in the CPA were not to receive formal protection, it is unlikely that any non-renewable resource development would occur in the area within the foreseeable future. However, the potential for some form of development could always remain as long as the land and resources of the area remain unprotected.

4.2 *Renewable Resources*

Even with no formal protection of the area, it is expected that current uses of the area would continue as at present because there would no non-renewable resource development that would compete with or affect the traditional, recreational or commercial activities in the area.

4.3 *Future Economic Benefits and Costs*

To estimate the future economic benefits and costs associated with lands and resources in the Dinàgà Wek'èhodi CPA, assuming that an NWA is not established, it is necessary to consider how the use of those resources may change over time.

4.3.1 Traditional Activities

In the future, it is expected that residents of Behchokq would continue to use the area within the Dinàgà Wek'èhodi CPA for traditional purposes. The extent of future traditional use will depend on two factors: population growth and the percentage of population that continues to rely on country foods for the majority of their diet. The most recent projection for Behchokq (NWT Bureau of Statistics, 2012) suggests that the population of Behchokq will increase by 5.8% between 2011 (2,064 people) and 2025 (2,183 people). Although Behchokq is a young community, with 29% of the population being under 15 years of age, and is expected to grow quite rapidly, it is expected that many people will move out of the community, resulting in an annual 0.4% increase in the community population. As was noted in the Phase 1 socio-economic report (AMEC, 2012), a very high percentage of households in Behchokq in (73.2%) currently (2008) rely on country food for 50% or more of their meat or fish consumption and, in 2010, the cost of purchased food in Behchokq was 35% higher than in Yellowknife. These conditions

are expected to continue in the future, as people who remain in the community will continue to pay higher costs for purchased food and will continue to rely on country food. Thus, future use of land and water in the Dinàgà Wek'èhodi CPA will be tied to the rate of population growth in the community.

4.3.2 Recreation

In terms of recreation, it is expected that use of the land and water within the Dinàgà Wek'èhodi CPA will gradually increase over time, in accordance with increases in the local and regional population.

According to the Phase 1 socio-economic assessment (AMEC 2012), there are currently about 3,690 days of recreation in the CPA, with residents of Behchokq accounting for about 2,660 days (72%) and residents of Yellowknife accounting for the other 1,030 days (28%). This includes about 45 days of waterfowl hunting per year by resident hunters; this represents 1.2% of current recreational activity in the CPA.

As noted in Section 4.3.1, the population of Behchokq is predicted to increase by an average of 0.4% per year between 2011 and 2025. Similarly, the population of Yellowknife is expected to increase from 19,888 in 2011 to 22,984 in 2025 (NWT Bureau of Statistics, 2012), suggesting an average increase of 1.1% per year. Based on these anticipated rates of population growth, recreational activity in the CPA will increase to 4,290 days per year by 2037, an increase of 16% above current levels.

4.3.3 Tourism

Future levels of tourism in the Dinàgà Wek'èhodi CPA will depend on many factors, including global tourism trends, foreign exchange rates, changes in the price of fuel, competition with areas having similar resources and features, caribou and other wildlife populations that support guided hunting, the effectiveness of tourism marketing activities, and increased ease of road access with completion of the Deh Cho Bridge over the Mackenzie River in late 2012. The most recent information for tourism in the NWT (Northwest Territories Tourism, 2012) indicates that visitation peaked in 2007-08 (79,572 visitors) and has been dropping steadily since, attracting only 65,196 visitors in 2010-11. This represents an 18% decrease over three years. While visitation in sectors relating to angling, hunting and aurora viewing declined during this period, there were slight increases in sectors related to visiting friends and relatives and general touring (Northwest Territories Industry Tourism and Investment, 2011). Projections for the period to 2015 predict that tourism is expected to rebound and grow, with much of the growth occurring in the market segments related to general touring, outdoor adventure, aurora viewing and business travel.

As the Dinàgà Wek'èhodi CPA is located adjacent to Highway 3 and boats and special equipment or support are required to access the North Arm, it is expected that future levels of tourism in the CPA will be tied to two market segments: outdoor adventure and general touring. In combination, these two sectors are expected to increase at a rate of about 3% per year between 2010 and 2015 (Northwest Territories Tourism, 2012). Additional expansion of tourism in the CPA could occur if opportunities for guided hunting of caribou were re-established as this would allow two of the four existing operators (True North Safaris and Rabesca's Resources Ltd.) to resume guided hunting. However, this additional tourism has not been factored into the analysis.

4.3.4 Cultural Values

There will be no change in the cultural values of the area. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

4.3.5 Ecological Goods and Services

There is expected to be no change in the range and value of ecological goods and services being provided by the land and waters in the Dinàgà Wek'èhodi CPA. In the absence of any non-renewable or other resource development activities that could affect the ecological functionality of the landscape, no changes to the landscape are expected and the results of any natural changes in functionality, such as forest fires, are included in the current values for the area. Thus, in the absence of formal protection, the extent and location of important areas for migratory waterbirds would remain unchanged, as would the number and extent of wetland areas within the CPA.

4.3.6 Summary

In summary, it is expected that, with no formal designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area, the current use of the area would largely continue and that there would be a slow increase in the benefits being generated by the CPA due to factors like population growth and increased tourism. The value of the quantifiable economic benefits of the area under this scenario is provided in Table 4-1. It shows that, using the recommended 8% rate of discount, the present value of the economic benefits being provided by lands and water in the Dinàgà Wek'èhodi CPA, without formal protection, would be about \$7.1 million.

Table 4-1: Present Value of Benefits from the Dinàgà Wek'èhodi CPA, No Protection Scenario

	Discount Rate		
	0%	3%	8%
Traditional Activities (millions)	\$6.5	\$3.4	\$1.6
Recreation	\$2.9	\$1.5	\$0.7
Tourism	\$27.6	\$12.2	\$4.8
Cultural	Not quantified but no change		
Ecological Goods and Services	Not quantified but no change		
TOTAL	\$37.1	\$17.1	\$7.1

4.4 *Regional Socio-Economic Effects*

Based on this scenario, there would be no changes in socio-economic conditions in Behchokq or Yellowknife. Although economic conditions in the community could be affected by non-renewable or other resource development opportunities in areas outside the CPA, a decision not to create a National Wildlife Area would have no effect on potential development opportunities for residents of the community. As noted in Volume 1 of the socio-economic study (AMEC 2012), Behchokq will continue to be a slow growing Aboriginal community where adults have relatively low educational attainment, below average participation in the labour force, and above average rates of unemployment. Average family incomes are expected to remain relatively low with the cost of living remaining higher than the

NWT average. Residents of the community will remain highly reliant on country food, and there may continue to be above average participation in trapping and the production of Northern arts and crafts, as long as these skills are being passed on to current generations.

5.0 CANDIDATE PROTECTED AREA BOUNDARY SCENARIO

Under this scenario, all of the in the Interim Land Withdrawal application for the Dinàgà Wek'èhodi CPA would be designated as a National Wildlife Area. Figure 5-1 shows a map of the protected area boundaries under this scenario. The NWA would be 593.2 km² in area and include the mainland shoreline, numerous islands and the water of the north portion of the North Arm of Great Slave Lake. The NWA would not include Waite Island or the open water area in the centre of the North Arm.

5.1 Non-Renewable Resources

If the area is designated as a National Wildlife Area, management of the surface would be transferred to Environment Canada. The potential for non-renewable resource development will depend on whether sub-surface development rights are withdrawn from disposal, and will be subject to terms of the surface access provisions in the NWA management plan, and Environment Canada's Policy when Considering Permitting or Authorizing Prohibited Activities in Protected areas Designated Under the *Canada Wildlife Act* and *Migratory Birds Convention Act 1994* (herein 'the Policy'). There are four options:

1. Designate the surface area as an NWA. Potential development of subsurface resources (both minerals and oil and gas) would be subject to the terms of the surface access provisions in the NWA management plan and the Policy.
2. Designate the area as an NWA and withdraw mineral rights under the *Territorial Lands Act*. Potential development of oil and gas resources would be subject to the terms of the surface access provisions in the NWA management plan.
3. Designate the area as an NWA and withdraw all sub-surface rights under the *Territorial Lands Act*, so there can be no exploration for or development of either minerals or possible oil and gas resources.
4. Designate the area as an NWA, but allow for the establishments of one or more zones within the NWA that would allow exploration for or development of either minerals or possible oil and gas resources only in those zones.

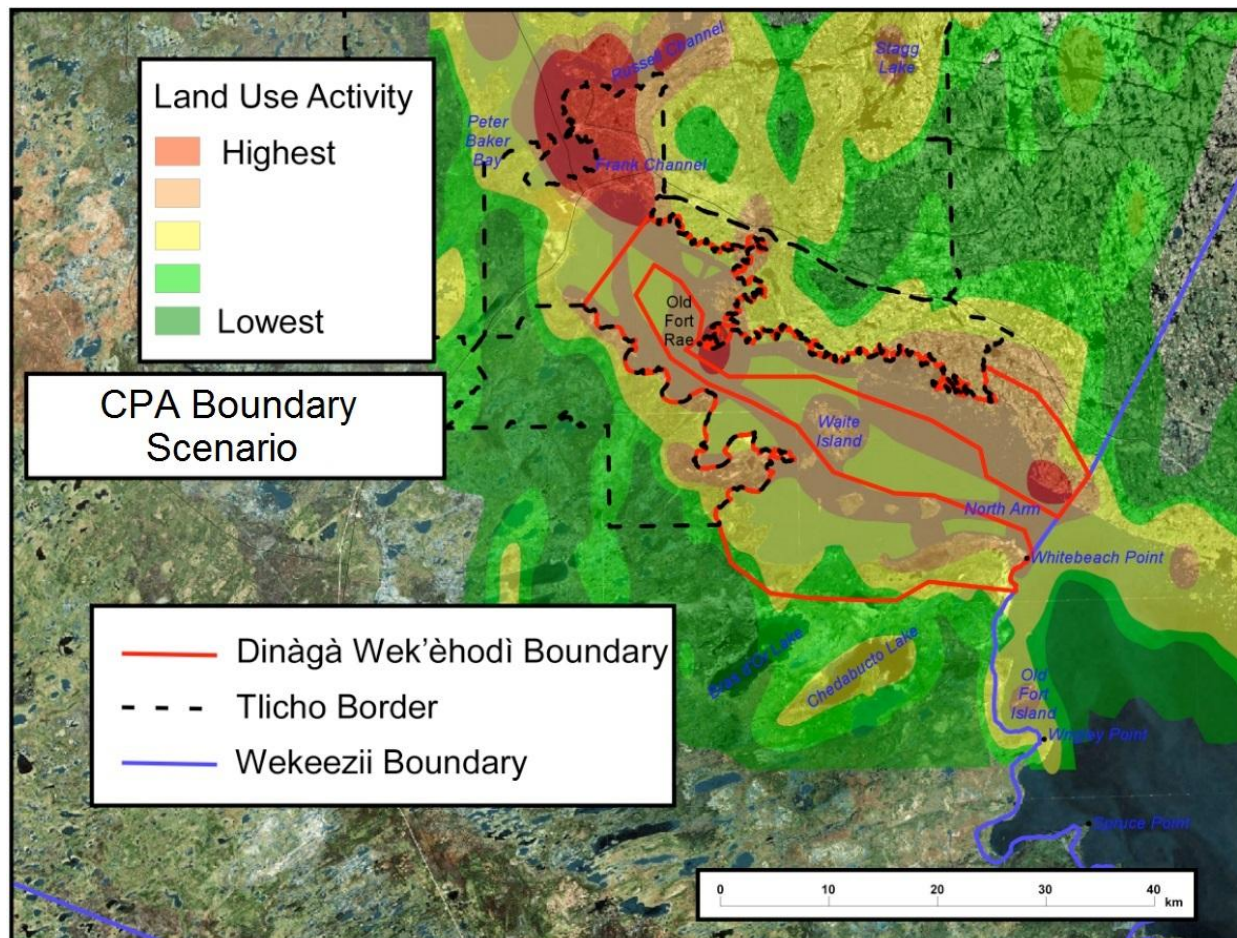
As there is no oil and gas potential in the area, option 2 would not be relevant. And, as noted in Section 3.0, it is unlikely that any mineral development would occur within the area in the foreseeable future so there would be no need to include terms for surface access (option 1) or identify zones for exploration and development (option 4). Thus, the assumption used in this analysis is that protection of the CPA would mean that surface rights would be transferred to Environment Canada, no mineral development would be permitted, and sub-surface rights may be withdrawn under the *Territorial Lands Act*.

5.2 Renewable Resources

Designation of the entire Dinàgà Wek'èhodi CPA as a National Wildlife Area would essentially protect all renewable resources, subject to the terms and conditions of the management plan that would be developed for the NWA. While traditional use could occur as at present, various other activities could continue to occur if the appropriate permits are required. For example, tourism operations could continue to use the area, assuming this activity is recognized in the management plan, but they would first have to

obtain a permit to operate in the NWA. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

Figure 5-1: Dinàgà Wek'èhodi Boundary: CPA Boundary Scenario



5.3 Future Economic Benefits and Costs

Assuming that a National Wildlife Area is established based on the initial boundaries shown in Figure 5-1, it is necessary to consider how use of those resources may change over time as a result of the designation.

5.3.1 Traditional Activities

It is expected that residents of Behchokq would continue to use the area within the Dinàgà Wek'èhodi CPA for traditional purposes as previously described in Section 4.3.1. Future use of land and water in the Dinàgà Wek'èhodi NWA is expected to gradually increase over time. This increase will be tied to the rate of population growth in the community (0.4% year) and assumes that a high percentage of the population will continue to rely on country foods for the majority of its diet.

5.3.2 Recreation

With designation of the area as an NWA, recreational use of the area is expected to gradually increase over time. However, the rate of increase will depend on what recreational activities are allowed to occur in the NWA under the management plan to be developed for the area. While activities like non-motorized boating and camping would be allowed to continue, other activities, such as motor-boating and snowmobiling, would be allowed but limited to current levels of use. And, although fishing and hunting could be allowed within the NWA, these activities would be contingent on participants possessing the appropriate licences and having NWA authorization. While added restrictions on selected activities could result in decreased recreational activity in the NWA, it is expected that official designation of the area as an NWA will raise awareness of the important ecological features of the area, potentially resulting in higher levels of interest in visiting the area. The net effect of raised awareness and increased restrictions on activity is difficult to predict. For ease of analysis, it is assumed that these two factors would be offsetting, such that future recreational use of the area will be tied to rates of population growth in Behchokq (0.4% per year) and Yellowknife (1.1% per year). On this basis, the levels of recreational use in the NWA would be the same as if the area were not given any formal level of protection.

5.3.3 Tourism

As noted in Section 4.3.3, future levels of tourism in a Dinàgà Wek'èhodi NWA will depend on many factors, with use of the area increasing over time due to growth in the market segments related to general touring and outdoor adventure. Growth in these two market segments are expected to increase tourist activity in the CPA at a rate of about 3% per year without formal designation of the area.

With formal designation of the area as a NWA, there will be increased interest in the area, and this could lead to additional growth in tourism activity in the area assuming that tourism activities are consistent with the management plan to be developed for the area and that existing and future tourism operators have acquired the appropriate permits for operating within the NWA. Assuming that this occurs, it is expected that tourism use (and associated revenues) will increase at a faster rate than if formal designation does not occur. Ultimately, the opportunities for expansion will depend on the number and capacity of tourism operators who wish to operate in the area, and their ability to capitalize on the enhanced interest in the area that might result from official designation as a NWA. For this assessment, it is assumed that tourism in the NWA would increase at a rate slightly higher than the expected overall rate of increase for outdoor adventure and general touring in the NWT (3% per year) so an annual rate of 4% per year has been assumed.

5.3.4 Cultural Values

There will be no change in the cultural values of the area even if the area is designated as a NWA. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

5.3.5 Ecological Goods and Services

It is expected there would be no change in the range and value of ecological goods and services being provided by the land and waters in the CPA if the area were to be officially designated as a NWA and all non-renewable resource development would be precluded. With no non-renewable or other resource

development activities occurring, the ecological functionality of the landscape would not be affected and any natural changes in functionality, such as forest fires, are included in the current values for the area.

As noted in Section 2.5, 1% of the CPA (5 km²) is considered to be of highest importance for migratory waterbirds and another 2% (13 km²) is considered to be of high importance. Similarly, there are 15.3 km² of wetlands in the CPA. With formal protection of the CPA as an NWA, these areas would be guaranteed protection from development of any sort and their ecological functionality would remain unchanged.

5.3.6 Existence Values for Protected Areas

Protected areas may have value for people who are not currently using these areas for recreation or tourism but who have an interest in seeing that areas of ecological, cultural or historical importance are protected. The economic literature identifies three different types of non-use values:

- Existence values - the benefit that people receive from knowing that an area of environmental importance, such as a Dinàgà Wek'èhodi NWA, actually exists
- Option value - the value placed on the environmental assets of the NWA by people who want to be able to visit it in the future
- Bequest value - the value that people perceive in protecting a NWA for the benefit of present and/or future generations.

Studies of these non-use values usually involve asking people how much they would be prepared to pay to protect landscapes that are perceived to be of recreational, cultural, or environmental importance. Although relatively few studies have quantified non-use values, one study undertaken in 1997 for Parks Canada, specifically attempted to quantify non-use values for creating protected areas in the NWT. The study by Rollins et al. (1997) asked Canadian households what they would be willing to pay to create additional parks in the NWT (which included Nunavut at the time). The study found that Canadian households would be willing to pay an average of \$235.18 for the creation of four new national parks and \$261.51 for the creation of 10 parks.² Thus, the study results show that Canadian households placed higher values on establishing the first four parks than on creating the additional six parks. While this study is somewhat dated, the results show that Canadians do place a positive value on establishing protected areas in the NWT and provide an estimate about the potential magnitude of these values.

Assuming that formal designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area could be considered as a being equivalent to creating a national park, the average willingness to pay per Canadian household could range from \$6.09 (assuming that Dinàgà Wek'èhodi CPA was the fifth new park) to \$3.18 (assuming it was the tenth new park). This is equivalent to \$8.20 to \$4.28 in 2012 dollars, or an average of \$5.90. Given the number of Canadian households in 2011, the total willingness to pay to protect the Dinàgà Wek'èhodi CPA as a National Wildlife Area could be equivalent to a one-time payment of \$42.4 million. This is equivalent to an annual amount of \$1.3 million per year in perpetuity, based on a discount rate of 3%, or \$3.4 million per year, based on a discount rate of 8.0%. The benefit for households in Behchokq, based on its current population, would be \$2,700, or between \$81 and \$215 per year (depending on the discount rate). Existence values for households in other parts of the NWT would

² Since 1991, three of the four hypothetical national parks considered in the survey have been established (Tuktut Nogait National Park, Sirmilik National Park, and Ukkusiksalik National Park) while designation of the fourth park (Thaidene Nene) is currently being assessed.

be \$44,100 or between \$1,325 and \$3,530 per year (depending on the discount rate). These values are not related to the size of the park or protected area and would not apply if the area is not designated as a National Wildlife Area.

5.3.7 Summary

In summary, it is expected that formal designation of the Dinàgà Wek'èhodi CPA as a National Wildlife Area would generate a number of additional benefits when compared to the baseline (no protection) scenario. These additional benefits relate to the increased status of the area, which is expected to generate increased recreational and tourism interest and activity in the area and raise the awareness of Canadians who currently do not use the area. The value of the benefits of establishing an NWA in the North Arm, with boundaries based on the CPA boundary, is provided in Table 5-1. It shows that, using the recommended 8% rate of discount, the present value of the economic benefits being provided by lands and water in the Dinàgà Wek'èhodi NWA, based on the original boundaries, would be about \$50.4 million. The vast majority of these benefits (84%) relate to the non-use values for Canadians that would result from recognizing the ecological importance of the area by giving it formal designation as a NWA.

Table 5-1: Present Value of Benefits from a Dinàgà Wek'èhodi NWA: CPA Boundary Scenario

	Discount Rate		
	0%	3%	8%
Traditional Activities (millions)	\$6.5	\$3.4	\$1.6
Recreation	\$2.9	\$1.5	\$0.7
Tourism	\$37.4	\$15.7	\$5.6
Cultural	Not quantified but no change		
Ecological Goods and Services	Not quantified but no change		
Non-Use Value	\$42.4	\$42.4	\$42.4
TOTAL	\$89.3	\$62.9	\$50.4

5.4 *Regional Socio-Economic Effects*

Based on this scenario, there could be some small changes in socio-economic conditions in Behchokq or Yellowknife. A decision to establish an NWA based on the CPA boundary could result in some increased employment opportunities that would result from the provision of goods and services to the additional recreational users and tourists who are attracted to the area because of its status as an NWA. However, these incremental employment and income benefits would be relatively small and are not likely to significantly improve economic conditions in the community. It is expected that the community will continue to have below average participation in the labour force and above-average rates of unemployment compared to the remainder of the NWT, and average family incomes are expected to remain relatively low. While residents of the community will remain highly reliant on country food, formal designation of the area as an NWA will ensure that the area can continue to be used for traditional harvests, trapping and the production of Northern arts and crafts by current and future generations.

In terms of the relative importance of the landscape, establishment of an NWA would formally protect 593.2 km², of which 20.7 km² (3.5% of the area) is considered to be of highest importance to the community, based on the heat map provided in Figure 2-4. As shown in Table 5-2, the majority of the

area (332.9 km² or 56.1%) that would be protected by the NWA is considered to be of high importance to the community and 208.5 km² (or 35.1%) is considered to be of medium importance.

Table 5-2: Importance of Areas within the Dinàgà Wek'èhodi NWA, CPA Boundary Scenario Boundary

Importance	Colour	Area (km ²)	Percent
Highest	Red	20.7	3.5%
High	Orange	332.9	56.1%
Medium	Yellow	208.5	35.1%
Low	Green	31.1	5.2%
Lowest	Dark green	0	0.0%
TOTAL		593.2	100.0%

6.0 PROPOSED BOUNDARY SCENARIOS

A number of other boundary scenarios for a Dinàgà Wek'èhodi NWA were identified by the Working Group for assessment. These include:

- Scenario 1: Using the boundary of the CPA but excluding the part of the CPA with high silica sand development potential. This would decrease the size of the NWA to 563 km²; this represents a decrease in size of about 30 km².
- Scenario 2: Expanding the NWA to include Waite Island and the entire water within the North Arm of Great Slave Lake. This would increase the size of the area to 793 km²; this represents an increase in size of about 200 km².
- Scenario 3: Expanding the NWA to include Waite Island and the entire water within the North Arm of Great Slave Lake, but would exclude lands within the Chief Drygeese boundary or the Akaitcho Interim Measures Area and areas that are the subject of existing mineral claims. This scenario would increase the size of the NWA to 663 km²; this represents a net increase in size of about 70 km².
- Scenario 4: Expanding the NWA to include Waite Island and the entire water within the North Arm of Great Slave Lake, but excluding portions of the area with high silica sand and areas that are the subject of existing mineral claims. This scenario would increase the size of the NWA to 704 km²; this represents a net increase in size of about 111 km².

Each of these scenarios is evaluated in the following sections.

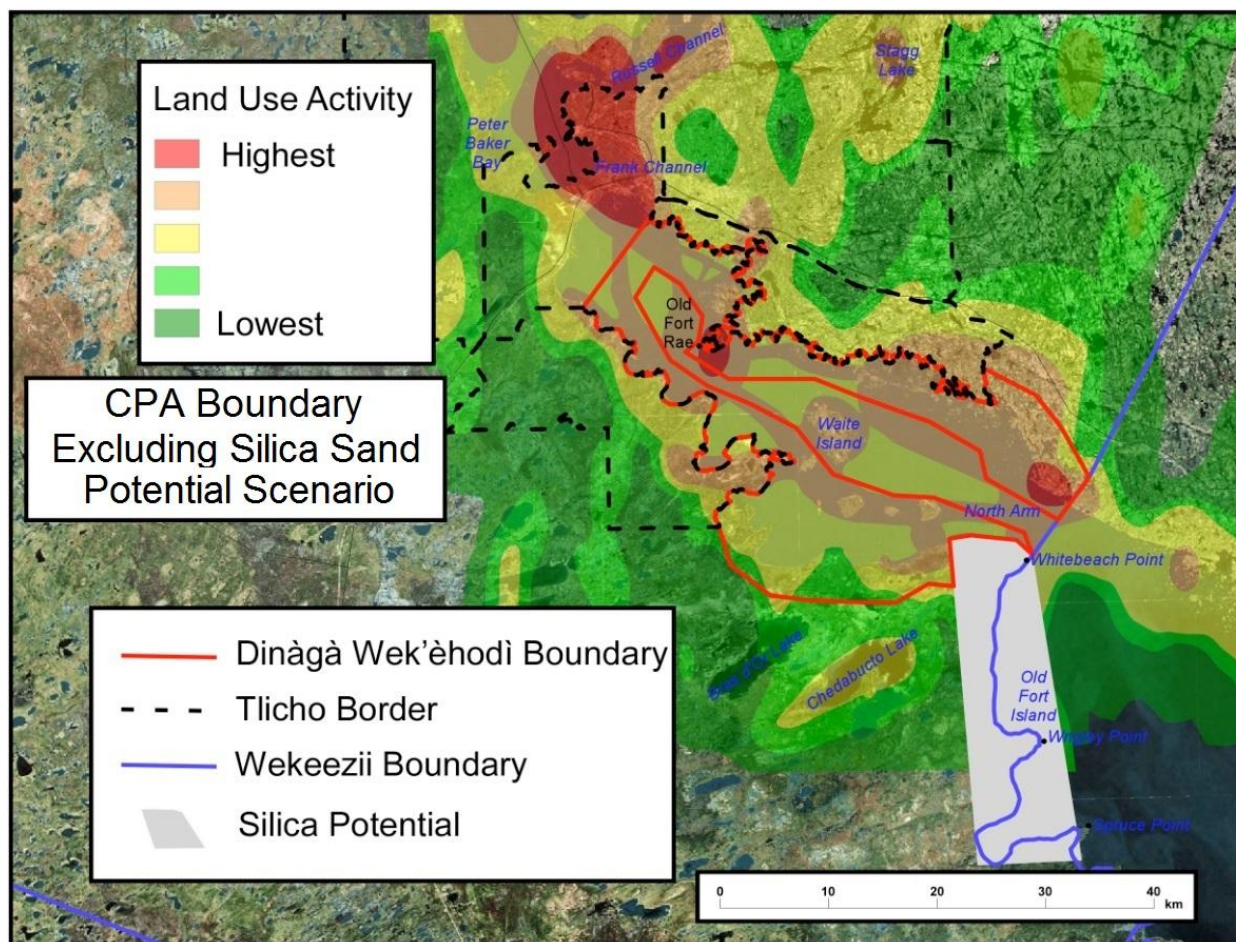
6.1 Scenario 1: CPA Boundary with Exclusion of Lands with Silica Sand Potential

Establishing an NWA that is based on the CPA boundary but excludes the part of the CPA with high silica sand development potential would decrease the size of the NWA to 562.9 km². This represents a decrease in size of about 30.3 km² from the CPA Boundary Scenario.

6.1.1 Non-Renewable Resources Development

Modifying the boundary of the NWA to exclude areas of silica sand potential would maintain the option of developing these resources although, as noted in Section 3.1.3.5, such development is unlikely given that there are other silica sand deposits in the NWT that are more likely to be developed in support of shale oil and gas development in the NWT. However, in the part of the CPA that would be designated as an NWA, it is assumed that surface resource rights would be transferred to Environment Canada, no non-renewable resource development would be permitted to occur in the NWA, and sub-surface rights may be withdrawn under the *Territorial Lands Act*.

Figure 6-1: Dinàgà Wek'èhodi Boundary: CPA Boundary with Exclusion of Silica Sand Potential Scenario



6.1.2 Renewable Resources

6.1.2.1 *Traditional Activities*

It is expected that residents of Behchokq would continue to use all of the land and water area within the Dinàgà Wek'èhodi NWA for traditional purposes, regardless of how much of the area is actually designated as an NWA. As with the CPA Boundary Scenario, it is assumed this use will increase over time based on the rate of population growth in the community (0.4% year) and assuming that a high percentage of the population will continue to rely on country foods for the majority of its diet.

6.1.2.2 *Recreation*

With designation of most of the CPA as an NWA, the levels of recreational use in the area are not expected to change from the current situation. Although recreational interests in the area may increase as a result of official designation of the area as an NWA, as was assumed for the CPA Boundary Scenario, there could also be increased restrictions on certain activities in the NWA that might offset the increase in interest. Excluding Whitebeach Point from the NWA would offer the option of recreational (cottage)

development at that location, although this may be limited by any silica sands development that may occur at that site.

6.1.2.3 **Tourism**

With formal designation of the most of the CPA as an NWA, as with the CPA Boundary Scenario, there would be increased tourist interest in the area. Tourism in the NWA is expected to increase at an annual rate of 4% per year on the assumption that tourism operators would expand their operations to capitalize on the enhanced interest in the area. Exclusion of the areas having silica sands potential is not expected to affect tourism in the North Arm.

6.1.2.4 **Cultural Values**

There will be no change in the cultural values of the area even if parts of the CPA are not designated as an NWA. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

6.1.2.5 **Ecological Goods and Services**

It is expected there would be no change in the range and value of ecological goods and services being provided by the land and waters in the CPA if only part of the CPA was to be officially designated as an NWA. With no resource development activities occurring inside the NWA and development unlikely to occur in the areas with silica sand potential, the ecological functionality of the landscape would not be affected. While there may be natural changes in functionality, such as forest fires, these are included in the current values for the area. However, by excluding the areas with silica sand potential, the extent of the landscape receiving full protection would decrease.

In terms of important migratory waterbird habitat, there is no quantified information for the 30 km² of CPA that would be excluded from the NWA. Excluding areas with silica sands potential from the NWA would still protect all of the areas within the CPA that are known to be of importance for waterbirds (see Table 6-1).

Table 6-1: Extent of Important Migratory Waterbird Areas: CPA Boundary with Exclusion of Silica Sand Potential

Activity	Area (km ²)	Percent of Total
Highest	4.6	0.8%
High	12.8	2.3%
Medium	25.5	4.5%
Lower	53.4	9.5%
Low	91.5	16.2%
Not quantified	375.4	66.7%
TOTAL	563.1	100%

In terms of wetlands, setting the boundary of the NWA to exclude areas in the CPA having silica sands potential would reduce the area of wetlands receiving formal protection by about 0.9 km². Thus, the NWA would provide formal protection of 14.4 km² of wetlands.

6.1.2.6 Existence Values for Protected Areas

As was explained in Section 5.3.6, protected areas may have value for people who are not currently using these areas for recreation or tourism but have an interest in seeing that areas of ecological, cultural or historical importance are protected. Using information from the study by Rollins (et al. 1997), it was estimated that these existence values were equivalent to a one-time payment of \$42.4 million for residents of Canada. This is equivalent to an annual amount of \$1.3 million per year in perpetuity, based on a discount rate of 3%, or \$3.4 million per year, based on a discount rate of 8.0%. This number includes existence values for residents of the NWT, which are estimated to total \$46,800 or an annual amount of \$900 to \$1,400 per year, depending on the discount rate. These values are not related to the size of the park or protected area and would be the same for the CPA Boundary with Exclusion of Silica Sand Potential and the CPA Boundary Scenario.

6.1.3 Summary

The CPA Boundary with Exclusion of Silica Sand Potential Scenario would generate the same types and values of quantifiable economic benefits as would the CPA Boundary Scenario. There would be no change in the use and value of activities in entire NWA, including those areas excluded from the CPA, and formal designation would result in the same existence values as the CPA Boundary Scenario. The present value of the economic benefits associated with CPA Boundary with Exclusion of Silica Sand Potential Scenario would be \$50.4 million, based on an 8% discount rate. The majority of these benefits (84%) relate to the non-use values for Canadians that would result from recognizing the ecological importance of the area by giving it formal designation as an NWA.

6.1.4 Regional Socio-Economic Effects

As with the CPA Boundary Scenario, development of an NWA based on the CPA Boundary with Exclusion of Silica Sand Potential Scenario would cause some small changes in socio-economic conditions in Behchokò. These would include some increased employment opportunities and income related to changes in recreational or tourism use but these effects would be relatively small and are not likely to significantly improve economic conditions in Behchokò. However, establishing an NWA that excludes areas having silica sands potential will ensure that the most of the area can continue to be used for traditional harvests, trapping and the production of Northern arts and crafts by current and future generations.

In terms of the relative importance of the landscape, establishment of an NWA that excludes areas having silica sands potential would formally protect 562.9 km². While this scenario would continue to provide protection for all of the 20.7 km² of the CPA that is considered to be of highest importance to the community, based on the heat map provided in Figure 2-4, there would be a reduction in the amount of area considered to be or high or medium importance.

As shown in Table 6-2, the CPA Boundary with Exclusion of Silica Sand Potential Scenario would protect 318.8 km² considered to be of high importance (a reduction of 14.1 km² from the CPA Boundary Scenario) and 192.2 km² considered to be of medium importance (a reduction of 16.3 km² from the CPA Boundary Scenario).

Table 6-2: Importance of Areas within an Dinàgà Wek'èhodi NWA, CPA Boundary with Exclusion of Silica Sand Potential

Importance	Colour	Area (km ²)	Percent
Highest	Red	20.7	3.7%
High	Orange	318.8	56.6%
Medium	Yellow	192.2	36.7%
Low	Green	31.1	3.9%
Lowest	Dark green	0.0	0.0%
TOTAL		562.9	100.0%

6.2 Scenario 2: Expanded CPA Boundary

This scenario would involve expanding the NWA to include Waite Island and the entire water within the North Arm of Great Slave Lake. This would increase the size of the area to 793.1 km²; this represents an increase in size of about 199.9 km². The boundaries of the NWA based on the expanded CPA Boundary Scenario are shown in Figure 6-2.

6.2.1 Non-Renewable Resources Development

If all the land and water in the North Arm is designated as an NWA, it is assumed that surface resource rights would be transferred to Environment Canada, no non-renewable resource development would be permitted to occur in the NWA, and sub-surface rights may be withdrawn under the *Territorial Lands Act*.

6.2.2 Renewable Resources

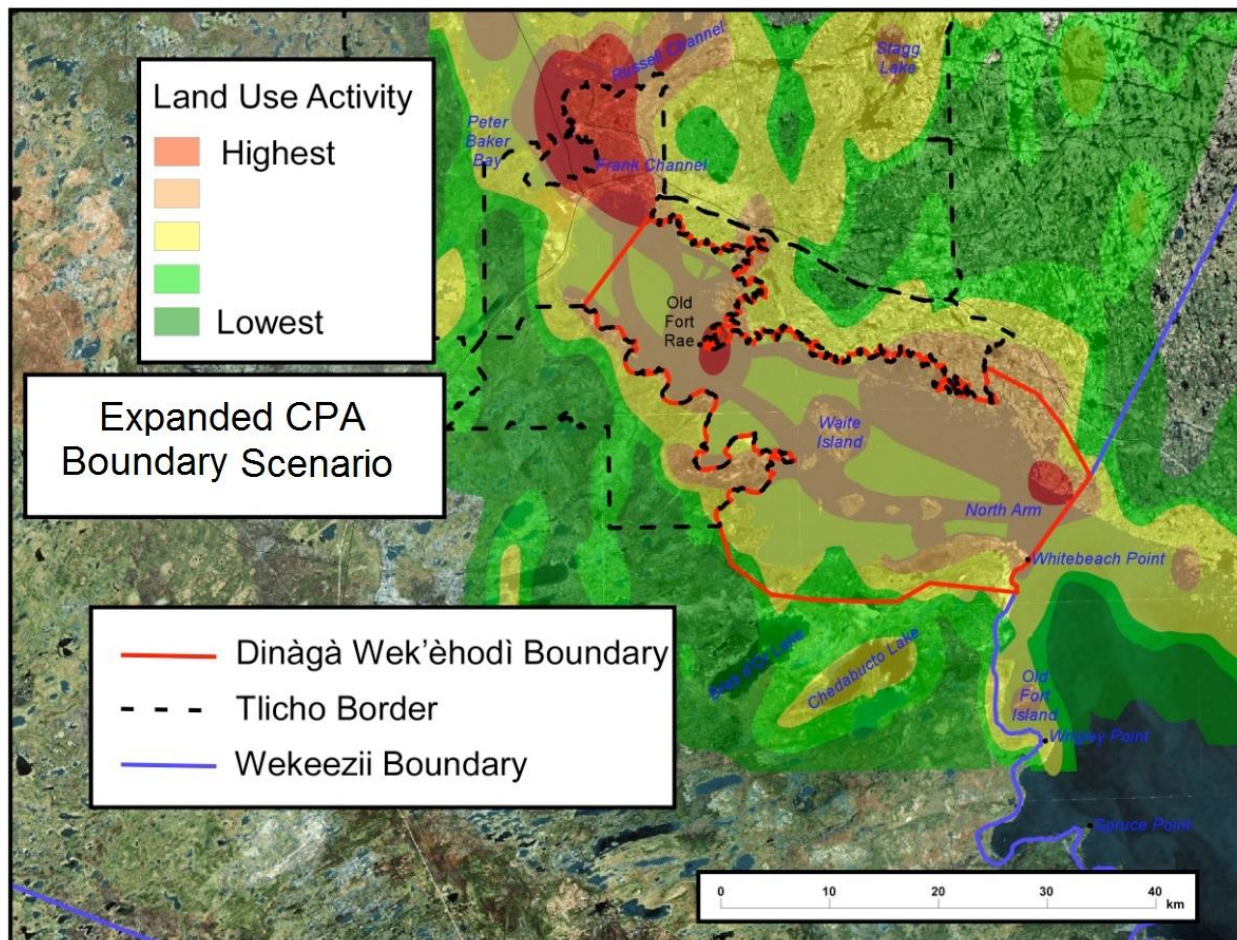
6.2.2.1 *Traditional Activities*

It is expected that residents of Behchokq would continue to use all of the land and water within the Dinàgà Wek'èhodi NWA for traditional purposes. As with the CPA Boundary Scenario, it is assumed traditional use will increase over time based on the rate of population growth in the community (0.4% year) and assuming that a high percentage of the population will continue to rely on country foods for the majority of its diet.

6.2.2.2 *Recreation*

With designation of all the land and water in the North Arm as an NWA, the levels of recreational use in the NWA are not expected to change from the current situation. Although recreational interest in the area may increase as a result of the official designation of the area as an NWA, as was assumed for the CPA Boundary Scenario, there will also be increased restrictions on these activities that will offset the increase in interest.

Figure 6-2: Dinàgà Wek'èhodi Boundary: Expanded CPA Boundary Scenario



6.2.2.3 Tourism

With formal designation of the area as a NWA, there will be increased tourist interest in the area. Tourism in the NWA is expected to increase at an annual rate of 4% per year on the assumption that tourism operators expand their operations to capitalize on the enhanced interest in the area.

6.2.2.4 Cultural Values

There will be no change in the cultural values of the area, even if all the land and water in the North Arm is designated as a NWA. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

6.2.2.5 Ecological Goods and Services

It is expected there would be no change in the range and value of ecological goods and services being provided by the land and waters in the CPA and surrounding area if the NWA boundary was based on the Expanded CPA Boundary Scenario. With no non-renewable or other resource development activities

occurring, the ecological functionality of the landscape would not be affected and any natural changes in functionality, such as forest fires, are included in the current values for the area. However, by including all the land and water in the North Arm, the extent of the landscape receiving full protection would increase.

Expanding the boundaries of the NWA to include all lands and water in would have not appear to have an observable effect on the amount of important migratory waterbird habitat that would be protected. There is no quantified information on waterbird use or activity in 95% of the additional 200 km² of land and water that would be protected and the other 5% of the incremental area is considered to be of lower importance. Table 6-3 shows the extent of important migratory waterbird areas for the Expanded CPA Boundary Scenario.

Table 6-3: Extent of Important Migratory Waterbird Areas: Expanded CPA Boundary Scenario

Activity	Area (km ²)	Percent of Total
Highest	4.6	0.6%
High	12.8	1.6%
Medium	25.5	3.2%
Lower	53.4	6.7%
Low	101.3	12.8%
Not quantified	595.7	75.1%
TOTAL	793.1	100%

In terms of wetlands, extending the boundary of the NWA to include all of the lands and water in the North Arm would result in formal protection for 0.5 km² of wetlands in addition to the wetland areas that would be protected under the CPA Boundary Scenario. Thus, the NWA under the Expanded CPA Boundary Scenario would provide formal protection of 15.8 km² of wetlands.

6.2.2.6 Existence Values for Protected Areas

As noted in Section 5.3.6, protected areas may have value for people who have an interest in seeing that areas of ecological, cultural or historical importance are protected, even if they are not currently using them for recreation or tourism. These existence values were determined to be equivalent to a one-time payment of \$42.4 million for residents of Canada. This is equivalent to an annual amount of \$1.3 million per year in perpetuity, based on a discount rate of 3%, or \$3.4 million per year, based on a discount rate of 8.0%. This number includes existence values for residents of the NWT, which are estimated to total \$46,800 or an annual amount of \$900 to \$1,400 per year, depending on the discount rate. These values are not related to the size of the park or protected area and would be the same for the Expanded CPA Boundary Scenario and the CPA Boundary Scenario.

6.2.3 Summary

Formal designation of all the land and water in the North Arm of Great Slave Lake as an NWA (the Expanded CPA Boundary Scenario) would generate the same types and values of economic benefits as the CPA Boundary Scenario. There would be no change in the use and value of activities in the additional lands and water that would be formally protected as an NWA and formal designation would result in the same existence values as the CPA Boundary Scenario. The present value of the economic benefits associated with the Expanded CPA Boundary Scenario would be \$50.4 million, based on an 8%

discount rate. The majority of these benefits (84%) relate to the non-use values for Canadians that would result from recognizing the ecological importance of the area by giving it formal designation as a NWA.

6.2.4 **Regional Socio-Economic Effects**

The Expanded CPA Boundary Scenario would result in some small changes in socio-economic conditions in Behchokq. These would include some increased employment opportunities related to changes in recreational or tourism use but these effects would be relatively small and are not likely to significantly improve economic conditions in Behchokq. However, formal designation of a larger area as an NWA under the Expanded CPA Boundary Scenario will ensure that the area can continue to be used for traditional harvests, trapping and the production of Northern arts and crafts by current and future generations.

In terms of the relative importance of the landscape, establishment of an NWA based on the Expanded CPA Boundary Scenario would formally protect 793.1 km², of which 22.0 km² (2.8% of the area) is considered to be of highest importance to the community (see Table 6-4), based on the heat map provided in Figure 2-4. When compared to the CPA Boundary Scenario, this scenario would protect an additional 1.3 km² that is known to be of highest importance to the community.

Table 6-4: Importance of Areas within an Dinàgà Wek'èhodi NWA, Expanded CPA Boundary Scenario

Importance	Colour	Area (km ²)	Percent
Highest	Red	22.0	2.8%
High	Orange	448.7	56.6%
Medium	Yellow	291.3	36.7%
Low	Green	31.1	3.9%
Lowest	Dark green	0.0	0.0%
TOTAL		793.1	100.0%

Under the Expanded CPA Boundary Scenario, the majority of the NWA (448.7 km² or 56.6%) would protect areas that are considered to be of high importance (115.8 km² more than would be protected under the CPA Boundary Scenario) and 291.3 km² or 36.7% is considered to be of medium importance (82.8 km² more than would be protected under the CPA Boundary Scenario).

6.3 ***Scenario 3: Expanded CPA Boundary Excluding All Competing Claims***

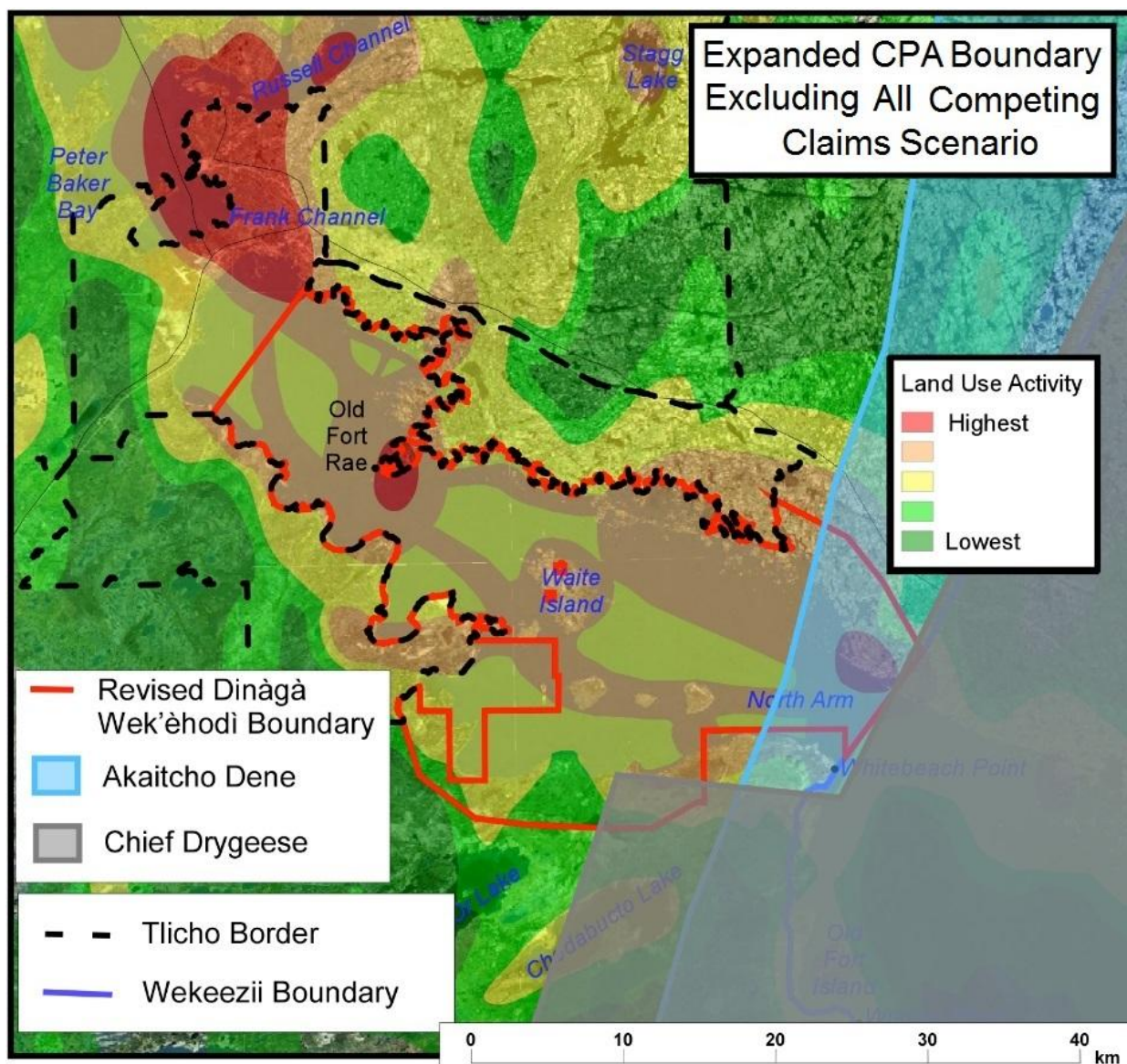
Under this boundary scenario, the boundaries of the NWA would be expanded to include Waite Island and the entire water within the North Arm of Great Slave Lake, but would exclude lands within the Chief Drygeese boundary or the Akaitcho Interim Measures Area and areas that are the subject of existing mineral claims. This scenario would increase the size of the NWA to 606.3 km²; this represents a net increase in size of about 13.1 km² when compared to the CPA Boundary Scenario. The boundaries of the Expanded CPA Boundary with Exclusion of All Competing Claims Scenario are shown in Figure 6-3.

6.3.1 **Non-Renewable Resources Development**

Establishing an NWA that covers all the lands and water in the North Arm exclude lands within the Chief Drygeese boundary or the Akaitcho Interim Measures Area and areas that are the subject of existing

mineral claims would have no effect on the non-renewable resource development of the larger area. Although parts of the competing land claims include lands that have some silica sand potential, Section 3.1.3.5 concluded that such development is unlikely given that there are other silica sand deposits in the NWT that are more likely to be developed in support of oil and gas development in the NWT. Within the NWA, it is assumed that surface resource rights would be transferred to Environment Canada, no non-renewable resource development would be permitted to occur in the NWA, and sub-surface rights may be withdrawn under the *Territorial Lands Act*.

Figure 6-3: Dinàgà Wek'èhodi Boundary: Expanded CPA Boundary Excluding All Competing Claims Scenario



6.3.2 Renewable Resources

6.3.2.1 *Traditional Activities*

It is expected that residents of Behchokq would continue to use all of the land and water area within the Dinàgà Wek'èhodi NWA for traditional purposes, regardless of how much of the area is actually designated as an NWA. As with the CPA Boundary Scenario, it is assumed the extent of traditional activities in the area will increase over time based on the rate of population growth in the community (0.4% year) and assuming that a high percentage of the population will continue to rely on country foods for the majority of its diet.

6.3.2.2 *Recreation*

Under the Expanded CPA Boundary Excluding All Competing Claims Scenario, it is expected that the levels of recreational use in the NWA will not change from the current situation. Although recreational interest in the area may increase as a result of official designation of the area as an NWA, as was assumed for the CPA Boundary Scenario, there will also be increased restrictions on these activities that are assumed to offset the increase in interest.

6.3.2.3 *Tourism*

Creating an NWA based on the CPA Boundary Excluding All Competing Claims Scenario will result in increased tourism interest in the area. Tourism in the NWA is expected to increase at an annual rate of 4% per year, but this also assumes that tourism operators expand their operations to capitalize on the enhanced interest in the area.

6.3.2.4 *Cultural Values*

There will be no change in the cultural values of the area under this boundary scenario. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

6.3.2.5 *Ecological Goods and Services*

It is expected that, if an NWA was established based on the Expanded CPA Boundary Excluding All Competing Claims Scenario, there would be no change in the range and value of ecological goods and services being provided by the land and waters in the NWA. With no non-renewable or resource development activities occurring, the ecological functionality of the landscape would not be affected and any natural changes in functionality, such as forest fires, are included in the current values for the area. However, by expanding the NWA to include all the land and water in the North Arm but exclude areas of competing land claims, there would be a net increase in the amount of the landscape receiving full protection.

With this scenario, there would be small a net loss in the amount of protected areas in the CPA considered to be of importance for migratory waterbirds (see Table 6-5). The NWA boundaries would exclude 12.7 km² of land and water in the CPA that is considered to have medium to highest importance for migratory waterbirds. However, there amount of area within the NWA for which there is no quantified information on migratory waterbirds would increase by 50.8 km².

Table 6-5: Extent of Important Migratory Waterbird Areas: Expanded CPA Boundary Excluding All Competing Claims Scenario

Activity	Area (km ²)	Percent of Total
Highest	4.6	0.7%
High	9.5	1.6%
Medium	16.2	2.7%
Lower	40.3	6.6%
Low	79.5	13.1%
Not quantified	456.4	75.3%
TOTAL	606.3	100%

In terms of wetlands, extending the boundary of the NWA to include all of the lands and water in the North Arm but excluding areas of competing land claims would result in a net reduction of about 6.7 km² in the area of wetlands that would be protected under the CPA Boundary Scenario. Thus, the NWA would provide formal protection of 8.6 km² of wetlands.

6.3.2.6 Existence Values for Protected Areas

As noted in Section 5.3.6, protected areas may have value for people who have an interest in seeing that areas of ecological, cultural or historical importance area protected but are not currently using these areas for recreation or tourism. These existence values were determined to be equivalent to a one-time payment of \$42.4 million for residents of Canada. This is equivalent to an annual amount of \$1.3 million per year in perpetuity, based on a discount rate of 3%, or \$3.4 million per year, based on a discount rate of 8.0%. This number includes existence values for residents of the NWT, which are estimated to total \$46,800 or an annual amount of \$900 to \$1,400 per year, depending on the discount rate. These values are not related to the size of the park or protected area and would be the same for the Expanded CPA Boundary Scenario Excluding All Competing Claims Scenario and the CPA Boundary Scenario.

6.3.3 Summary

Establishing an NWA based on the Expanded CPA Boundary Scenario Excluding All Competing Claims Scenario would generate the same types and values of quantifiable economic benefits as the CPA Boundary Scenario. There would be no change in the use and value of activities being supported by the additional lands and water that would be formally protected and formal designation of the area as an NWA would result in the same existence values as the CPA Boundary Scenario. The present value of the quantifiable economic benefits associated with the Expanded CPA Boundary Scenario Excluding All Competing Claims Scenario would be \$50.4 million, based on an 8% discount rate. The majority of these benefits (84%) relate to the non-use values for Canadians that would result from recognizing the ecological importance of the area by formally designating it as an NWA.

6.3.4 Regional Socio-Economic Effects

Creating an NWA based on the Expanded CPA Boundary Scenario Excluding All Competing Claims Scenario would result in some small changes in socio-economic conditions in Behchokq. These would include some increased employment and income opportunities related to changes in recreational or tourism use, but these effects would be relatively small and are not likely to significantly improve economic conditions in the Behchokq. However, formal designation of a larger area as an NWA will

ensure that the area can continue to be used for traditional harvests, trapping and the production of Northern arts and crafts by current and future generations.

In terms of the relative importance of the landscape, establishment of an NWA that includes all the lands and water in the North Arm but excludes areas of competing land claims would formally protect 606.3 km², of which 7.4 km² (1.2% of the area) is considered to be of highest importance to Behchokq (see Table 6-6), based on the heat map provided in Figure 2-4. Compared to the CPA Boundary Scenario, this scenario would protect 12.0 km² less area that is considered to be of highest importance to the community.

Table 6-6: Importance of Areas within an Dinàgà Wek'èhodi NWA, Expanded CPA Boundary Excluding All Competing Claims Scenario

Importance	Colour	Area (km ²)	Percent
Highest	Red	8.7	1.4%
High	Orange	351.4	58.0%
Medium	Yellow	219.5	36.2%
Low	Green	26.6	4.4%
Lowest	Dark green	0.0	0.0%
TOTAL		606.3	100.0%

Under the Expanded CPA Boundary Excluding All Competing Claims Scenario, the majority of the NWA (351.4 km² or 58.03%) is considered to be of high importance to the community (which is 18.5 km² more than under the CPA Boundary Scenario) and 219.5 km² or 36.2% is considered to be of medium importance (which is 11.1 km² more than under the CPA Boundary Scenario).

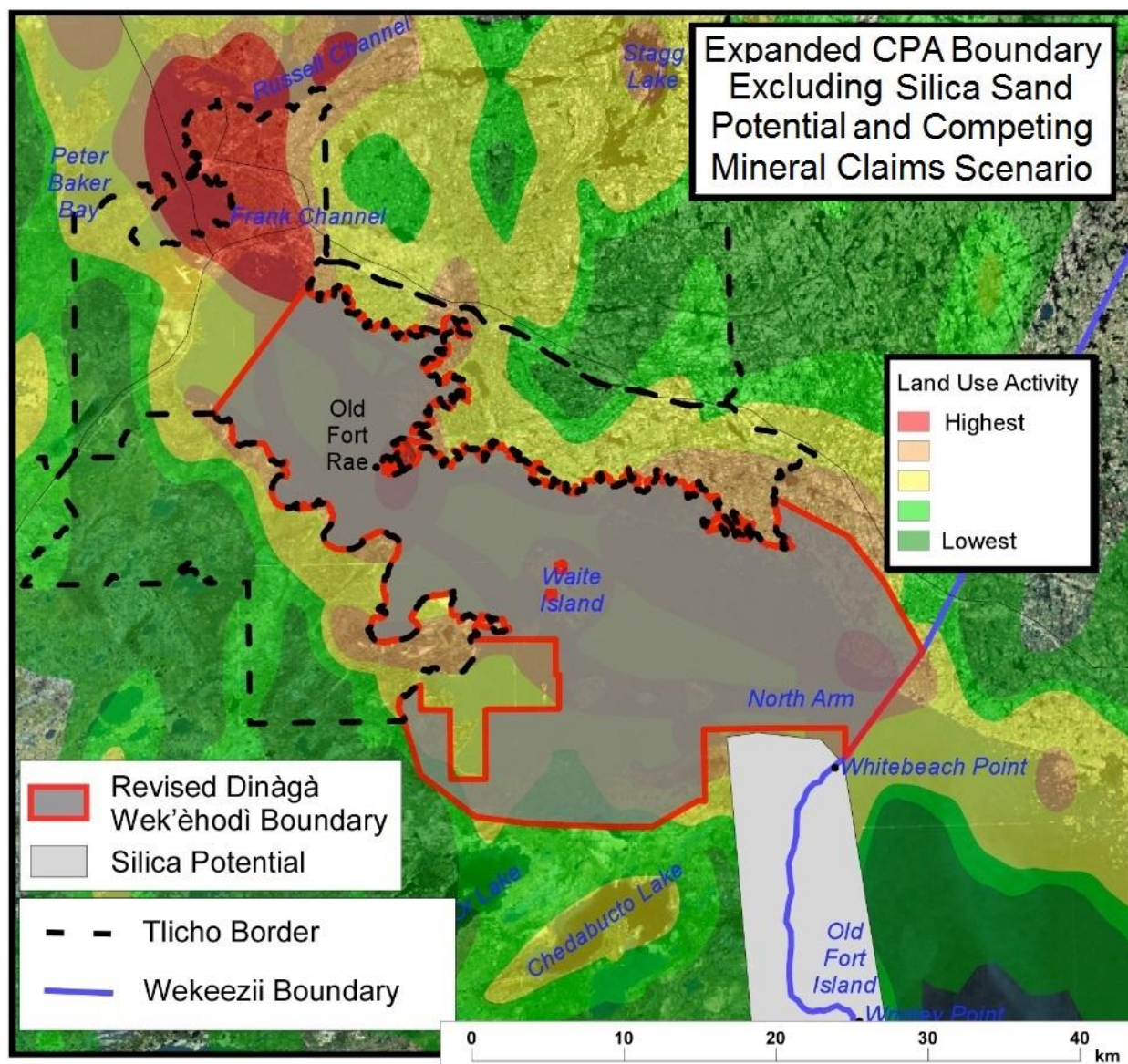
6.4 Scenario 4: Expanded CPA Excluding Areas with Silica Sand Potential and Competing Mineral Claims

This scenario would involve expanding the NWA to include Waite Island and most of the water area within the North Arm of Great Slave Lake, but would exclude portions of the area with high silica sand potential and areas that are the subject of existing mineral claims. Under this scenario, the NWA would be 703.8 km² in area. This represents a net increase in size of about 110.6 km² when compared to the CPA Boundary Scenario.

6.4.1 Non-Renewable Resources Development

If the NWA boundary based on the Expanded CPA Excluding Areas of Silica Sand Potential and Competing Mineral Claims Scenario is implemented, it is assumed that surface resource rights would be transferred to Environment Canada, no non-renewable resource development would be permitted to occur in the NWA, and sub-surface rights may be withdrawn under the *Territorial Lands Act*. Mineral development activities could occur in areas outside the NWA boundaries.

Figure 6-4: Dinàgà Wek'èhodi Boundary: Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario



6.4.2 Renewable Resources

6.4.2.1 *Traditional Activities*

It is expected that, under the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario, residents of Behchokq would continue to use all of the land and water area within the Dinàgà Wek'èhodi NWA for traditional purposes. As with the CPA Boundary Scenario, it is assumed that this use will increase over time based on the rate of population growth in the community

(0.4% year) and assuming that a high percentage of the population will continue to rely on country foods for the majority of its diet.

6.4.2.2 Recreation

With designation of most of the land and water in the North Arm as an NWA, but excluding areas with silica sands potential, the levels of recreational use in the NWA are not expected change from the current situation. Although recreational interest in the area may increase as a result of official designation of the area as an NWA, as was assumed for the CPA Boundary Scenario, there will also be increased restrictions on these activities that will offset the increase in interest.

6.4.2.3 Tourism

With formal designation of the area as an NWA, based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario, there will be increased tourism interest in the area. Tourism in the NWA is expected to increase at an annual rate of 4% per year on the assumption that tourism operators expand their operations to capitalize on the enhanced interest in the area.

6.4.2.4 Cultural Values

There will be no change in the cultural values of the area under the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario. Archaeological sites would continue to be protected under the Northwest Territories Archaeological Sites Regulations of the *Northwest Territories Act*.

6.4.2.5 Ecological Goods and Services

It is expected there would be no change in the range and value of ecological goods and services being provided by the land and waters in the CPA if an NWA were to be established based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario. With no non-renewable resource or other development activities occurring in the area, the ecological functionality of the landscape would not be affected and any natural changes in functionality, such as forest fires, are included in the current values for the area. However, by including all the land and water in the North Arm within the NWA, the extent of the landscape receiving full protection would increase.

In terms of important migratory waterbird habitat, the NWA boundary based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would protect all of the areas within the CPA that are considered to be of importance for waterbirds (see Table 6-7). While the NWA under this scenario would be 110.6 km² larger than the CPA Boundary Scenario, there is no waterbird information for the additional area that would be included in the NWA.

Table 6-7: Extent of Important Migratory Waterbird Areas: Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario

Activity	Area (km ²)	Percent of Total
Highest	4.6	0.6%
High	12.8	1.8%
Medium	25.5	3.6%
Lower	53.4	7.6%
Low	101.3	14.4%
Not quantified	506.4	71.9%
TOTAL	703.8	100%

In terms of wetlands, an NWA boundary based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would protect 13.8 km² of wetlands. This is 1.5 km² less than under the CPA Boundary Scenario.

6.4.2.6 Existence Values for Protected Areas

As noted in Section 5.3.6, protected areas may have value for people who have an interest in seeing that areas of ecological, cultural or historical importance area protected but are not currently using these areas for recreation or tourism. These existence values were determined to be equivalent to a one-time payment of \$42.4 million for residents of Canada. This is equivalent to an annual amount of \$1.3 million per year in perpetuity, based on a discount rate of 3%, or \$3.4 million per year, based on a discount rate of 8.0%. This number includes existence values for residents of the NWT, which are estimated to total \$46,800 or an annual amount of \$900 to \$1,400 per year, depending on the discount rate. These values are not related to the size of the park or protected area and would be the same for the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario and the CPA Boundary Scenario.

6.4.3 Summary

Formal designation of most of the land and water in the North Arm of Great Slave Lake as an NWA based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would generate the same types and values of quantifiable economic benefits as the CPA Boundary Scenario. There would be no change in the use and value of activities in the additional lands and water that would be formally protected and formal designation would result in the same existence values as the CPA Boundary Scenario. The present value of the quantifiable economic benefits associated with the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would be \$50.4 million, based on an 8% discount rate. The vast majority of these benefits (84%) relate to the non-use values for Canadians that would result from recognizing the ecological importance of the area by giving it formal designation as a NWA.

6.4.4 Regional Socio-Economic Effects

The establishment of an NWA based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario could result in some small changes in socio-economic conditions in Behchokq. These would include some increased employment and income opportunities related to changes in recreational or tourism use but these effects would be relatively small and are not

likely to significantly improve economic conditions in the Behchokò. However, formal designation of a larger area as an NWA will ensure that the area can continue to be used for traditional harvests, trapping and production of Northern arts and crafts by current and future generations.

In terms of the relative importance of the landscape, establishment of an NWA based on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would formally protect 703.8 km², of which 22.0 km² (3.1% of the area) is considered to be of highest importance to Behchokò (see Table 6-8), based on the heat map provided in Figure 2-4. This area is 1.3 km² larger than under the CPA Boundary Scenario.

Table 6-8: Importance of Areas within an Dinàgà Wek'èhodi NWA, Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario

Importance	Colour	Area (km ²)	Percent
Highest	Red	22.0	3.1%
High	Orange	412.8	58.7%
Medium	Yellow	238.2	33.8%
Low	Green	30.8	4.4%
Lowest	Dark green	0.0	0.0%
TOTAL		703.8	100.0%

Under the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario, the majority of the area in the NWA (412.8 km² or 58.7%) is considered to be of high importance to the community (this is 79.9km² higher than under the CPA Boundary Scenario) and 238.2 km² or 33.8% is considered to be of medium importance (this is 29.7 km² larger than under the CPA Boundary Scenario).

7.0 SUMMARY AND RECOMMENDATIONS

7.1 Summary of Results

The overall objective of this report is to provide a comparative analysis of the potential socio-economic effects of designating parts of the North Arm of Great Slave Lake as a National Wildlife Area. This report examined the potential effects of six options:

1. No formal protection of the Kwets'ootl'ää (Dinàgà Wek'èhodi) area
2. Designation of Kwets'ootl'ää (Dinàgà Wek'èhodi) as a National Wildlife Area with the boundary based on the Interim Land Withdrawal application (the CPA Boundary)

Designation of Kwets'ootl'ää (Dinàgà Wek'èhodi) as a National Wildlife Area but with modified boundaries:

1. A modified boundary that excludes areas with silica sand potential (the CPA Boundary Excluding Silica Sands Potential Scenario)
2. An expanded boundary (the Expanded CPA Boundary)
3. An expanded boundary that excludes areas of competing land claims (the Expanded CPA Boundary Excluding All Competing Claims Scenario)
4. An expanded boundary that excludes areas with silica sand potential (the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Scenario)

This section of the report summarizes the comparative advantages and disadvantages of these six options using five criteria:

- the possibility of non-renewable resource (silica sand) development
- the extent to which important migratory waterbird habitat would be protected
- the extent to which wetland areas would be protected
- the extent to which areas of importance to the community of Behchokq would be protected
- the economic value of present and future quantified benefits that would be generated by the area

The results of the analysis are summarized in Table 7-1 and are discussed in the following sections.

7.1.1 **Non-Renewable Resource Development Potential**

The possibility for non-renewable resource potential of the CPA was described in Section 3.0 of this report. The non-renewable resource potential, based on available information, was generally concluded to be low, with the highest potential being for development of the silica sand deposits on the shores of North Arm, especially near Whitebeach Point. However, based on a review of the demand and supply for silica sand in the NWT, it was concluded that development of the silica sand deposits in the CPA was unlikely in the near future because there are other silica sand deposits in the NWT that would be more favourable to develop.

Table 7-1: Potential Effects Associated with Various Boundary Scenarios for a Proposed Dinàgà Wek'èhodi National Wildlife Area

Evaluation Criteria	No Protection	Candidate Protected Area Boundary	Boundary Scenarios			
			CPA Boundary Excluding Silica Sand Potential	Expanded CPA Boundary	Expanded CPA Boundary Excluding All Competing Claims	Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims
Non-Renewable Resource Development Potential						
Silica Sand	Possible but unlikely	Prohibited	Possible but unlikely	Prohibited	Possible but unlikely	Possible but unlikely
Protection of Migratory Waterbird Habitat (km²)						
Highest	0.0	4.6	4.6	4.6	4.4	4.6
High	0.0	12.8	12.8	12.8	9.5	12.8
Medium	0.0	25.5	25.5	25.5	16.2	25.5
Low	0.0	53.4	53.4	53.4	40.3	53.4
Lowest	0.0	91.5	91.5	101.3	79.5	101.3
Not quantified	0.0	405.6	375.4	595.7	456.4	506.4
TOTAL	0.0	593.2	563.1	793.1	606.3	703.8
Protection of Wetlands (km²)						
Area protected	0.0	15.3	14.4	15.8	7.6	13.8
Protection of Areas of Importance to Behchokq (km²)						
Highest	0.0	20.7	20.7	22.0	8.7	22.0
High	0.0	332.9	318.8	448.7	351.4	412.8
Medium	0.0	208.5	192.2	291.3	219.5	238.2
Low	0.0	31.1	31.1	31.1	26.6	30.8
Lowest	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	593.2	563.1	793.1	606.3	703.8
Present Value of Economic Benefits from the Area (\$millions discounted at 8%)						
Economic Benefits	\$7.1	\$50.4	\$50.4	\$50.4	\$50.4	\$50.4

The challenges of developing the silica sand potential in the CPA include high transportation costs to shale oil and gas operations in the NWT and northern BC, mining operations would be seasonal, and there would be high costs involved in providing transportation and other infrastructure (power) to this site. Thus, modification of the boundaries to exclude areas with silica sand potential is highly unlikely to affect the likelihood that these resources would ever be developed in the near future. While establishment of an NWA would preclude any possible development of these silica sand resources, adjusting the NWA boundaries to exclude the silica sand deposits would allow silica sand development to occur but such development is considered to be unlikely, given currently available information.

7.1.2 Migratory Waterbird Habitat

As noted in Section 2.5, the Dinàgà Wek'èhodi CPA represents important migratory waterbird habitat. The area is partially situated within a BirdLife International Important Bird Areas (IBA) Program site and has been internationally recognized as an area important to migrating and breeding birds and the North Arm has been identified as a “Key Migratory Bird Terrestrial Habitat Site” that supports over 1% of the national populations of a number of migratory bird populations (CWS, 2011). The north shore of the North Arm is of particular importance for migratory waterbirds and studies undertaken by CWS suggest that about 42.9 km² of the CPA can be considered to be of medium, high or highest importance for migratory waterbirds. This represents only 7.2% of the CPA, but 22.9% of the area within the CPA that was studied by the CWS. None of this area would be protected if an NWA were not established although, in the absence of any development, migratory bird use of the area is not likely to change.

Because the importance of migratory waterbird habitat has only been quantified for a portion of the CPA, most of the boundary scenarios do not affect the total amount of medium to highest migratory waterbird habitat that would be protected by an NWA. The only exception is the Expanded CPA Boundary Excluding All Competing Claims Scenario. In this case, the NWA would protect 30.1 km² of the CPA considered to be of medium, high or highest importance for migratory waterbirds; this represents 70% of the important areas that would be protected under the other boundary scenarios.

7.1.3 Wetlands

Section 2.5.2 discussed the value of wetlands in terms of their importance in providing services such as water filtration (improves water quality), flood prevention and nursery habitat. Within the CPA there were determined to be 15.3 km² of wetlands that would be protected if an NWA were to be established based on the CPA boundaries. While none of these wetlands would be protected if an NWA were not established, the functionality of these wetlands is not anticipated to change unless there is some sort of development that affects these wetland areas.

Under the CPA Boundary Excluding Silica Sand Potential Scenario, the amount of protected wetland areas would increase to 14.4 km² while expanding NWA boundary beyond the CPA (the Expanded CPA Boundary Scenario) will increase the amount of wetlands being protected to 15.8 km². The lowest amount of protected wetland area (7.6 km²) would result under the Expanded CPA Boundary Excluding All Competing Claims Scenario while the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would result in the second lowest amount of protected wetland areas (13.8 km²).

7.1.4 Areas of Importance to Behchokq

As noted in Section 2.7, available information on traditional use and archaeological sites was combined with input from some Elders from Behchokq to develop a heat map that demonstrated the relative importance of parts of the CPA to the community. Within the CPA boundary, 352.7 km² of land and water were identified as being of high or highest importance to the community; this represents 59% of the CPA. All of these areas would be protected if an NWA were established based on the CPA Boundary Scenario and it is expected that community use of the NWA would continue as it has in the past. If an NWA were not established, these areas would not be protected, but it is unlikely that community use of the area would change unless some type of development occurs.

Under the CPA Boundary Excluding Silica Sand Potential Scenario, the area of high or highest importance to the community would drop to 339.5 km²; this represents a decrease of 13.2 km² or a 4% decrease when compared to the CPA Boundary Scenario. The Expanded CPA Boundary Scenario would include 470.7 km² of land and water considered to be of high or highest importance to Behchokq; this represents an increase of 118.0 km² or a 33% increase. While the Expanded CPA Boundary Excluding All Competing Claims Scenario would result in an overall increase in the area of high or highest importance to Behchokq (to 360.1 km²), it would also result in a major decrease in the area considered to be of highest importance to the community. Under this scenario, 8.7 km² of land and water considered to be of highest importance would be protected compared to 20.7 km² if the NWA boundary were based on the CPA Boundary Scenario. Basing the NWA boundary on the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario would see the area of high or highest importance to Behchokq increase to 434.8 km²; this represents an increase of 82.1 km² or a 23% increase from the CPA Boundary Scenario.

7.1.5 Economic Values

Section 2.6 summarized some of the economic benefits being currently being generated by the CPA. Overall, it is estimated that the Dinàgà Wek'èhodi CPA provides socio-economic benefits for the residents of Behchokq and the NWT that are in the range of \$389,500 to \$437,400 per year.

In the absence of any formal protection of the Dinàgà Wek'èhodi CPA as an NWA, it is expected that current use of the area would largely continue and that there would be a slow increase in the benefits being generated by the area due to factors like population growth and increased tourism. It is predicted that these benefits would have a present value of \$7.1 million when calculated using the recommended 8% rate of discount.

If an NWA were established, the economic benefits are expected to increase substantially, to a present value of about \$50.4 million. The large increase is due to capturing what are termed “non-use values”. These non-use values reflect what Canadian households would be willing to protect areas of ecological importance. Studies of willingness to pay for establishing new national parks in the NWT found that Canadian households were willing to pay an average of \$5.90 to create a new national park. Based on the number of Canadian households in 2011 and assuming that creation of an NWA is equivalent to creating a national park, total Canadian willingness to pay to establish a Dinàgà Wek'èhodi NWA would amount to a one-time payment of \$42.4 million. This number includes existence values for residents of the NWT, which are estimated to total \$46,800 or an annual amount of \$900 to \$1,400 per year, depending on the discount rate. These values are not related to the size of the park or protected area so would be the same regardless of which boundary scenario is selected.

7.1.6 Summary

Using these five evaluation criteria, it is possible to score and rank the various boundary scenarios being proposed for a proposed Dinàgà Wek'èhodi National Wildlife Area. For purposes of comparison, each boundary scenario was ranked in terms of how well it addressed each of the five criteria, with a ranking of “5” being given to the scenario that best achieved the criterion and a “0” if the boundary scenario completely failed to address the criterion. For some criteria, such as economic benefits, where all the boundary scenarios had the same outcome, each was assigned the same ranking. For non-renewable resource development, a score of “3” was assigned to all the options that would allow silica sand development (this score was given because such development was concluded to be possible but not likely) and a “0” was assigned to those options where silica sand development would be precluded. Total scores were calculated for each boundary scenario by adding the scores for each criterion, and treating each criterion equally (i.e. the criteria were each given equal weight). The boundary scenario with the total highest score was considered the best of the alternatives in terms of achieving the five criteria. The results of the ranking and scoring are shown in Table 7-2.

Table 7-2: Scores and Ranking of Potential Boundary Scenarios for a Proposed Dinàgà Wek'èhodi National Wildlife Area

Evaluation Criteria	No Protection	Candidate Protected Area Boundary	Boundary Scenarios			
			CPA Boundary Excluding Silica Sand Potential	Expanded CPA Boundary	Expanded CPA Boundary Excluding All Competing Claims	Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims
Non-renewable Resource Development	3	0	3	0	3	3
Protection of Migratory Waterbird Habitat	0	5	5	5	3	5
Protection of Wetlands	0	4	3	5	1	2
Protection of Areas of Importance to Behchokq	0	3	1	5	2	4
Economic Benefits	2	5	5	5	5	5
TOTAL	5	17	17	20	14	19

The results show that, based on this scoring and assigning equal weight to each criterion, the Expanded CPA Boundary Scenario, with no exclusions for silica sand potential or competing claims, had the highest total score. This is consistent with the observation that this boundary scenario would protect the largest

area and could therefore be assumed to offer the highest level of protection for migratory waterbird habitat, wetlands, and areas of importance to Behchokq.

The second preferred scenario would be the Expanded CPA Boundary Excluding Silica Sand Potential and Competing Mineral Claims Scenario. This scenario would result in an NWA that is slightly smaller than the Expanded CPA Boundary Scenario but would allow development of the silica sand resources to occur. Of all the scenarios, this ranks second highest in terms of protection areas of importance to Behchokq, but ranks fourth in terms of protection of wetlands. The results suggest that expansion of the CPA boundaries to include Waite Island and the entire water within the North Arm of Great Slave Lake would generate benefits that would more than offset the land area that would be excluded from the CPA for purposes of potential silica sand development.

The results of the assessment indicate that the scenarios where the NWA boundary would be based on the CPA Boundary or where the NWA boundary would be based on the CPA boundary but exclude areas of silica sand potential would each have the third highest score. While the CPA Boundary Excluding Silica Sand Potential Scenario has a higher score for allowing potential development of the silica sands, it ranks lowest in terms of protecting areas of importance to Behchokq and was third best in terms of protecting wetlands. In contrast, a CPA boundary based on the NWA boundary would completely preclude silica sand development, but would be second best in terms of protecting wetlands but third best in terms of protecting areas of importance to Behchokq.

The Expanded CPA Boundary Excluding All Competing Claims Scenario had the next highest score. Some of the areas that would be excluded from the NWA under this scenario are of very high importance to Behchokq and include some important migratory waterbird habitat and wetlands.

The no protection scenario had the lowest score of all the scenarios. Without NWA designation, none of the criteria related to protecting wetlands, migratory waterbird habitat or areas of importance to the community would be achieved. In addition, the potential increase in economic benefits that would be associated with designating all or parts of the area as an NWA would more than outweigh any of the potential benefits associated with possible non-renewable resource development in the area.

7.1.7 Regional Socio-Economic Effects

The terms of reference for this study called for an assessment of the potential socio-economic effects that designation of all or parts of Dinàgà Wek'èhodi as an NWA would have on the surrounding communities (Behchokq), the Wek'èezhii (resource management) area, the entire NWT and for Canada. Based on the available information, it is very difficult to demonstrate that there would be significant socio-economic changes or effects on any constituent group.

Given that available information suggests that development of non-renewable resources (include silica sands) may not occur in the foreseeable future, it is unlikely that existing land and resource uses in the area would change regardless of whether all or parts of the area are designated as an NWA. As noted for all boundary scenarios, it is expected that residents of Behchokq would continue to use the land and water areas within the Dinàgà Wek'èhodi CPA for traditional purposes. There would also be no change in the cultural values of the area because archaeological sites are protected by legislation. And, while designation of the area as an NWA may generate some increased interest in visiting the area for recreational purposes, actual recreational use of the area would be limited by restrictions placed on recreational activities within an NWA.

The greatest potential for changes in socio-economic effects would be associated with the possible increase in tourism that would result from formal designation of the area as an NWA. This could generate some increased employment and income opportunities in businesses that provide goods and services for tourism. These incremental employment and income benefits are expected to be relatively small, however, and will depend on the ability of residents and businesses in Behchokq to capitalize on the opportunities that designation of the area as an NWA may provide, assuming that these uses are consistent with the management plan. Even so, designation of the area is not expected to significantly improve economic conditions in the community. Compared to the remainder of the NWT, Behchokq will continue to have below average participation in the labour force, above average rates of unemployment, and average family incomes are expected to remain relatively low. Formal designation of the area as an NWA will continue to allow residents of Behchokq to use the area as a source of country foods, trapping and the production of Northern arts and crafts.

7.1.8 Discussion

The results in Table 7-2 reflect the range of evaluation criteria being considered, the scores assigned to each scenario, and the assumption that each criterion was given equal weights. Slightly different outcomes might arise if different weights were applied to the different criteria or if additional criteria were used to evaluate the scenarios. Nevertheless, two general conclusions can be drawn from the analysis:

1. Larger protected areas will best achieve the five criteria. The boundary scenarios that would protect the largest areas of land and water tend to do a better job of protecting areas of importance to Behchokq and protecting wetlands and migratory waterbird habitat. In addition, the losses in values that might occur as a result of adopting boundaries that exclude areas with silica sand potential could be more than offset by expanding the NWA boundaries to include Waite Island and the entire water within the North Arm of Great Slave Lake.
2. If the NWA boundary is not expanded beyond the CPA boundaries, there is no clear conclusion about whether areas having silica sand deposits should be excluded from the NWA. While excluding areas with silica sands would potentially allow development of these resources to occur, this option ranks lowest in terms of protecting areas of importance to Behchokq. Conversely, the best option for protecting areas of importance to Behchokq would be to establish NWA boundaries that would preclude development of the silica sands, thereby losing any potential benefits that might arise if silica sand development were to ultimately prove viable. Thus, if expansion of the NWA beyond the CPA boundaries does not occur, the selection of an appropriate boundary will ultimately depend on whether silica sand development will ever occur. Available information suggests such development is unlikely.

7.2 Uncertainties and Issues

There are many uncertainties inherent in undertaking this type of analysis. To begin, the assessment of the benefits that residents of Behchokq, Yellowknife and the Tłı̄chq Region and the NWT derive from the Dinàgà Wek'èhodi CPA relies on information about renewable resource use and values that is known to be incomplete, especially in terms of actual use of the area. In addition, there is even less information about the spatial distribution of these activities within the Dinàgà Wek'èhodi CPA. Despite these

problems, this analysis has used whatever information is available to describe the use and value of the Dinàgà Wek'èhodi CPA. The heat map that was developed to show areas of high use and importance to the community was prepared using available information from the Tłı̄chǫ Government and was validated through discussions with the community and is believed to provide a reasonably reliable description of spatial information.

The second challenge is to develop reasonable non-renewable resource development scenarios given the uncertainties related to the extent of economically developable resources in the area as well as the range of complex factors that will determine if and when such development actually occurs. The assessment of non-renewable resource development presented in Section 3.0 represents a best guess based on available information. This information suggests that silica sand development at Whitebeach Point is highly unlikely because there appear to be multiple other sources of silica sand that are located nearer shale oil and gas deposits in the NWT and northern BC and these other sources will be less expensive to develop. While demand and supply conditions for silica sands may change over the longer term, development of the silica sand resources in the CPA is still considered to be highly unlikely in the foreseeable future.

A third challenge is to look forward and describe the extent to which the Dinàgà Wek'èhodi CPA will continue to provide benefits for residents of Behchokǫ and the surrounding region. Climate change may result in long-term changes in the landscape, the range and distribution of plants and animals, biological productivity, and the incidence of fire. Changes in any of these could affect the ability of Dinàgà Wek'èhodi to continue to support the residents of Behchokǫ as it has in the past. However, demographic changes in the community will also affect future use of the Dinàgà Wek'èhodi CPA. Future levels of use will depend on whether the current generation continues to participate in the traditional and cultural use of the landscape to the same extent as their parents or their grandparents, and whether they pass these interests on to future generations. It is challenging to even speculate on what the future will bring, but all or partial protection of the Dinàgà Wek'èhodi CPA would at least provide current and future residents of Behchokǫ with the option of participating in these activities, whereas opening the area to development may preclude or impair these opportunities.

There is no easy way to address these methodological issues and information gaps. The only approach involves clearly laying out all of the assumptions and data sources used in the analysis so that the readers can fully understand the strengths, weaknesses, and implications of the study and its findings so that they can draw their own conclusions about the future of the Dinàgà Wek'èhodi CPA.

REFERENCES

- AMEC, 2012. Phase 1 Socio-Economic Assessment of the Kwets'ootl'àà Candidate Protected Area. Available at:
- Canadian Silica Products. 2011. Frac Sand and Aggregates. Available at:
<http://laprairiegroup.com/companies/canadian-silica-industries/>
- Canadian Wildlife Services. 2011. Ecological Assessment of the Kwets'ootl'àà Candidate Protected Area: Phase II. Canadian Wildlife Service, Yellowknife, NT. Available at:
<http://www.nwtpas.ca/area-kwetsootlaa.asp>
- Hayes, B.J.R. 2011. Regional Characterization of Shale Gas and Shale Oil Potential, Northwest Territories. Northwest Territories GeoScience Office, NWT Open File 2011-08. Available at:
http://www.nwtgeoscience.ca/services/new_publications.html
- Legat, Allice. 2012. New Research and Documentation Relating to Kwets'ootl'àà. Prepared for Indian and Northern Affairs Canada in collaboration with the Lands Protection Department and the Tłìchq Knowledge Research and Monitoring Division of the Tłìchq Government.
- Levson, V. L. Pyle and M. Fournier. 2012. Identification of Potential Silica Sand Deposits in the Northwest Territories. Northwest Territories GeoScience Office, NWT Open File 2012-06. Available at: <http://gateway.nwtgeoscience.ca/>
- Natural Resources Conservation Board. 2000. Decision Report - United Industrial Services Ltd. - Silica Mine dated July 6, 2000. Available at: <http://www.nrcb.gov.ab.ca/nrp/Decisions.aspx?id=169>
- North Slave Métis Alliance. 2012. Executive Summary: Documentation of North Slave Métis Culturally Important Areas Within the North Arm of Great Slave Lake. Available at:
<http://www.nwtpas.ca/area-kwetsootlaa.asp>
- Northwest Territories Bureau of Statistics. 2012. Behchokò (Rae-Edzo) - Statistical Profile. Available at:
<http://www.statsnwt.ca/community-data/infrastructure/Behchokò.html>
- Northwest Territories Industry Tourism and Investment. 2011. Tourism 2015 New Directions for a Spectacular Future. Available at: <http://www.iti.gov.nt.ca/publications/index.shtml>
- Northwest Territories Protected Areas Strategy. 2011. Dinàgà Wek'èhodi (formerly Kwets'ootl'àà). Available at: <http://www.nwtpas.ca/area-dinagawekehodi.asp>
- Northwest Territories Tourism. 2012. Marketing Plan 2012-13. Available at:
<http://www.iti.gov.nt.ca/publications/index.shtml>
- Rollins K. S., C. Gunning-Trant and A. J. Lyke. 1997. Estimating Existence Values of Four Proposed Parks Sites in the Northwest Territories. Report to Parks Canada, Canadian Heritage, Hull, Quebec.
- SENES Consultants Limited. 2011 Renewable Resource Assessment for the Kwets'ootl'àà (North Arm of Great Slave Lake) Candidate Protected Area. Prepared for Indian and Northern Affairs Canada. Available at: <http://www.nwtpas.ca/area-kwetsootlaa.asp>

Silica North Resources Ltd. 2011. Silica North Resources Ltd. Announces Status of Its Frac Sand Project to Supply the Horn River Basin. Available at: <http://www.marketwire.com/press-release/silica-north-resources-ltd-announces-status-its-frac-sand-project-supply-horn-river-1594925.htm>

Wardrop. 2011b. Technical Report and Preliminary Economic Assessment of the Nondo Project, Northern NC. A Report to Stikine Energy Corp. Available at: <http://www.stikineenergy.com/i/misc/1192020100-REP-R0001-04-Nonda-Project-PEA-FINAL-1.jpg>

Wardrop. 2011b. Technical Report and Preliminary Economic Assessment of the Angus Project, Northern BC. A Report to Stikine Energy Corp. Available at: <http://www.stikineenergy.com/i/misc/2011-Angus-Project-PEA-FINAL-1.jpg>

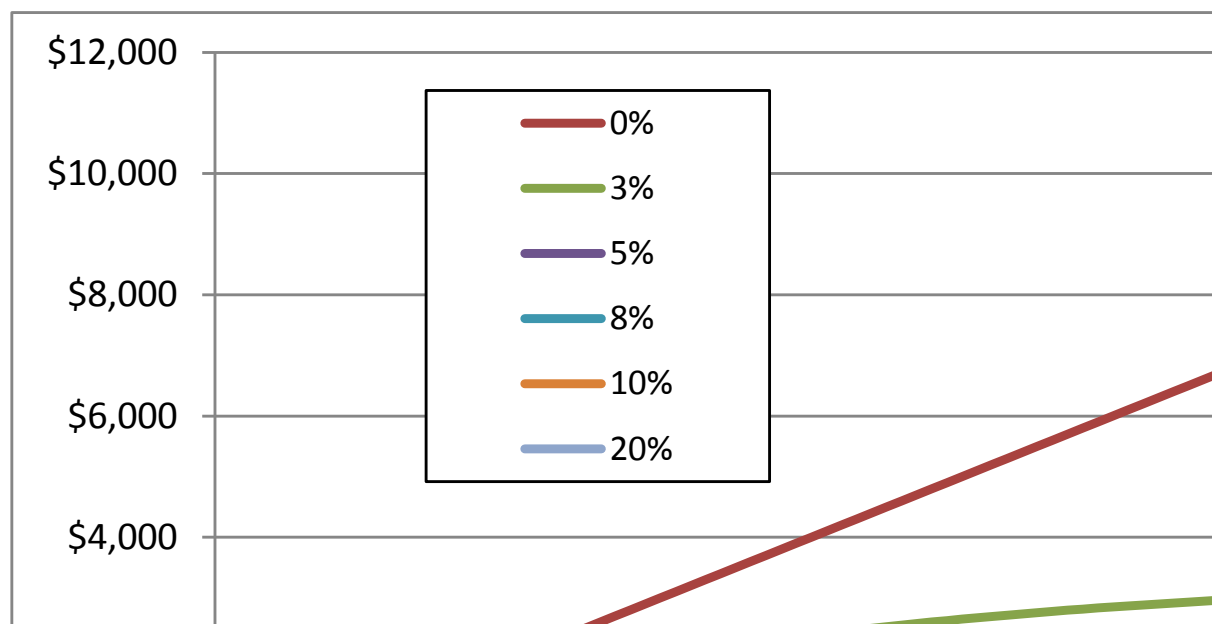
Watson, D M. 2013. Non-Renewable Resource Assessment (Minerals): Kwets'ootl'àà Candidate Protected Area, NTS 085J, 085K. NWT Open File 2013-02.

APPENDIX A: WHAT IS DISCOUNTING?

One of the challenges facing decision-makers or investors is how benefits and costs that may occur at different times in the future can be effectively compared to each other. How does an investment that offers a lot of money 20 years from now compare to another investment that offers smaller amounts of money steadily over the next 20 years? To address this issue, economists use the concept of net present value or PV. This concept is based on the idea that a dollar today is worth more than a dollar one or more years from now, regardless of inflation. This reflects the idea that there is some risk and uncertainty as to whether that future dollar will ever be received. Thus, future values are discounted to give a current dollar equivalent.

The question then becomes how much less is a dollar tomorrow compared to a dollar today? In financial terms, the answer relates to how much interest you would have to get in order not to spend the dollar now but to wait for a year. So if banks are offering a 3.0% interest rate, it means that \$1.00 today would be the same as \$1.03 a year from now or alternatively, \$1.00 a year from now would be worth \$0.97 today. The farther into the future, the more heavily the value the dollar is discounted. For 3.0% discount rate, a payment of \$1.00 five years from now would currently be worth \$0.86. One dollar 10 years from now would have a net present value of \$0.74. The higher the discount rate, the more heavily future values are discounted. Current direction from the Treasury Board of Canada suggests that public sector investments should be evaluated using a discount rate of 8.0%, but also at 3.0% for sensitivity analysis. For private sector investments, investors often use discount rates of 15% or greater

The effects of discounting can be shown in the chart below.



The graph shows the accumulating net present value of receiving \$100 per year over 100 years. For the undiscounted case (0%) the graph shows that the cumulative value would amount to \$10,000. For a 3.0% discount rate the net present value would amount to \$3260. For a 7.0% discount rate the net present value

would be \$1530. The graph also shows that past 50 years in the future, the net present value changes relatively little depending on a discount rate. For example, in year 50, the net present value at 3.0% will be 82% of its total value in 100 years while at 5.0%, the net present value in year 50 will be 92% of its total value in 100 years. Thus, in economic terms, any values beyond 50 years will have very little effect on the net present value, meaning that it is unnecessary to develop forecasts of much longer than 50 years.