

**SOCIO-ECONOMIC ANALYSIS FOR
CUMBERLAND SOUND BELUGA**

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1.0 INTRODUCTION

Socio-economic (SE) analysis is required at several stages in the *Species at Risk Act (SARA)* decision-making process. Stages in *SARA* decision-making can be broadly categorized into pre-listing and post-listing. The first level or tier of SE analysis occurs at the pre-listing stage where SE analysis contributes to the decision of whether listing should occur. This report represents a first tier of SE analysis and as such is intended to assist decision-makers in determining whether to list Cumberland Sound Belugas as a 'threatened' species under *SARA*. Also, should there be a decision to list this SE analysis is intended to provide a base (the first tier) of socio-economic information and analysis to support Federal Regulatory policy requirements, future SE assessments and decisions during development of recovery strategies, recovery action plans and management plans.

The first stage of this SE analysis involved a scoping exercise to identify and characterize the potential socio-economic impacts resulting from listing the Cumberland Sound beluga population as threatened, as well as propose a framework and methods for conducting the first tier SE analysis (hereinafter referred to as "the Scoping Stage"). The results of the Scoping Stage were documented in a draft report entitled "Outline/Scoping Report, Socio-Economic Analysis for Cumberland Sound Beluga, October 22, 2009", under separate cover.

1.1 Overview

This first tier SE analysis examines the benefits and costs associated with three possible listing scenarios relative to a baseline scenario. Four impact categories were considered in the assessment: Inuit food harvesting; non-use/passive values; beluga population recovery management actions; and consultation with Inuit organizations and agencies. Incremental changes to each of the four impact categories during the recovery and post recovery periods, under the three Listing Scenarios, are described in both qualitative and quantitative terms.

Values associated with Inuit food harvesting were developed using a replacement cost model to estimate the economic value of Cumberland Sound beluga as a source of food for Pangnirtung Inuit. The economic value is based upon literature concerning live and edible beluga weights, Canadian government statistics regarding nutrient values and retail food costs, and discussions with Nunavut Inuit regarding beluga consumption patterns. Social and cultural values associated with beluga harvesting and consumption have not been quantified in this SE analysis. Non-use/passive values are based upon a review of relevant literature concerning societal willing-to-pay for government recovery actions for *SARA* listed species. Preliminary values for recovery management actions are based upon actual DFO costs associated with a 2009 Cumberland Sound beluga population survey, while values for consultation costs are based upon estimates of staff time, travel costs and numbers of meetings, developed in consultation with DFO representatives.

The benefits and costs of the three Listing Scenarios, relative to the baseline scenario, were analyzed over a twenty-year impact policy period, using an inflation rate of 1% and a discount rate of 3%. The analysis indicates that when non-use/passive values are excluded from the analysis, the baseline scenario (ΣPV \$2.6 million) has a more favourable benefit cost outcome than any of the three Listing Scenarios considered (ranging from ΣPV -\$0.71 million to ΣPV \$2.33 million). The inclusion of relatively modest non-use/passive values (ranging from ΣPV -\$0.36 to \$3.42 million) results in any of the three Listing Scenarios having a benefit cost outcome equal to or greater than the baseline scenario.

1.2 Background and Context

1.2.1 Current Status of Cumberland Sound Belugas

Cumberland Sound Belugas are one of seven recognized populations in Canada and one of four which are considered endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).¹ The Cumberland Sound population was previously grouped with the South Baffin Island population and designated Endangered in April of 1990. This group was disaggregated in May 2004 with the South Baffin Island stock included in the Western Hudson Bay and the Cumberland Sound stock recognized as a distinct population. That same year the Cumberland Sound population was re-examined and designated as Threatened. The Federal government received the COSEWIC assessment of Cumberland Sound belugas in November of 2005; however the Governor in Council, in August of 2006, decided to not list in order to further consult with the Nunavut Wildlife Management Board and to allow for further consideration of the views of Inuit.

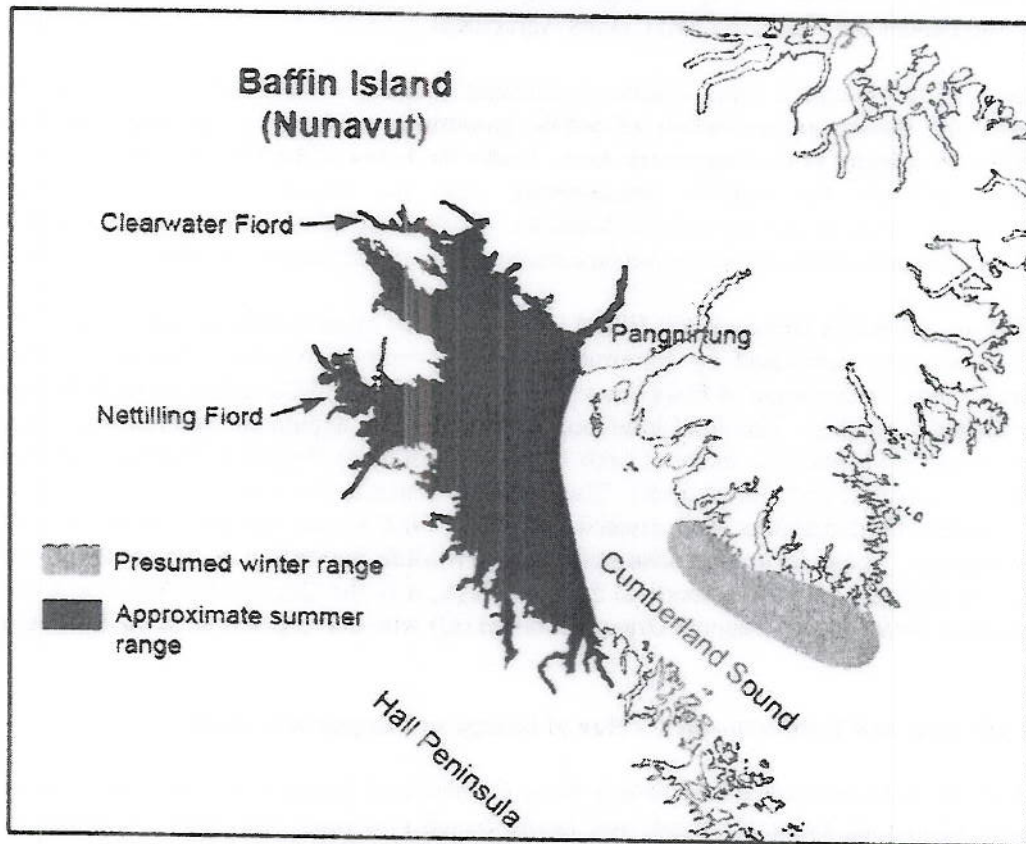
Cumberland Sound belugas are thought to spend their entire life cycle in the Cumberland Sound area (see Figure 1). They mostly occupy the western side of the sound in spring and autumn, with Clearwater Fiord and adjacent bays considered to be the most important summer habitat. In late autumn they move to the centre of the sound and then move to the eastern side of the mouth of Cumberland Sound during early winter (DFO 2002). The entire area inhabited by the Cumberland Sound population is situated within the Nunavut Land Claims Agreement Settlement Area.

Commercial hunting of beluga was carried out by the Hudson Bay Company until the 1940's and then by residents of Pangnirtung until approximately 1964 (DFO 1989, 2005). During the period from 1948 through 1964, the combined commercial and domestic food harvest averaged 202 animals/year. The only harvest since 1970 has been for domestic food purposes. From 1969 until 1980, the Inuit residents of the community of Pangnirtung attempted to self-regulate the food harvest to 40 animals per year. Apparently they were not as successful as they had hoped (average annual harvest during the period was 61 animals) and in 1980 government imposed an annual quota of 40 animals/year. During the period from 1980 through 1987, the average annual harvest was 40 (range 26-45) (DFO, 1989). From 1992 to 2002, the annual quota was 35 animals and the average annual harvest was 36.5 (1992-2001).² DFO and the Nunavut Wildlife Management Board authorized an increase in the quota in 2002 from 35 to 41 animals, as part of a community-based management system (DFO 2002).

¹ The other three are: Eastern Hudson Bay, Ungava Bay and the St. Lawrence River Estuary. DFO, 2005. Recovery Potential Assessment of Cumberland Sound, Ungava Bay, Eastern Hudson Bay and St. Lawrence beluga populations (*Delphinapterus leucas*). DFO Can. Sci. Advis. Sec. Advis. Rep. 2005/036.

² This quota predates the Nunavut Land Claims Agreement. However Article 5.6.4 of that agreement stipulates that any restrictions or quotas on the amount of wildlife that may be harvested that was in force prior to the date of the agreement would be deemed to have been established by the Nunavut Wildlife Management Board.

FIGURE 1: Seasonal Range of Cumberland Sound Beluga



The historical, pre-commercial whaling population size of the Cumberland Sound population has been estimated at 8,465 (S.E. = 426). Beluga numbers were estimated to be in the low hundreds in the early 1980's, which lead to the establishment of the quota system (DFO 2005). In 1999 the population was reported as 1,960 (S.E.=250) animals (DFO, 2002, 2005). A Bayesian model estimated the 2002 population size at 2,018 animals (95% C.L. 1,553-2,623), or 24% of the estimated historical population size. The population is estimated to be on an increasing trend under the current quota-regulated local domestic food harvest levels (DFO, 2005).

1.2.2 Current Management and Regulatory Environment

The Cumberland Sound beluga population is situated within the boundaries of the Nunavut Land Claims Settlement area where Nunavut Inuit have defined Treaty and Aboriginal rights to wildlife, including marine mammals. Under current conditions, Inuit beneficiaries recognized

under the Nunavut Land Claims Agreement are the only persons allowed to harvest beluga for food purposes from the Cumberland Sound population. Since 2002, the annual quota, which was authorized by DFO and the Nunavut Wildlife Management Board, has been 41 animals/year. Allocation of the quota amongst Pangnirtung Inuit is determined by the Pangnirtung HTO, established under the Nunavut Land Claims Agreement.

Article 5 of the Nunavut Land Claims Agreement (NLCA) established the Nunavut Wildlife Management Board, an institution of public government, which is the main instrument of wildlife management in the Settlement Area. Under the terms of the NLCA, Government retains ultimate authority for wildlife management, with the Board making recommendations concerning wildlife to the appropriate Minister. In the case of marine mammals, the Nunavut Wildlife Management Board makes recommendations to the Minister of Fisheries and Oceans.

The Nunavut Wildlife Management Board is composed of eight members and a chair.³ Four of the members are nominated by government (Government of Nunavut, Indian and Northern Affairs Canada, Department of Fisheries and Oceans Canada, and Canadian Wildlife Services for Environment Canada). The four Inuit board members are appointed by Nunavut Tunngavik Incorporated (NTI) and one member each from the three Inuit Regional Wildlife Organizations (Kitikmeot, Kivalliq and Qikiqtaaluk). The Board co-ordinates its activities with the 27 Hunters and Trappers Organizations also created under the NLCA and the three Regional Wildlife Organizations. These latter organizations oversee wildlife harvesting at the local and regional levels. In the case of the Cumberland Sound beluga, it is the Qikiqtaaluk Wildlife Board and Pangnirtung Hunters and Trappers Organization (HTO) who are responsible at the local level.

1.2.3 Historic and Contemporary Value of Beluga to Pangnirtung Inuit

The harvest and consumption of beluga from Cumberland Sound has since time immemorial provided economic, cultural, social, and health benefits to Inuit individuals, families and the community at large. In the decade prior to beluga harvests being regulated, Pangnirtung Inuit harvested between 26 and 178 animals/year for food purposes during the 1970's (DFO, 1989). Beluga whales have and continue to be an important source of nutrition for both humans and dogs in the community. Since 1980, the Pangnirtung Inuit beluga food harvest has been regulated (≤ 41 animals). Typically between 21 and 26 hunters engage in beluga harvesting activities each year (Nunavut Wildlife Management Board, 2004). Beluga harvesting activity provides opportunities for intergenerational promotion and transfer of traditional knowledge, traditional harvesting skills, social organization and sharing norms and patterns, and preservation of cultural identity.⁴

³ There are also two alternate members appointed by Makivik Corporation who represent the Inuit of Nunavik (northern Quebec) when the board discusses issues relating to the overlap Areas of Equal Use and Opportunity shared by Nunavut and Nunavik Inuit.

⁴ See for example, Nobuhiro Kishigami, N. 2008. A Cultural Anthropological Study of Subsistence Activities with Special Focus on Indigenous Hunting, Fishing and Gathering in the Arctic Regions, National Museum of Ethnology, Osaka, Japan. http://www.minpaku.ac.jp/staff/kishigami/subsistence_paper.pdf.

2.0 SE ANALYSIS FRAMEWORK

2.1 Recovery Targets, Strategies and Recovery Periods

The target recovery population for the Cumberland Sound beluga population has been set at 5,926 animals. This target represents 70% of the historical, pre-commercial whaling population (8,465 animals) and is considered by DFO to be consistent with patterns of natural variability for many species with life histories characteristics of cetaceans. The criterion of 70% is thought to reflect the characteristics of the beluga population when it was "healthy", i.e. it's state prior to the period when commercial harvesting occurred. (DFO, 2005).

The recovery potential assessment conducted by DFO explored three recovery options (DFO, 2005) and concluded that:

- (1) complete closure of the current Aboriginal food harvest quota of 41 animals/year would result in the recovery population target being realized in about 40 years.
- (2) reduction of the food harvest level by approximately 50% or to 20 animals/year would result in the recovery population target being realized in about 55 years.
- (3) maintaining the current food harvest quota of 41 animals/year would result in the recovery target being realized in about 90 years.

2.2 Baseline and Listing Scenarios

The baseline scenario for this SE Analysis is the status quo of an annual quota limit for Pangnirtung Inuit of 41 animals/year for food purposes. The three listing scenarios evaluated in this SE analysis are:

Listing Scenario #1: complete closure of the current food harvest quota for a period of forty (40) years.

Listing Scenario #2: reduction of current food harvest quota from 41 to 20 animals per year for a period of fifty-five (55) years.

Listing Scenario #3: maintaining the current food harvest quota of 41 animals per year for a period of ninety (90) years.

2.3 Impact Categories

The four impact categories identified at the Scoping Stage are:⁵

- Inuit food harvesting
- Non-use/passive values
- Recovery management actions⁶
- Consultation

2.3.1 Inuit Food Harvesting

The harvest of Cumberland Sound belugas by Pangnirtung Inuit provides hunters, families, and the community at large with a substantial quantity of food which is used for both human consumption and to some extent as dog feed. In addition to the income-in-kind value of beluga, the combined experience of hunting, processing and sharing of the beluga promotes the expression of Inuit culture and contributes to the preservation and continuation of traditional knowledge, land based skills, and community social organization. A decrease in the beluga quota as proposed under Listing Scenarios #1 or #2 would have economic, as well as socio-cultural impacts on Pangnirtung Inuit.

2.3.2 Non-Use/Passive Values

Non-use or passive use refers to the service provided by natural resources, such as wildlife, to people that will likely not visit, contact or otherwise use the resource, but which nonetheless hold aesthetic and intrinsic value to people because there is appreciation in simply knowing that the natural resource exists. The two principle values usually included in non-use/passive values are existence value, the value of knowing something exists even if it never be used or seen, and bequest value, the value of leaving something behind for the next generation (see Moran and Pearce, 1994; Freeman, 2003).

Inclusion of non-use/passive values in the socio-economic assessment of government legislative and policy proposals directed at species at risk protection is becoming more widely accepted, although the methods for determining economic values and their use in benefit/cost analysis are by no means broadly accepted. In Canada, the *SARA* recognizes that inherent values concerning wildlife are important to Canadians.⁷ In recent years DFO has contributed to research on non-

⁵ Under the current regulatory regime, commercial and recreational/sport harvesting of beluga is not permitted. Therefore, neither of these activities is considered in this SE analysis.

⁶ In the scoping/outline report this category was identified as population monitoring. The scope of actions has been broadened to include all recovery management actions, of which population monitoring is a component.

⁷ "...wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons."

use/passive valuation of species at risk being considered for listing under *SARA* (see for example Rudd, 2007 and Olar et.al., 2007).

In the context of government proposals to protect species at risk, the approach used most frequently is the stated-preference valuation method that quantifies citizens' willingness to pay (WTP) for the costs associated with protection measures (see for example Moran and Pearce, 1994; Freeman, 2003; Rudd, 2007; Olar et.al., 2007; Lew, 2009). The proposal to include non-use/passive values at the Scoping Stage was supported and thus this impact category is examined in this SE analysis.

2.3.3 Recovery Management Actions

Clause 37 of *SARA* requires that the relevant Minister(s) prepare a "recovery strategy" for any species listed as extirpated, endangered or threatened. In the case of species listed as endangered, as is proposed for the Cumberland Sound belugas, the competent Minister must include a final recovery strategy (or an existing and adopted wildlife plan that is deemed to meet the requirements of a recovery strategy) in the *SARA* public registry within two years after the species is listed (Clauses 42(1) and 44(1)). Clause 46 requires that the Minister(s) must report on the implementation of the recovery strategy, and progress towards meeting its objectives, within five years after it is posted in the public registry, and every five years thereafter, until the objectives of the strategy have been achieved or the species' recovery is no longer feasible. In addition, Clause 47 of *SARA* also requires that one or more "action plans", based upon the recovery strategy, must be developed. Clause 49 describes the required content for such action plans. The cost of these recovery management actions, as well as certain associated research and monitoring tasks, are identified as incremental to the baseline scenario.

2.3.4 Consultation

There are two types of consultation that need to be considered in the SE assessment. The first concerns the process required under the NLCA between DFO and the Nunavut Wildlife Management Board. The second concerns the Crown's legal responsibility to consult with the Inuit beneficiaries under the NLCA.

Article 5.2.34 provides for the Nunavut Wildlife Management Board to (1) approve plans for the management, classification, protection, etc. of wildlife, including endangered species and (2) approve the designation of rare, threatened and endangered species. In May of 2008, Canada and the Nunavut Wildlife Management Board signed a memorandum of understanding to ensure that the listing process under *SARA* fully complies with the terms of the NLCA through a harmonization process.⁸ This memorandum of understanding indicates that the Minister will

⁸ A Memorandum of Understanding to Harmonize the Designation of Rare, Threatened and Endangered Species under the Nunavut Land Claims Agreement and the Listing of Wildlife Species at Risk under the Species at Risk Act, May 28, 2008. Between Canada (represented by the Minister of Environment responsible for the Department of Environment and for the Parks Canada Agency and by the Minister of Fisheries and Oceans responsible for the Department of Fisheries and Oceans) and the Nunavut Wildlife Management Board.

request the Board approve a decision on a *SARA* listing and that DFO will consult with the Board regarding "policies, operational guidelines or other such matters under development that could directly or indirectly affect the species at risk listing or delisting process in Nunavut."

There will also likely be a requirement for Crown Consultation⁹ with NTI, the Qikiqtaaluk Wildlife Board, and the Pangnirtung HTO. The aforementioned memorandum of understanding reflects this as it states that Crown consultation will occur with the Inuit, although it does not set out the details of such a process. It is assumed that the greater the limitation on beluga harvesting contemplated under the Listing Scenario the higher the level of consultation that will be required.

It is also noted that the *SARA* speaks to the need for cooperation and consultation with the Nunavut Wildlife Management Board and the Pangnirtung Inuit. Clauses 39(1 through 3) state that the recovery strategy and Clauses 48 (1) state that action plans, must, to the extent possible, be prepared in cooperation with a wildlife management board authorized by a land claims agreement to perform functions in respect of wildlife species and every aboriginal organization that the Minister considers will be directly affected by the recovery strategy or action plan. For purposes of this SE analysis, the costs associated with these post-listing requirements are included in the recovery management actions impact category.

2.4 Incremental Impacts

The identification of impacts which are subsequently characterized as either benefits or costs has to recognize that impact identification must be limited to only those changes that occur as a result of implementing the policy alternative (in this case any of the Listing Scenarios). These incremental impacts need to be distinguished from changes that would occur without implementing the policy alternative. In order to identify incremental impacts, two scenarios must be constructed; one that identifies changes (impacts) that would occur without implementing the policy alternative (the baseline scenario) and one that identifies changes that result from the policy alternative, in this case there are three policy alternatives which correspond with the three Listing Scenarios.

2.5 Net Present Value, Discount Rates and Impact Policy Period

Discounting accounts for the time value of money by converting the value of impacts that occur in the future to the present. This allows for the calculation of the net benefit of the baseline scenario and the policy alternative(s) in present dollars. If the present value of net benefits of the policy alternative is greater than the present value of the net benefits of the baseline scenario,

⁹ Crown Consultation refers to the common law duty of government to consult when Aboriginal or treaty rights protected under Section 35 of the *Constitution Act, 1982* may be impacted. It also refers to the legal requirement of Government to consult (e.g. *Haida* and *Taku River* Supreme Court decisions), and if appropriate, accommodate, when the Crown contemplates conduct that might adversely impact Section 35 rights (Government of Canada, Aboriginal Consultation and Accommodation, Interim Guidelines for Federal Officials to Fulfill the Legal Duty to Consult, February 2008).

then the policy alternative should be recommended for implementation on efficiency grounds (see Canadian Cost-Benefit Analysis Guide: Regulatory Proposals, pg. 35).

Choosing a discount rate has been one of the most contentious and controversial aspects of the cost-benefit analysis of regulatory policies. A variety of factors have been considered regarding the choice of a discount rate, including the rate of time preference at which individuals are willing to exchange consumption over time, the opportunity cost of forgone investment and inter-generational equity. Currently, the Treasury Board of Canada recommends an opportunity cost of capital/investment approach when program funds are extracted from capital markets. As of 2007, the recommended rate was 8%. The Treasury Board of Canada also notes that in certain circumstances where consumer consumption is involved and there are no or minimal resources involving opportunity costs (such as human health and environmental goods and services) factors other than the opportunity cost of capital have been taken into consideration when determining an appropriate discount rate. When these factors are considered, a social time preference rate (the rate at which individuals discount future consumption and projected growth rate in consumption) has been used. As of 2007, the Canadian social time preference rate has been estimated at 3% and in appropriate circumstances a discount rate of 3% may be used (Canadian Cost-Benefit Analysis Guide: Regulatory Proposals pgs.35, 37, 38).

The 3% discount rate was considered appropriate as DFO officials indicate that recovery program costs likely would not be extracted from capital markets. Therefore this SE analysis uses a 1% inflation rate and 3% discount rate and provides an analysis of the sensitivity of the findings based upon discount rates of 3, 5, 7 and 9%.

The timeframe for recovery under both the baseline and Listing Scenarios appears to be significantly longer than what appears to be "normal" when using a cost-benefit analysis framework (40-90 years). As the cost-benefit analysis time frame increases, so does the uncertainty associated with estimating the various factors required to monetize benefits and costs. Also, depending upon the choice of discount rates, at some point in the future, the present value of future benefits or costs will be so small that they will no longer make a meaningful contribution to decision-making.¹⁰

Current (2007), TB Canadian Cost-Benefit Analysis Guide Regulatory proposals do not provide any guidelines regarding the maximum policy impact period that should be incorporated into a cost-benefit analysis. At the Scoping Stage of this SE analysis, it was proposed that a 20-year policy impact period be used on the grounds that this timeframe would reduce the uncertainty associated with estimating the various factors required to monetize benefits and costs. Further, this approach would allow efforts to be focused on the collection and analysis of data that has a greater potential to improve decision-making, rather than exerting effort on what could prove to be highly speculative and/or overly theoretical attempts to quantify benefits and costs beyond a 20-year policy impact period. This proposal was accepted, and thus this SE Analysis qualitatively addresses the impact of the three Listing Scenarios over the recovery and post-

¹⁰ For example, assuming uncertainty could be reduced to a manageable level, using an 8% discount rate to determine the present value (PV) of a \$1 cost or benefit experienced 50 years in the future results in a PV of \$0.02. A 3% discount rate would result in a PV of \$0.228. Unless the previous 49 years did not generate any benefits or costs, it is hard to see how consideration of benefits or costs 50 years into the future can improve decision-making.

recovery periods, but restricts the quantitative assessment of benefits and costs to the 20-year policy period.

3.0 SOCIO-ECONOMIC ANALYSIS

3.1 Inuit Food Harvest

The only authorized Cumberland Sound beluga harvest currently allowed is for domestic food purposes by the Inuit residents of Pangnirtung. Since 2002, DFO and the Nunavut Wildlife Management Board have authorized a quota of 41 animals/year. The Pangnirtung HTO has been involved in a community-based management system since 2002 which involves reporting the numbers of beluga harvested, as well as the number that are shot but not retrieved.

Historically, most parts of beluga, except the head were used for food and equipment purposes. The outer layers (outer dermis, skin and blubber) of the animal, known as muktuk when eaten, as well as choice parts of the meat provided food for people. Blubber and organ meats were fed to the many dogs used by the Inuit for transportation and harvesting activities. The stomach and skin were used to make equipment such as whip handles and ropes, the blubber was used extensively to fuel the "Qulik" (stove), and finally the bones were used in the winter as fox bait or eaten when no other meat was available (Kilabuk, 1988).

In contemporary times, it is mostly the two outer layers, which combined are called muktuk, the flippers, and choice meats that are utilized for human consumption. According to the Pangnirtung HTA, about 50% of Pangnirtung families still eat the meat. The organs, meat and some blubber are used to feed dogs.¹¹ This appears to be the norm amongst Nunavut Inuit, where "older" people are said to continue to eat dried beluga meat and those who still have dog teams use the meat, including organs, and bones for feed.¹²

According to the 2006 Census, the Pangnirtung Hamlet population was 1,325, of which 94% (1,240) self-identified as Aboriginal persons.¹³ Pangnirtung Inuit harvest a variety of wildlife and fish including caribou, bear, large and small furbearers, waterfowl and upland birds, seals, whales, fish, and other sea foods. During the period from June 1996 through May 2001, typically between 21 and 26 Pangnirtung Inuit hunters engaged in beluga hunting each year, with the majority of harvest effort occurring during the months of June, July and August (Nunavut Wildlife Management Board, 2004).

3.1.1 Discussion of Impacts

Baseline Scenario

¹¹ Personal Communication with Jevua Maniapik, Pangnirtung HTA, November 17, 2009.

¹² Personal Communication with John Hicks, NTI Negotiator on November 3rd and 18th, 2009.

¹³ Statistics Canada website, 2006 Community Profiles. <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/9291/details/Page.cfm?Lang=E&Geo1=CS&Code1=6204009&Geo2=PR&Code2=62&Data=Count&SearchText=pangnirtung&SearchType=Begin&SearchPR=62&B1=All&Custom=>

Under the baseline scenario, it is assumed that the Pangnirtung Inuit would continue harvesting beluga at current levels and notwithstanding increases in the Pangnirtung population, the current quota of 41 animals/year would not be increased at time in the recovery period. Although the actual harvest has varied from year to year in the past (\pm 41 animals/year), for purposes of the analysis, it is assumed that the annual harvest equals the quota.¹⁴

Listing Scenario #1

Under this listing scenario, the Pangnirtung Inuit would be prohibited from harvesting any belugas from the Cumberland Sound population during a recovery period of 40 years. During the post-recovery period, it would be reasonable to assume that Pangnirtung Inuit could resume harvesting beluga for food purposes. The level of harvest post-recovery will require an estimate of allowable post-recovery hunting mortality. However given that DFO scientists report that the beluga population is growing under current harvest levels it will be assumed that at a minimum harvest levels could return to baseline conditions (41 animals/year) at the start of the post-recovery period.

Listing Scenario #1 results in a 100% reduction in beluga harvesting levels over the baseline during the recovery period. This impact is characterized as a cost as the Pangnirtung Inuit will lose all beluga harvesting activity and food production benefits.

Listing Scenario #2

Under this listing scenario, the Pangnirtung Inuit would be limited to harvesting about half of their current levels (20 animals/year versus 41 animals/year) during a recovery period of 55 years. As discussed under Listing Scenarios #1 and 2, it is assumed that at a minimum harvest levels could return to baseline conditions (41 animals/year) at the start of the post-recovery period.

Listing Scenario #2 results in a 51% reduction in beluga harvesting levels over the baseline during the recovery period. The portion of the harvest that is precluded during the recovery period is characterized as a cost as the Pangnirtung Inuit will lose slightly more than half of their beluga harvesting opportunity and food production benefits. The remaining allowable quota of 21 animals/year is characterized as a benefit.

Listing Scenario #3

Under this listing scenario, the Pangnirtung Inuit would continue to harvest their current quota allowance of 41 animals/year during a recovery period of 90 years. The level of harvest post-recovery is assumed to be the same as the recovery period. Under this Listing Scenario, the benefit associated with the current harvest level remains in effect throughout the recovery and post-recovery periods. That is, there is no increase or decrease in benefits, and thus the impact is characterized as a benefit that does not change.

¹⁴ At the scoping report stage it was proposed that the analysis of benefits and costs would be based upon an average of actual harvest levels. However, upon further contemplation it was decided to use the actual quotas for the baseline and listing scenarios because these represent the maximum cost or benefit opportunities.

The nature of impacts on Inuit food harvesting under the three listing scenarios, relative to the baseline, are summarized in Table 1 below.

TABLE 1: Characterization of Impacts on Inuit Food Harvesting

Impact Category	RECOVERY PERIOD				POST-RECOVERY PERIOD			
	Baseline 0-90 Years	Listing Scenario #1 0-40 Years	Listing Scenario #2 0-55 Years	Listing Scenario #3 0-90 Years	Baseline 0-91 Years	Listing Scenario #1 Post 40 Years	Listing Scenario #2 Post 55 Years	Listing Scenario #3 Post 90 Years
Nature and Direction of Change	↔ B	↑ C	↑ C	↔ B	↔ B	↑ B	↑ B	↔ B
Annual Allowable Harvest	↔ 41	↓ 0	↓ 21	↔ 41	↔ 41	↑ 41	↑ 21	↔ 41

B=Benefit/ C=Cost ↔ No Change ↑ Increase in Cost or Benefit ↓ Decrease in Cost or Benefit

3.1.2 Valuation

The intent of this first tier SE analysis is to provide a perspective on the benefits and costs associated with changes in recovery period harvest levels under the three Listing Scenarios relative to the baseline (no listing scenario). The value of the beluga harvest to Pangnirtung Inuit likely includes:

- Economic benefits, source of food for human consumption and dog feed;
- Cultural benefits, including opportunities to preserve and promote traditional culture, including traditional skills and knowledge;
- Social benefits, including opportunities to preserve and promote social norms and values (e.g. sharing, feasts); and
- Opportunity to exercise Aboriginal and treaty rights.

This SE analysis only considers the economic value of Cumberland Sound belugas. Beluga products (muktuk, meat and blubber) are not formally marketed within the Hamlet of Pangnirtung nor are they available in the general market anywhere in Canada. That is to say, there is no established market or market value (wholesale or retail) for beluga which can be used to quantify the economic value of beluga as a food source. It is highly unlikely that Pangnirtung hunters will have the opportunity to harvest beluga from other populations due to: other populations in Canada also being designated as endangered or threatened, cost prohibitive distances to alternative locations, and issues regarding competing/overlapping rights of

Aboriginal peoples outside of Nunavut. Finally, it is equally unlikely that a supply of beluga food products from other areas within and outside of Nunavut can be acquired for the same reasons. How Pangnirtung Inuit would respond to quota reduction/elimination (Listing Scenarios #2 and #1) is difficult to predict. The possible range of responses to address a reduction or total loss of beluga as a food source could have the following possible distributional effects:

- a. An increase in store bought foods to replace the nutrient value of the lost beluga;
- b. Increased harvests of other "country foods" such as fish, seal, caribou and/or other species;
- c. Both of the above in some combination.

Scenarios (b) and (c) above could result in possible impacts on the sustainability of other species. However, in the absence of knowing with any degree of certainty how Pangnirtung Inuit may respond to quota reduction/elimination, distributional effects cannot be assessed.

Methods and limitations involved in valuing country food sources harvested by Aboriginal peoples in Canada have been widely published.¹⁵ The general consensus in the literature is that when there is no established market for the commodity in question its value should be imputed from the price of the most appropriate substitute, for which there is a market. This approach is generally referred to as the 'replacement cost method' or 'substitution cost method.'

In the case of estimating the value of food from subsistence harvesting activities, the replacement cost approach involves three major steps. The first step involves determining the nature and quantity of the food item to be valued (e.g. kgs. of food per animal). The second step involves estimating the net value of the food item (typically on a per kg. basis). The gross value is achieved by determining the value (retail price) of an appropriate substitute food or foods as a proxy for the value of the food item no longer available. The net value to the consumers of non-marketed economic goods is the replacement cost of the substitute food item(s) less the cost of acquiring the non-marketed good (production costs=harvesting costs).¹⁶ The third step involves quantifying the annual volume and value of the harvest being affected (\$/kg. net value x total volume of harvested good).

Step 1 – Nature and Quantity of Food from Beluga

Pangnirtung Inuit utilize beluga both for human consumption and for dog feed. It is estimated that the average beluga harvested by Pangnirtung Inuit weighs 600 kgs. (live weight) and that a beluga of this average weight yields 170 kgs. of edible product for human consumption (comprised of 95 kgs of muktuk and 75 kgs. of meat) and 208 kgs. of product used for dog feed, largely meat, organs, and blubber (see Appendix A for details).

¹⁵ See for example: Berger, 1977; Berkes et al., 1994; Brown and Burch, 1992; Chibnik, 1978; Duffield, 1997; Palmer, 1973; Quigley and McBride, 1987; and Usher, 1976. Full citations listed in reference section of this report.

¹⁶ Production or harvesting costs includes capital (e.g. boats, motors, rifles) and operating costs (e.g. equipment maintenance, fuel, ammunition) and effort (time, labour).

Step 2 – Net Value of Beluga as Food

The gross and net values of beluga for human consumption and as dog feed are presented in Table 2 (see Appendix A for details).

TABLE 2: Gross and Net Replacement Values per Beluga (per kg.)

	Gross Value/Kg.	Net Value/Kg.
Human Consumption:		
Muktuk	\$27.80	\$20.85
Loin Meat/Flippers	\$27.80	\$20.85
Dog Feed:		
Meat & Blubber	\$4.36	\$4.36

Step 3 – Annual Volume and Value of Beluga Harvest

Table 3 below presents the unit (per beluga) and total annual calculations of the volume of food product available from the baseline harvest (41 animals/year) and an estimate of the total annual replacement value of the baseline harvest. The estimates indicate that an average 600 kg. beluga (live weight) has a net economic value (food value) of \$4,450 and the total economic value of the baseline harvest is \$182,500/year.

TABLE 3: Total Volume of Edible Meat and Net Annual Replacement Value of Baseline Beluga Harvest/Year

	Edible Weight per Animal (kgs.)	Edible Weight per Harvest/Year (41 animals)	Net Value/Kg.	Net Value/Year
	A	B=A*41	C	D=B*C
Human Consumption:				
Muktuk	95	3,895	\$20.85	\$81,210
Loin Meat/Flippers	75	3,075	\$20.85	\$64,114
Dog Feed:				
Meat	208	8,528	\$4.36	\$37,182
Blubber	3.4			
TOTAL/YEAR				\$182,506 Rounded to \$182,500
Average Economic Value Per Beluga				\$4,451 Rounded to \$4,450

3.1.3 Nominal Value of Costs/Benefits

Table 4 below presents the nominal annual value estimates for the incremental costs and benefits concerning Inuit food under the three Listing Scenarios.

TABLE 4: Nominal Value of Inuit Food Costs and Benefits

Policy Alternative	Costs			Benefits		
	# animals lost	Cost/ year	Duration (Recovery Period)	# animals retained	Benefit/ year	Duration (Recovery Period)
Baseline	0			41	\$182,500	
Listing Scenarios:						
#1	41	\$182,500	40	0	\$0	40
#2	21	\$93,476	55	20	\$89,024	55
#3	0	\$0	90	41	\$182,500	90

3.2 Non-Use/Passive Values

3.2.1 Preliminary Characterization of Impacts

The working hypothesis presented at the Scoping Stage was that during the recovery period non-use/passive values would be greater under listing scenarios #1 (40 years) and #2 (55 years) than a non-listing/baseline scenario or listing scenario #3 (both 90 years). The rationale underlying this hypothesis is that Canadians would attach higher non-use/passive values to shorter recovery periods. Post-recovery, it was proposed that non-use/passive values would be the same for all scenarios, but it was unclear if values would remain the same or decline once recovery of the population was achieved.

During the recovery period non-use/passive values are characterized as benefits because it is presumed that society is willing to pay (WTP) for actions directed at ensuring a species will persist at some population level in the future. It is assumed that this benefit will vary as a function of the population level and the time required to reach a given population level. Based upon this assumption, the non-use/passive benefits experienced under Listing Scenario #1 or #2 during the recovery period would exceed those experienced under Listing Scenario #3 (the scenario with the longest recovery period) because of the shorter recovery period and greater population levels during the recovery periods. At the Scoping Stage it was proposed that there would be benefits associated with Listing Scenario #3 based upon the assumption that WTP would be higher under this scenario than the baseline due to the knowledge that harvest levels

would be "frozen" and there would be increased recovery management actions (required under *SARA*).

Post-recovery, given that population size is the same in all cases (baseline, 3 Listing Scenarios), non-use/passive benefits it was proposed that WTP would be equal in all cases, but experienced earlier under Listing Scenarios #1 and #2. The relative size/value of post recovery non-use/passive values to recovery non-use/passive values was indicated as uncertain. A rationalization could be made that post recovery values would be less because once recovery has been achieved it would be known that the population will persist at a much higher level and the component of WTP attributable to reaching a recovery target population level would no longer be present. Alternatively, a rationalization could be made for the position that post-recovery values would be greater than recovery period values because higher post-recovery population levels provide a greater assurance of the species long term survival and greater opportunity to experience benefits from passive use (e.g. viewing).

The nature of impacts on non-use/passive values under the three listing scenarios, relative to the baseline, at the Scoping Stage were as depicted in Table 5 below.

TABLE 5: Preliminary Characterization of Impacts on Non-Use/Passive Value Benefits

Impact Category	RECOVERY PERIOD				POST-RECOVERY PERIOD			
	Baseline 0-90 Years	Listing Scenario #1 0-40 Years	Listing Scenario #2 0-55 Years	Listing Scenario #3 0-90 Years	Baseline 0-91 Years	Listing Scenario #1 Post 40 Years	Listing Scenario #2 Post 55 Years	Listing Scenario #3 Post 90 Years
Nature and Direction of Change	↔	↑	↑	↑	↔	?	?	?

↔ No Change in Benefit ↑ Increase in Benefit ? Change Uncertain

Based upon a review of pertinent literature (see Appendix B), the impact of the three Listing Scenarios, relative to the baseline, on non-use/passive values for the recovery period are revised as illustrated in Table 6 below.

3.2.2 Nominal Value of Costs/Benefits

The literature indicates that WTP values are valid indicators of the monetary value of non-use/passive benefits in the context of assessing the socio-economic impact of a *SARA* listing.

The two key studies that were reviewed (Rudd, 2007 and Olar et.al., 2007) provide WTP values for whales.

TABLE 6: Direction and Relative Value of Non-Use/Passive Benefits

Indicator	RECOVERY PERIOD			
	Baseline 90 Years	Listing Scenario #3 90 Years	Listing Scenario #2 55 Years	Listing Scenario #1 40 Years
Direction of Impact	↔ No change	↔ ↑ No change to Increase in Benefits	↑ Increase in Benefits	↑ Increase in Benefits
Non-Use/Passive Value Benefits	0	≥ Baseline	> Listing Scenario #3	> Listing Scenario #2

In the case of the Rudd study, WTP values are not reported specifically for the North Atlantic Right whale, rather the author has reported WTP values of individual species relative to the WTP values of all species addressed in the survey. That is, Rudd's study indicates that when the Right whale was chosen as the most preferred species by survey respondents, these respondents were WTP between \$36.18 to \$43.41 more per household/year to support recovery programs for the Right whale than they were for their least preferred species. Since the respondent groups that identified Right whale as their preferred species indicated a WTP value of close to zero for their least preferred species, the actual WTP value for Right whales was somewhere between \$36 and \$44/household/year over a twenty-year period (the policy planning period for the study).

The Olar et.al. study does provide discrete WTP values for belugas (\$107/household per year over a 50-year policy period), however the recovery program options respondents were asked to consider in this study were much more complex than those posed by the three Listing Scenarios for recovery of the Cumberland Sound belugas, i.e. there were multiple species considered, program options included impacts on shipping and recreational use, and the recovery program included the creation of broad management plan area.

Given the wide range of WTP values between the two studies, this indicates that extreme caution must be used in applying specific species WTP values from other studies. Having said that, both studies suggest that a high profile species such as beluga is likely to attract WTP values in excess of \$100 million/year.

3.3 Recovery Management Actions

Section 2.3.3 outlined the initial and on-going actions required under *SARA* if the Cumberland Sound beluga population is listed. To reiterate, within two years after listing, a recovery strategy must be completed and a report on the progress of the strategy in meeting the objectives of the listing must be done every five years throughout the recovery period. Additionally, an action plan or plans, based upon the recovery strategy, must be prepared.

3.3.1 Discussion of Impacts

Under any of the three Listing Scenarios, the costs associated with preparing a recovery strategy and an action plan or plans, and the costs associated with reporting on progress every five years are considered to be the same and incremental to the baseline scenario, i.e. if there is no listing there is no legislative requirement to prepare these documents.

In addition to the costs associated with the recovery strategy, action plan(s), and five-year reporting schedule, it is expected there would be incremental costs associated with the implementation of various research and management tasks provided for in the recovery strategy and plan(s). A draft recovery strategy for the Cumberland Beluga population was prepared by DFO in 2005.¹⁷ This recovery strategy was developed under the assumption that the population would be listed under Listing Scenario #3 (no change in baseline harvest quota). The strategy, in part, identifies a number of actions pertaining to: continued research and monitoring of the beluga population, its environment, and human activities to assess ongoing and newly-emerging threats and establish guidelines for human activities as needed; assessment and protection of beluga habitat in Cumberland Sound as required; and, communications regarding the need for and content of the recovery strategy to promote understanding and support within the community, Nunavut and elsewhere. The list of tasks in the draft recovery strategy was reviewed to identify which actions, if any, would be incremental under any of the three Listing Scenarios. The results of this review and the preliminary assumptions regarding whether each task would be an incremental cost to the baseline scenario are included in Appendix C.

The nature of impacts on government expenditures for recovery management actions under the three Listing Scenarios relative to the baseline, are summarized in Table 7 below.

With one exception, at this stage in the SE analysis (i.e. first tier) it is premature to assess the monetary value of all the specific tasks identified as being incremental costs to the baseline scenario because (a) the recovery strategy is in draft form and (b) the recovery strategy lacks sufficient detail to formulate reasonable cost estimates. The exception pertains to beluga population monitoring and analysis. Regardless of what the final recovery strategy document addresses, the requirement to monitor and report on beluga populations during the recovery period will be a constant. The characterization of monitoring and associated cost estimates are discussed below.

Apart from the food harvest, the only other known threats to the recovery of Cumberland Sound beluga are increases in the numbers of killer whales frequenting the sound and a proposal to allow gillnets to be used in the turbot fishery in and around the sound. Gillnets present a risk of net entanglement for whales. There are beluga, narwhal and bowhead whale populations in the

¹⁷ Recovery Strategy for the Cumberland Sound Belugas, Draft 2005.

turbot regulatory Subarea 0, and the potential for net entanglement is a concern. Areas of particular concern include Cumberland Sound, where all three species can be found¹⁸.

TABLE 7: Characterization of Cost Impacts on Recovery Management Actions

Impact Category	RECOVERY PERIOD				POST-RECOVERY PERIOD			
	Baseline 0-90 Years	Listing Scenario #1 0-40 Years	Listing Scenario #2 0-55 Years	Listing Scenario #3 0-90 Years	Baseline 0-91 Years	Listing Scenario #1 Post 40 Years	Listing Scenario #2 Post 55 Years	Listing Scenario #3 Post 90 Years
Nature and Direction of Change	↔	↑	↑	↑	↔	↓	↓	↓

↔ No Change ↑ Increase in Cost ↓ Decrease in Cost

Listing Cumberland Sound beluga under SARA would result in SARA recovery planning taking precedence over turbot management plans.¹⁹ Two possible SARA regulatory responses to the threat of entanglement from a turbot gillnet fishery could include: (1) prohibition of the use of gillnets for turbot fishing in Cumberland Sound or (2) permitting the use of gillnets for turbot fishing in Cumberland Sound with incidental harm permits issued to turbot fishers. Conditions of incidental harm permits could include requirements to deliver all incidentally caught beluga to Pangnirtung for community use. Incidentally caught beluga would be part of allowable quotas under a listing scenario. The second response would only be possible in the context of a listing scenario that does not completely eliminate beluga harvesting (Scenario #2 or #3). In the case of a listing scenario that eliminates beluga harvesting entirely (Scenario #1), the most likely regulatory response would be the prohibition of gillnets in the Cumberland Sound area.

3.3.1.1 Population Monitoring and Analysis

Under current conditions, it appears that all past Cumberland Sound beluga population monitoring activities have been undertaken by DFO. The literature indicates that DFO has undertaken aerial survey population counts approximately every ten years. An aerial survey was done in 1999 and another completed in 2009.²⁰ Additionally, DFO has done some tagging work

¹⁸ Fishery Management Plan Greenland Halibut NAFO Subarea 0 2006-2008. Produced by: Fisheries and Oceans Canada, Central and Arctic Region Resource Management and Aboriginal Affairs 501 University Crescent Winnipeg, MB R3T 2N6.

¹⁹ Ibid.

²⁰ A survey was done in 2005 but due to poor weather the results were deemed by DFO to be of low quality and the 2009 survey was subsequently implemented.

(2006, 2007) to evaluate preferred habitats and to develop a correction factor to account for animals below the water surface during aerial surveys.²¹

Provision 46 of *SARA* requires that progress towards meeting the recovery strategy objectives of listed species must be reported within the first five years of the listing and then every five years thereafter until the objectives have been achieved, or it is determined that recovery of the species in question is no longer feasible. For purposes of this SE analysis, it is assumed that DFO's population monitoring efforts under any of the three Listing Scenarios during a recovery period would be more frequent than under the baseline scenario (i.e. every five years rather than every ten years), thus it is assumed that every second survey program cost would be incremental to listing.

The estimated cost of future population monitoring and analysis is based upon actual costs associated with the population survey and analysis done in 2009. Discussions with DFO personnel indicate that the current cost of conducting an aerial survey of Cumberland Sound belugas and completing a report, including analysis of patterns and trends from previous work, is in the order of \$200,000 (see Appendix D for details).

3.3.2 Nominal Value of Costs/Benefits

The recovery management action undertakings that are identified as incremental to the baseline scenario are summarized in Table 8 below. At this stage in the SE Analysis, the only action that has been assessed a monetary value is population monitoring and analysis. Further stages of SE analysis will need to determine the incremental costs of the other identified undertakings.

TABLE 8: Summary of Incidence and Costs of Recovery Management Actions

Action	One-Time		On-Going Costs	
	Frequency	Cost	Frequency	Cost
Recovery Strategy	Once within 2 years of listing	unknown	Possible updates/revisions	unknown
Action Plan(s)	Once	unknown	Possible updates/revisions	unknown
<i>SARA</i> Reporting			Within 1 st five years of listing and then every 5 years	unknown
Recovery Strategy Tasks:				
Population Monitoring/Analysis	Once within 1 st five years of listing	\$200,000	every 10 th year	\$200,000
Other tasks	unknown	unknown	unknown	unknown

3.4 Consultation

²¹ Nunavut Wildlife Management Board Minutes, Regular Meeting #56, May 27-29, 2008.

There are two types of consultation that need to be considered in the SE assessment were previously introduced in Section 2.3.4. To briefly reiterate, the first concerns the process required under the NLCA between DFO and the Nunavut Wildlife Management Board and the second concerns the Crown's legal responsibility to consult with the Inuit beneficiaries under the NLCA. It is noted that the costs associated with consultation will likely be incurred prior to actual listing, i.e. consultation should be completed prior to a listing decision. However since the purpose of this SE analysis is to assist decision-making at the pre-listing stage, the nature of the likely impacts regarding consultation and associated costs are included.

3.4.1 Discussion of Impacts

Baseline Scenario

The status quo does not trigger a need for Government to consult with the Nunavut Wildlife Management Board because there is no change in the status of beluga. Similarly, there is no requirement to consult with NTI, Qikiqtaaluk Wildlife Board, Pangnirtung HTO, and Pangnirtung Inuit in general, as there is no change or impact on Inuit harvesting rights. Any routine beluga population monitoring efforts and/or management planning by Government would continue to be discussed with the Nunavut Wildlife Management Board as per the terms of Article 5 of the NLCA. In both the recovery and post-recovery periods, the cost of consultation remains static and is therefore is characterized as a cost but with no incremental change.

Listing Scenarios #1 and #2

Elimination or reduction of current harvest levels would trigger a duty to consult with the various Inuit entities, and this is characterized as an incremental cost. If recovery period harvest level limitations were to continue in effect during the post-recovery period or if new harvest levels were to be considered at that time, this would also trigger a duty to consult, however this is beyond the policy impact period considered in this SE analysis.

Government would need to consult with the Nunavut Wildlife Management Board concerning any plans and activities during the recovery and post-recovery periods, however it is expected that the cost would be covered under DFO's regular budget for Board activities. Therefore, consultation with the Board under this scenario is characterized as a cost but with "no incremental change."

Listing Scenario #3

Leaving harvest levels at the current quota level may also require Government to consult with the NTI, the Qikiqtaaluk Wildlife Board and the Pangnirtung HTO. Although this Listing Scenario does not adversely affect existing rights, it may preclude any increases in the current quota throughout the recovery period, and this likely would need to be discussed with the Inuit. Consultation under this scenario is characterized as an incremental cost however it is assumed that the level of consultation, and therefore the cost, would be less than required for Listing Scenarios #1 and #2.

Again, Government would need to consult with the Nunavut Wildlife Management Board on the listing decision and any plans and activities during the recovery period. However it is expected

that the cost would be covered under DFO's regular budget for Board activities. As such, consultation with the Board under this scenario is characterized as a cost but with "no incremental change."

3.4.2 Valuation

For purposes of this analysis it is proposed that consultation would involve one or more meetings between DFO and Inuit parties. A rough estimate of \$28,100/meeting has been developed based upon broad assumptions as follows (see Appendix E for details):

- Consultation under any of the three Listing Scenarios would involve representatives of DFO meeting in Pangnirtung with representatives of NTL, Qikiqtaaluk Wildlife Board, Pangnirtung HTO, and community members;
- NTL, Qikiqtaaluk Wildlife Board and Pangnirtung HTO representatives time and travel costs would be covered by their respective organizations;
- DFO would involve a team of three representatives including an individual with consultation expertise, an individual with beluga biology expertise, and a Justice Canada lawyer with an Aboriginal law background; and
- DFO would cover meeting room, refreshments, and lunch for all meeting participants.

It is expected that the number of meetings required under Listing Scenarios #1 and #2 would be greater than under Listing Scenario #3 because they involve eliminating/reducing the current food harvest quota. At this stage in the analysis it has been assumed that consultation under Listing Scenario #3 would involve one meeting and consultation under Listing Scenarios #1 and #2 would involve three meetings.²²

3.4.3 Nominal Value of Costs/Benefits

It is estimated that the incremental cost of a pre-listing consultation under Listing Scenarios #1 and #2 would be \$84,300, under Listing Scenario the cost would be \$28,100 and would be one-time costs.

4.0 COST/BENEFIT ANALYSIS

4.1 Summary of Benefits and Costs under a Baseline/No Listing Scenario

The benefits associated with the baseline scenario are restricted to the food value of the Pangnirtung Inuit harvest which has been estimated at \$182,500. It is noted that this value does not include the social or cultural values held by Pangnirtung Inuit with respect to the harvesting and consumption of beluga. The analysis suggests that there would be no non-use/passive value benefits associated with the status quo. Costs under the baseline scenario are those associated with routine population monitoring and other research activities. At a minimum, on-going costs

²² Recommended by DFO contract authority.

will be approximately \$200,000 every ten years which is the cost that was quantified for population monitoring and analysis. These benefits and costs are shown in Table 9.

4.2 Summary of Benefits and Costs Under the Listing Scenarios

For logistics reasons, the order of the three Listing Scenarios is reversed in the following discussion.

4.2.1 Benefits

The benefits associated with Listing Scenario #3 include the Inuit food harvest value and non-use/passive use value. The value of the Inuit food harvest has the same value as under the baseline scenario (\$182,500/year) because Listing Scenario #3 does not change the baseline quota. Qualitatively speaking, it is assumed that non-use/passive values for Listing Scenario #3 would be greater than or equal to the baseline scenario, but less than for Listing Scenario #2 and #1.

TABLE 9: Qualification of Costs and Benefits

IMPACT CATEGORIES	Baseline	LISTING SCENARIO		
		#3	#2	#1
		No Change in Harvest 90 Year Recovery Period	Harvest Reduced to 20 55 Year Recovery Period	Harvest Reduced to 0 40 Year Recovery Period
BENEFITS:				
Inuit Food	\$182,500	100% of baseline	48.8% of baseline	0% of baseline
Non-Use/ Passive Use Values	\$0	≥ \$0 and < \$ Listing Scenario #2	> \$ for Listing Scenario #3	> \$ for Listing Scenario #2
COSTS:				
Inuit Food	\$0	\$0	\$0	\$0
Recovery Actions	≥ \$200,000	Greater than baseline	Same as Scenarios #1 and #3	Same as Scenarios #1 and #3
Consultation	\$0	≥ \$28,100 and < \$ Listing	> Scenario #3	> Scenario #3 and = Scenario

		Scenario #2		#2
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The benefits associated with Listing Scenario #2 include a portion of the Inuit food harvest value and non-use/passive use value. The value of the Inuit food harvest is 48.8% of the baseline, which reflects the value of the remaining allowable quota (21 animals/year). Qualitatively speaking, it is assumed that WTP for Listing Scenario #2 would be greater than Listing Scenario #3 because of the shorter recovery period (55 years versus 90 years) but less than Listing Scenario #1 which has a shorter recovery period (55 years versus 40 years).

The benefits associated with Listing Scenario #1 are restricted to non-use/passive use value. Qualitatively speaking, it is assumed that WTP for Listing Scenario #1 would be greater than Listing Scenario #2 because the recovery period is shorter (40 years versus 55 years).

4.2.2 Costs

Costs associated with Listing Scenario #3 include recovery actions and consultation. At a minimum, recovery actions will cost an additional \$200,000 every ten years, i.e. the cost of conducting population monitoring and analysis more frequently. This value is characterized as a minimum cost because the remaining costs, which have not been quantified in this SE analysis, associated with listing (e.g. recovery strategy, recovery plan(s), communications, and recovery strategy/plan tasks) would be additive. One-time recovery action costs would be incurred early in the policy impact period (e.g. recovery strategy must be completed within two years after listing) and other costs would be on-going (e.g. communications, reporting). Costs associated with consultation cannot be fully quantified, however qualitatively speaking it is expected that the cost would be greater than the baseline scenario where no consultation is required and likely less than required under Scenario #2 because a reduction of harvest quota is not involved.

Costs associated with Listing Scenario #2 include recovery actions and consultation. The cost of recovery actions is the same as described for Listing Scenario #3. With respect to consultation, qualitatively speaking it is expected that the cost would be greater than the baseline and Listing Scenario #3 because this scenario involves a reduction of the harvest quota. For purposes of this analysis, it is assumed that consultation under Listing Scenario #2 would involve three meetings.

Costs associated with Listing Scenario #1 also include recovery actions and consultation. The cost of recovery actions is the same as described for Listing Scenarios #2 and #3. With respect to consultation, qualitatively speaking it is expected that the cost would be greater than the baseline and Listing Scenario #3 because this scenario involves elimination of the harvest quota. It is not expected that the cost would be greater than Listing Scenario #2 because whether the quota is being reduced or eliminated, both constitute an infringement on Aboriginal rights, albeit to varying degree.

4.3 Results Discussion

Conclusion #1: When non-use/passive values are excluded from the analysis, the baseline scenario will always have a more favourable benefit cost outcome than the Listing Scenarios.

In this circumstance (i.e. excluding consideration of non-use/passive values), benefits of the baseline scenario are equal to the food value of the harvest, and costs consist of routine monitoring and management programs. Beluga population monitoring is assumed to occur in years 10 and 20 of the policy impact period. Benefits of all three Listing Scenarios are either equal to or less than the baseline scenario. Costs of all three listing scenarios exceed costs of the baseline scenario in that incremental recovery action activity costs and consultation costs would be incurred. In the case of beluga population monitoring, costs would occur more frequently (years 5, 10, 15 and 20).

Conclusion #2: When non-use/passive values are included in the benefit-cost analysis, Listing Scenarios #1 and #2, should always have a more favourable benefit cost outcome than Listing Scenario #3 and the baseline scenario.

Assuming that non-use/passive values associated with Listing Scenarios #1 and #2 will be in the tens of millions of dollars annually, these benefits will exceed consultation, population monitoring and the reduced value of the food harvest by tens of millions of dollars annually. If shorter recovery periods are perceived as a proxy for a higher probability of successful recovery, then Listing Scenario #1 will always have the most favourable benefit cost outcome.

Table 10 illustrates the first conclusion. When non-use/passive values are excluded from the analysis, the differences between the Σ PV of benefits and costs are \$2.69, \$2.33, \$0.75 and - \$0.71 (\$million) for the baseline scenario, Scenario #3, Scenario #2 and Scenario #1, respectively (See Tables 1-4 in Appendix F). These results are consistent with an increase in annual costs and benefits of 1% and a 3% discount rate over the policy impact period.

TABLE 10:
 Σ PV Benefits - Σ PV Costs (\$Millions)
(Excluding Non-Use/Passive Values, Over 20-Year Policy Impact Period)

IMPACT CATEGORY	BASELINE	LISTING SCENARIOS		
		#3	#2	#1
		Harvest = 41	Harvest = 20	Harvest = 0
ΣPV BENEFITS				
Inuit Food	\$2.99	\$2.99	\$1.46	\$0.00
Non-Use/Passive Values	\$0.00	\$0.00	\$0.00	\$0.00
Sub-Total	\$2.99	\$2.99	\$1.46	\$0.00
ΣPV COSTS				
Recovery Actions	\$0.30	\$0.63	\$0.63	\$0.63

Table 11 illustrates the second conclusion. The table illustrates the minimum Σ PV of non-use/passive values required in each of Listing Scenarios #1-#3 to achieve a more favorable benefit-cost outcome than the baseline scenario, which are \$0.36, \$1.94 and \$3.32 (\$ millions) for Listing Scenarios #3, #2 and #1, respectively (See Tables 1-4 in Appendix F). These values are consistent with annual non-use/passive values of \$22,000, \$119,000, and \$207,000 for Listing Scenarios #3, #2, and #1, respectively, which are much less than the tens of millions of dollars annually suggested in the literature.

Σ PV Benefit - Σ PV Costs	\$2.69	\$2.33	\$0.75	(\$0.71)
Sub-Total	\$0.30	\$0.66	\$0.71	\$0.71
Consultation	\$0.00	\$0.03	\$0.08	\$0.08

TABLE 11:

Σ PV Benefits - Σ PV Costs (\$Millions)
(Including Non-Use/Passive Values, Over 20-Year Policy Impact Period)

IMPACT CATEGORY	BASELINE	LISTING SCENARIOS		
		#3	#2	#1
		Harvest = 41	Harvest = 20	Harvest = 0
Σ PV BENEFITS				
Inuit Food	\$2.99	\$2.99	\$1.46	\$0.00
NU/Passive Values	\$0.00	\$0.36	\$1.94	\$3.42
Sub-Total	\$2.99	\$3.35	\$3.40	\$3.42
Σ PV COSTS				
Recovery Actions	\$0.30	\$0.63	\$0.63	\$0.63
Consultation	\$0.00	\$0.03	\$0.08	\$0.08
Sub-Total	\$0.30	\$0.66	\$0.71	\$0.71
Σ PV Benefit - Σ PV Costs	\$2.69	\$2.69	\$2.69	\$2.71

The relationships between the baseline and Listing Scenarios as described in conclusions 1 and 2 above and illustrated in Tables 10 and 11, are insensitive to changes in discount rates. Table 12 illustrates that as discount rates increase, the baseline scenario continues to have a more favourable benefit-cost outcome compared to all Listing Scenarios when non-use/passive values are excluded from the analysis.

TABLE 12: Discount Rate Sensitivity Excluding Non-Use/Passive Values
(Σ PV Benefits - Σ PV Costs/Over 20-Year Policy Impact Period, \$Millions)

Discount Rate %	Baseline	Listing Scenario		
		#3	#2	#1
3	\$2.69	\$2.33	\$0.75	\$-0.71

Table 13 illustrates that as discount rates increase, Listing Scenarios #1 and #2 continue to have a more favourable benefit cost outcome than Listing Scenario #3 and the baseline scenario when non-use/passive values are included in the analysis. This occurs with relatively modest annual non-use/passive values of \$22,000, \$118,000, and \$207,000 for Listing Scenarios #3, #2, and #1, respectively. As discount rates increase the net PV decreases for all scenarios, as does the difference between net PV among the scenarios.

9	\$1.67	\$1.44	\$0.46	\$-0.41
7	\$1.93	\$1.67	\$0.54	\$-0.49
5	\$2.27	\$1.96	\$0.63	\$-0.58

TABLE 13: Discount Rate Sensitivity Including Non-Use/Passive Values
(Σ PV Benefits - Σ PV Costs/Over 20-Year Policy Impact Period, \$Millions)

Discount Rate %	Baseline		Listing Scenario	
	#3	#2	#1	
3	\$2.69	\$2.70	\$2.70	
5	\$2.27	\$2.25	\$2.26	
7	\$1.93	\$1.92	\$1.92	
9	\$1.67	\$1.66	\$1.64	

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