

Cumulative Effects Referral Criteria Report for the Nunavut Planning Commission

FINAL REPORT

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Executive Summary

The Nunavut Planning Commission (NPC) was established through the Nunavut Land Claims Agreement (NLCA) as an Institution of Public Government (IPG), responsible for the preparation of land use plans to guide and direct resource use and development in the Nunavut Settlement Area. Once a land use plan is approved, all federal and territorial departments and agencies are required to conduct their activities and operations in accordance with the land use plan. Project proposals are reviewed for conformity with approved land use plans by the NPC. Compliant proposals are advanced to the Nunavut Impact Review Board (NIRB) for screening or, where the proposal is exempt from screening (Schedule 12-1 of the NLCA), directly to territorial or federal agencies. Where the NPC has concerns respecting the cumulative impact of a project proposal in relation to other development activities in a planning region, Articles 12.3.3 and 13.4.4 of the NLCA provide the NPC with authority to refer proposals on Schedule 12-1 to the NIRB for screening. The NPC proposes to develop a process for the referral of projects on Schedule 12-1 when it has concerns with respect to cumulative effects. The NPC retained Nunami Jacques Whitford Limited (Nunami) to prepare a discussion paper to inform the planning process and contribute to the development of a cumulative impact referral process in the land use planning process.

Considerable attention has been given to investigating how to assess and manage cumulative effects in Canada, and the north in particular. During the literature review for this paper, Nunami reviewed 59 references related to cumulative effects assessment and management, many of which had a northern focus. In addition to the literature review, interviews were conducted with a variety of officials throughout Nunavut. The results of the literature review, interviews, dialogue with the NPC and the author's professional experience were applied to develop criteria to assist the NPC in the development of a referral process to determine when potential cumulative effects from project proposals falling on Schedule 12-1 may present a concern warranting further attention through screening by the NIRB. The criteria presented are based on consideration of spatial analysis and activity type. A number of considerations for addressing cumulative effects were presented and evaluated with reference to applicability to the NPC's requirements.

To advance the development of the referral criteria, the following recommendations are offered:

- NPC and government continue to work towards the establishment of thresholds. This is a long term solution based on considerable research and analysis and should be pursued in consideration of the Nunavut General Monitoring Plan.
- The NPC and its planning partners, consider the applicability, practicality and potential implications of implementing the proposed referral criteria. Such review should consider the simulated application of the criteria to a range of previously completed Schedule 12-1 projects which were exempt from screening.
- The NPC and its planning partners review the preliminary list of Schedule 12-1 project proposals that are considered to raise cumulative effects concerns.
- The appropriate parties in Nunavut address the approach to systematically assessing and managing cumulative effects in Nunavut.

This report presents a set of referral criteria for consideration during the development of the NLUP. It must be acknowledged that the authors consider the criteria presented to be an *interim* measure to be applied in the absence of thresholds. Additionally, the criteria proposed were developed to address NPC's cumulative effects referral responsibility under the NLCA and should not be considered as a cumulative effects assessment and management system, but could be part of a larger management system that may be developed by other parties.

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Abbreviations

CEAA	Canadian Environmental Assessment Act
CEAMF	Cumulative Effects Assessment and Management Framework
CGS	.....	Community and Government Services (GN)
GMP	.....	General Monitoring Plan
GN	.....	Government of Nunavut
INAC	.....	Indian and Northern Affairs Canada
IOL	.....	Inuit Owned Lands
IPG	.....	Institutions of Public Government
MVEIRB	.....	Mackenzie Valley Environmental Impact Review Board
NIRB	.....	Nunavut Impact Review Board
NLCA	.....	Nunavut Land Claim Act
NLUP	.....	Nunavut Land Use Plan
NPC	.....	Nunavut Planning Commission
NSA	.....	Nunavut Settlement Area
NSRT	.....	Nunavut Surface Rights Tribunal
NWB	.....	Nunavut Water Board
NWMB	.....	Nunavut Wildlife Management Board
NWNSRTA	.....	Nunavut Waters and Nunavut Surface Rights Tribunal Act
VEC	.....	Valued Ecosystem Component

1 Introduction

1.1 Background

The Nunavut Planning Commission (NPC) was established through the Nunavut Land Claims Agreement (NLCA) as an Institution of Public Government (IPG), responsible for the preparation of land use plans to guide and direct resource use and development in the Nunavut Settlement Area (11.4.1(b)). As defined in the NLCA, the purpose of a land use plan is to protect and promote the well - being of the residents and communities in Nunavut, taking into account the interests of all Canadians, and to protect, and where necessary, restore the environmental integrity of Nunavut (11.3.2).

To date the NPC has developed two regional plans, the North Baffin Regional Plan and the Keewatin Regional Land Use Plan, both approved in 2000. The NPC is currently preparing a territorial Nunavut Land Use Plan (11.5.1) to guide development throughout the Nunavut Settlement Area. The Nunavut Land Use Plan (NLUP) may contain regional or sub-regional components to assist with management of issues specific to a particular region.

Once a plan is approved, all federal and territorial departments and agencies are required to conduct their activities and operations in accordance with the plan (11.5.9). Project proposals are reviewed for conformity with approved land use plans by the NPC. Compliant proposals are advanced to the Nunavut Impact Review Board (NIRB) for screening or, where the proposal is exempt from screening (Schedule 12-1 of the NLCA), directly to territorial or federal agencies. However, where the NPC has concerns respecting the cumulative impact of a project proposal in relation to other development activities in a planning region, it may refer proposals on Schedule 12-1 to the NIRB for screening. Through the development of the NLUP, the NPC proposes to develop a process for the referral of projects on Schedule 12-1 when it has concerns with respect to cumulative effects. Accordingly, the NPC retained Nunami Jacques Whitford Limited to prepare this discussion paper to inform the planning process and contribute to the development of a cumulative impact referral process in the NLUP.

Such a referral process is project specific and could be a component of an overall framework to manage cumulative effects in Nunavut. Articles 12.3.3 and 13.4.4 of the NLCA set out the NPC's role as being contained to a referral process to the NIRB where the NPC has concerns regarding cumulative effects. The NIRB, with its responsibility for screening and reviewing the ecosystemic and socio-economic impacts of project proposals would be responsible for evaluating the acceptability of potential cumulative effects resulting from project proposals, whether the NPC raises cumulative effects concerns or not.

In a broader context, responsible parties may want to develop a coordinated and systematic framework or process to manage cumulative effects in Nunavut. The referral criteria presented herein and the criteria eventually incorporated in the NLUP are not intended to be a Cumulative Effects Assessment and Management Framework (CEAMF) for Nunavut, but rather one component of such a system, implemented during NPC's initial conformity review of project proposals.

1.2 Study Approach and Outline

Considerable attention has been given to investigating how to assess and manage cumulative effects in Canada, and the north in particular. During the preparation of this report the project team reviewed fifty-nine cumulative effects type documents to identify potential lessons for Nunavut and inform the NPC in its development of referral criteria. Parties with an interest in the management of cumulative effects in Nunavut were also interviewed for their insight. Using the information collected during this study and its own professional experience, the project team has prepared the following discussion to assist the NPC in the development of a referral process for determining when the potential cumulative effects from project proposals falling on Schedule 12-1 may present a concern warranting further attention through screening by the NIRB.

Following this introductory section, a number of considerations for addressing cumulative effects are presented and evaluated with reference to applicability to the NPC's requirements. Lessons learned from the literature are summarized in Section 3, with full details provided in Appendix A. Potential cumulative effects referral criteria to satisfy the NPC's responsibilities outlined in the NLCA are presented in Section 4. Conclusions and recommendations are presented in Section 5. Appendix A contains the results of the literature review. Appendix B presents a summary of the referral criteria.

2 Addressing Cumulative Effects

The section describes the fundamental principles behind what the NPC is required to do and how its mandate on referrals, based on cumulative effects, may be accomplished. This includes the statutory referral requirements (Section 2.1), an overview of cumulative effects solutions (Section 2.2), the practice of decision making (Section 2.3), and the relevant information and direction that comes from existing land use plans (Section 2.4).

2.1 The NPC Referral

2.1.1 Basis of Referral

The NPC reviews project proposals and water applications to determine conformance to land use plans, and informs the Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB) or other territorial and federal agencies of its determination. During such reviews the NPC also is required to refer projects exempt from screening to NIRB for screening if it has concerns about cumulative effects. These requirements are reproduced below (with emphasis added as underline) from the NLCA.

DEVELOPMENT IMPACT — PART 3: RELATIONSHIP TO THE LAND USE PLANNING PROVISIONS

12.3.1 Where the NPC determines, pursuant to Section 11.5.10, that a project proposal is in conformity with the land use plans, or a variance has been approved, the NPC shall, subject to Sections 12.3.2, 12.3.3 and 12.4.3, forward the project proposal with its determination and recommendations to NIRB for screening.

12.3.2 Project proposals falling within Schedule 12-1 shall be exempt from the requirement for screening by NIRB. The NPC shall not forward such project proposals to NIRB.

*12.3.3 Notwithstanding Section 12.3.2, the NPC may refer a project proposal falling within Schedule 12-1 to NIRB for screening, where the NPC has concerns respecting the **cumulative** impact of that project proposal in relation to other development activities in a planning region.*

12.3.4 NIRB shall not screen project proposals that are not in conformity with land use plans, unless an exemption has been received under 11.5.11 or a variance has been approved under Section 11.5.10.

12.3.5 Sections 12.3.1 to 12.3.4 shall apply where a land use plan has been approved pursuant to Section 11.5.9. In the absence of an approved land use plan, all project proposals other than those that fall within Schedule 12-1 shall be referred directly to NIRB for screening.

WATER MANAGEMENT — PART 4: RELATIONSHIP TO LAND USE PLANNING

13.4.3 Where the NPC determines, pursuant to Section 11.5.10, that a water application is in conformity with land use plans or a variance has been approved, and where the application falls within Schedule 12-1, the NPC shall forward the application with its determination and recommendations to the NWB for disposition, unless the NPC exercises its authority under Section 13.4.4.

*13.4.4 Where the NPC has concerns respecting the **cumulative** impact of development activities in a planning region, it may refer water applications to NIRB for screening even though the application falls within Schedule 12-1.*

2.1.2 The Referral Challenge

The NPC therefore must determine what is a cumulative effect of “concern”. This means that they must first understand if an effect is acting cumulatively, and then if so, if that effect causes a problem or “concern.”

The NPC’s challenge is not unique; in fact, the challenge is common for project reviewers on two fronts: in the discerning of an effect as cumulative (as opposed to caused only by the project under review), and determining what constitutes a “concern.” This challenge is particularly true for the NPC as Schedule 12-1 projects are smaller projects not subject to screening by the NIRB. It has come into general acceptance that a project is “small” when its spatial and temporal scope typically are limited to a relatively local area and/or for a relatively brief period of time. In the NPC’s case these projects are listed under Schedule 12-1 of the NLCA.

There are no clear and simple means of making these two determinations, and such solutions have long evaded both practitioners (those who write the assessments) and reviewers (those who review the assessments). The reasons are simple: in many cases we do not fully understand a cause-effect relationship. We do not have enough data, science, insight or time to pursue these relationships to the point that we are confident we have a defensible and reasonable conclusion. This is exemplified by the recent controversies and debate regarding the state of caribou and polar bear populations in Nunavut, in which scientific and local knowledge combine and separate on observations and predictions on two of the most valued mega-fauna in Canada’s north.

To be clear, and by way of a Schedule 12-1 land use example, a cause-effect relationship is a linking between what people do in the environment and the environment’s response. Its description is made through a series of linked events. A classic northern example (see Figure 1.1) is a helicopter over flight (the cause) causing noise that distracts a caribou which experiences a physiological response that makes the caribou run. This incrementally diminishes its fat reserves that therefore reduces, however slightly, its probability to remain healthy during the winter and therefore increases the risk of mortality (the effect). So far, there are no cumulative effects involved. However, if that same caribou then encounters research camp “A”, it may again and similarly respond. Now there is a cumulative effect on that caribou. Later, the caribou may also encounter a twenty bed tourism camp “B”. By now, the caribou has experienced three unnatural events in its movement across the landscape. So, just what is the state of the caribou by the time it passes camp “B”?

How does the NPC determine if there are cumulative effects of concern with small projects such as the example above? The conventional view of the “picture” created here typically is:

1. Would the addition of camp B, along with camp A and helicopter over flights, be too much for the caribou? Technically — would the addition of another anthropogenic disturbance to any individual within an interbreeding population result in behavioural and/or physiological responses that may reduce fat reserves or natality through increased energetics associated with direct response and displacement to non-preferred habitat? And, from a human use point of view, will the risk of less caribou to hunt increase or movement of caribou be changed so they can no longer be found in traditional areas?
2. The response of caribou to such disturbances, as described in the literature and from local knowledge, is reviewed but is inconclusive and at times contradictory. Suffice to say that some response will likely happen.
3. The population status of the herd is reviewed as to whether there is or appears to be a discernable trend, and if it is a decreasing trend of numbers, then any effect, particularly at certain times of the year or places, would be viewed as a high risk.
4. Also, there is interest in the region from exploration companies, and although none are “on the books” now, it is reasonable to assume that more applications will come in for the same general area.

5. It is not possible to discern if the spatial proximity of these projects and activities are simply too close, and then at what distance they may have to be separated for the combined (cumulative) effects to diminish.
6. Finally, regardless of what may or may not happen in these ways, the camp would be located in a known area of some designated importance, whether for ecological reasons (e.g., calving area, movement corridor) or cultural (e.g., heritage resources, location of seasonal hunting camp).

Given the above, on balance, a referral is made on the grounds that a cumulative effect may occur, and if it occurs, it would be one of concern because of the uncertainty of response and herd status and the importance of the effect to humans if the effect was negative.

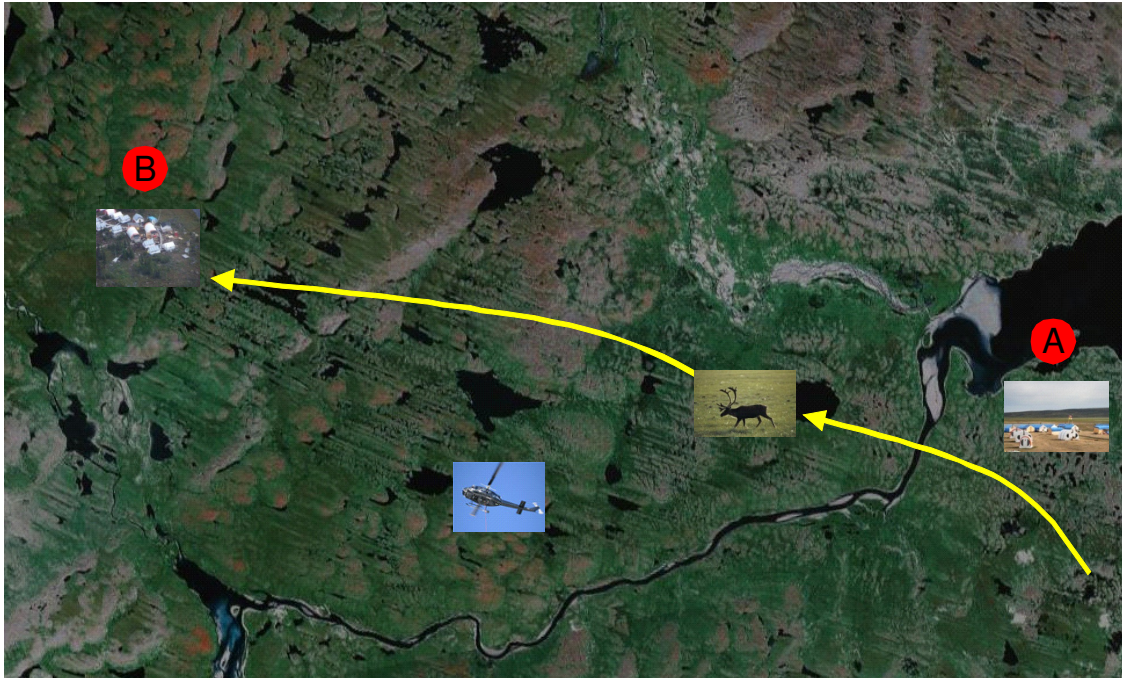


Figure 1.1 A Cumulative Effects Problem

Now, the optimistic view of the NPC, looking ahead to what may come from current initiatives on resource management, wildlife ecology and cumulative effects assessment and management would include the following questions and process:

1. Is there a threshold that could be applied? Perhaps one based on maximum number of camps within a certain area, or minimum distance between camps, or maximum noise and light levels? And, if one is available, does the contribution of the project under review cause an exceedance of that threshold?
2. If no threshold is available, then does the state of knowledge of the status of the herd and possible individual and herd response to disturbance indicate a high risk to the herd, with a high degree of certainty?
3. Is the “mere” presence of another camp cause from the community to view that such additional presence on the land is unacceptable?
4. Beyond what is happening now, and may happen at the time of the project, will the region continue to be developed because of this project, or notwithstanding this project, creating a possible future that may with more certainty cause cumulative effects? If the project is not an issue spatially (because of *where* it is), does it cause concern temporally (because of *when* it is)?
5. If there is a high degree of uncertainty to the above, then could a monitoring program be put into place that was, through its design, effective enough to watch the project under review and effect of

concern (e.g., caribou response), and determine if a certain point has been reached that is unacceptable?

6. Meanwhile, parallel efforts are made to improve on available information through initiatives as described in Section 3 or a customized amalgam to suit specific NPC or government agency needs. Those efforts may be developed and progressed to the point that information is collected and eventually becomes available to the NPC. Over time, the NPC's ability to make referral decisions improves.

As that information considered necessary above is typically not available, a basis of referral decision must nonetheless be made to meet the current regulatory mandate. ***The challenge is to make a referral in the absence of all the information required to make a fully informed decision.*** This is because using the latter process is not yet possible, and in some cases may never be possible for some aspects of what it refers to. Regardless, land use plans may apply criteria through zoning or by identifying land use activities that are known to have the potential to raise cumulative effect concerns.

2.2 Cumulative Effects Solutions

2.2.1 Summary of Options

The literature has many examples of possible solutions to the cumulative effects challenge; namely, approaches taken by various jurisdictions in identifying conditions that may lead to cumulative effects of concern, and what they then did about those effects. Such approaches typically include one or more of the following:

1. Base mapping of natural features that may be impacted by human actions (i.e., activities and projects).
2. Natural resource inventories and studies (e.g., wildlife populations).
3. Results of community consultation regarding identification of valued natural and social/cultural components and desired future outcomes (includes traditional knowledge).
4. Results of scientific study regarding identification of valued natural and social/cultural components.
5. Identification of valued natural and social/cultural components from government initiatives (e.g., conservation plans, scientific research, studies).
6. Derived mapping of potential conflicts and effects (e.g., wildlife and cultural hotspots).
7. Mapping of human actions, including existing (which includes past actions for which any remain) and reasonably foreseeable (at minimum, actions publically announced and within regulatory review).
8. Future scenario forecasting of other possible actions beyond the above (in #7).
9. Correlations of cause-effect between human actions and natural receptors (e.g., aircraft over flights on wildlife, failure of waste containment on water quality).
10. Identification of land uses that may lead to cumulative effects concerns (e.g., mineral staking).
11. Management options to minimize potential effects, including project-specific and regional multi-stakeholder initiatives (e.g., thresholds).

Identifying conditions that may lead to cumulative effects of concern can be simple or complex. It can be simple if it can be clearly demonstrated that affected natural and human features are not spatially or temporally affected by more than one action. The likelihood of this condition can be high in northern landscapes because of the possible large distances between actions. However, it can be complex because, particularly for biological receptors, the nature of the effect is unclear however strongly an effect is suspected.

Therefore, referral criteria must be expansive enough to allow various options as conditions and data warrant, but be clear on what constitutes a decision “trigger” leading to a referral so the land use plan guides and directs land use. The trigger must be simple to be effectively included in a land use plan, and derivation of a simple trigger is challenging because it must practically overcome the complexities involved to allow the decision maker to arrive at a conclusion. The trigger process must be redundant by providing options if certain key information (e.g., maps of sensitive areas) is not available. This is why the identification of many options is beneficial, providing the needed flexibility in the referral decision. As such, the literature review (Section 3) provides an insight into what other options may be available and appropriate for the NPC.

2.2.2 Project and Regional Assessment Partnership

There are clearly two initiatives that repeatedly and strongly stand out as the lead solutions, without which the cumulative effects problem cannot be solved: land use plans and implementation of thresholds within those plans. The very reasons why these are such strong candidates are the same reasons that they are only infrequently implemented. To address cumulative effects effectively implies management that does not allow for free access anywhere and anytime; however, such restriction of access to resources is understandably contentious. At this point, the solution to the cumulative effects problem is no longer a technical, scientific or land planning issue; it is one in which the fundamental, historic and legal right-of-entry and tenure would require change.

In the absence of land use plans with identified development thresholds, individual project applications serve as surrogates to meaningful and coordinated regional cumulative effects management solutions. This is currently happening to some exploration projects (larger in scale than Schedule 12-1 projects) in some parts of northern Canada (e.g., MVEIRB 2007, MVEIRB 2008, NIRB 2008, NIRB 2009). These projects are being subject to a regulatory review process that has little or nothing against which to place the application into any decision making context. There is nothing available to test the application on cumulative effects because there is no benchmark to do so. This is why many project applicants have their applications, however “small”, subject to the full scrutiny of acceptability in the absence of clear acceptability criteria.

The majority of initiatives that claim to be associated with cumulative effects are largely regional data gathering exercises. These initiatives have many names; most common are “cumulative impact management frameworks,” “regional cumulative effects assessments,” “regional cumulative effects monitoring programs,” and derivations thereof.

Few such initiatives offer immediate solutions to assist the screening level determination of a specific project’s potential contribution to cumulative effects. The NPC’s obligation under NLCA sections 12.3.3 and 13.4.4 is unique. However, all these initiatives do offer insights, concepts, approaches and process that if implemented may assist screening level reviews by providing useful information. They can also provide direction to the development of regional cumulative effects management processes, of which the referral process would be a component.

Review bodies, such as NIRB and the NPC, need to make immediate decisions based on available information (i.e., not wait for the right information to become available unless a moratorium is decided). Meanwhile, both those parties and other government institutions may collaborate on developing Nunavut wide approaches, such as the already under development Nunavut Land Use Plan and Nunavut General Monitoring Plan (NGMP). As these plans come to fruition, and along the way information to support these plans is collected, it will inevitably help the review of project applications. And, as project applications are reviewed, that detailed information will be subsumed with the larger regional initiative(s) to improve the quality of that information.

2.2.2.1 The Regional Solutions Gap

Regional approaches seldom describe the process of interpreting the data in the context of identifying a management response. Essentially, the focus of efforts has been on data collection to the absence of data interpretation. In the face of information gaps, decision makers must still translate a wide variety of often disparate information into a sensible and meaningful decision. And, recognizing the failure of available data to meet expectations, decisions then default to ones based on overcoming the unknown represented by uncertainty, such as through mitigation, monitoring and outright rejection of project applications.

The assumption driving so many cumulative effects initiatives has been that "...if only enough data are collected, then surely, eventually, enough insights will emerge pointing to the appropriate, scientifically defensible, management actions." Unfortunately, that is not true, and so determinations on cumulative effects concerns, such as what the NPC needs to do, need to rely on available information and focus on spatial approaches. This can be provided through a systematic process of evaluation where Schedule 12-1 land uses in certain areas may raise cumulative effects concerns.

The aforementioned assumption (i.e., collect enough data inevitably results in a self evident solution) is rarely the case. The failure of these initiatives (and some do fail to deliver on all or any of their original objectives), is that in the end management actions to address cumulative effects must be based on some form of restriction to current regulatory approval and industrial practices. Such restrictions may be as seemingly innocuous as reducing the width of a seismic line (an example of a project-specific mitigation measure) to as potentially onerous (to unimpeded resource access) as identifying land use activities, thresholds or protective zoning (examples of landscape spatial restrictions).

Clearly, the closest any initiative, and any scientific study, is to developing clear criteria for discerning a "cumulative effect of concern" is based on one principle: non-conformance to spatially based thresholds. Said in another way, the first case is the classic restriction common in certain land use zones within land use plans (which can itself be based on specific important natural attributes, such as core overwintering habitat), and the latter case is the numerical terrestrial or water based disturbance threshold, the most common and well known being km of vehicle accessible "roads" divided by the km² of land area within the managed boundaries.

This approach, while the simplest to implement as a referral criteria, and therefore the most attractive, is also the most difficult to implement. It is the most attractive because, once set up, it provides the least ambiguous basis of referral determination (i.e., a binary "it's in" or "it's out" conclusion). The reason this is the most difficult to implement is because technically the certainty of the scientific basis is often subject to dispute, especially given the potential ramifications to resource access, which then becomes a political challenge. The other reason is that its implementation is very data intensive; substantial resources and time are needed to even map natural features and human disturbances (a seemingly straight-forward process), while also requiring updating that data continuously on a real-time basis. And, to do that always will require resources (people and money) and time far beyond what many such initiatives first can support or to meet the demands of a regulator's imperative to exercise timely responses to approval applications.

Which comes full circle to why many cumulative effects initiatives become stuck as data gathering exercises, only to collect the data necessary to support solutions to "solving the cumulative effects problem".

The problem is compounded by a basic but not always remembered premise of cumulative effects: you need more than one human action acting on the same resource (a term that is all encompassing for all natural and human features), and where that resource in any way responds to all those human actions. In other words, in Nunavut for example, one exploration program in a caribou calving grounds may not

cause a cumulative effects problem if that's the only human action acting on those caribou or their habitat. The project may still cause a problem, but it is not a cumulative effects problem.

Basic scientific study combined with traditional knowledge still may differ and argue over even what that one project may do to the caribou. Add even one more human action, say a staking program 20 km away (as with the "case study" example in Section 2.1.2), and the previous situation is now made more complex by determining if their combined effect is of concern. Given the paucity of data and inherent uncertainties regarding caribou (including basic information on the actual number of animals that may be affected) to cause-effect relationships (such as negative physiological responses), the complexities eventually overburden any reviewer (such as a government reviewing officer) of the projects. These complexities of understanding, or details required to explain current understanding, are often overcome by using a simpler "rule of thumb" basis. These simplified rules often necessarily become more coarse and broad in basis, and often reflect a gross interpretation of the many details. However, they do not require the reviewer to either understand or describe complexities, thus avoiding the protracted effort and time to resolve each project determination.

For land use plan referrals, an *interim* solution is suggested in this report until sufficient data and understanding is available, including the identification of specific land uses which are expected to induce future development. Secondly, identifying specific geographic areas where Schedule 12-1 project proposals will be referred is another and complementary approach, either of which would provide NPC with a spatial and/or conformance based referral process.

2.3 Decision Making

Solving the cumulative effects role of the NPC under the NLCA, whereby NPC must refer Schedule 12-1 project proposals and water applications which raise cumulative effects concerns is not going to happen with the direction that the majority of such initiatives, claiming to do so, are going, most which focus on the *collection* of information. A solution will evolve when it is determined how the information will be interpreted and used to arrive at a conformity/management decision.

An effective NPC referral criteria cannot rely solely on information. It must also know *what to do with* that information, a process of translating what is known, suspected, conjectured and uncertain into a defensible, objective decision within the opportunities and constraints of its legislated mandate.

In all reviews there are people involved whose responsibility is to make a decision, or advise government, on the fate of the project application. The decision will include consideration of various forms of evidence.

Decision makers, in the development of their decision, do have available some help in the form of precedents from other similar decisions, information from other similar assessments, application of good science, and the options allowed under their formal mandate. But this is not enough.

Projects are proposed because there is a demand for what the projects do. And decision makers have responded by approving, with conditions, many projects in recognition of this need. Therefore, ultimately, project applications are tested not just by the merits of their technical content and argument, but by how compelling the weight of that evidence is given the costs, risks and benefits involved. In the case of the NPC's referral requirements, such decision making must be distilled into an as prescriptive approach as possible that has already a built in basis of arriving at a decision.

2.3.1 Information Needs

Availability of that information can be improved in the following ways:

- Defining how to evaluate the importance of an effect by defining a level of acceptability
- Using the past, or historical trends in Schedule 12.1 land use activities to forecast the future, or at least to understand the place or context of a proposed project framed within a larger historical progression
- Obtaining reliable information regarding sensitive times of year for wildlife and habitat
- Reducing ecological complexity to become simpler but understandable

2.3.2 Thresholds

The assumption has been that the answer to addressing cumulative effects through land use plans are thresholds, also referred to as limits of change or carrying capacity. But thresholds, as numbers, can be difficult to derive and even more difficult to apply. Exceptions are those, as mentioned earlier, based on the relatively simple physical and chemical properties of air and water, as opposed to the more complex way in which organisms interact with that physical environment.

At least in terrestrial ecosystems, in particular sensitive habitat (e.g. critical migratory bird habitat), it is not realistic to expect cumulative effects assessors to determine significance. In Canada, a large amount of research has, for example, been necessary to bring our understanding of caribou — an icon of the Canadian wilderness — to the point where a quantitative attempt at assessing effects can be made with even a relatively low level of confidence. For example, we know that removing and altering habitat will eventually result in extirpation. Do we need to know exactly how much can be removed before extirpation is inevitable and, by extension, how big an increment of additional disturbance will tip the balance?

2.3.3 Scenario Forecasting

If we wish, we can take known human and natural history and project it ahead in a future scenario forecast. Such forecasts offer various simulated futures that vary depending on the degree of human disturbance. These may be accomplished by mapping conceivable futures over time, and for *each* such moment discerning possible effects on selected environmental features. However sophisticated these may be, they fundamentally help answer the question “what if?” when decision makers question the implications and acceptability of increased human activity.

Such analysis, however attractive for its apparent depiction, must be approached with caution and used appropriately. Cumulative effects assessment can be like forecasting weather or climate. The system under examination is complex and inherently difficult to forecast in the short term or in detail. However some longer term forecasting is possible. We know it will be colder in the winter even if we can't say with any confidence exactly how cold and exactly when. Similarly we know that if we keep removing or altering habitat, populations of plants and animals that depend on it will decline and, eventually, disappear. Forecasting *when* they will disappear is more difficult.

Also, both natural and human systems demonstrate remarkable periods of stability marked by equally remarkable periods of instability. This can throw future forecasting for a loop and predicting hypothetical or induced futures into the universe of error bars greater than its originating data.

2.4 Nunavut Land Use Plans

As stated in Section 2.1.1, the technical basis of the NPC's referral are two provisions in the NLCA. In both cases, the NPC refers an application if it “...*has concerns respecting the cumulative impact of that*

project proposal in relation to other development activities in a planning region". That requirement raises the implication of land use plans in the referral decision; indeed, the related dual-mandate of confirming conformance to land use plans. This then raises the question of "conformance to specifically what?" within those plans.

Land use plans do not always provide a level of detail (e.g., resolution) required to fully support decision making on cumulative effects for specific individual project applications. The closest most plans get to satisfying that objective is in the zonation of land and water, and in specifying management (mitigation) requirements. Otherwise, land use plans offer a strategic or high-level vision and direction, which if recognized for what it is may also offer further insight into deciding the fate of project applications. In fact, land use plans, and particularly the zoning of lands and water (which includes designation of protected areas), provide one of the most valuable, practical, attainable and effective means of addressing cumulative effects.

Land use plans tackle cumulative effects on a coarse landscape scale by parsing the landscape into tiers of human intervention, which often is far more useful than trying to tackle the nuances and complexities of the cause-effects of any given individual project and pursuing the resultant determination of significance. Basically, land use plans say that an effect is assumed significant based solely on where the project is, because *where it is* has already been determined as susceptible to certain or any human disturbance. In this way a land use plan serves as a *de facto* cumulative effects screener.

In Nunavut there are currently two approved land use plans, Keewatin and North Baffin. The two approved plans share the same essential components. As such, any consideration of NPC's referral criteria must start with what the land use plans say, both at a strategic level and what it offers for "on the ground" measures.

The following summarizes a review of the Keewatin and North Baffin Regional Land Use Plans (NPC 2000a, NPC 2000b) for content relevant to a referral.

2.4.1 Strategic Considerations

The land use plan's strategic vision is based on principals of sustainable development. The following excerpts exemplify this.

Planning Principles under the NLCA

The primary purpose of land use planning in the Nunavut Settlement Area shall be to protect and promote the existing and future well being of those persons ordinarily resident and communities of the Nunavut Settlement Area taking into account the interests of all Canadians; special attention shall be devoted to protecting and promoting the existing and future well being of Inuit and Inuit Owned Lands.

Support for Regional Economic Development

Residents would like to see the development of a stronger local and regional economy that would provide more business and employment opportunities, particularly for youth. At the same time, they want to maintain, as far as possible, the traditional lifestyle of Inuit, and would like to see more economic endeavours that combine elements of tradition with wage employment and business opportunities.

Encouragement of Multiple Land Uses

The land and resources of the Keewatin should be available to all users, subject to the principle of sustainable development.

Although it is true that such statements may at first appear to offer little guidance to referral decisions, such statements are an important first step by revealing the importance of certain key indicators and objectives that should not be compromised by project development. This includes communities, livelihood of its residents and acceptance of the need for economic development but in full cognizance of its implications to not just the natural environment, but also to social and cultural environment. In other words, they all have equal footing.

2.4.2 Specific Conditions

A review of the land use plans reveal a variety of specific information and conditions that may apply to project reviews, summarized as follows:

- Prohibition of development activities in certain areas for specific ecological or cultural reasons
- Prohibition of development activities within caribou calving areas during calving season and within water crossings
- Site waste management (cleanup)
- Closure and restoration of projects (mines, oil and gas)
- Registry of archaeological sites
- Review (by NPC, NIRB, NWB and NWMB) of issues related to uranium exploration and mining prior to continuation of such development
- No “low level” flights
- Concept of transportation and communication corridors
- Use of local and traditional knowledge
- Monitoring of cumulative effects
- Recognition of biological limits exist (but are not specified) of fish, wildlife and other renewable resources to renewable resource harvesting
- Implementation of a General Monitoring Plan (GMP)
- Identification of land values as elements of the planning region, identified by communities and/or wildlife managers as being important (e.g., wildlife species harvested by a community, travel routes, types of wildlife habitat, or archaeological sites)
- Cumulative impacts of additional hydroelectric power development in other jurisdictions (Manitoba, Ontario and Quebec) surrounding Hudson’s Bay
- Caribou protection measures (DIAND)
 - No activity between May 15 and July 15 within Caribou Protection Areas (CPAs)
 - Exemption if past May 15, upon visual detection of caribou cows, activities cease and non-essential personnel depart, no blasting, no over flights < 300m, no ATVs outside camp
 - If outside CPA and caribou cows detected, then same conditions
 - Do not locate any operation that blocks or causes substantial diversion to migration
 - Cease activities that may interfere with migration, such as airborne geophysics surveys or movement of equipment, until migrating caribou have passed
 - Between May 15 and September 1 do not construct any camp, cache any fuel, or conduct any blasting within 10 km of “Designated Crossings”

- Between May 15 and September 1 do not conduct any diamond drilling operation within 5 km of any “Designated Crossing”

Consideration of the above requirements leads to two observations:

- The most powerful contribution to addressing cumulative effects, represented by a number of conditions, is exclusion (no go areas), either spatially, in time (i.e., “timing windows”), or both.
- The most extraordinary requirement is in regards to effects on Hudson Bay (which lies outside of NPC’s jurisdiction) representing a trans-boundary level of assessment. Generically, this recognition of how effects may appear at supra-regional scales is an important one for marine and fresh water quality and for far ranging wildlife and marine species (e.g., for the Beverly Qamanirjuaq caribou herd given the southern extent of its range is in Manitoba). Management at such scales however first requires agreements on inter-jurisdictional cooperation before the results of cumulative effects assessments at such scales may have an opportunity to be realized in effective regional management.

2.4.3 Valued Components and Indicators

Any early discussion of cumulative effects quickly and understandably includes an identification of just what may be affected by a Schedule 12-1 project proposal. Commonly referred to as valued ecosystem components (VECs), in the language of environmental impact assessments, these receptors to project effects are typically well known, and certainly the most important ones, in relatively large and homogenous landscapes as in Nunavut.

Indicators are those things that show the state of a VEC; in many cases they are the same thing. If caribou is a VEC, for example, an indicator could be effective habitat. The hallmark of an indicator is that it is measurable, and if measured, assists in indicating the condition of something that may be affected by a project and that we consider important enough to care about.

The terms VECs, indicators and its close cousin “measurable parameter” at times appear and indeed are used loosely and interchangeably. Notwithstanding the semantics, fundamentally what we are talking about are things “out there” and within the human community that may need to be assessed.

The identification of VECs and indicators is itself a large and dedicated task. However, for the moment, relevant examples of candidate “indicators” exist from the land use plans (specifically, the draft West Kitikmeot plan which borrowed them from the North Baffin). In summary, these indicators are:

- Natural Environment
 - Landscape (e.g. habitat)
 - Fresh water (e.g. aquatic habitat, community water supplies)
 - Marine (e.g., whales)
 - Atmosphere (e.g., air quality)
 - Biota (e.g. polar bears, caribou)
- Economic Environment
 - Natural resource harvesting (e.g., of caribou)
 - Employment (e.g., proportion of annual income from wages)
 - Commercial and industrial activity (e.g., hunting, uranium and gold mining)
 - Consumption (e.g., use of goods and services)
- Community Environment
 - Demographics
 - Services
 - Health care

- Education
- Public participation
- Culture, heritage, recreation
- environmental protection
- Cultural Environment
 - Individual health
 - Social equity
 - Personal safety
 - Quality of life

3 Review of Cumulative Effects Approaches

3.1 Approach

Given the challenges and opportunities discussed in Section 2, the logical question is then raised: just what has been attempted elsewhere that may answer to NPC's challenge? What have others done to address this "cumulative effects problem?"

A literature review was conducted to do just this — to identify project and regional level options based on what's been tried by others. And, more specifically, to find project level approaches that may be used by NPC in identifying conditions that may lead to cumulative effects of concern and incorporated into its referral criteria for Schedule 12-1 project proposals. And, regional level approaches, with a broader support, that may be used to improve that referral process by providing more useful information.

The rationale for the particular literature selected was based on knowledge and familiarity by the reviewing team, and potential or certainty for it to be relevant to the interests of NPC and other agencies in Nunavut. As such, given the broad ranging nature of such literature, this review does not profess to be complete. It also does not profess to represent an equally weighted sample of initiatives (by number of references) amongst the types identified. However, it is relevant by way of examples illustrating what opportunities there are which have been tried or conceptualized. Further, these examples are drawn from various geographic regions, notably the Canadian Arctic and western Canada. Content therein included:

- How valued components are identified (both natural and human environments)
- How valued components are mapped, communicated and used
- Approaches to "analyzing" a landscape to identify thresholds (aka. limits to change, carrying capacity, caps)
- Specific cause-effect relationships between human disturbances and valued components typical of Nunavut (e.g., ocean shipping on marine mammals)
- Specific mitigation of human disturbances on valued components for northern regions
- Approaches and lessons learned to apply all the above in a decision making process (e.g., regulatory review of project applications, land use planning) to determine the fate of individual project applications or the preparation of information and conditions for a region prior to review of project applications

Table 3.1 summarizes the geographic location (total of eight) and type (total of nine) for the 59 references reviewed. The regions and type were selected to meet the purposes of this report. Table 3.2 provides the region and type for each reference. Appendix A provides the literature review itself. In Appendix A, full bibliographic and source information for each reference is provided, followed by a summary of the initiative and extraction of approaches that are relevant to NPC and its specific referral role established under Articles 12.3.3 and 12.4.4 of the NLCA.

Table 3.1 References by Region and Type

Geographic Region (Global Scale)	#	Type	#
All	6	Analytical Tool	11
Arctic (Alaska)	1	Assessment	1
Arctic (Canada)	30	Framework	5
Arctic (circumpolar)	2	Land Use Plan	5
Arctic (Europe)	2	Management Approach	12
Canada	3	Monitoring	3
Canada (south)	14	Policy	4
Europe	1	Regional Study	6
		Research Study	12
Total	59		59

Table 3.2 List of References by Geographic Region

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
8	A Landscape Cumulative Effects Simulator (ALCES)	All		Analytical Tool
11	Conservation Matrix Model	All		Analytical Tool
14	Science-based Thresholds	All		Research Study
16	GLOBIO – Global methodology for mapping human impacts on the biosphere	All		Analytical Tool
40	Environmental Risk Assessment (ERA)	All		Analytical Tools
57	Regional Strategic Environmental Assessment (R-SEA)	All		Research Study
21	Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope	Arctic (Alaska)		Research Study
27	North Yukon Land Use Plan	Arctic (Canada)	North Yukon	Land Use Plan
33	Wildlife Resource and Habitat Values in Nunavut	Arctic (Canada)	Nunavut	Research Study
47	West Kitikmeot/Slave Study	Arctic (Canada)	Nunavut	Regional Study
29	Beverly and Qamanirjuaq Caribou Management Plan	Arctic (Canada)	Nunavut, NWT, Manitoba	Management Approach
15	Mackenzie Gas Project Scenarios of Future Developments	Arctic (Canada)	NWT	Analytical Tool
17	Potential Landscape Impacts of Gas Development in Northern Canada	Arctic (Canada)	NWT	Analytical Tool
24	Beaufort Sea Strategic Plan of Action (BSSrPA)	Arctic (Canada)	NWT	Regional Study
26	NWT Species at Risk Action Plan: Boreal Woodland Caribou Conservation	Arctic (Canada)	NWT	Management Approach
28	Thelon Game Sanctuary Management Plan	Arctic (Canada)	NWT	Management Approach
32	Beaufort Delta Cumulative Effects Project	Arctic (Canada)	NWT	Research Study
34	Developing and implementing thresholds in the Northwest Territories	Arctic (Canada)	NWT	Research Study
46	Fort Liard Area Cumulative Impacts Mapping Project	Arctic (Canada)	NWT	Analytical Tool
48	Cumulative Effects Management in the Deh Cho Territory	Arctic (Canada)	NWT	Management Approach
58	Cumulative Impact Monitoring Program (CIMP)	Arctic (Canada)	NWT	Monitoring
49	Deh Cho Draft Land Use Plan	Arctic (Canada)	NWT	Land Use Plan
50	Gwich'in Land Use Plan	Arctic (Canada)	NWT	Land Use Plan

Table 3.2 List of References by Geographic Region (cont'd)

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
51	Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Proponents	Arctic (Canada)	NWT	Management Approach
52	Cumulative Effects Assessments in the Inuvialuit Settlement Region: Current and Potential Capability	Arctic (Canada)	NWT	Policy
53	Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Reviewers	Arctic (Canada)	NWT	Policy
54	EKATI Independent Environmental Monitoring Agency (IEMA)	Arctic (Canada)	NWT	Monitoring
55	Diavik Environmental Monitoring Advisory Board (EMAB)	Arctic (Canada)	NWT	Monitoring
56	NWT Environmental Stewardship Framework	Arctic (Canada)	NWT	Framework
59	Great Bear Lake Watershed Management Plan	Arctic (Canada)	NWT	Land Use Plan
9	Kluane National Park CEA	Arctic (Canada)	Yukon	Assessment
10	Yukon Caribou Thresholds Pilot	Arctic (Canada)	Yukon	Research Study
31	Thresholds for addressing cumulative effects on terrestrial and avian wildlife in the Yukon.	Arctic (Canada)	Yukon	Research Study
13	Road to Improvement – The Review of the Regulatory Systems Across the North	Arctic (Canada)		Policy
18	Cumulative Effects Modeling of the Mackenzie Gas Project	Arctic (Canada)		Analytical Tool
30	Habitat-Based Population Viability Analysis to Wildlife of the Canadian Central Arctic	Arctic (Canada)		Analytical Tool
43	Regional Approaches to Managing Cumulative Effects in Canada's North	Arctic (Canada)		Research Study
19	Arctic Human Development Report	Arctic (circumpolar)		Research Study
20	Arctic Climate Impact Assessment (ACIA)	Arctic (circumpolar)		Research Study
22	Social Impact Assessment in Regional Land Use Planning	Arctic (Europe)		Research Study
25	Barents Sea Integrated Management of the Marine Environment	Arctic (Europe)		Regional Study
12	Oil and Natural Gas Industry Best Management Practices	Canada		Management Approach

Table 3.2 List of References by Geographic Region (cont'd)

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
41	Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada	Canada		Management Approach
42	Strategic environmental assessment Cabinet Directive	Canada		Policy
6	Alberta Land Use Framework	Canada (south)	Alberta	Land Use Plan
36	Alberta Woodland Caribou Recovery Plan 2004/5–2013/14	Canada (south)	Alberta	Management Approach
38	Landscape, biodiversity and watershed indicator review and assessment	Canada (south)	northeast Alberta	Analytical Tools
39	Predictive modeling tools for wildlife and fish in the Wood Buffalo region	Canada (south)	northeast Alberta	Analytical Tools
35	Interim Oil and Gas Industry Guidelines for Boreal Caribou Ranges in Northeastern BC	Canada (south)	northeast BC	Management Approach
37	Besa-Prophet Pre-Tenure Plan — Phase I	Canada (south)	northeast BC	Management Approach
44	Cumulative Effects Assessment and Management Framework for Northeast British Columbia	Canada (south)	northeast BC	Framework
45	Cumulative Impact Management Screener	Canada (south)	northeast BC	Framework
3	Terrestrial Ecosystem Management Framework, Regional Municipality of Wood Buffalo	Canada (south)	northeastern Alberta	Framework
5	Cumulative Environmental Association (CEMA)	Canada (south)	north-eastern Alberta	Framework
7	Conservation and Biodiversity Offsets in Alberta's Boreal Forest	Canada (south)	northern Alberta	Management Approach
1	Southern Foothills Study (Report)	Canada (south)	Southern Alberta	Regional Study
2	Southern Foothills Study (Thesis)	Canada (south)	Southern Alberta	Regional Study

Table 3.2 List of References by Geographic Region (cont'd)

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
4	Great Sand Hills Environmental Study	Canada (south)	southern Saskatchewan	Regional Study
23	Natura 2000 Network for Biodiversity Conservation and Protection	Europe		Management Approach

Geographic Region (Global Scale)

All
 Arctic (Alaska)
 Arctic (Canada)
 Arctic (circumpolar)
 Arctic (Europe)
 Canada
 Canada (south)
 Europe

Type

Analytical Tool
 Assessment
 Framework
 Land Use Plan
 Management Approach
 Monitoring
 Policy
 Regional Study
 Research Study

3.2 Findings

A review of Appendix A reveals the following dominant approaches. They are organized here by project-specific and regional (multi-jurisdictional, multi-disciplinary) focus.

- **Project-specific**
 - Screeners
 - Cumulative effects assessments
 - Project effects management (mitigation) and monitoring
- **Regional (multi-jurisdictional, multi-disciplinary)**
 - Land use planning
 - Thresholds
 - Protected areas, networks, conservation offsets
 - Species protection/ recovery plans
 - Baseline data collection, mapping, monitoring
 - Future scenario modelling
 - Frameworks
 - Integrated effects management
 - Strategic environmental assessment

The following observations can be made of these approaches:

- No single and universally applicable solution exists to the assessment and management of cumulative effects. No single referral solution for the NPC is apparent. No other jurisdiction has the land use planning responsibility to refer projects for screening by an environmental assessment agency based on cumulative effects concerns identified during the conformity review process. Additionally no single regional solution is apparent for Nunavut. These solutions will need to come from a “pick and choose” of these initiatives, either as “turn-key” packages or selection of specific techniques to be combined with others from other approaches.
- Few screening level approaches exist. Few or no decision making processes exist.
- A common single theme characterizing all approaches is that they are collectors of information. The pursuit of data collection has at times overshadowed progress on moving ahead with various initiatives in the acceptance of those gaps and uncertainties. These approaches do not support the NPC referral role of small projects to NIRB for screening.
- Regional approaches are focused on spatial allocation of land (and water) as to allowed activity, from none to some degree of constraint.
- Regional level analysis in support of this is principally the tool of future scenario forecasting.
- All encompassing regional approaches, under such labels as “frameworks” and “strategic assessment”, are hampered in making substantial progress by lack of adequate information to support (undefined) decision making process, and by the human resources to collect that data and implement the programs therein. That said, these approaches have made progress primarily in recognizing what likely needs to be done, and bringing together various stakeholders to at least begin establishing the basis of such approaches.
- Until all encompassing regional approaches have the time required to advance further, the primary means of addressing cumulative effects defaults to the established convention of land use planning, repeatedly recognized as the most powerful opportunity, and indeed a prerequisite, to regional land and resource management (which ultimately is what cumulative effects assessment and management is all about).

- In the circumpolar Arctic, European examples are few, and if anything validate North American examples and show how relatively advanced such efforts are in Canada, and certainly in the Canadian Arctic.

As an expansion of the findings listed above, Table 3.3 explains what each fundamentally does and places each into a context regarding project-specific and regional approaches.

Table 3.3 Application of Approaches

Approach	Question that the Approach Tries to Answer	What is Most Useful About This for Project Referrals?	What is Most Useful About This for Regional Approaches?
Project-specific			
screeners	what contribution may one small project have to effects on the surrounding environment?	helps the reviewer systematically and defensibly make a decision using what information is available	describes projects that may then be entered into a database/maps to continue a better understanding of human activity in a region
cumulative effects assessments	what contribution may one project have to effects within a regional context?	provides further information and insights if that project is similar and in a similar region	describes baseline information and projects that may then be entered into a database/maps to continue a better understanding of human activity and certain or potential effects in a region
project effects management (mitigation) and monitoring	what can be done to eliminate or minimize an effect?	describes opportunities to eliminate or minimize project effects	describes opportunities to eliminate or minimize project effects and regional effects
Multi-jurisdictional, multi-disciplinary, regional			
land use planning	what can you do, and cannot do, in a given area?	provides a clear and readily definable and usable decision criteria, uses zoning to identify sensitive areas that may be more susceptible to cumulative effects concerns	structures the landscape to define <i>à priori</i> the allocation of natural and human presence to achieve a balance supporting retention of natural features and human use
thresholds	how much can you do in a given area?	provides a clear and readily usable decision criteria	guides the presence and pace of human development
protected areas, networks, conservation offsets	what areas can be set aside to offset effects of development elsewhere?	provides an opportunity to accept a project effect if land and water elsewhere remains to negate that effect on a regional basis	provides an opportunity to minimize the risk of uncertainty associated with project development
species protection/recovery plans	what can be done to manage effects on specific species?	provides an opportunity to accept a projects effect if a regional management program exists to mitigate those project effects	provides an opportunity to manage species on a regional and coordinated basis; thereby improving the effectiveness of the program and its chance of success

Table 3.3 Application of Approaches (cont'd)

Approach	Question that the Approach Tries to Answer	What is Most Useful About This for Project Referrals?	What is Most Useful About This for Regional Approaches?
baseline data collection, mapping, monitoring	what is there now	helps the reviewer better understand the project's environmental setting, and therefore better chance of identifying applicable potential project effects	allows for the understanding of existing conditions, which then better allows for the identification of desired future conditions
future scenario modelling	what may happen?	places the project relative to a possible different (typically, an increase) level of activity that indicates if this project is part of a trend that must be addressed now rather than later	describes a possible future so that planning can be started earlier on to ameliorate what possible effects that future may bring
frameworks	how can one organize many initiatives to work together towards a common objective of addressing cumulative effects?	provides possible information that may be considered	coordinates a collective attempt to assess and manage lands, waters and its resources
integrated effects management	how may regional effects from many activities be managed collaboratively?	offers possible joint (collaborative) management solutions that could be conditions for each project in a certain region	offers possible joint (collaborative) management solutions to address effects at regional scales
strategic environmental assessment	what may happen in a given area before anything, or anything more, happens?	provides insight into issues and direction of a landscape to provide better context for an individual project	helps define what is a desired outcome of a landscape prior to further human caused change

4 Referral Criteria

4.1 Introduction

The NPC is responsible for referring Schedule 12-1 project proposals that are typically exempt from screening to the NIRB for screening where the NPC has concerns respecting the cumulative effects of that project proposal in relation to other development activities in a planning region.

Ideally, thresholds or other mechanisms would be in place to establish when a particular project proposal raises cumulative effects concerns; however, until these are available the NPC requires an interim solution upon which to make decisions, on which Schedule 12-1 project proposals, if any, raise cumulative effects concerns and should be referred to the NIRB for screening. The interim referral criteria need to acknowledge that the NPC needs a clear, consistent and systematic review process which can be completed efficiently within its existing resource availability.

Examining the direction from the NLCA, the NPC is responsible for referring a **project proposal or water application** falling within Schedule 12-1 where it has concerns respecting the **cumulative impact** of that proposal in relation to other development activities in a planning region. The first test which needs to be applied is to confirm whether the Schedule 12-1 activity is a project proposal as defined in the NLCA. Secondly, the NPC needs to then consider if the Schedule 12-1 project proposal raises a cumulative effects concern. These two tests are examined below to lead to the development of interim referral criteria.

4.2 Project Proposals

4.2.1 Projects Exempt from Screening

To refine the referral criteria, an understanding of the land uses associated with Project Proposals exempted from screening under the NLCA Schedule 12-1 is required. Project Proposals that are exempt from screening based on the NLCA Schedule 12- 1 (Article 12, NLCA) are limited to:

1. Land use activities not requiring a permit or authorization from the Government of Canada or Territorial Government.

Most commercial and institutional land use activities require some form of authorization by one of the governments (*e.g.*, Wildlife Research Permit, License to Harvest Wildlife, Big Game Outfitter License). The Government of Nunavut, Department of Environment (GNDoE) has defined and received NIRB approval to exempt a number of permits under the Nunavut *Wildlife Act* from screening. Actual land use activities that would fall under this section would include physical activities:

- a. On federal crown lands, activities under threshold for a Class B land use permit (*e.g.*, storage of less than 4000 litres of fuel, camp of less than 100 person days, recreational land uses).
 - b. On Commissioner's Lands activities not requiring a permit (*e.g.* municipal projects such as road construction).
 - c. Land Use licenses and leases on Inuit Owned Land (IOL; *e.g.*, exploration programs).
2. Land use activities requiring only a Class B permit under the Territorial Land Use Regulations.

These are activities that fall below Class A activity and equipment thresholds specified in the Territorial Land Use Regulations (*e.g.*, research camps, limited exploration activities, fuel caches below threshold).

3. All construction, operation and maintenance of all buildings and services within an established municipality, except for bulk storage of fuel, power generation with nuclear fuels or hydro power and any industrial activity.
 - a. Industrial activities which should be screened according to GN-CGS (August 13, 2007) include:
 - i. Land Farm
 - ii. Manufacturing plant (steel, metal, chemical)
 - iii. Recycling depot
 - iv. Hazardous waste of chemical storage or use
 - v. Quarries – initial development or expansion of existing quarry and decommissioning if not screened initially
 - vi. Explosives storage
 - vii. Tanneries
 - viii. Meat and fish production facilities (establishment or change in operations)
 - ix. Exploration, bulk sampling, mining and associated mining activities
 - b. Industrial activities which should be excluded from screening according to GN-CGS (August 13, 2007) include:
 - i. All institutional activities
 - ii. Building supply centre
 - iii. Animal hospital
 - iv. Custom workshop
 - v. Construction equipment yard
 - vi. Heavy equipment sales and rental
 - vii. Automotive commercial garage
 - viii. Extraction from existing quarries
 - ix. Home occupations
 - x. Bulk storage of fuel less than 80,000 litres
4. All hotels, motels or tourist facilities of 20 beds or less outside the boundaries of a municipality.

This would include small tourist lodges, outpost camps from established tourist lodges, etc.
5. Water uses that do not require a public hearing under Section 13.7.3.

This includes Type B Water Licences for smaller operations including commercial water uses under 300m³ per day, water crossing structures 5m in length or less, deposit of drill waste to a sump, municipal systems using less than 2000m³ of water per day and putting out sewage for a population less than 2000. (e.g., all municipal water licences except Iqaluit, exploration camps (though they are often screened as a result of requiring a Class A Land Use permit), research camps, road crossing structures such as culverts and small bridges).
6. Prospecting, staking or locating a mineral claim unless it requires more than a Class B permit mentioned in item 2.

This would include small scale programs and/or programs that are supported from an existing community with no land use activity above Class B threshold.
7. Such other categories of activities and projects as may be agreed upon by NIRB and the appropriate Minister.

(e.g., permits under the *Nunavut Wildlife Act*).

4.2.2 Exclusions to Definition of Project Proposal

Article 10 of the NLCA requires that the IPGs along with all substantive powers, functions, objectives and duties, be set out in statute. A Legislative Working Group consisting of Indian and Northern Affairs Canada, the Government of Nunavut, Nunavut Tunngavik Incorporated, the NPC and the NIRB was established and has developed several drafts of the legislation to date.

Early drafts of the legislation attempt to further define Project Proposals. Additionally, the drafts have included a schedule of exclusions from the definition of Project Proposal. Projects under this schedule would be exempt from land use plan conformity requirements and are not considered projects for NIRB or NPC screening purposes. Examples of exclusions from the definition could include:

- Inuit harvesting rights related to hunting, fishing and trapping
- Activities under the sole responsibility of municipalities
- Activities that are below the threshold for a Class B permit under the *Territorial Land Use Regulations* such as:
 - Any activity or work that involves the use of 50 kg or less of explosives in any 30-day period
 - Any activity or work that involves the use, except on a public road or trail maintained wholly or in part by federal funds, of any vehicle that is 5 t or less net vehicle weight, or the use of any vehicle of any weight that exerts pressure on the ground of 35 k pa or less
 - Any activity or work that involves the use of any power driven machinery for earth drilling purposes whose operating weight, excluding the weight of drill rods or stems and bits, pumps and other ancillary equipment, is 500 kg or less
 - Any activity or work that involves the establishment of any campsite that is to be used by two persons or less for 100 man-days or less
 - Any activity or work that involves the establishment of any petroleum fuel storage facility that has a capacity of 4000 l or less or the use of a single container for the storage of petroleum fuel that has a capacity of 2000 l or less
 - Any activity or work that involves the levelling, grading, clearing, cutting or snowploughing of any line, trail or right-of-way 1.5 m in width or less and 4 ha or less in area
- Small scale activities in National and Territorial Parks (these are outside NPC jurisdiction)
- Activities with known negligible ecological and socio-economic impacts

The legislation will likely replicate Schedule 12-1, but contain an additional schedule of exemptions from NIRB that have been agreed to by NIRB and the appropriate minister, similar to exemption 12-1 (7). These exemptions are currently unknown. The Minister of INAC recently announced that a draft of the legislation is expected to be released for public consultation in 2009, as such the above list of Schedule 12-1 activities may need to be amended.

Further definition of Schedule 12-1 project proposals may be derived from the definition of a project proposal in Article 1 of the NLCA which states that a “*Project Proposal*” means a physical work that the proponent proposes to construct, operate, modify, decommission, abandon or otherwise carry out, or a physical activity that the proponent proposes to undertake or otherwise carry out....”

This implies that to be considered a project proposal there is intent to carry out a physical work or activity. While exemption 12-1 (1) could be interpreted that any permit or approval issued by government requires screening, the above definition of a project proposal would exclude such things as the INAC Prospecting Permits as these permits only provide the applicant with the exclusive right to prospect. Land Use Permits or Land Leases are required before physical activity can occur. Similarly, agreement between the NIRB

and the Government in Nunavut has identified a number of permits or licences under the *Wildlife Act* that are exempt from screening.

In summary, a project proposal to be reviewed for cumulative effects concerns by the NPC would be one listed on Schedule 12-1 which meets the definition of a project proposal in the NLCA, specifically it involves a physical work or activity the proponent intends to carry out. This could exclude government approvals which typically grant a “right”, but exclude a specific facility or activity (e.g. prospecting permit, research licence, etc).

4.3 The Criteria

The challenge for the NPC, when broken into its respective parts, is in answering the following basic cumulative effect’s questions:

1. What are the Schedule 12-1 project proposal’s effects, if any, on anything?
2. If there are effects, is there a possibility that the effects are cumulative?
3. If some effects are cumulative, are they of concern?

Parts 1 and 2 are the essential but often missed prerequisites for what typically does get the attention (Part 3), being the real challenge and point of the whole exercise; namely, what does all this mean?

Given however the lack of information truly required to fully support answering these questions, and given NPC’s unique referral role and resources, an alternative series of questions can be posed. This essentially translates the questions into a form that can more practically be answered based on two concepts previously discussed; namely, spatial overlap of the project on designated areas and what other projects may be involved now or in the future.

A project proposal is referred by the NPC to NIRB for screening if:

1. The project does not contravene any specific condition in an applicable land use plan or has received a variance; or
2. The project contribution to cumulative effects results in the exceedance of a threshold, if available and the application of the threshold is applicable and defensible; or
3. Where no threshold is available that applies to any of the potential project effects and/or no land use plan condition exists or no condition is applicable, if:
 - a. the Schedule 12- 1 project proposal or water application is located within a zone of ecological or socio-cultural importance; and
 - b. evoke public and political concern because of many existing demands on the same resources (e.g., many uses of water from the same waterbody), or
 - c. the project proposal will or may:
 - i. involve other activities beyond the footprint of the project?; or,
 - ii. have the potential to induce activity (e.g., its implementation has the potential to lead to further activity in the region)?

“Concern”, as used in the NLCA, does not mean “significant” in the conventional sense as used in EIAs; concern is interpreted here as only indicating potential of an effect that, notwithstanding all the uncertainties and unknowns, may be detrimental to the objectives of a land use plan. The term “significance” is not used because asking to determine significance immediately requires an even greater degree of knowledge than typically is ever available at this screening level of review, or indeed is typically available after even the most comprehensive assessment possible. “Concern” does not come with a ranking that indicates degree of concern, but can be interpreted here as referring to acceptability by the

communities. NPC may also refer projects where there are concerns regarding human health and public safety.

The following provides further details to assist NPC reviewers in using the criteria.

4.3.1 Spatial Overlap with Designated Areas

Question 3a applies a spatial filter to the project proposal, and is straightforward and unambiguous: is the project proposal located within an identified area of ecological or socio-cultural concern (i.e., a designated area)?

Examples of areas of *ecological* concern include:

- Areas of Ecological Interest without protection status:
 - Important Bird Areas
 - International Biological Program sites
 - Key Migratory Bird Terrestrial Habitats
 - Known/Suspected Areas of Polar Bear Concentration
 - Marine Mammal Areas of Concentration
 - Wetlands of International Importance
 - Wildlife Areas of Special Interest
- Caribou Protection Areas
- Conservation Areas (i.e., National Parks, National Wildlife Areas)
- Critical Wildlife Areas
- Migratory Bird Sanctuaries
- National Historic Sites, Heritage Rivers)
- Proposed National Parks
- Territorial Game Sanctuary
- Territorial Parks
- Territorial Wildlife Preserves
- Territorial Wildlife Sanctuaries

Examples of areas of social-cultural importance may also include areas identified in the land use planning process as 'Areas of Interest' by Inuit organizations or communities. Although these areas would not be established through legislation, they could be identified as important socio-cultural areas and would be part of the spatial filter as outlined in question 3a.

For a complete listing of areas of ecological importance, refer to "Nunavut Wildlife Resource and Habitat Values" (Nunami Jacques-Whitford. October 2008). Also refer to maps prepared by the Nunavut Department of Environment (2005) for "Known Ecological Areas of Interest in Nunavut" and "Nunavut Terrestrial Conservation Areas". Other agencies (e.g., Inuit agencies and the Nunavut Department of Culture, Languages, Elders and Youth may have information on areas of socio-cultural importance in Nunavut).

4.3.2 Implications for Other Projects

Question 3c raises the possibility that other projects, than the one under review, may be implicated now or later. If this happens, then the "reach" of the project under review may extend elsewhere spatially and over time, thus increasing the possibility of other [cumulative] effects. This criteria follows the reasoning as implemented in the Canadian Environmental Assessment Act (CEAA) for two unique situations:

- *Linked projects*: other projects (themselves possibly subject to separate reviews) that must happen for the project under review to happen (e.g., a road to access a lodge)

- *Induced projects*: other projects that *may* happen if the project under review occurs (e.g., new or improved community support services due to the opening of a facility)

It is recognized that in some cases the identification of such other projects comes with substantial uncertainty, bordering on conjecture and hypothetical future scenarios. Discerning such futures, and the need and degree and means to do so, is a matter of current debate amongst Canadian assessment practitioners and regulators. In recognition of this, given that there are no clear rules or guides otherwise, the following Schedule 12-1 project proposals, selected from those identified in section 4.2, *may* in particular raise such cumulative effect's concerns, based on the potential for project activities to occur beyond the footprint and the potential to induce future activity, for the NPC:

- Small scale exploration projects triggering only a Type B Water Licence under the Nunavut Waters and Nunavut Surface Rights Tribunal Act and a Class B Land Use Permit under the Territorial Land Use Regulations. (*Note*: The transitional provision in Section 173 of the NWNSRTA states that Type B licences do not require hearings and are therefore exempt from NIRB screening under Schedule 12-1(5).)
- Municipal projects that require only a Type B Water License such as sewage lagoons, wastewater treatment facilities, solid waste disposal facilities, structures across watercourses that are less than 5m wide, water course training, water course diversion. (*Note*: Only Iqaluit has required a Type A Water Licence, all other communities are Type B.)
- Abstractions of water or deposits of waste requiring only a Type B Water Licence and no land use permit, this could include very small exploration projects with thresholds for explosive use, camp size and drill size below the threshold for a Class B Land Use permit under the Territorial Land Use Regulations.
- Extraction of aggregate from existing quarries (*Note*: NIRB and GN-CGS have agreed that only proposals for new quarries will be screened by NIRB based on correspondence between Robert Chapple (CGS) and NIRB, August 13, 2007).
- Game outfitting and wildlife observation operations (*Note*: Cumulative effects concerns on these projects may be more an issue for NWMB).
- Construction of small hotels and tourist facilities of 20 beds or less, where thresholds for water use and land use and below levels defined in Schedule 12-1 (2) and (5) respectively, and where there are no other government permit requirements triggering a screening.

5 Conclusions and Recommendations

The NPC, in cooperation with its planning partners, is responsible for preparing land use plans in Nunavut. Where an approved land use plan exists, project proposals are reviewed for conformity by the NPC before referral to screening by the NIRB or, for projects exempt from screening (Schedule 12-1 of the NLCA), directly to the regulatory agency for permitting. The NPC may; however, refer project proposals on Schedule 12-1 to the NIRB for screening where it has concerns respecting the cumulative effects of that project proposal in relation to other development activities in the region. To fulfill this screening level referral responsibility, the NPC must develop criteria and a process with which to make referral decisions. Essentially, when reviewing project proposals the NPC must determine if an effect will occur, if the effect will act cumulatively and, finally if the cumulative effect is of concern, thereby justifying referral of the Schedule 12-1 project proposal to the NIRB for screening.

Increasingly the public, regulatory and management agencies have been concerned about the scale at which development will overwhelm the capacity of the biophysical and socio-cultural environment and the resulting consequences. Considerable attention has been directed towards the development of cumulative effects assessment and management processes in Canada and the north specifically. Unfortunately, the practice of cumulative effects assessment and management has not progressed to a state where solutions for Nunavut are readily apparent. Many exercises have recognized, and rightly so, that the assessment of cumulative effects within current decision making contexts requires the generation and maintenance of huge amounts of information, which is not currently available and unlikely to be available for considerable time. Decision makers typically want to have a complete understanding of the resources potentially affected, the cause - effect relationship between a project action and response from the resource, how the responses may accumulate and at what point those responses/effects become significant. Such is the “cumulative effects problem”, whereby insufficient information is available to make a decision with the desired level of confidence and which will stand up to scrutiny. As such many cumulative effects exercises have focussed on collecting the information thought to be required for decision making, rather than progressing towards being able to make cumulative effects decisions.

The referral challenge for NPC, and indeed other review agencies, is really a challenge of making a decision in the absence of all the information necessary for making an informed decision. To date few initiatives offer immediate solutions to a screening level determination of a specific project’s potential contribution to cumulative effects; however, they do offer insights and approaches that could be useful. Tackling the cumulative effects problem needs to be addressed on two levels:

1. At a project level — where the potential cumulative effects of specific Project proposals are evaluated based on available information and a systematic process of evaluation.
2. At a regional scale — where parties collaborate on defining the environmental and socio-cultural elements of interest (VECs), undertake initiatives to better define the cause- effect relationship and how such effects may accumulate, and implement actions (e.g., spatial and/or temporal restrictions) to manage potential cumulative effects to acceptable levels.

The two levels need to interact and evolve together; however, regulatory processes demand that the project level screening and review processes occur now, in absence of a fully developed second level system.

A literature review was conducted to examine what initiatives to assess and manage cumulative effects has already occurred, with the intent of identifying actions that may assist with the development of referral criteria for the NPC. Fifty nine references were reviewed to examine assessment and management approaches considered or implemented in various geographic regions, notably the Canadian Arctic and

western Canada. Table 3-1 summarizes the geographic location (total of eight) and type (total of nine) of each of the 59 references reviewed. A summary of each of the references is provided in Appendix A. The literature review indicated that a universally applicable solution for the assessment and management of cumulative effects does not exist and no single referral solution for the NPC is apparent. Additionally, few screening level cumulative effects assessment processes are in place. Many cumulative effects initiatives focus on the collection of information which has overshadowed progress on moving ahead with initiatives which accept those information gaps and uncertainties. Regional approaches are focussed on spatial allocation with respect to allowed activity, from none to some level of constraint. All encompassing regional approaches, under such labels as “frameworks” and “strategic assessment” are hampered in making substantial progress by lack of adequate information to support (undefined) decision making processes, and by the human resources to collect that data and implement the program. Until all encompassing regional approaches have the time required to advance further, the primary means of addressing cumulative effects defaults to land use planning. Finally, the literature indicates that efforts to develop cumulative effects assessment and management approaches are relatively advanced in Canada, including the Canadian Arctic.

Given the challenges presented and acceptance that an interim approach needs to be implemented in the absence of the desired level of information, a condition which is likely to exist for some time, a screening level approach using a coarser filter and level of information can be developed and implemented. Such an interim approach, based on the concepts of spatial allocation and identification of Schedule 12-1 land uses that may cause cumulative effects concerns would seek to determine if a Schedule 12-1 project is proposed on an important natural or socio-cultural area. A structured, yet practical approach would be followed to address these questions and provide for a substantiated decision. The criteria upon which the Schedule 12-1 project would be referred would include:

- The Schedule 12-1 project does not contravene any specific condition in an applicable land use plan or has received a variance; or
- The Schedule 12-1 project contribution to cumulative effects results in the exceedance of a threshold, if available and the application of the threshold is applicable and defensible; or
- Where no threshold is available that applies to any of the potential project effects and/or no land use plan condition exists or no condition is applicable, if:
 - a. the Schedule 12- 1 project proposal or water application is located within a zone of ecological or socio-cultural importance; and
 - b. evoke public and political concern because of many existing demands on the same resources (e.g., many uses of water from the same waterbody), or:
 - c. the project proposal will or may:
 - i. involve other activities beyond the footprint of the project?; or,
 - ii. have the potential to induce activity (e.g., its implementation has the potential to lead to further activity in the region)?

Answering the criteria relies on having identified Schedule 12- 1 project proposals that may lead to cumulative effects and mapped information that establishes the important ecological or socio-cultural features that may be impacted. A preliminary list of Schedule 12 -1 project proposals raising cumulative effects concerns is presented in Section 4.3.2 of this report. Much of the spatial information to define areas of ecological or socio-ecological importance has already been collected by the NPC. This process is based on two concepts. The first concept is spatial implication, and the second is management. Although a referral based on the first concept is possible, it ignores the fact that mitigation measures may themselves be part of a project description and may allow a project to be acceptable. As adequate data, despite the best intentions, is often not available, the process must have a built-in acceptance of

uncertainty; referrals are then made conservatively (i.e., project anticipated to raise a cumulative effects concern, to be evaluated under the screening process delivered by the NIRB.

This report presents a set of referral criteria for consideration during the development of the NLUP. It must be acknowledged that the authors consider the criteria presented to be an *interim* measure to be applied in the absence of thresholds. Additionally, the criteria proposed were developed to address NPC's cumulative effects referral responsibility under the NLCA and should not be considered as a cumulative effects assessment and management system, rather they could be part of a larger management system that may be developed by other parties.

To advance the development of the referral criteria, the following recommendations are offered:

NPC and government continue to work towards the establishment of thresholds. This is a long term solution based on considerable research and analysis and should be pursued in consideration of the Nunavut General Monitoring Plan.

The NPC and its planning partners, consider the applicability, practicality and potential implications of implementing the proposed referral criteria. Such review should consider the simulated application of the criteria to a range of previously completed Schedule 12-1 projects which were exempt from screening

The NPC and its planning partners review the preliminary list of Schedule 12-1 project proposals that are considered to raise cumulative effects concerns

The appropriate parties in Nunavut address the approach to systematically assessing and managing cumulative effects in Nunavut.

6 Bibliography

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Appendix A Literature Review Summary

Appendix A includes:

- Table A1 summarizing the reviewed references, which identifies:
 - Review index number (1 to 59; the order is loosely based on global scale)
 - Title
 - Geographic region
 - Global scale (see table footnote for options)
 - Regional scale (see table footnote for options)
 - Type (see table footnote for options)
- The reviews, each starting on a new page, ordered and identified by index number, with the following provided for each:
 - Reference (general descriptive information to identify, characterize and source the reference)
 - Name/Title
 - Geographic region (global and regional scale)
 - Approach (key words that describe the most relevant method/technique/process/concept the initiative offers to the interests of the NPC and GoN)
 - Bibliographic Citation(s) reviewed
 - Website URLs (for websites from which the specific bibliographic citation may be obtained and/or information on the initiative)
 - Description (the review text “write-up”)
 - Summary (brief summary of what the initiative/publication is)
 - Approaches (brief summary of the most relevant attributes of the initiative/publication to regional approaches to addressing cumulative effects and project-specific approaches, as relevant to the interests of the NPC and GoN)

Table A1 List of References

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
1	Southern Foothills Study (Report)	Canada (south)	Southern Alberta	Regional Study
2	Southern Foothills Study (Thesis)	Canada (south)	Southern Alberta	Regional Study
3	Terrestrial Ecosystem Management Framework	Canada (south)	North-eastern Alberta	Framework
4	Great Sand Hills Environmental Study	Canada (south)	Southern Saskatchewan	Regional Study
5	Cumulative Environmental Management Association (CEMA)	Canada (south)	North-eastern Alberta	Framework
6	Alberta Land Use Framework	Canada (south)	Alberta	Land Use Plan
7	Conservation and Biodiversity Offsets	Canada (south)	Northern Alberta	Management Approach
8	A Landscape Cumulative Effects Simulator (ALCES)	All		Analytical Tool
9	Kluane National Park CEA	Arctic (Canada)	Yukon	Assessment
10	Caribou Thresholds Pilot	Arctic (Canada)	Yukon	Research Study
11	Conservation Matrix Model	All		Analytical Tool
12	Oil and Natural Gas Industry Best Management Practices	Canada		Management Approach
13	Road to Improvement – The Review of the Regulatory Systems Across the North	Arctic (Canada)		Policy
14	Science-based Thresholds	All		Research Study
15	Mackenzie Gas Project Scenarios of Future Developments	Arctic (Canada)	NWT	Analytical Tool
16	Global methodology for mapping human impacts on the biosphere (GLOBIO)	All		Analytical Tool
17	Potential Landscape Impacts of Gas Development in Northern Canada	Arctic (Canada)	NWT	Analytical Tool
18	Cumulative Effects Modelling of the Mackenzie Gas Project	Arctic (Canada)	NWT	Analytical Tool
19	Arctic Human Development Report	Arctic (circumpolar)		Research Study
20	Arctic Climate Impact Assessment (ACIA)	Arctic (circumpolar)		Research Study
21	Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope	Arctic (Alaska)		Research Study
22	Social Impact Assessment in Regional Land Use Planning	Arctic (Europe)		Research Study
23	Natura 2000 Network for Biodiversity Conservation and Protection	Europe		Management Approach
24	Beaufort Sea Strategic Plan of Action (BSStRPA)	Arctic (Canada)	NWT	Regional Study
25	Barents Sea Integrated Management of the Marine Environment	Arctic (Europe)		Regional Study

Table A1 List of References (cont'd)

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
26	NWT Species at Risk Action Plan: Boreal Woodland Caribou Conservation	Arctic (Canada)	NWT	Management Approach
27	North Yukon Land Use Plan	Arctic (Canada)	Yukon	Land Use Plan
28	Thelon Game Sanctuary Management Plan	Arctic (Canada)	NWT, Nunavut	Management Approach
29	Beverly and Qamanirjuaq Caribou Management Plan	Arctic (Canada)	Nunavut, NWT, Manitoba	Management Approach
30	Habitat-Based Population Viability Analysis to Wildlife of the Canadian Central Arctic	Arctic (Canada)		Analytical Tool
31	Thresholds for addressing cumulative effects on terrestrial and avian wildlife in the Yukon.	Arctic (Canada)	Yukon	Research Study
32	Beaufort Delta Cumulative Effects Project	Arctic (Canada)	NWT	Research Study
33	Wildlife Resource and Habitat Values in Nunavut	Arctic (Canada)	Nunavut	Research Study
34	Developing and implementing thresholds in the Northwest Territories	Arctic (Canada)	NWT	Research Study
35	Interim Oil and Gas Industry Guidelines for Boreal Caribou Ranges in Northeastern BC	Canada (south)	Northeast BC	Management Approach
36	Alberta Woodland Caribou Recovery Plan	Canada (south)	Alberta	Management Approach
37	Besa-Prophet Pre-Tenure Plan — Phase I	Canada (south)	Northeast BC	Management Approach
38	Landscape, biodiversity and watershed indicator review and assessment	Canada (south)	Northeast Alberta	Analytical Tools
39	Predictive modelling tools for wildlife and fish in the Wood Buffalo region	Canada (south)	Northeast Alberta	Analytical Tools
40	Environmental Risk Assessment (ERA)	All		Analytical Tools
41	Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada	Canada		Management Approach
42	Strategic environmental assessment Cabinet Directive	Canada		Policy
43	Regional Approaches to Managing Cumulative Effects in Canada's North	Arctic (Canada)		Research Study
44	Cumulative Effects Assessment and Management Framework for Northeast British Columbia	Canada (south)	Northeast BC	Framework
45	Cumulative Impact Management Screener	Canada (south)	Northeast BC	Framework

Table A1 List of References (cont'd)

#	Name/Title	Geographic Region		Type
		Global Scale	Regional Scale	
46	Fort Liard Area Cumulative Impacts Mapping Project	Arctic (Canada)	NWT	Analytical Tool
47	West Kitikmeot/Slave Study	Arctic (Canada)	Nunavut	Regional Study
48	Cumulative Effects Management in the Deh Cho Territory	Arctic (Canada)	NWT	Management Approach
49	Deh Cho Draft Land Use Plan	Arctic (Canada)	NWT	Land Use Plan
50	Gwich'in Land Use Plan	Arctic (Canada)	NWT	Land Use Plan
51	Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Proponents	Arctic (Canada)	NWT	Management Approach
52	Cumulative Effects Assessments in the Inuvialuit Settlement Region: Current and Potential Capability	Arctic (Canada)	NWT	Policy
53	Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Reviewers	Arctic (Canada)	NWT	Policy
54	EKATI Independent Environmental Monitoring Agency (IEMA)	Arctic (Canada)	NWT	Monitoring
55	Diavik Environmental Monitoring Advisory Board (EMAB)	Arctic (Canada)	NWT	Monitoring
56	NWT Environmental Stewardship Framework	Arctic (Canada)	NWT	Framework
57	Regional Strategic Environmental Assessment (R-SEA)	All		Research Study
58	Cumulative Impact Monitoring Program (CIMP)	Arctic (Canada)	NWT	Monitoring
59	Great Bear Lake Watershed Management Plan	Arctic (Canada)	NWT	Land Use Plan

NOTES:

**Geographic Region
(Global Scale)**

All
Arctic (Alaska)
Arctic (Canada)
Arctic (circumpolar)
Arctic (Europe)
Canada
Canada (south)
Europe

Type

Analytical Tool
Assessment
Framework
Land Use Plan
Management Approach
Monitoring
Policy
Regional Study
Research Study

A.1 Reference 1

Name/Title: Southern Foothills Study (Report)

Geographic Region: Canada (south), southern Alberta

Type: Regional Study

Approach: landscape simulation model

Bibliographic Citation(s) Reviewed:

Southern Foothills Study. 2007. The Changing Landscape of the Southern Alberta Foothills: Report of the Southern Foothills Study Business as Usual Scenario and Public Survey. Southern Alberta Land Trust Society (SALTS). 29 pp.

Website URL(s):

- www.salts-landtrust.org/sfs/docs/D_070716_phase_onetwo_report_final.pdf

A.1.1 Description

A.1.1.1 Summary

The southern foothills region of Alberta is an area known for its spectacular scenery. It provides important economic, ecological and social benefits far beyond its geographic boundary and, perhaps most importantly, it is a key watershed. The region is one of Alberta's richest biological areas, containing a wide diversity of plants and animals. A large part of this landscape is still ecologically intact and relatively unfragmented. However, this nearly pristine status is changing rapidly due to significant development pressure from the energy and forest sectors, recreational users, intensive agricultural operations, and residential acreages. All of these uses provide benefits to the provincial economy, yet they also bring significant liabilities such as land and water disturbance, habitat fragmentation, and invasive weed infestations. In 2005, a group of concerned landowners came together at Chain Lakes and agreed that to understand the issues and examine potential solutions; they would need to use a scientific approach. As a result, Dr. Brad Stelfox of Forem Technologies was hired to conduct a cumulative effects study on three million acres of the southeastern Slopes to determine the current state of the landscape today as well as to project land use changes fifty years into the future. This became known as the Southern Foothills Study.

A.1.1.2 Approaches

The Southern Alberta Land Trust Society (SALTS) undertook project management of the study, now called the Southern Foothills Study (SFS). SALTS is a locally-based, rancher-driven, non-profit organization dedicated to protecting the ecological, productive, scenic, and cultural values of Alberta's East Slopes, prairie, and foothill regions.

The methodology used on the project was the ALCES® landscape simulation model (www.alces.com) created by Dr. Brad Stelfox. Dr. Stelfox worked with the group to create a "base case", or Business as Usual scenario, using ALCES®. Through previous work done by Dr. Stelfox, key land use and landscape data was acquired from the Alberta Government's Southern Alberta Landscape (SAL) Study. Future land use trajectory information was acquired from Alberta Energy and various other governmental and industrial sources.

Once the data was acquired, Dr. Stelfox and the ALCES® team entered the data into the ALCES® model, generated the output, and created a powerful presentation that illustrated a 100-year historical land use

trajectory, as well as projections 50 years into the future. The presentation brought together multiple land use trends into a cumulative effects analysis. The presentation was then used to inform the public of the findings.

Seven public meetings were scheduled throughout the study area during October and November 2006. The format of each meeting was to have Dr. Stelfox present the results of the Business as Usual scenario, and then allow an hour for questions and discussion. Total attendance at the meetings was just over 600 people. At these meetings the participants were asked to fill out a written survey form and a total of 344 survey forms were completed and returned. Meetings were held in Nanton, Black Diamond, Cowley, Claresholm, Chain Lakes, Pincher Creek and High River. The level of attendance, the discussions, and the number and quality of survey forms returned indicated a high degree of interest and concern among the population about development pressures on the landscape.

Praxis Research, a well-known survey company based in Calgary, assisted with the survey and was also hired to perform separate random-sample telephone surveys with similar questions. Currently some 40,000 people live within the study area, and over one million people live immediately adjacent to the Southern Foothills Landscape. The telephone survey gathered responses from the two major urban areas (Calgary and Lethbridge), as well as from more than 20 communities within and around the area.

While there was no written formal Terms of Reference for Phase 1, there were certain principles to guide the overall process that were expressed in discussions. These principles included such things as inclusiveness, openness, clarity and balance. This was a cumulative effects study that would examine all natural and anthropogenic disturbances and activities on the landscape. No particular industry or activity was singled out for special attention or treatment.

A.2 Reference 2

Name/Title: Southern Foothills Study (Thesis)

Geographic Region: Canada (south), southern Alberta

Type: Regional Study

Approach: applying thresholds through land use planning, modeling of landscape changes

Bibliographic Citation(s) Reviewed:

- Holroyd, Peggy. 2008. Towards Acceptable Change: A Thresholds Approach to Manage Cumulative Effects of Land Use Change in the Southern Foothills of Alberta. A Master's degree project submitted to the Faculty of Environmental Design in partial fulfillment of the requirements for the degree of Master of Environmental Design (Environmental Science). Faculty of Environmental Design, Calgary, Alberta. 166 pp.

Website URL(s):

- www.salts-landtrust.org/sfs/docs/D_080128_holroyd_thesis_thresholds.pdf

A.2.1 Description

A.2.1.1 Summary

In September 2005, a group of landowners, industry representatives, environmental groups and local governments launched an ALCES® (A Landscape Cumulative Effects Simulator) project to assess the cumulative impact of future land use in southwest Alberta, called the Southern Foothills Study (SFS). ALCES® is a STELLA-based computer model that allows resource managers to quantify and track cumulative changes to the natural landscape in response to ecological processes and human land use

practices. The project was created in response to local concerns over the potential impact of growing land use development and the desire for a stakeholder-driven land use planning process. At the outset of the project, the Southern Foothills Study members identified three components of environmental and socio-economic value: native fescue grassland, grizzly bears, and water. This research builds upon the work of the Southern Foothills Study to look at how thresholds might help to manage cumulative effects of land use change on the key ecosystem components: water, grizzly bears and native fescue grassland.

A.2.1.2 Approaches

Developing and applying thresholds through land use planning is a proactive approach to cumulative effects management and requires the integration of ecological science and social values. Thresholds can be determined at the regional or sub-regional scale and can be set to protect ecosystem components for future generations. At the project level, thresholds can provide guidance to decision makers on the significance of a project's contribution to cumulative effects.

Through the application of thresholds we can address not only where development can occur (as in past land use planning initiatives) but also how much should occur. Thresholds should be set at the spatial scale relevant to the valued components of concern. If applied over too large an area, the threshold may not have value to the component of concern; applied over too small an area and it may be vehemently opposed as a restriction to development. Different threshold values may need to be applied to different areas. For example, in urban areas, more lenient thresholds may be applied to allow for higher density of residential developments. In the mountainous areas, more stringent thresholds may be required for the protection of water resources.

Overcoming the barriers to threshold implementation begins with open, transparent discussion and clear mechanisms for implementation. Land use planners and resource managers should be careful in how thresholds are communicated. It should be clear what pushing an indicator beyond the threshold would mean. Alternatively the term target could be used to represent desirable landscape conditions created to achieve a balance between conservation and development. In the Southern Foothills, the social acceptability of change to water quality and fescue grassland may have already been exceeded.

A summary of the recommendations for an effective process to define thresholds are as follows:

- Define a vision for the future, involving all stakeholders
- Determine valued components and indicators
- Rank valued components to determine a possible 'ultimate constraining goal
- Model landscape changes to understand the potential impacts of land use activities within a range of possible futures
- Use both science and social values to inform appropriate threshold values
- Ensure all stakeholders are involved in the discussion on threshold levels, scientific evidence, social values and tradeoffs
- In a multi-stakeholder process, encourage open discussion of threshold values and potential implications to other social, environmental or economic factors
- Use clear definitions for thresholds, targets and objectives
- Set the thresholds at the scale relevant to the ecosystem component
- Set different threshold values for different regions depending upon the desired future landscape conditions

A good process for determining thresholds must involve the following steps: a landscape vision; ecological and social objectives; participation of all stakeholders; the incorporation of ecological science

and social values; measurable and meaningful indicators; research and education on the impact of land uses; and an explicit discussion of tradeoffs. The Alberta Government is developing a s new Land Use Framework and proposed policy on cumulative effects management, and these , contain some of the steps necessary for thresholds implementation.

A.3 Reference 3

Name/Title: Terrestrial Ecosystem Management Framework

Geographic Region: Canada (south), north-eastern Alberta

Type: Framework

Approach: regional assessment and management, future scenario models, thresholds linked to natural variability, triad land zonation

Bibliographic Citation(s) Reviewed:

- CEMA. 2008. Terrestrial Ecosystem Management Framework for the Regional Municipality of Wood Buffalo. Prepared by the Sustainable Ecosystem Working Group of the Cumulative Environmental Management Association. 57 pp.

Website URL(s):

- <http://www.cemaonline.ca/content/view/75/182/>

A.3.1 Description

A.3.1.1 Summary

The Terrestrial Ecosystem Management Framework (Framework) is the Cumulative Environmental Management Association's (CEMA) recommended approach to managing the cumulative effects of development and resource use on ecosystems and landscapes in the Regional Municipality of Wood Buffalo (RMWB). The Framework aligns with the stated direction of the Government of Alberta (GoA) to enable oil sands development while maintaining ecosystem integrity and social and cultural needs. The Framework is intended to complement the existing policies and regulatory system currently in place.

A.3.1.2 Approaches

The Framework is based on a detailed analysis using models describing development over the next 100 years, and acknowledging energy development as a dominant driver of land use. Three hypothetical management scenarios were developed and contrasted with a base case model to understand indicator performance. Most environmental indicators of terrestrial ecosystems are expected to decline with continued development in the absence of management intervention. Modeling results demonstrate that options are available to mitigate impacts.

The Framework recommends a regional management objective, broad regional strategies, and the application of specific management measures at a sub-regional scale. Establishment of a regional monitoring program is also recommended to measure achievement of desired outcomes.

The concept that healthy ecosystems, and therefore indicators, vary naturally over time has informed the definition of the regional environmental management objective. CEMA recommends that environmental indicators be maintained within 10% below the lower limit of the natural range of variation. This target recognizes that in some areas of the RMWB, indicators would be far outside NRV while in other areas they would be within NRV. A system of management response triggers is recommended involving three levels: green being acceptable; yellow being cautionary, indicating that management response planning

should be initiated; and red indicating immediate action is required. Trigger conditions are assigned based on a combination of the current monitored levels of an indicator, and the timeframe within which any reductions are predicted (through modeling) to occur. Four out of the seven identified environmental indicators are currently in a yellow or red condition based on available information, thus requiring immediate action.

In response, the primary recommended regional strategy is the application of a Triad land management approach that is the core of this framework. The Triad approach involves the identification of three land use zones: Intensive, Extensive and Protected. CEMA recommends the establishment of an Intensive Zone characterized by bitumen extraction comprising 5% to 14% of the RMWB at any time; an Extensive Zone characterized by ecosystem forestry and other natural disturbance based activities comprising at least 46% of the RMWB at any time; and an expanded permanently Protected Zone where industrial activities are excluded comprising 20% to 40% of the RMWB.

CEMA also recommends further work to refine the sizes of the Intensive and Protected Zones, the application of the Intensive Zone constraint, and specific boundaries for new protected areas.

Aggressive management of off-highway vehicle access is also recommended as a powerful strategy to mitigate impacts on several indicators. Approaches to minimize the extent and duration of footprint, through technological innovation, integrated planning, and improved reclamation are also key. It is vital to engage Aboriginal people in developing strategies for conserving or managing opportunities for traditional land use, particularly in proximity to communities.

Further, CEMA recommends areas of public policy that require adjustment to ensure a coordinated and comprehensive approach to achieving the objectives of the Framework. Application of management strategies is recommended to be consistent with the management intent for each Triad zone. Based on the current and forecast condition of indicators, CEMA recommends a variety of immediate and concurrent actions. The Framework includes a schedule of recommended actions and timelines to enable full implementation of the Framework by 2011. This Framework should be reviewed and renewed every five years.

A.4 Reference 4

Name/Title: Great Sand Hills Environmental Study

Geographic Region: Canada (south), southern Saskatchewan

Type: Regional Study

Approach: strategic environmental assessment, land use strategy and land use plan, biodiversity/conservation hotspots

Bibliographic Citation(s) Reviewed:

- Government of Saskatchewan. 2007. The Great Sand Hills Regional Environmental Study: Final Report. Environment: Environmental Assessment Branch. 233 pp.

Website URL(s):

- <http://www.environment.gov.sk.ca/2007-104GreatSandHillsEnvironmentalStudy>

A.4.1 Description

A.4.1.1 Summary

The Great Sand Hills Representative Area Ecological Reserve (RAER) was announced on March 10, 2005 with amendments to *The Ecological Reserves Act* introduced by the Saskatchewan Minister of Environment on March 24, 2005. The designation and amendments were designed to lead to improved management of the Great Sand Hills, one of the largest remnants of native grassland in Canada. In December of 2004, shortly before the designation of the new ecological reserve, the Government of Saskatchewan committed to undertake a Regional Environmental Study of the Great Sand Hills. The Regional Environmental Study (RES) was designed to provide strategic recommendations to guide human activities in the Great Sand Hills so that the long-term ecological integrity of the area is maintained while a corresponding level of environmental, socio-cultural, and economic benefits are realized.

A.4.1.2 Approaches

This report is best viewed as a land use strategy and land use plan. The report outlines the methodology and results of the RES and provides strategic recommendations to guide human activities in the GSH so that the long-term ecological integrity of the area is maintained while a corresponding level of environmental, socio-cultural, and economic benefits are realized. The basic research approach of the RES, following the general philosophy of Strategic Environmental Assessment, is scenario analysis.

The GSH RES commenced with a baseline assessment, which characterized the current and cumulative natural, social, and economic conditions of the GSH region that are consistent with its sustainability. This included an assessment of changes in selected baseline components over time. The baseline assessment was followed by an analysis of three alternative future scenarios.

The study used the site-selection algorithm, MARXAN, to highlight biodiversity hotspots and other areas of conservation importance within the GSH Review Area. MARXAN minimizes the total “cost” of a potential reserve design by identifying the smallest overall area needed to meet planning goals and by selecting planning units that are clustered rather than dispersed.

Three different scenarios were identified, including a preferred scenario. The scenario projections focused on those human activities that have the greatest potential for surface disturbance and, therefore, for affecting the ecological integrity and sustainability of the GSH - namely those activities associated with gas development and ranching. The scenarios examined different intensity levels of gas development, well spacing, conservation protection measures or ecological reserve establishment, controls on new gas well drilling and both mineral and surface leases, controls on establishment of watering holes, and wetland protection.

Based on the results of the baseline assessment and the scenario analysis, general recommendations were made for governance, institutional frameworks and environmental assessment. Governance recommendations discussed the problems with existing institutional frameworks, the need to improve information exchange, establish greater consensus and to form a clearer vision of what is required to be consistent with principles of sustainability between government departments. There is considerable recognition of potential land-use conflicts and the need to resolve differences before they escalate to non-productive or destructive levels. The lack of financial, human, and infrastructure resources combined with a lack of baseline data limits the overall effectiveness of governance and the scope of viable management options. Stakeholders and First Nations raised two common issues with respect to legislation affecting governance in the GSH. First, the scope of the legislation is inadequate to address the current mix of land uses and interests in the region. This is sometimes due to outdated legislation or legislation that has been conceived too narrowly to cover the range of relevant issues encountered in

current management. Second, legislation and management mechanisms lack sufficient enforcement, making it difficult for responsible authorities to prevent or curb undesirable activity. The most common suggestion to improve governance is to establish a central, higher-level governing body with decision-making power, supported by an effective and balanced network of interests focused on long-range planning.

The review of the assessment process and its historical application in the GSH revealed some serious concerns. The concern was not within the Act itself, but in the changing way that the Act has been applied over the last 20 years, especially with respect to cumulative environmental effects. As part of Environmental Assessments, proponents have not been required to consider their project effects as additive to those of other projects already approved. Detailed recommendations for the RAER can be found in the report.

A.5 Reference 5

Name/Title: Cumulative Environmental Management Association (CEMA)

Geographic Region: Canada (south), north-eastern Alberta

Type: Framework

Approach: regional environment management system, forum consensus- based decisions

Bibliographic Citation(s) Reviewed:

- N/A

Website URL(s):

- www.cemaonline.ca

A.5.1 Description

A.5.1.1 Summary

The Cumulative Environmental Management Association (CEMA) is a registered not-for-profit, non-governmental organization that was established in Fort McMurray, Alberta in June 2000. CEMA's mandate is to study the cumulative environmental effects of industrial development in the region and produce guidelines and management frameworks.

A multi-stakeholder organization, CEMA is governed by 44 members representing all levels of government, industry, regulatory bodies, environmental groups, Aboriginal groups, and the local health authority, which have an interest in protecting the environment in the Wood Buffalo region.

Technical and scientific work for CEMA is completed through five working groups as well as subcommittees and task groups. CEMA also operates a Traditional Environmental Knowledge (TEK) Standing Committee, which provides standards and direction for the collection and use of traditional environmental knowledge within the CEMA process. The working groups and subcommittees are made up of representatives from CEMA's member organizations.

A.5.1.2 Approaches

CEMA's vision is that:

The environment of the region, including the land, forest, air, water, wildlife and biodiversity, will be protected, sustained, and restored over the long term and that the collective activity of industrial activity in the region will not cause any lasting harm to the environment or adverse effects to the health of humans.

Should these impacts be evident, the Association and its Members will recommend, promote and implement mitigation action to reverse their effects.

CEMA's purpose is to provide a forum for its stakeholders to discuss and make consensus-based decisions, forming the basis for action by members, and recommendations to Alberta Environment's Regional Sustainable Development (RSDS), as appropriate, on managing the region's cumulative environmental effects. This thereby forms the core of a proactive regional environment management system that addresses cumulative biophysical, health and resources-use impacts of regional developments. CEMA's purpose is also to develop and apply environmental management tools, thresholds, guidelines and objectives.

CEMA's objectives are to ensure that an effective and efficient, stakeholder driven, regional environmental management system is established.

Ensure regional environmental guidelines, objectives and thresholds are in place or established and recommended to RSDS where appropriate for effective implementation.

Develop the basis for the ongoing management of impacts of industrial development on the regional environment, including recommending the priorities and objectives for, and content of, monitoring and research, and both employing and recommending mitigation options.

Respond to issues brought forward by stakeholders. Issues not within the mandate of the Association will be referred to an appropriate organization for a response.

Work cooperatively with other activities and organizations that also have responsibilities with respect to managing the regional environment, including establishing appropriate linkages to other environmental management initiatives or activities in the region: e.g. Wood Buffalo Environmental Association (WBEA). Alberta Environment's Regional Sustainable Development Strategy (RSDS). Canadian Oil sands Network for Research and Development (CONRAD).

Effectively communicate the need, activities, and results of the Association to internal and external stakeholders.

Prepare a work plan and budget annually.

CEMA's mandate is to achieve the vision, purpose and objective of the Association and ensure the principles of the association are consistently applied in aspect of its activities. Set terms of References for Working Groups, reviews and endorse Working groups recommendations and provide comments and guidelines to Working Groups. Approve business plans and budgets according to the requirements of its members; and Report in a timely fashion all issues that need to be brought to the attention of Members.

A.6 Reference 6

Name/Title: Alberta Land Use Framework

Geographic Region: Canada (south), Alberta

Type: Land Use Plan

Approach: strategies to improve land-use decision-making

Bibliographic Citation(s) Reviewed:

- Government of Alberta. 2008. Land-Use Framework. 54 pp.

Website URL(s):

- <http://www.landuse.alberta.ca>

A.6.1 Description

A.6.1.1 Summary

Alberta's rapid growth in population and economic activity is placing unprecedented pressure on provincial landscapes. The Government of Alberta has responded to these pressures through the development of a Land-Use Framework. Under the Land-Use Framework, Alberta is divided into seven regions, for which land-use plans will be developed.

Alberta's seven land-use regions are based on the province's major watersheds, adjusted to best fit with existing municipal boundaries and natural regions. The six regions are the Lower Peace, Upper Peace, Lower Athabasca, Upper Athabasca, North Saskatchewan, Red Deer, and South Saskatchewan.

The regional plans will integrate provincial policies at the regional level, set out regional land-use objectives and provide the context for land-use decision-making within the region, and reflect the uniqueness of the landscape and priorities of each region. Municipalities and provincial government departments will be required to comply with regional plans in their decision-making.

A.6.1.2 Approaches

The Land-use Framework is to be based on a vision that states three desired outcomes to help measure progress, and a set of guiding principles to help inform decision-making. Alberta's vision is that "Albertans work together to respect and care for the land as the foundation of our economic, environmental and social well-being."

Desired outcomes include, a healthy economy supported by our land and natural resources, healthy ecosystems and environment, and people-friendly communities with ample recreational and cultural opportunities.

To help decision-makers ensure that actions are aligned with the vision and desired outcomes, the government has adopted a set of guiding principles. In Alberta, land-use decisions are to be sustainable; accountable and responsible; supported by a land-stewardship ethic; collaborative and transparent; integrated; knowledge-based; responsive; fair, equitable and timely; respectful of private property rights; and, respectful of the constitutionally protected rights of aboriginal communities.

The Land-use Framework consists of seven basic strategies to improve land-use decision-making in Alberta:

- Strategy 1: Develop seven regional land-use plans based on seven new land-use regions.
- Strategy 2: Create a Land-use Secretariat and establish a Regional Advisory Council for each region.
- Strategy 3: Cumulative effects management will be used at the regional level to manage the impacts of development on land, water and air.
- Strategy 4: Develop a strategy for conservation and stewardship on private and public lands.
- Strategy 5: Promote efficient use of land to reduce the footprint of human activities on Alberta's landscape.
- Strategy 6: Establish an information, monitoring and knowledge system to contribute to continuous improvement of land-use planning and decision-making.
- Strategy 7: Inclusion of aboriginal peoples in land-use planning.

The Land-use Framework creates seven regions for Alberta that are based on the major watersheds within the Province, with boundaries aligned to best fit with existing municipal boundaries and the natural regions. Provincial policy direction will guide the development of regional plans. At times, and depending

on the issue, a region will be strongly directed by provincial interests. At the regional level, plans will set out the economic, environmental and social outcomes for the regions. These integrated regional plans will provide guidance to municipal and provincial planning and decision-making.

A.7 Reference 7

Name/Title: Conservation and Biodiversity Offsets

Geographic Region: Canada (south), northern Alberta

Type: Management Approach

Approach: biodiversity offsets as a tool to address the impacts of industrial development

Bibliographic Citation(s) Reviewed:

- Dyer, Simon, Jennifer Grant, Terra Lesack, and Marian Weber. 2008. Catching Up: Conservation and Biodiversity Offsets in Alberta's Boreal Forest. Canadian Boreal Initiative. 36 pp.

Website URL(s):

- <http://pubs.pembina.org/reports/CatchingUp-Offsets.pdf>

A.7.1 Description

A.7.1.1 Summary

This report, commissioned by the Canadian Boreal Initiative, explores biodiversity offsets as a tool to address the impacts of industrial development in the Boreal Forest Natural Region (BFNR). Managing development to maintain biodiversity in the BFNR is a significant challenge because of the combined effects of energy and forest sector development. The purpose of the report is to explore options for meeting biodiversity objectives for the BFNR overall, with a focus on opportunities to mitigate the impacts of development in the RMWB through a pilot biodiversity offset program. While the report focuses on the RMWB as a case study, the concepts are broadly applicable to Boreal Forest management across Canada.

A.7.1.2 Approaches

The report provides an overview of the ecological context for biodiversity offsets in the BFNR. Examples of actual biodiversity offset programs are used to illustrate how these tools could be applied for mitigating impacts of development in the RMWB. The feasibility of offset options is further explored through qualitative interviews with thirty-three key informed stakeholders including eleven from industry, eight from government departments, seven from environmental non-government organizations (ENGOS), five from First Nations, and two from academic institutions. Four types of biodiversity conservation programs for the RMWB were described and respondents were asked to determine the strengths, weaknesses, opportunities and barriers of these options. The interviews were used to explore stakeholder awareness of biodiversity offsets, including whether organizations are considering offsets and what values or habitats should be protected by offsets. To accompany the report, a multi-stakeholder workshop was held to further discuss opportunities to implement biodiversity offsets in the RMWB. The goal of the workshop was to identify opportunities and actions needed to pilot biodiversity offsets in the Athabasca region of Alberta's Boreal Forest. Findings of this workshop will inform decision makers in their deliberations of a biodiversity offsets program for the future.

Four conservation program options were outlined to the interviewees: voluntary offsets, regulatory offsets without conservation banking, regulatory offsets with conservation banking, and cap and trade. While cap

and trade is not an offset program by definition, it was presented to stakeholders as an alternative conservation approach with similar attributes and objectives. Of these programs, the stakeholders preferred the conservation banking option.

The perceived main strengths of this option include fair treatment of firms, certainty of environmental benefits, clear rules, low transaction and administrative costs relative to the no-banking alternative, flexibility for firms in meeting regulatory objectives, and private incentives to invest in reclamation and conservation to create sellable credits. However, interview respondents also noted that this option requires a lengthy process for establishing public credibility and government commitment and is likely not feasible in the near term. Therefore, learning about biodiversity offsets and market evolution through a more formal voluntary program such as a voluntary registry challenge is encouraged as an initial step toward a more comprehensive offset program.

In general, the report noted that appropriate program design will depend on identifying clear goals and objectives of the offset program. Program design issues discussed in the report include geographic scope of the offset program, incorporation of private versus public lands, defining environmental equivalence, and monitoring and enforcement options. In terms of geographic scope, the findings suggest that a program limiting offset credit creation to the RMWB would be constrained by the lack of availability of undisturbed areas that could be developed as credits. Expanding the potential for credit creation to the whole BFNR as well as incorporating private lands would help alleviate these constraints. Other issues that must be resolved for successful program implementation include: ability to establish offsets on public lands with overlapping resource rights; ability of public land occupants to sell offsets under current regulations; duration of offset obligations and permanent versus temporary offsets; and treatment of reclamation and time lags between offset creation and benefits.

Based on feedback from stakeholders, an offset program should: encourage the establishment of offsets prior to development to minimize any time-lag effect; secure offsets in perpetuity (if possible) and explore opportunities for temporary offsets; represent a coordinated industry approach to biodiversity protection based on conservation management plans; achieve additional conservation benefits beyond business as usual practices; and adapt to increased knowledge and understanding of restoration and reclamation potential.

A.8 Reference 8

Name/Title: A Landscape Cumulative Effects Simulator (ALCES®)

Geographic Region: All

Type: Analytical Tool

Approach: future scenario forecasting at broad landscape scales

Bibliographic Citation(s) Reviewed:

- None

Website URL(s):

- <http://www.foremtech.com/>

A.8.1 Description

A.8.1.1 Summary

The computer application ALCES® (A Landscape Cumulative Effects Simulator), developed by Forem Technologies, provided a graphical representation of long-term changes in various natural and

anthropogenic landscape variables. Its purpose is to simulate landscape level change and effectiveness of management options in ameliorating that change.

A.8.1.2 Approaches

ALCES® is fundamentally an analytical tool to conduct future scenario forecasting at broad landscape scales. Its many inputs include characterization of natural features (e.g., vegetation cover) and land use pressures (e.g., access roads). Its output is a graphical (x-y charts) prediction of how any of those variables may change over many years (often 100 years), influenced by ongoing changes such as reclamation and wildfire.

Its database is aspatial as opposed to the more common spatial datasets used in conventional geographic information systems (GIS), “aspatial” meaning that land features are recognized as occupying an area within a given larger study area, but the exact location of those features is not recognized. This results in some loss of a true representation of effects while still providing a useful gross reflection of change.

ALCES® has been used as a modelling tool of choice for various studies, most noticeably in Alberta, including the Southern Foothills Study and a likely tool to support the recently announced Land Use Framework. ALCES® has been investigated for possible use in the north, including use by the Canadian Arctic Resources Committee for their (now defunct) Plan for the Land initiative.

The ALCES® model is a powerful tool but one that must be implemented with an understanding of its assumptions and uncertainties, best used to provide a high-level “regional” or “strategic” view as to what *may* (not *will*) happen. ALCES® output results must be combined therefore with other considerations, such as the implications of land tenure, regulatory process and by government political, social and economic need in the public interest.

A.9 Reference 9

Name/Title: Kluane National Park CEA

Geographic Region: Arctic (Canada), Yukon

Type: Assessment

Approach: cumulative effects assessment for a park management plan

Bibliographic Citation(s) Reviewed:

- Hegmann, G., 1995, A Cumulative Effects Assessment of Proposed Projects in Kluane National Park Reserve, Yukon Territory, Prepared for the Department of Canadian Heritage by the Environmental Research Centre, University of Calgary.

Website URL(s):

- None

A.9.1 Description

A.9.1.1 Summary

A cumulative effects assessment (CEA) was conducted of known and possible human activity in Kluane National Park Reserve, Yukon.

A.9.1.2 Approaches

This assessment was done as part of the updating of the Kluane National Park Management Plan. Park managers were concerned about the potential effects of humans, particularly visitation and proposed projects on park features, notably the park mega-fauna (e.g., grizzly bear).

The assessment included a review of current natural conditions and human activity that was then screened for possible effects. Effects were analyzed qualitatively, using available literature, using the concepts of impact hypotheses, hotspots and scenarios.

The CEA concluded with management recommendations suitable for consideration and implementation within a park management plan.

A.10 Reference 10

Name/Title: Yukon Caribou Thresholds Pilot

Geographic Region: Arctic (Canada), Yukon

Type: Research Study

Approach: thresholds-based management of caribou herds

Bibliographic Citation(s) Reviewed:

- AXYS. 2002. Options for Implementation of a Yukon Wildlife Thresholds Pilot Program: A Scoping Level Review
- Anderson, R. et. al., 2002, Development of a Threshold Approach for Assessing Industrial Impacts on Woodland Caribou in Yukon, Prepared for Department of Indian Affairs by Applied Ecosystem Management Ltd., Whitehorse, Yukon.

Website URL(s):

- http://www.planyukon.ca/index.php?option=com_docman&task=cat_view&gid=45&dir=ASC&order=date&limit=5&limitstart=0
- www.planyukon.ca/index.php?option=com_docman&task=doc_download&gid=20

A.10.1 Description

A.10.1.1 Summary

The Yukon Caribou Thresholds Pilot Project was an initiative to develop a practical means of implementing a thresholds-based approach in the management of caribou herds in the Yukon.

A.10.1.2 Approaches

Options on the use of thresholds were studied for possible application to the management, as a pilot study, of the Rancheria Herd in the southeast Yukon. Leading options included minimum core overwintering habitat and the retention, within an area under commercial timber harvesting, of protected habitat travel corridors to summer range. A tiered approach to thresholds and management response was suggested based on monitored habitat effectiveness.

An associated study was done (Anderson et. al.) that investigated options in detail, leading to a recommendation for a habitat effectiveness or zone of influence approach to thresholds.

A.11 Reference 11

Name/Title: Conservation Matrix Model

Geographic Region: All

Type: Analytical Tool

Approach: modelling tool to aid planning of a national conservation network and ecologically sustainable forest management

Bibliographic Citation(s) Reviewed:

- BEACONS (The Canadian BEACONS Project). 2008. Evaluation of Saskatchewan designated protected lands as ecological benchmarks for forest management. Prepared by the Canadian BEACONS Project, University of Alberta for Saskatchewan Environment Forest Service, Government of Saskatchewan. DRAFT, March 2008. 117 p.

Website URL(s):

- <http://www.beaconsproject.ca/cmm.htm>

A.11.1 Description

A.11.1.1 Summary

The Conservation Matrix Model (CMM) is a modelling tool that was developed by University of Alberta Boreal Ecosystems Analysis of Conservation Networks (BEACONS) research project to aid conservation planning in Canada's boreal region. The aim of the project is to aid the implementation of a national conservation network and ecologically sustainable forest management.

A.11.1.2 Approaches

The CMM was designed to assist in land-use planning and it consists of four elements: "*ecological benchmark areas, additional reserves, active management areas, and the larger conservation matrix within which the former three elements are embedded, and to which they contribute.*" (BEACONS website)

- "*Ecological benchmarks...serve as reference sites or controls for understanding both the natural dynamics of ecosystems as well as their response to human activities.*" The benchmark sites form a Representative Areas Network (RAN) that captures a range of forest ecosystems in a sufficient spatial extent.
- *Additional reserves capture values that may not be well represented within benchmark areas, such as identified special elements (e.g., early-season open water for migrating waterbirds, areas of cultural significance, rare species occurrences), and may include existing and new protected areas (e.g., national parks, wildlife reserves) that do not fulfill benchmark criteria.*
- *Active management areas are sites of relatively intense human activity, such as forestry, mining, or oil and gas exploration. These areas are managed under the principles of Adaptive Resource Management, such that management activities are treated as experiments designed to identify truly sustainable practices.*
- *The conservation matrix is the supportive landscape within which less intense human activities are carefully managed so as not to erode other values.*" (BEACONS website)

The BEACONS research group is currently developing and analyzing ecological benchmarks for boreal and taiga regions of Canada, Saskatchewan being one of the first areas where the model has been applied (BEACONS 2008). The recent work focused on defining the criteria for ecological benchmarks in the context of forest management and evaluating the adequacy of the existing RAN in Saskatchewan.

The next steps would be to identify proposed benchmark areas that do not yet fall under the RAN. The study further concluded that the analysis methods require still some work in some areas, for example, including hydrologic connectivity in the ecological integrity analysis (BEACONS 2008).

A.12 Reference 12

Name/Title: Oil and Natural Gas Industry Best Management Practices

Geographic Region: Canada

Type: Management Approach

Approach: practices and technologies that reduce the 'footprint' of oil and gas activities

Bibliographic Citation(s) Reviewed:

- CAPP (Canadian Association of Petroleum Producers). 2004. Best Management Practice – Evolving approaches to minimize the footprint of the Canadian oil and natural gas industry. 105 p.

Website URL(s):

- www.capp.ca/getdoc.aspx?DocId=81251&DT=NTV

A.12.1 Description

A.12.1.1 Summary

Canadian Association of Petroleum Producers (CAPP) published a document in 2004 that outlined “*new and evolving...practices and technologies that reduce the ‘footprint’ of oil and gas activities forested regions of western Canada.*” It is noteworthy that the document does not discuss best practices, but practices that could become best practices. The purpose of the document was to aid companies in reducing project-specific footprints and regional cumulative effects. The emphasis was placed on project design features rather than a theoretical examination of evolving practices.

A.12.1.2 Approaches

In regard to cumulative impacts, the report states: “*Impact management tools specifically designed to evaluate and reduce cumulative effects of local oil and gas activities are still evolving. Mitigation of project-specific activities remains the most practical and essential approach for managing cumulative effects.*”

Evolving practices and technologies were discussed under the following categories:

- Integrating land uses – “*The ideal approach to manage cumulative effects would be to coordinate all land use activities in a defined area such that activities are optimized in space and time... experience in Alberta indicates that this frequently reduces development costs not increases them. The best known example of a multi-sector impact management tool is the Integrated Landscape Management (ILM) initiative.*”
- Avoiding important features – Evolving practices included “*innovative approaches such as regional ‘constraint mapping’ used by CAPP members.*”
- Managing mortality – “*Indirect harvest and mortality associated with linear corridors and clearings is generally the most significant cumulative impact for species of concern in forested areas of Alberta, British Columbia, and the southern NWT. Footprint minimization tools may reduce indirect mortality by reducing ‘edge area’ – the area adjacent to corridors and clearings where indirect mortality has been shown to increase.*”

- Minimizing direct habitat loss – Evolving practices included “*techniques to reduce seismic line width, reduce the number and size of well leases, and avoid disturbance of watercourse bed and banks.*”
- Minimizing indirect habitat loss – Evolving practices included measures to “*reduce seasonal and year-round project activity levels; minimize line-of-sight; and reduce the abrupt change between forest and corridors or clearings.*”
- Enhancing habitat reclamation – “*Mulchers are one innovative tool that encourages vegetation recovery by reducing root damage and corridor width.*”

As a general conclusion, the CAPP report stated that its members actively identify and implement new practices and technologies to reduce the footprint of activities.

A.13 Reference 13

Title of Report: Road to Improvement – The Review of the Regulatory Systems Across the North

Geographic Region: Canada Arctic

Type: Policy

Approach: streamlining of regulatory process

Bibliographic Citation(s) Reviewed:

- McCrank, N. 2008. Road to improvement – The review of the regulatory systems across the north. Prepared for the Ministry of Indian Affairs and Northern Development. 38 p + Appendices.

Website URL(s):

- <http://www.ainc-inac.gc.ca/ai/mr/nr/m-a2008/ri08-eng.asp>

A.13.1 Description

A.13.1.1 Summary

The report provides a review of the status of the non-renewable resource regulatory systems in Northern Canada, with a special focus on the Northwest Territories, and recommendations for streamlining the regulatory process. The report was based on extensive stakeholder meetings and literature review.

A.13.1.2 Approaches

In order to have a distinct comparison, the report outlines an ideal regulatory system that would be understandable, fair and accountable. Against this background, McCrank listed some realities that affect the regulatory systems, including pending land claims and the devolution of land and resource management responsibilities. The review focused mostly on the legislative and regulatory framework under the *Mackenzie Valley Resource Management Act*, however, more brief commentaries were provided for Yukon and Nunavut as well.

As a general observation, McCrank noted that “*the current regulatory process...achieves the objectives of being open, transparent and fair*” and therefore, the review focused on ideal objectives that were not consistently met in the current regulatory system, namely: neutrality, clear mandate, timelines, consistency and predictability, accountability, coordination and established rules. Two ideal objectives were deemed to be unattainable: understandability (due to inherent complexity) and capacity (due to the difficulty in developing sufficient skill and expertise to fulfill mandates). A detailed restructuring proposal with two options was developed for the NWT based on the outlined approach. In addition, specific recommendations were made in the following fields: policy and management frameworks, process

improvements, legislative and regulatory amendments and federal government role. An implementation plan with a timeline and assigned responsibility for actions was also provided.

The cursory review of the Nunavut regulatory regime yielded three recommendations and a general observation that the main difference of the systems in the NWT and Nunavut was “*the simplicity of the system in Nunavut...one comprehensive land claim agreement covers the whole territory.*” The recommendations specific for Nunavut were presented as follows:

- “*The federal government should, with the collaboration of the Government of Nunavut, Nunavut Tunngavik Incorporated, the Nunavut Impact Review Board and the Nunavut Planning Commission, complete the Nunavut Land Use Planning and Impact Assessment Act.*”
- *The federal government should make completing Land Use Plans for all of Nunavut a priority.*
- *The duplication of efforts by the Nunavut Impact Review Environmental Assessment Agency should be addressed.*”

A.14 Reference 14

Name/Title: Science-based Thresholds

Geographic Region: All

Type: Research Study

Approach: threshold-based approach to cumulative effects management

Bibliographic Citation(s) Reviewed:

- Kennett, S. 2006. From science-based thresholds to regulatory limits: implementation issues for cumulative effects management. Prepared for Environment Canada, Northern Division. 23 p.

Website URL(s):

- <http://www.ngps.nt.ca/Upload/Interveners/Environment%20Canada/071121%20EC%20Report%20-%20From%20Science-Based%20Thresholds%20to%20Regulatory%20Limits.pdf>

A.14.1 Description

A.14.1.1 Summary

The paper provides a discussion on the “*key issues that should be confronted directly in order to implement a threshold-based approach to cumulative effects management*”. Threshold-based approach was defined as “*the establishment and enforcement of regulatory limits on specified human activities that contribute to cumulative environmental effects.*”

A.14.1.2 Approaches

Kennett (2006) made a clear distinction between:

- *thresholds*, which are often indicators or benchmarks based on scientific information but which do not provide meaningful constraints on human activities but rather “*work best when used to manage negative effects, not stop development*”
- *limits*, which restrict cumulative human activity
- *decisions* that are based on information

In Kennett's view, the key to successful implementation of threshold-based approach to cumulative effects management is in understanding this difference and applying a proper implementation process that includes an analysis of limits, trade-offs and specific decision-making processes. Kennett based his discussion on Terry Antoniuk's review of thresholds in the Northwest Territories¹ which showed that extensive work has already been done on developing scientific thresholds in Northern Canada and that *"many of the tools and decision-making processes needed to develop and implement a threshold-based approach...are already in place or are under development in the NWT and elsewhere"* (Kennett 2006).

Thresholds have been met with controversy in the implementation stage due to complexity, unclear derivation, resource use restrictions, not reflecting existing issues with data and unclear trade-offs. The majority of opposition has occurred in areas with economically recoverable resources when restrictions on development have been proposed. Kennett (2006) concludes that *"whatever the appeal of thresholds in theory, the resistance of key decision-makers and stakeholders to follow through with implementation may be explained by issues that may not simply be resolved over time by improved science."*

The key implementation issues were identified as follows:

- *"Society's willingness to accept limits on certain human activities in order to preserve natural capital, reduce the risk of unintended and potentially catastrophic environmental change, protect a range of environmental, economic, social and cultural values, and reconcile competing land and resource use."* In other words, the society must recognize a need for limits before they can be implemented.
- *"Trade-offs are inevitable at some point as human activities increase in scope and intensity"* but a direct discussion on trade-offs is often avoided. Furthermore, limits and trade-offs are closely linked and this relationship should not be overlooked in the implementation process.
- *"Key point is that accepting limits in principle does not imply simply imposing caps on the existing suite of human activities"* but rather *"it should be viewed as altering incentive structures and regulatory processes...[to] invite innovation, not stagnation."*
 - *"Limits create scarcity where none existed before"* and make previously 'free' land and resources cost the developers.
- *"Managing cumulative effects requires attention to the broader legal, institutional and policy context" and what is needed is "a fundamental shift from blind incrementalism and fragmented decision-making to an integrated system for managing land and resource use."*

A well-designed planning process was put forward as the solution to the key issues, and details were provided on a recommended planning process. The planning process discussion highlighted the need to incorporate societal values and traditional knowledge into the process in addition to scientific information and stated that scientific uncertainty should not be viewed as a valid reason to refuse to set limits. Additionally, feedback and flexibility mechanisms were viewed as being important. The key issue in implementation of limits in practice was deemed to be the activity-by-activity or project-by-project approach and that *"there is a need to aggregate individual decisions."*

¹ Salmo Consulting Inc. 2006. Developing and implementing thresholds in the Northwest Territories – A discussion paper. Prepared for Environment Canada, Northern Division.

A.15 Reference 15

Name/Title: Mackenzie Gas Project Scenarios of Future Developments

Geographic Region: Arctic (Canada), NWT

Type: Analytical Tool

Approach: use of scenario analysis in cumulative impact assessments

Bibliographic Citation(s) Reviewed:

- Greig, L. and P. Duinker. 2007. Scenarios of future developments in cumulative effects assessment: Approaches for the Mackenzie Gas Project. Prepared by ESSA Technologies Ltd. for the Mackenzie Gas Project – Joint Review Panel. 31 p.
- Holroyd, P., J. Grant and S. Dyer. 2007. Scenario analysis: A best practice approach to assessing the cumulative impacts of the Mackenzie Gas Project. Prepared by the Pembina Institute, Drayton Valley, Alberta, Canada. 32 p.

Website URL(s):

- http://www.ngps.nt.ca/Upload/Joint%20Review%20Panel/Specialist%20Advisors/ESSA%20Technologies%20Ltd/070312_Scenarios_in_CEA_Greig_Duinker.pdf
- <http://pubs.pembina.org/reports/Submission-ScenarioAnalysis-MGProject.pdf>

A.15.1 Description

A.15.1.1 Summary

The cited papers discuss the requirements and best practices of the inclusion of future developments and the use of scenario analysis in cumulative impact assessments (CEAs). Both of the papers were prepared for the Mackenzie Gas Project (MGP) Joint Review Panel hearings on cumulative effects. Because the MGP project is viewed as “basin-opening”, the discussion of induced development and the inclusion of reasonably foreseeable projects in the CEA has become an important discussion point.

A.15.1.2 Approaches

While a CEA is required under the *Canadian Environmental Assessment Act*, a level of interpretation exists on the requirements of including future developments in the analysis. Greig and Duinker (2007) state that “*identifying what future projects to include in CEA...has proven to be one of the most difficult and controversial aspects of CEA practice*”. The minimum requirement is considered to be the inclusion of approved projects and projects that are in the approval process. However, a consensus does not exist on whether growth-induced projects or developments (i.e., reasonably foreseeable projects) should be included in the analysis or not. Proponents are encouraged to include reasonably foreseeable projects; however, this is not generally a requirement. The minimum requirement approach was chosen by the proponent of MGP, and the CEA therefore included projects that are imminent but not induced development. Greig and Duinker (2007) commented that “*this approach provides an analysis that will underestimate the likely cumulative effects, essentially providing only a minimum view*”. Further, Holroyd et al. (2007) stated that “*there is little doubt that the Mackenzie Gas Project is designed to induce more development than is presented in the current proposal for the MGP*”.

Greig and Duinker (2007) suggested that different future scenarios would provide useful information for decision-makers and stakeholders. They further concluded that “*there is sufficient experience with oil and gas developments elsewhere in Canada that reasonable estimates could be made of the level of indirect*

induced development.” Holroyd et al. (2007) stated similarly that “*with respect to cumulative effects assessment methodology, scenario analysis represents a demonstrated best practice for assessing the cumulative impact of resource development projects and associated induced development*” and further that scenario analysis should be viewed as “*simply due diligence.*” Both papers presented slightly different step-by-step instructions to create scenarios and assess the impacts and mitigation measures.

A.16 Reference 16

Name/Title: Global methodology for mapping human impacts on the biosphere (GLOBIO)

Geographic Region: All

Type: Analytical Tool

Approach: mapping of risk of human impacts on biosphere

Bibliographic Citation(s) Reviewed:

- UNEP. 2001. GLOBIO – Global methodology for mapping human impacts on the biosphere. UNEP/DEWA/TR.01-3. 47 p.
- Ahlenius, H., K. Johnsen and C. Nellemann. 2005. Vital Arctic Graphics – People and global heritage on our last wild shores. Prepared for UNEP/GRID Arendal, Arendal, Norway. 43 p.

Website URL(s):

- <http://www.globio.info>

A.16.1 Description

A.16.1.1 Summary

GLOBIO is a mapping tool developed by the United Nations Environment Programme (UNEP). In 2001, a pilot study of using GLOBIO was published, which presented predictions and mapping results for the Arctic region (UNEP 2001). Since that time, GLOBIO has been used extensively to map the risk of human impacts on the biosphere.

A.16.1.2 Approaches

GLOBIO requires minimal baseline information in the form of infrastructure maps, and human impacts are mapped as “zones of influence” around infrastructure based on scientific studies on the extent of impact of different types of infrastructure on fauna and flora. For example, the Arctic pilot study established the zones of influence based on some 200 reviewed studies (UNEP 2001). The following four categories were used:

- *Reduced abundance of birds (0-1 km from infrastructure)*
- *Reduced abundance of large mammals (0-3 km)*
- *Cumulative impacts on flora and fauna, including shifts in insect composition, food chains, hydrology, predation patterns etc. (0-20 km)*
- *Areas with low or no disturbance (>20 km)*

Infrastructure maps from 1940 and 1990 were compared and three future scenarios were established that represented the same growth rate as between 1940-1990, 50% reduced growth and 200% growth. The results showed that “*continued growth at current rates...will within 20-50 years seriously impact wildlife populations, vegetation, and ecosystem functions across 50-80% of the Arctic*” (UNEP 2001).

A follow-up report, published in 2005 provided “a number of *vital*” Arctic graphics that describe the Arctic, the livelihoods of Arctic indigenous peoples and the future well-being of this region” (Ahlenius et al. 2005). The report concluded that the protection of Arctic coastal areas and resource allocation that take into account indigenous people are of high importance.

A.17 Reference 17

Name/Title: Potential Landscape Impacts of Gas Development in Northern Canada

Geographic Region: Arctic (Canada), NWT

Type: Analytical Tool

Approach: potential cumulative effects of gas development to the Northern communities

Bibliographic Citation(s) Reviewed:

- Holroyd, P., and H. Retzer. 2005. A Peak into the Future – Potential Landscape Impacts of Gas Development in Northern Canada. The Pembina Institute, Drayton Valley, Alberta, Canada. 38 p.

Website URL(s):

- <http://arctic.pembina.org/pub/183>

A.17.1 Description

A.17.1.1 Summary

The potential future footprint of gas development in the Mackenzie Delta (NWT, onshore only), Colville Hills (NWT) and Peel Plateau (Yukon) were modelled using ALCES® landscape-scale simulation model over 30 years. Additionally, alternative management scenarios were investigated with ALCES®. The aim of the study was to provide a visual image of the potential cumulative effects of gas development to the Northern communities.

A.17.1.2 Approaches

The model inputs included an estimation of the future general pattern of gas field development, i.e., percent of land under development, not exact locations of wells and other infrastructure. Existing development was also included. The effect of industry “best practice” options, such as reducing the width of seismic lines from five to two metres, were investigated in the Colville Hills case study. Results were provided for production rates, well numbers and cumulative linear and surface area footprints. Map pairs of current development and 30-year development scenario snapshots were provided. The results also showed that industry best practices can “*significantly reduce linear and surface area disturbance*”.

The study concludes maps created with ALCES® provide a foundation for a quantitative cumulative effects assessment and that such assessments “*are necessary to more fully understand the direct and indirect effects of development activities*”. The use of GLOBIO model and its “zone of influence” approach was also recommended. Generally, it was concluded that model outputs that provide a full “picture” of future development are accessible, easy to understand and with these tools, “*Northerners will be able to assess trade-offs and risks, and attempt to balance current competing objectives and related decisions that will affect Northern ecosystems and communities into the future.*”

A.18 Reference 18

Name/Title: Cumulative Effects Modelling of the Mackenzie Gas Project

Geographic Region: Arctic (Canada), NWT

Type: Analytical Tool

Approach: future scenario modelling

Bibliographic Citation(s) Reviewed:

- Cizek, P., and S. Montgomery. 2005. Cumulative Effects Modelling of the Mackenzie Gas Project – Scoping and Development. Prepared for the Canadian Arctic Resources Committee. 27 p.

Website URL(s):

- [http://www.carc.org/2005/MGP%20Development%20and%20Cumulative%20Effects%20Mapping%20\(CARC,%20Jan.%2010%202005,%20text%20only\).pdf](http://www.carc.org/2005/MGP%20Development%20and%20Cumulative%20Effects%20Mapping%20(CARC,%20Jan.%2010%202005,%20text%20only).pdf)

A.18.1 Description

A.18.1.1 Summary

The paper presents the results of three dynamic landscape simulation models: GLOBIO (Global Methodology for Mapping Human Impacts on the Biosphere), IDRISI Dynamic Modelling Module and DINAMICA Landscape Dynamics Simulation Software. The models were used to map induced gas wells required to supply the Mackenzie Gas Project (MGP) until 2049.

A.18.1.2 Approaches

The following data were included in the modelling:

- Existing human activities were mapped, including settlements, roads, gas pipelines, wells and seismic lines within the set study area
- Maximum future gas supply scenario (previously identified) was adopted for the study, including number of wells, seismic lines and pipelines
 - Contingent and prospective resources were included, with an estimate of seismic lines needed for new wells
 - The length of new feeder pipeline required to connect new wells to the main pipeline trunk was estimated
 - Information on proposed all weather and winter roads were included from the MGP Environmental Impact Statement

The future development was modelled and snapshots in time were investigated. In addition, cumulative impacts were estimated with GLOBIO software that allows “zones of influence” to be assigned to different infrastructure types (e.g., 300 m high impact zone, based on reduced abundance of birds, was assigned around all roads and communities).

It was concluded that the produced maps showing cumulative impacts illustrated the scale of implications clearly and that these maps could be used in land use planning. Further study with more detailed inclusion of impacts and more realistic pipeline modelling etc. was suggested. Additionally, the MGP Environmental Impact Statement was criticized for not applying the GLOBIO “zones of influence” in their cumulative effects assessment.

A.19 Reference 19

Name/Title: Arctic Human Development Report

Geographic Region: Arctic (circumpolar)

Type: Research Study

Approach: assessment of human development and well-being in the Arctic

Bibliographic Citation(s) Reviewed:

- Stefansson Arctic Institute. 2004. Arctic Human Development Report. Prepared for the Arctic Council's Sustainable Development Working Group. 233 p.

Website URL(s):

- <http://www.svs.is/AHDR/>

A.19.1 Description

A.19.1.1 Summary

The report provides the first circumpolar assessment of human development and well-being in the Arctic. Information synthesis is provided for social aspects such as demography, cultures, gender issues, education and political, economic and legal systems. The report additionally puts forward policy-related conclusions and findings.

A.19.1.2 Approaches

Regional and circumpolar issues and trends were identified for all key topics based on several local-scale examples and by drawing conclusions for larger areas based on these examples. The majority of the report contributors were social scientists and only existing information was used, no new data were gathered in the process for completing the report.

The Arctic community trends were generally described as changing, especially during the 20th century, with adaptiveness and resilience making the communities equipped to integrate modernity. Moving from centralized decision-making to local was identified as one of the most important factors in reducing cultural and social problems. In terms of economy, it was concluded that it is "*highly dependent on global economic and political trends*" and mainly based on extracting resources that benefit the industrialized world. The role of the state was viewed as important in mediating between private and civil society interests. The political systems of the Arctic States share a history of colonial views; however, contemporary policies are emphasizing the increased indigenous influence around the world. The growth of regional autonomy in the form of public governments and self-governance are examples of this trend. The legal system is based on international human rights conventions, even though the level of implementation of the conventions was deemed variable. Definition and clarification of resource rights in the Arctic and incorporating traditional knowledge into resource management were highlighted as profound matters for political, economic, cultural and social development. From a human health perspective, the report concluded that trends were difficult to identify due to lack of consistent circumpolar data. The most critical issues for education were identified as control, access to education and relevance of educational materials. Data gaps were obvious and hindered overall conclusions for gender matters. International cooperation has been increasing since post-Cold-War era, increasing the voice of the Arctic region on the international scene.

The report concludes that the main findings of the report should be used to direct policy-making in the Arctic and to steer program development, for example, during the International Polar Year (2007-2008).

A.20 Reference 20

Name of Initiative: Arctic Climate Impact Assessment (ACIA)

Geographic Region: Arctic (Circumpolar)

Type: Research Study

Approach: evaluation of arctic climate change based on a moderate future warming scenario

Bibliographic Citation(s) Reviewed:

- Hassol, J.S. 2004. Impacts of a Warming Arctic – Arctic Climate Impact Assessment (Synthesis Report). Cambridge University Press, New York, New York, 139 p.
- Arctic Climate Impact Assessment (ACIA). 2005. Arctic Climate Impact Assessment – Scientific Report. Cambridge University Press, New York, New York, 1024 p.

Website URL(s):

- <http://www.acia.uaf.edu/>
- <http://www.ainc-inac.gc.ca/enr/clc/ccs/aci-eng.asp>

A.20.1 Description

A.20.1.1 Summary

The report provides “*the first comprehensive evaluation of arctic climate change, changes in ultraviolet radiation, and their impacts for the region and for the world*” based on a moderate future warming scenario from Intergovernmental Panel on Climate Change (IPCC). Over 300 scientists, experts and members of the indigenous communities were involved in the preparation of the assessment.

A.20.1.2 Approaches

The Arctic was divided into four geographical regions for the assessment, one of these (Region 4) being Western Canadian Arctic and Greenland. Effects of climate change and UV radiation on climate, selected ecosystems (e.g., arctic tundra, freshwater and marine systems) and societal components (e.g., hunting and gathering, land management, infrastructure and human health) were assessed.

The main impacts identified for Region 4 included:

- Change in biomes (general to all four regions assessed), including northward shift of both the tundra and the treeline, decline in polar deserts
- Less significant biodiversity loss than in the other assessed regions due to relatively few rare endemic species
- Increased stress on caribou due to insects and parasites
- Increasingly limited forage ability of Peary caribou and muskoxen due to adverse snow conditions
- Significant shifts in species range, composition and trophic relations in freshwater systems
 - Salmonid species are likely to extend their ranges northward
- Likely decline in marine mammal populations due to receding sea ice, with the exception of beluga and bow-head whales
- Possible extinction of polar bear

- Changes in climate affect peoples' lifestyles through changes in the timing of animal migrations as well as in the numbers and health of some animal populations and in the quality of animal skins and pelts

As a general outcome, it is stated that the “assessment of the projected impacts of changes in climate and UV radiation is a difficult and long-term undertaking and the conclusions presented here, while as complete as present information allows, are only a first step in what must be a continuing process. There are likely to be future surprises, such as relatively rapid shifts in the prevailing trends in climatic regimes and in the frequency and intensity of extreme events; such changes, while likely, are expected to remain very difficult to project with high confidence”. The report also emphasizes the importance and need to conduct vulnerability assessments in the Arctic Region, because it is the communities that have the least adaptive capacity that require attention, both in the environmental and societal sphere.

A.21 Reference 21

Name/Title: Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope

Geographic Region: Arctic (Alaska)

Type: Research Study

Approach: potential effects of oil and gas activities in Alaska

Bibliographic Citation(s) Reviewed:

- National Research Council (NRC). 2003. Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope. The National Academic Press, Washington, D.C. 288 p.

Website URL(s):

- <http://books.nap.edu/openbook.php?isbn=0309087376>

A.21.1 Description

A.21.1.1 Summary

The report provides a review and synthesis of the existing information (from experts, literature, public meetings and various organizations) on oil and gas activities on Alaska's North Slope and an assessment of known and probable future cumulative effects on the environment, including physical, biological and human aspects. Knowledge gaps were additionally identified, however, no management actions were brought forward.

A.21.1.2 Approaches

Oil and gas activities have taken place on Alaska's North Slope since the 1960s. The assessment of cumulative effects was done with the following steps:

- Specifying “the class of actions whose effects are to be analyzed”
- Designating “the appropriate time and space domain in which the relevant actions occur”
- Identifying and characterizing “the set of receptors to be assessed”
- Determining “the magnitude of effects on the receptors and whether those effects are accumulating”

An explanation on the selection criteria for receptors was not provided, however, assessed receptors included tundra vegetation, species of special concern, subsistence hunting and employment. The assessed activities included, for example, seismic exploration, road building and gravel mining.

The main findings and recommendations of the assessments mainly highlighted the need for further studies and data gathering. The report concluded that predictions of cumulative effects remain uncertain despite of extensive data. Generally, the report stated that “*continued expansion will exacerbate existing effects and create new ones*” and that the acceptability of these effects is “*an issue for society as a whole to debate and judge*”.

A.22 Reference 22

Name/Title: Social Impact Assessment in Regional Land Use Planning

Geographic Region: Arctic (Europe)

Type: Research Study

Approach: social impact assessment (SIA) in regional land use planning

Bibliographic Citation(s) Reviewed:

- Heikkinen, T. and R. Sairinen. 2007. Social Impact Assessment in Regional Land Use Planning. Nordic Research Programme Report 2005-2008. Report: 3. Nordregio, Stockholm, Sweden. 52 p.

Website URL(s):

- <http://www.nordregio.se/>

A.22.1 Description

A.22.1.1 Summary

The report provides an analysis of the fairly new experiences in using social impact assessment (SIA) in regional land use planning in Finland. Three case studies are presented, with comments from experts on how SIA should be integrated in the planning process and what the contents should be.

A.22.1.2 Approaches

In Finland, regional land use plans outline the principles of land use and community structure and designate future development areas. These plans have a timeframe of 10-20 years, and they draw from strategic regional plans that provide national strategic vision and development goals. Finland’s *Land Use and Building Act* (1999) requires that social and environmental impacts of a plan need to be investigated. Regional land use plans are currently in different stages of development and 25 had been ratified in 2007 when the study was completed. The study found that in the majority of cases, SIA was performed by the planners themselves, and that only in a few cases had an external assessor been used.

Three types of SIA approaches were used in the three case studies. Firstly, a geographic approach was applied, which used physical changes in a sub-regional level caused by the regional land use plan as a starting point, and analyzed the anticipated social changes due to changes in the physical environment. Secondly, a sociological approach was used, which starts the assessment from the social environment and analyzed the changes caused by the regional land use plan at a general level. The third approach that was used was a mix of the first and the second approach, starting from social themes of various social groups, such as the elderly and children, and analyzed the effects of the regional land use plan at a general level and also at selected target sites.

The study concluded that the methods, content, stakeholder consultation, publication of results and the relevance of SIAs to the planning process varied and were insufficient in some cases and that the use of SIA in regional land use planning should be improved by studying these early examples and developed further.

A.23 Reference 23

Name/Title: Natura 2000 Network for Biodiversity Conservation and Protection

Geographic Region: Europe

Type: Management Approach

Approach: biodiversity protection through a protected areas network

Bibliographic Citation(s) Reviewed:

- ETC/BD (European Topic Centre on Biological Diversity). 2005. A data overview of the network of Special Protection Areas. 75 pp.
- Natura 2000. 1999. Natura 2000 – European Commission DG XI's Nature Newsletter. Issue 10, October 1999. 10p. Available at http://ec.europa.eu/environment/nature/info/pubs/docs/nat2000newsl/nat10_en.pdf
- Donald, P.F., F.J. Sanderson, I.J. Burfield, S.M. Bierman, R.D. Gregory and Z. Waliczky. 2007. International conservation policy delivers benefits for birds in Europe. *Science* 317:810-813.
- Linnell, J., V. Salvatori and L. Boitani. 2008. Guidelines for Population Management Plans for Large Carnivores in Europe. A Large Carnivore Initiative for Europe report prepared for the European Commission. 85 p.

Website URL(s):

- <http://ec.europa.eu/environment/nature/natura2000/>
- http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
- http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
- <http://www.lcie.org/>
- http://www.mmm.fi/en/index/frontpage/Fishing,_game_reindeer/hunting_game_management/managementplans.html

A.23.1 Description

A.23.1.1 Summary

In 2001, The European Union Member States made the commitment to halt the loss of biodiversity within the EU by 2010. Biodiversity conservation and protection in the EU is largely based on Natura 2000 network of protected areas, which is the largest coherent network of protected areas in the world. The policy basis for the Natura 2000 network comes from the Birds Directive (April 1979 – Directive 79/409/EEC) and the Habitats Directive (May 1992 – Directive 92/43/EEC). These Directives outline the Member States' obligations for habitat conservation based on the habitat use of threatened or endangered species and internationally important sites.

A.23.1.2 Approaches

Birds Directive

The Birds Directive names 181 endangered and migratory bird species, which are listed in Annex I of the Directive. The Member States are required to protect the “*most suitable territories*” of all of these species, both in number and in area, by classifying these areas as Special Protection Areas (SPAs). Additionally, the Member States are required to protect the habitats of migratory birds not listed in Annex I, especially

any wetlands of “*international importance*”. According to an update in June 2008 (Natura 2000, 2008a), there are currently 5,004 SPAs in Europe that cover 518 km².

The Birds Directive does not provide explicit ornithological criteria for classifying SPAs nor does it provide a definition for “most suitable territories” (ETC/BD, 2005). However, Natura 2000 (1999) provides the following description: “*Member States have a margin of discretion in choosing the most suitable sites for classification but this must result from the application of valid ornithological criteria. In the 1980s experts from the Member States, the European Commission and the non-governmental organization – BirdLife International – worked out a set of criteria for identifying sites of great importance for the conservation of birds in the European Union – known as Important Birds Areas (IBAs). These criteria were used to prepare the 1989 IBA inventory, which together with other similar national reviews, are used by the Commission to assess if Member States have classified their most suitable territories as SPAs. The validity of this approach has recently been recognized by the Court of Justice.*”

Additionally, ETC/BD (2005) continues: “*the European Commission ... presented ... in 1988 the ornithological criteria that were used in the preparation of the 1989 Important Bird Areas list published by the then International Council for Bird Preservation (which became BirdLife International in 1992). Ornithological criteria had been developed since the 1970s, namely in the framework of the Ramsar Convention to identify wetlands of international importance for birds: 1 % of a biogeographical population of a species was used as the threshold level for establishing the international importance of a site.*”

Examples of the above criteria include the following:

- *The site holds significant numbers of globally threatened species, or other species of global conservation concern.*
- *The site is known to regularly hold at least 1 % of a flyway population or of the EU population of a species threatened at the EU level (listed on Annex I of the Birds Directive).*
- *The site is known to regularly hold at least 1 % of a flyway population of a migratory species not listed on Annex I of the Birds Directive.*
- *The site is known to regularly hold at least 20 000 migratory water birds and/or 10 000 pairs of migratory seabirds of one or more species.*
- *The site is a 'bottleneck' site where at least 5 000 storks (Ciconiidae) and/or at least 3 000 raptors (Accipitriformes and Falconiformes) and/or 3 000 cranes (Gruidae) regularly pass on spring and autumn migration.*
- *The site is one of the five most important in the European... in question for a species or subspecies considered threatened in the European Union (i.e. listed in Annex I of the Birds Directive.)*

The Member States' performance on assigning SPAs on a national level is compared to the existing information in IBAs based on Member States' regular updates that are submitted in a standardized data forms and by using standard software (ETC/BD 2005). The comparison allows a barometer value to be assigned to each Member State, from “notably insufficient” to “largely complete”. According to an update in June 2008, there are currently 5,004 SPAs in Europe that cover 518 km².

A recent data review (Donald et al. 2007) showed that the Birds Directive has had a significant effect on bird population trends in Europe, especially for Annex I species. The study concluded that “*for every additional 1% of a country's land area designated as SPAs, the odds of a species being in more-positive population trend classes increased by 4% across all species...and by around 7% for Annex I species.*” This trend was detected despite the variable land use and management of SPAs across Member States; it has been noted that most SPAs “*provide services other than nature conservation ones*” (ETC/BD 2005).

Habitats Directive

The Habitats Directive lists over 1,000 animals and plant species and over 200 "*habitat types of European importance*" for which protection measures are required by the Member States. The process involves the Member States to identify Sites of Community Importance (SCI) on the national level, which are subsequently validated and assigned as Special Areas of Conservation (SAC) on the EU level by the European Commission. The Directive includes both terrestrial and aquatic environments. According to an update in June 2008, there are currently 21,612 SCIs in Europe that cover 656 km².

The Habitat Directive divides the EU into nine ecologically coherent biogeographical regions and Natura 2000 sites are selected according to each biogeographical region. Each biogeographical region has a reference list of habitats and species of concern and their occurrence in the Member States. The lists have been developed through two rounds of special technical seminars for each of the nine biogeographical regions. Annex II of the Habitat Directive specifies the habitat types and species of concern for Europe, and there has not been a need to update this list since the Directive was passed in 1992, although the interpretation of habitat types has been more specifically defined. The Directive also specifies which areas should be protected and on what basis.

This first goal of the directive refers to the conservation of natural habitats and of the habitats of species. The Habitats Directive also includes a second goal, which is related to the strict protection of individual species listed in Annex IV(a) of the Directive (Species Of Community Interest In Need Of Strict Protection). The following sections describe initiatives and management plan development for individual species, mainly mammals.

Initiatives such as European Mammal Assessment and Large Carnivore Initiative for Europe (LCIE) provide baseline information and guidelines for achieving transboundary cooperation that focuses conservation efforts on biologically defined populations for wolves, brown bears, wolverines and Eurasian lynx. Following the work of these initiatives, Guidelines for Population Level Management Plans for Large Carnivores were published in 2008 (Linnell et al. 2008). The document provides operational definitions for Favourable Reference Population (i.e., minimum viable population in a certain biogeographical region) and Favourable Reference Range (i.e., area needed to contain favourable population), and provides criteria for setting these values. The document also provides a step-by-step process for developing population level management plans in the European legislative context

For example, a northern European country Finland has population management plans in place for wolf (2005), brown bear (2007), lynx (2007), wild Finnish forest reindeer (2007) and seals (2007). These management plans have been prepared by the Ministry of Agriculture and Forestry, with participation from stakeholder groups. As an example, the forest reindeer management plan outlines existing management actions in place, identifies sub-populations of forest reindeer and sets population goals for each sub-population, and outlines actions that will be taken to "ensure genetic purity" of the sub-populations (i.e., building fences between wild reindeer and domesticated reindeer areas). Additionally, socio-economic factors are considered in the forest reindeer management plan, including the costs from damage to agriculture and traffic accidents, and the length and onset of hunting season.

A.24 Reference 24

Name/Title: Beaufort Sea Strategic Plan of Action (BSStRPA)

Geographic Region: Arctic (Canada), NWT

Type: Regional Study

Approach: regional strategic environmental assessment of future oil and gas development

Bibliographic Citation(s) Reviewed:

- BSSrPA Steering Committee. 2008. Beaufort Sea Strategic Regional Plan of Action. 47 p.
- Cobb, D., H. Fast, M.H. Papst, D. Rosenberg, R. Rutherford and J.E. Sareault (Editors). 2008. Beaufort Sea Large Ocean Management Area Ecosystem Overview and Assessment Report. Can. Tech. Rep. Fish. Aquat. Sci. 2780: ii-ix + 188 p.

Website URL(s):

- <http://www.bsstrpa.ca>
- <http://www.beaufortseapartnership.ca>

A.24.1 Description

A.24.1.1 Summary

The Beaufort Sea Strategic Plan of Action (BSStRPA) provides a regional strategic environmental assessment of future oil and gas development in the Beaufort Sea. The plan includes input from a large base of stakeholders and it provides recommended actions to streamline project evaluation process and to plan for unknown future effects of oil and gas development. The plan is partly based on ecosystem information compiled by Cobb et al. (2008) as part of Beaufort Sea Integrated Management Plan development.

A.24.1.2 Approaches

Beaufort Sea Strategic Plan of Action Steering Committee has prepared a regional strategic environmental assessment “to prepare for future exploration” for Beaufort Sea area (BSStRPA 2008). The preparation of the BSStRPA included the participation of Inuvialuit groups, communities, government and industry through workshops. The result of the work is presented as recommendations with assigned lead agencies to initiate each specific action. These recommendations include improvements to regulatory efficiency and effectiveness in evaluating project proposals, ways to advance knowledge in mitigation options for social and environmental effects and improvements in planning for uncertain effects.

As a parallel and supporting effort, the Beaufort Sea region was selected as the first Arctic Large Ocean Management Area (LOMA) where an Integrated Management Plan is to be developed by Fisheries and Oceans under Canada’s Oceans Act. Under the LOMA mandate, Cobb et al. (2008) have prepared a summary of existing ecosystem information in Beaufort Sea Ecosystem Overview and Assessment Report. The document provides a review of current knowledge of the ecosystem and proposes a list of Ecologically Significant Species and Communities (ECCS) and Ecologically and Biologically Significant Areas (EBSAs).

Cobb et al. (2008) identified EBSAs as follows: “each candidate area was evaluated using the National Evaluation Framework developed by DFO, which provided the necessary criteria. Each area was ranked against the main dimensions (uniqueness, aggregation, fitness consequences) and the additional dimensions (resilience and naturalness) outlined in the Framework”. ECCS were identified through the following process: a general process for identifying ESSCs based on their trophic roles has been developed as a National Evaluation Framework...the general process for identifying ESSCs focuses on four key trophic roles in the ecosystem: (1) forage species; (2) highly influential predators; (3) nutrient importing and exporting species; and (4) primary production and decomposition communities and/or species....candidate species were identified through consultation with local community members and the scientific community. Additionally, the report provides an inventory of conservation areas and impacted areas. Identified major human-induced stressors have been cross-tabulated with major ecosystem

structures and functions to reveal cause and effects relationships. The report functions as a first major step towards an Integrated Management Plan for the Beaufort Sea.

A.25 Reference 25

Name/Title: Barents Sea Integrated Management of the Marine Environment

Geographic Region: Arctic (Europe)

Type: Regional Study

Approach: area-based framework to achieve sustainable use of offshore natural resources

Bibliographic Citation(s) Reviewed:

- The Royal Ministry of the Environment. 2006. Report No. 8 to the Storting (2005-2006). Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands. 144 p.

Website URL(s):

- http://www.regjeringen.no/en/dep/md/Selected-topics/Svalbard_og_polaromradene/integrated-management-of-the-barents-sea.html?id=87148

A.25.1 Description

A.25.1.1 Summary

This area-based framework was validated by the Norwegian Government in 2006 and it aims to achieve a sustainable use of natural resources in the Barents Sea-Lofoten Area while maintaining the structure, productivity and functioning of ecosystems. The framework's areal coverage extends from the coast of northern Norway to the Arctic Ocean in the north and covers 1,400,000 km². The framework is based on identified valuable and vulnerable areas, where certain restrictions for existing and new human activities apply.

A.25.1.2 Approaches

The basis of the framework was founded on compiled information on environmental conditions, commercial activities, underwater cultural heritage and social conditions, followed by impact assessments of different activities that occur in the region, including fisheries, petroleum activities, maritime transport, and included impacts from transboundary pollution, onshore emissions and climate change. The impact assessment process included involvement of local authorities, Sami (i.e., local aboriginal) interest groups, ENGOs, industry and academia.

Criteria used in selecting valuable and/or vulnerable areas included high biological production, high concentrations of species, endangered or vulnerable habitats and habitats that function as key areas for endangered or vulnerable species. Vulnerability was assessed "*respect to specific environmental pressures such as oil pollution, fluctuations in food supply and physical damage*" and it was further noted that it "*varies from one time of year to another*". The areas identified as vulnerable included key spawning/egg and larval drift areas for commercial fish stocks, breeding/wintering areas for sea birds and benthic habitats with cold-water corals and sponge communities along the Norwegian coast.

The impacts with most challenge until 2020 were identified as long-range transboundary pollution and the risk of acute oil pollution. Interestingly, it was concluded that after 2020, climate change will be the most important environmental pressure on all ecosystem components.

The following examples of relevant management actions were identified in the framework:

- Government initiative for new mandatory traffic separation schemes for maritime transport approximately 30 nautical miles from the Norwegian coast, subject to International Maritime Organization (IMO) approval
- Petroleum activities
 - No petroleum activities will be initiated in certain regions, for example, in or near the marginal ice zone and the polar front
 - No exploratory drilling will be permitted in certain areas between March 1 and August 31
 - In other areas, no special restrictions or requirements apply (i.e., any previous license-specific conditions do no longer apply), apart from zero-discharge policy under normal operating conditions

Monitoring indicators, reference values and action thresholds (some under development) were developed for climate, marginal ice zone, phytoplankton, zooplankton, fish stocks, benthic organisms, seabirds, marine mammals, alien species, endangered species and pollutants. For example, reference value for certain seabirds is “*average population numbers, last 10 years, and historical data*” an action threshold is “*a population decrease of 20% or more in five years, or failed breeding five years in a row*”.

The framework additionally included a commitment for further monitoring and evaluation of management actions, for example, the petroleum activity management actions are due to be revised in 2010, and the establishment of a forum on environmental risk management.

A.26 Reference 26

Name/Title: NWT Species at Risk Action Plan: Boreal Woodland Caribou Conservation

Geographic Region: Arctic (Canada), NWT

Type: Management Approach

Approach: recovery strategy for boreal caribou conservation

Bibliographic Citation(s) Reviewed:

- Northwest Territories Environment and Natural Resources. 2008. Public Discussion Draft Action Plan Boreal Woodland Caribou Conservation in the Northwest Territories 2009–2014. October 2008. 19pp. Available online:
http://www.nwtwildlife.com/pdf/Caribou%20Action%20Plan_public%20discussion%20draft.pdf

Website URL(s):

- <http://www.nwtwildlife.com/>

A.26.1 Description

A.26.1.1 Summary

In response to the federal listing of the boreal population of woodland caribou as “Threatened”, a national recovery strategy was developed. Associated with that national recovery strategy was the preparation of this Action Plan for boreal caribou conservation in the NWT. Three of six identified “implications” of the goals are related to managing landscape-level environmental effects. This action plan is considered draft while public input is sought in the three goals and 23 specific action items identified to help conserve boreal caribou in the NWT.

A.26.1.2 Approaches

Although management of cumulative effects is not explicitly mentioned, there are several action items related specifically to land use planning and identification of thresholds. Land use planning related action items include the establishment of conservation zones where industrial activity is excluded, and special management zones where acceptable levels of habitat change and levels of access are identified. The Action Plan suggests that best practices guidelines or regional strategic access management land use plans be developed for industrial and commercial activities to manage or reduce/mitigate habitat impacts and sensory disturbances. In combination with several other action items, identification of appropriate thresholds at a scale relevant to boreal caribou in the NWT for specific regions or important habitat areas is suggested. It was also recommended that monitoring be conducted to determine the response of boreal caribou to land use activities by tracking their movements and habitat use in relation to land use activities.

A.27 Reference 27

Name/Title: North Yukon Land Use Plan

Geographic Region: Arctic (Canada), Yukon

Type: Land Use Plan

Approach: land use plan with cumulative effects thresholds

Bibliographic Citation(s) Reviewed:

- North Yukon Planning Commission. 2008. Recommended north Yukon land use plan. Prepared March 31, 2008. Available online: <http://www.planyukon.ca/>

Website URL(s):

- <http://www.planyukon.ca/>

A.27.1 Description

A.27.1.1 Summary

A land use plan is being developed for the north Yukon that incorporates land use zoning, consideration of and identification of cumulative effect “thresholds.” This plan focuses on ensuring that regional conservation measures are in place prior to an increase in levels of land use activity.

A.27.1.2 Approaches

The North Yukon Land Use Plan recommends a number of tools and approaches to minimize land use conflicts, including identification of Landscape Management Units, a Land Use Designation System (e.g., Protected Areas and zones of varying emphasis on conservation and development) and General Management Direction. To address a section of the Vuntut Gwitchin First Nation Final Agreement (11.4.5.8 ... “*Shall take into account that the management of land, water and resources, including fish, wildlife and their habitats, is to be integrated*”), the plan considers cumulative impacts to land and water from multiple land use activities.

The plan identifies some disturbances which are considered exempt from what would be considered threats to ecosystem function (e.g., linear features <1.5 m wide, activity on frozen water-bodies, winter work that does not require tree clearing, etc.). There is a focus on two key indicators of cumulative effects - surface disturbance and linear (access) density, and identifies thresholds for those indicators by Landscape Management Unit (by proportionally scaling indicator levels from units of high conservation

value to units of high development value). The thresholds are intended to trigger a precautionary approach to project review where further management/research action may be required. The thresholds are also identified to provide guidance to environmental review and to trigger when cumulative effects concerns are of concern for a given landscape management unit.

A.28 Reference 28

Name/Title: Thelon Game Sanctuary Management Plan

Geographic Region: Arctic (Canada), NWT, Nunavut

Type: Management Approach

Approach: protection and management policies/recommendations

Bibliographic Citation(s) Reviewed:

- Kivalliq Inuit Association, Nunavut Tuungavik Inc., Baker Lake, Nunavut Wildlife Management Board, Government of Nunavut — Department of Sustainable Development, Government of the Northwest Territories — Department of Resources, Wildlife and Economic Development, and Government of Canada — Department of Indian Affairs and Northern Development. 2005. Thelon Game Sanctuary Management Plan. 43 pp. Approved plan in August 2005. Available online http://www.mveirb.nt.ca/upload/project_document/1159544997_Thelon%20Game%20Sanctuary%20Management%20Plan.pdf
- Wyma, R. 2009. Government of Nunavut, Department of Environment, Manager – Parks: Program Development. Personal communication with EDI regarding status of the Thelon Game Sanctuary Management Plan, 19 January 2009.

Website URL(s):

- http://www.mveirb.nt.ca/upload/project_document/1159544997_Thelon%20Game%20Sanctuary%20Management%20Plan.pdf

A.28.1 Description

A.28.1.1 Summary

The Thelon Game Sanctuary Management Plan was approved by all Canada in August 2005, following approvals by Baker Lake, the Kivalliq Inuit Association, NTI, the Government of Nunavut, and the Nunavut Wildlife Management Board. The plan was prepared in response to Section 9.5.2 of the Nunavut Land Claims Agreement (NLCA) requiring that the Thelon Game Sanctuary Management Plan be developed within five years of the date of ratification of the NLCA (1993). Aspects of the Management Plan relative to cumulative effects management include 1) recommendations for the establishment of buffer areas adjacent to the Sanctuary; and 2) policies/recommendations to be used as guidelines for management. Although the majority of the management plan described the proposed structure of the management authority, recommendations were made for the Nunavut Wildlife Management Board (NWMB) regarding special management areas (SMAs), and restrictions. The NWMB is currently considering those recommendations but no new plans have been developed regarding the Thelon (R. Wyma, pers. comm. 2009).

A.28.1.2 Approaches

The role of the Management Authority (whose status is uncertain) can include 1) monitoring fish and wildlife populations, their habitats, and any impacts; 2) monitor activities within the Sanctuary and SMAs if they are created; and 3) recommend resource use practices, guidelines, limits and restrictions or other

regulatory measures. The conservation goals for the Sanctuary place priority on: ensuring sustainable wildlife populations; maintaining the naturalness of this diverse ecosystem; and, maintaining sufficient abundance of species and lack of disturbance by humans to promote significant wildlife viewing opportunities. The Thelon Game Sanctuary Management Authority would apply only within the sanctuary and adjacent SMAs, should they be proposed. The role of the Authority is to provide input to the land use permitting process, outlining resource concerns and optional mitigating measures in the SMA. The SMAs highlight the areas of critical resources linked to the Sanctuary and identify the area within which the Management Authority will be a contributing participant in the land use regulatory process.

A.29 Reference 29

Name/Title: Beverly and Qamanirjuaq Caribou Management Plan

Geographic Region: Arctic (Canada), Nunavut, NWT, Manitoba

Type: Management Approach

Approach: multi-jurisdictional caribou management plan

Bibliographic Citation(s) Reviewed:

- Beverly and Qamanirjuaq Caribou Management Board. 2005. Beverly and Qamanirjuaq Caribou Management Plan 2005–2012. 17 pp. Available online: http://www.arctic-caribou.com/PDF/Management_plan_2005_2012.pdf
- Wakelyn, L. 2008a. BQCMB response to the Nunavut Impact Review Board re: NIRB File No. 08EN057 – UraVan Minerals Inc. Garry Lake Project Proposal. Available online: http://ftp.nirb.ca/REVIEWS/CURRENT_REVIEWS/08EN037-URAVAN_GARRY_LAKE/1-SCREENING/03-DECISION/080627-08EN037-SDR%20-%20Appendix%20B-OMAE.pdf
- Wakelyn, L. 2008. BQCMB contract biologist. Personal communication with M. Setterington, 22 September 2008. Discussion regarding the development of cumulative impact management framework and land use planning in Nunavut.

Website URL(s):

- <http://www.arctic-caribou.com/>

A.29.1 Description

A.29.1.1 Summary

This is an independent multi-jurisdictional management plan that promotes coordinated management efforts to ensure the wise use of caribou, to prevent population decline, and safeguard the needs of traditional hunters and others. The trans-boundary management plan applies across the entire range of the caribou herds. While not explicitly stated in the Management Plan, the BQCMB considers the cumulative effects of industrial activity across the entire range of the two herds. The plan focuses on community involvement and emphasizes the coordinating function of the BQCMB as to ensure that governments continue to make appropriate resource allocation to caribou management, and a single forum for the management of the caribou herds.

Goals of the Management Plan include cooperation with land-use boards (i.e., the NPC) to encourage governments to manage land-use activities in a manner that protects caribou range, particularly in key habitats such as calving and post-calving areas. One of the priorities of the Management plan includes increased involvement in environmental assessment of the cumulative effects of development on caribou ranges.

To that effect, the BQCMB provided comments in 2008 on exploration projects proposed within the Beverly herd's calving area. In those comments, the BQCMB reiterated concerns based on their management objectives, in that there is a need for a regional assessment of the cumulative impacts of mineral exploration and other land use activities:

"From the BQCMB's perspective it is clear that continued assessment of individual projects on a case-by-case basis will not be adequate to ensure that significant adverse eco-systemic and socio-economic effects will be prevented. Furthermore, because so little is known about the status and vulnerability of the Beverly, Ahiak, Qamanirjuaq, and other barren-ground caribou herds that use seasonal ranges in the Kivalliq region, the potential adverse effects and their accumulating impacts on caribou are not highly predictable." (Wakelyn, 2008a).

A.29.1.2 Approaches

The BQCMB bases their concern of cumulative effects on identification of any industrial activities conducted in critical (calving) habitats. Based on lack of defensible data to determine cumulative industrial impacts on caribou, the BQCMB advocates identification of and exclusion of industrial activity from critical habitats (e.g., calving and post-calving areas) and implementing protection measures (e.g., seasonal limitations) in areas such as migration routes and water crossings. Outside of critical areas, the BQCMB advocates site/situation-specific implementation of Caribou Protection Measures to reduce disturbance to groups of caribou/caribou herds. The BQCMB advocates continued monitoring and assessment to determine what effects actually cause impacts (Wakelyn, pers. comm. 2008b).

A.30 Reference 30

Name/Title: Habitat-Based Population Viability Analysis to Wildlife of the Canadian Central Arctic

Geographic Region: Arctic (Canada)

Type: Analytical Tool

Approach: quantify cumulative effects of development at regional scale

Bibliographic Citation(s) Reviewed:

- Johnson, C.J. and M.S. Boyce. 2004. A quantitative approach for regional environmental assessment: application of a habitat-based population viability analysis to wildlife of the Canadian central Arctic. Canadian Environmental Assessment Agency Research and Development Monograph Series, http://www.ceaa-acee.gc.ca/015/0002/index_e.htm
- Johnson, C.J., M.S. Boyce, R.L. Case, H.D. Cluff, R.J. Gau, A. Gunn and R. Mulders. 2005. Cumulative effects of human developments on arctic wildlife. Wildlife Monographs. 16:-1–36.

Website URL(s):

- http://www.ceaa.gc.ca/015/001/028/abstract_e.htm;

A.30.1 Description

A.30.1.1 Summary

Both publications are based on the same data and analyses. The 2004 study (Johnson and Boyce 2004) was completed for the Canadian Environmental Assessment Agency, resulting in the revised Johnson et al. (2005) publication for Wildlife Monographs. The study describes a habitat-based population viability analysis (PVA) tool that can be used to quantify cumulative effects of development at the regional scale.

The authors note that cost effectiveness and limited availability of baseline (e.g., satellite collar data) will be a limiting feature of this approach. This approach, when the data are available, allows for quantification of habitat selection and avoidance by animals of human developments at a regional level. This type of study on its own does not allow for determination of population-level thresholds of disturbance tolerance. The paper acknowledges that for the purposes of this type of modeling, resources inventory and habitat data sets in Nunavut are crude and not readily available.

A.30.1.2 Approaches

The model is data intensive involving both 1) animal point locations (e.g., satellite collar data) and 2) habitat data at a scale appropriate to determining site-specific use. A geographic information system is used to determine resource selection functions to quantify habitat quality based on proportional use of habitats (assuming that animals spend more time in good habitats). Hypothetical zones of influence were extrapolated from the literature to determine the area of influence surrounding various types of development, and animal use of habitats within those zones of influence was quantified. Results show a reduction in high quality habitat and an increase in low-quality habitat near industrial developments. Model results showed that the habitat losses resulted in reduction on the total number of grizzly bear and wolverine in the central arctic due to the cumulative effects of industrial development. The relationship in loss of habitat quality and its effects on population viability were not clear due to data limitations. Overall the study provides a tool for retrospective analysis of cumulative effects resulting from multiple developments, and thus is appropriate to regional-level monitoring initiatives.

A.31 Reference 31

Name/Title: Thresholds for addressing cumulative effects on terrestrial and avian wildlife in the Yukon.

Geographic Region: Arctic (Canada), Yukon

Type: Research Study

Approach: threshold concepts and options for wildlife

Bibliographic Citation(s) Reviewed:

- Axy's Environmental Consulting Ltd. 2001. Thresholds for addressing cumulative effects on terrestrial and avian wildlife in the Yukon. Prepared for Department of Indian and Northern Affairs, Environmental Directorate and Environment Canada, Whitehorse Yukon. March 2001. 92 pp. + Appendices. Available online: http://www.axys.net/news/publications/n08_WildlifeCEAThresholdsReport.pdf
- Anderson, R.B., S.J. Dyer, S.R. Francis, and E.M. Anderson. 2002. Development of a threshold approach for assessing industrial impacts on woodland caribou in Yukon. Draft Report ver. 2.1, November 2002. Prepared by Applied Ecosystem Management Ltd. for Environment Directorate, Northern Affairs Program, DIAND. 60 pp.

Website URL(s):

- http://www.axys.net/news/publications/n08_WildlifeCEAThresholdsReport.pdf (reference no. 1 only)

A.31.1 Description

A.31.1.1 Summary

One of several reports prepared for the Department of Indian and Northern Affairs and Environment Canada on developing wildlife and land use thresholds in the Yukon. This report reviews overall threshold concepts relevant to key birds and mammals including grizzly bear, woodland caribou, moose, landbirds,

and waterbirds. Candidate thresholds are recommended based on information availability and suitability. This was a jurisdiction-specific review of literature and data availability for determining thresholds for some key wildlife species in the Yukon. It involved extensive literature review and discussion with key scientific knowledge holders for species-specific issues. It presented the best available information on identifying thresholds for wildlife in the Yukon.

A.31.1.2 Approaches

This was a jurisdiction-specific literature review and knowledge-holder (e.g., species biologist) review of available information and data applicable to the determination of cumulative effects thresholds for use in the Yukon. The review found that there was information suitable for development of thresholds of some of the larger, more charismatic wildlife, and included thresholds for habitat availability, population demographics, land use thresholds, and social (aesthetic) thresholds. There was little applicable information for threshold identification for birds. This report was the basis for further management efforts such as the development of a threshold approach for assessing industrial impacts on woodland caribou in the Yukon (Anderson et al. 2002).

A.32 Reference 32

Name/Title: Beaufort Delta Cumulative Effects Project

Geographic Region: Arctic (Canada), NWT

Type: Research Study

Approach: cumulative effects management tools

Bibliographic Citation(s) Reviewed:

- Dillon Consulting Limited and Salmo Consulting Inc., 2005. Beaufort Delta Cumulative Effects Project, May 2005, Environmental Studies Research Funds Report No. 155, Calgary, 263 p.

Website URL(s):

- <http://www.esrfunds.org/publications.html#Environmental>

A.32.1 Description

A.32.1.1 Summary

A commissioned study to identify cumulative effects management tools for the Beaufort Delta region of the NWT. Based on information review and workshop-based feedback with key stakeholders, the study identified Valued Components and associated cumulative effects indicators. The report reviewed the current state of each indicator and identified thresholds, carrying capacity, and/or limits of acceptable change for each indicator.

A.32.1.2 Approaches

This framework approach is intended as a supplement to the existing Beaufort Delta regulatory and resource management institutions and initiatives, and to reflect regional values and concerns. It is a "baseline" document that summarizes suggested indicators, thresholds and limits in the Beaufort region. Further work is required before candidate indicators and thresholds are implemented, including further consultation, modeling to help understand the implications of thresholds, development of standardized methods for data collection, and development of a public database.

A.33 Reference 33

Name/Title: Wildlife Resource and Habitat Values in Nunavut

Geographic Region: Arctic (Canada), Nunavut

Type: Research Study

Approach: wildlife baseline information and mapping

Bibliographic Citation(s) Reviewed:

- Nunami Jacques Whitford and EDI Environmental Dynamics Inc. 2008. Nunavut wildlife resource and habitat values. Prepared for the Nunavut Planning Commission. October 2008. 238 pp.

Website URL(s):

- None

A.33.1 Description

A.33.1.1 Summary

This report and accompanying spatial (GIS) database compiled available information on Nunavut's fish, wildlife, and marine mammal resources. The report identified key life history characteristics with a focus on those features pertinent to land use planning in Nunavut. The accompanying maps and database identified key areas of concentration of wildlife (e.g., barren ground caribou calving areas) that may require some form of formal or informal protection from human disturbance.

A.33.1.2 Approaches

The report was intended as one of the "building blocks" for land use planning in Nunavut by identifying available key wildlife and habitat features in Nunavut. The information presented in the document and accompanying database can be used to "flag" locations in the territory where development activities may be of particular concern (e.g., caribou calving areas, known areas of marine mammal concentration).

A.34 Reference 34

Name/Title: Developing and implementing thresholds in the Northwest Territories – a discussion paper

Geographic Region: Arctic (Canada), NWT

Type: Research Study

Approach: state of knowledge of setting and using thresholds

Bibliographic Citation(s) Reviewed:

- Salmo Consulting Inc. 2006. Developing and implementing thresholds in the Northwest Territories — a discussion paper. Prepared for Environment Canada. February 2006. 28 pp.

Website URL(s):

- <http://www.ngps.nt.ca/Upload/Intervenors/Environment%20Canada/071121%20EC%20Report%20-%20Developing%20and%20Implementing%20Thresholds%20in%20the%20NWT.pdf>

A.34.1 Description

A.34.1.1 Summary

This discussion paper was commissioned to provide a summary of the current state of knowledge of setting and using thresholds, and to describe options that exist in the NWT. To that end, the first half of the paper provides introductory material on the concepts and terminology of cumulative effects indicators and thresholds. An example of the use of Valued Components and associated cumulative effects indicators in the NWT is provided for the Environmental Studies Research Fund (ESRF) Beaufort Delta Cumulative Effects Study. One of the conclusions of the introductory material is that thresholds work best (are more accepted) when 1) there is clear regional management vision, and 2) thresholds are used to manage negative effects of human activities, not stop resource development.

A.34.1.2 Approaches

This document provides a general overview of the use of thresholds in northern jurisdictions. It emphasizes the importance of developing clear regional management vision, and to use “tiered thresholds” to manage negative human impact by triggering differing management action, while not necessarily indicating where resource development should be stopped. The paper also advocates the development and management of regional information management networks that track key data related to cumulative effects monitoring.

To that end, the paper advocated the use of “Tiered Thresholds” that incorporate “Cautionary Thresholds,” “Target Thresholds” and “Critical Thresholds” for various Valued components, with each succeeding threshold level triggering different management actions. The remainder of the paper provides detailed summaries of several programs including the NWT Cumulative Impact Monitoring Program, the Dehcho Land Use Plan, Beaufort Sea – Mackenzie Delta Initiatives, Slave Geological Province Regional Plan of Action, and Yukon Wildlife Thresholds. For most examples it was noted that there was controversy over the identification of thresholds under the perception that it would limit industrial development and reduce social benefit.

A.35 Reference 35

Name/Title: Interim Oil and Gas Industry Guidelines for Boreal Caribou Ranges in Northeastern BC

Geographic Region: Canada (south), North-east BC

Type: Management Approach

Approach: guidelines to protect caribou habitat

Bibliographic Citation(s) Reviewed:

- Culling, D., B. Culling, R. Backmeyer, T. Antoniuk. 2004. Interim Oil and Gas Industry Guidelines for Boreal Caribou Ranges in northeaster BC. Prepared for Oil and Gas Commission, Fort St. John BC. July 2004. 32 pp.

Website URL(s):

- http://www.ogc.gov.bc.ca/documents/scek/Final_Reports/d-ECIM-Com-Axys-2004-19-Rep.pdf

A.35.1 Description

A.35.1.1 Summary

In response to the boreal ecotype woodland caribou being federally listed as threatened, studies were conducted to determine habitat use and ecology in northeast British Columbia. Based on survey and satellite collar information, range maps were developed that identified potential areas of critical boreal caribou habitat. Thirteen core habitats were identified in four ranges. Based on the initial findings of the distribution studies in NE BC, and from research in adjacent jurisdictions, interim guidelines were designed to be compatible with the Oil and Gas Commission's (OGC) application review process.

A.35.1.2 Approaches

Woodland caribou-focused Best Practices are identified with Higher Level Planning objectives including the development of range-specific management plans, the development of a GIS database, identification of range-specific thresholds, and recovery planning. At the operations planning level, seasonal timing windows (including critical and cautionary times) where industrial activities may be limited are suggested. Disturbance-specific guidelines include techniques for modifying linear disturbances to reduce ease of human and predator access, and avoidance of treed patches within peatlands.

A.36 Reference 36

Name/Title: Alberta Woodland Caribou Recovery Plan

Geographic Region: Canada (south), Alberta

Type: Management Approach

Approach: recovery and management plan for woodland caribou

Bibliographic Citation(s) Reviewed:

- Alberta Woodland Caribou Recovery Team. 2005. Alberta woodland caribou recovery plan 2004/05-2013/14. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan No. 4. Edmonton, AB. 48 pp.

Website URL(s):

- http://www.srd.gov.ab.ca/fishwildlife/speciesatrisk/pdf/final_caribou_recovery_plan_photo_cover_July_12_05.pdf

A.36.1 Description

A.36.1.1 Summary

A recovery and management plan for woodland caribou in Alberta. Management actions are identified on a herd-by-herd basis based on the herd's population status (e.g., declining, stable). Management plans based on herd ranges is also suggested.

A.36.1.2 Approaches

The plan outlines actions on a herd-by-herd basis based on the herd's status (e.g., Immediate Risk of Extinction, In Decline, Stable, and Unknown). Management actions are suggested on the basis of habitat conservation, access management, operational guidelines, predator management, alternative prey management, harvest management, and monitoring. Population (herd)-based management actions

include a moratorium of further mineral and timber resource allocation within the range of herds at immediate risk of extinction (although this particular action is not supported by the Alberta Government). An assessment of industrial and other human activities on caribou range, and measures to eliminate hunting of herds that are at Immediate Risk of Extinction and In Decline are also suggested. Of relevance to cumulative effects and thresholds, habitat targets are identified based on the relationship between caribou population trend and functional habitat loss. Habitat targets are considered the minimum habitat that is necessary for the survival and recovery of woodland caribou within Alberta.

A.37 Reference 37

Name/Title: Besa-Prophet Pre-Tenure Plan — Phase I

Geographic Region: Canada (south), North-east BC

Type: Management Approach

Approach: strategies/best management practices for oil and gas development

Bibliographic Citation(s) Reviewed:

- British Columbia Ministry of Sustainable Resource Management. 2002. Besa-Prophet Pre-Tenure Plan — Phase I. August 2002. 120 pp.

Website URL(s):

- http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/357220/bpntp_phase1.pdf

A.37.1 Description

A.37.1.1 Summary

The pre-tenure plan is intended to encourage responsible oil and gas development in a portion of the Muskwa-Kechika Management Area. This plan was developed in response to a requirement in the *Muskwa-Kechika Management Area Act* that prior to the issuance of oil and gas tenures, pre-tenure plans must be developed that identify objectives and strategies within the plan area. The management goals, objectives and strategies apply only to oil and gas activities. Phase I applies to the more accessible portions of the Besa-Prophet Pre-Tenure Planning Area. Phase II was expected to apply to the portions of the area with greater access restrictions.

A.37.1.2 Approaches

The document contains all aspects of what one would expect to find in very detailed land use plan, including statements of broad management intent by planning units down to prescriptive practices in particular ecological units. Management direction for the plan area is identified with a series of goals. It also contains a number of strategies/best management practices based on activities related to oil and gas development (e.g., exploration, production, pipeline development). Best management practices are also included for consultation, access management, and reclamation. Management guidelines are also provided for specific ecological zones within the area (e.g., major river floodplains, incised streams, wetlands, habitat mosaics, steep slope warm aspect). Guidelines for conducting overview and impact assessments provide further direction for proponents of oil and gas projects in the pre-tenure area. While the plan lists fairly detailed guidance of allowable management and operational activities by planning unit and topography, there are no explicitly stated disturbance thresholds in the pre-tenure area. Instead, proponents are instructed to demonstrate that practicable options with the lowest impact are to be used, following the list of best management practices detailed throughout the document.

A.38 Reference 38

Name/Title: Landscape, biodiversity and watershed indicator review and assessment

Geographic Region: Canada (South), Northeast Alberta

Type: Analytical Tools

Approach: vegetation, biodiversity and watershed indicators for management objectives

Bibliographic Citation(s) Reviewed:

- Olson and Olson Planning and Design Consultants Inc., Watertight Solutions Ltd., and Bandaloo Landscape-Ecosystem Services Ltd. 2002. Landscape, biodiversity and watershed indicator review and assessment — Regional Municipality of Wood Buffalo. Prepared for Cumulative Environmental Management Association (CEMA) Landscape and Biodiversity Subgroup. February 2002. 246 pp.

Website URL(s):

- <http://www.cemaonline.ca/content/view/21/176/>

A.38.1 Description

A.38.1.1 Summary

This paper evaluates and rationalizes a set of vegetation, biodiversity and watershed indicators for use in the Municipality of Wood Buffalo. Some indicators were identified to determine if management objectives (target values) are being achieved, while other indicators are monitored for the sake of reporting purposes. The paper describes the natural and human-caused disturbance regime in the study area: landscape features that are affected by those disturbances.

A.38.1.2 Approaches

The paper reviews a broad list of “sustainability” indicators, determines the metrics to measure, and discusses their usefulness in decision-making process. This paper is a good example of a detailed review of landscape-level indicators that may contribute to a database. A suite of indicators are recommended for the broad scale, site (stand) level, biodiversity, and watersheds. The interpretation of that data in combination with trend analysis of key indicators may assist with determination of habitat disturbance thresholds in the Municipality of Wood Buffalo.

Determining the suitability of indicators is based on a number of criteria including: 1) relevance to ecological processes; 2) relevance to planning goals and values; 3) degree of integration with goals; 4) sensitivity to change in use and management; 4) measurability; 5) temporal applicability; 6) predictability; 7) applicability to scale of investigation; 8) data availability; 9) pragmatics of implementation; and 10) usefulness in decision making. Of the ~50 indicators reviewed, it was determined that not all indicators are measurable, and not all measurable indicators were deemed useful in the decision-making process. Cost and effort estimates to maintain appropriate databases are provided in the paper. The paper also includes a review of indicator systems from other programs and jurisdictions.

A.39 Reference 39

Name/Title: Predictive modelling tools for wildlife and fish in the Wood Buffalo region

Geographic Region: Canada (south), Northeast Alberta

Type: Analytical Tools

Approach: predictive habitat and wildlife population modeling tools at regional and management unit scales

Bibliographic Citation(s) Reviewed:

- Salmo Consulting Inc., Ursus Ecosystem Management Ltd. and GAIA Consultants Inc. 2001. Review of predictive modelling tools for wildlife and fish key indicators in the Wood Buffalo region. Prepared for Cumulative Environmental Management Association (CEMA) Landscape and Biodiversity Subgroup, Fort McMurray, AB. October 2001. 55 pp. + attachments.

Website URL(s):

- <http://www.cemaonline.ca/content/view/21/176/>

A.39.1 Description

A.39.1.1 Summary

A review of the suitability for use of predictive habitat and wildlife population modeling tools at the regional and management unit scales. The paper begins with a fairly extensive review of general modeling terminology. It is followed by a review of models such as those used for habitat suitability, populations, population and meta-population viability assessment, forest planning, and instream incremental flow models and determines their usefulness at various spatial scales of management.

A.39.1.2 Approaches

This paper advocates a modeling approach, using a variety of habitat, population, and disturbance scenario models as an aid to determining target (management) and critical (capacity) thresholds for populations, habitat, and disturbances. One of the conclusions was that explicit regional and management unit population goals should be established for each indicator species to help focus modeling. The concepts and review presented in this paper may be useful if a modeling approach is being considered to help establish targets at the land use plan development stage.

A.40 Reference 40

Name/Title: Environmental Risk Assessment (ERA)

Geographic Region: All

Type: Analytical Tools

Approach: estimating likelihood of adverse outcomes from changes in environmental conditions resulting from human activities

Bibliographic Citation(s) Reviewed:

- Ministry of Environment, Lands and Parks (MELP), Habitat Branch. 2000. Environmental Risk Assessment (ERA): An approach for assessing and reporting environmental conditions. Technical Bulletin No. 1. 70 pp

Website URL(s):

- <http://www.env.gov.bc.ca/wld/documents/era.pdf>

A.40.1 Description

A.40.1.1 Summary

Environmental Risk Assessment is considered a support tool for policy evaluation, land use planning, and resource management decision making. This report was prepared to assist government agency staff in assessing and reporting environmental conditions through the process of environmental risk assessment (ERA). It focuses on risk assessment within land use planning and development review by outlining a process for estimating the likelihood of an adverse outcome due to pressures or changes in environmental conditions resulting from human activities. ERA is complementary to EIA and risk management.

A.40.1.2 Approaches

Using an ERA approach is a tool for decision makers to ensure that risk information is systematically compiled, appropriately qualified, and documented. It appears to be well suited as a tool to assist with development of land use plans where existing and anticipated future land uses (disturbances) can be evaluated to estimate the risk to a valued resource. This approach is still data intensive and requires considerable knowledge and understanding of the resources in question.

ERA is based on comparison of indicators of environmental values over time. Current conditions are compared to historic (natural) range of variation and predicted future ranges based on differing management scenarios. Assessment of environmental conditions and indicators is summarized in terms of a "risk index," and it is considered useful to define specific thresholds, or low risk benchmarks, based on best management practices. Key steps of an ERA include 1) establishing the context — identify where it will be used, what is at risk, available data; 2) characterize key environmental pressures — what are the threats; 3) specify values and indicators that are related to what is at risk and the key threats; 4) characterize indicator trends (past and future) and define risk classes; 5) Evaluate changes to indicators and risk; and 6) document and develop strategies to reduce risk.

A.41 Reference 41

Name/Title: Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada

Geographic Region: Canada

Type: Management Approach

Approach: best practice in environmental assessment

Bibliographic Citation(s) Reviewed:

- Lynch-Stewart, P. 2004. Environmental assessment best practice guide for wildlife at risk in Canada. Prepared for Canadian Wildlife Service, Environment Canada, Gatineau, QC, 27 February 2004. 63 pp.

Website URL(s):

- <http://www.cws-scf.ec.gc.ca/publications/AbstractTemplate.cfm?lang=e&id=1059>

A.41.1 Description

A.41.1.1 Summary

A guidebook prepared for project proponents that emphasize best practice in environmental assessment for wildlife species at risk. It is not specific to any piece of legislation. The presence of wildlife at risk in environmental assessment is an important issue because it indicates that the project is planned in an area or habitat that is already threatened by human activity. The guide recommends the research that must be completed and information to be provided relative to considering wildlife at risk, identifies key information sources, outlines policy commitments, and provides an overview of the implications of the federal *Species at Risk Act* for environmental assessment.

A.41.1.2 Approaches

The document outlines some best management practices to address wildlife at risk in environmental assessment. The guidelines are generally applicable to the conduct of an EA regardless of the presence of species at risk, but it does emphasize where the Canadian Wildlife Service will focus its review of project applications. Considering that many of the threats to wildlife occur at the landscape level, there is emphasis on project-specific and cumulative environmental effects assessments to coordinate actions with regional plans and strategies for conservation and sustainable development (notably included in many regional land use plans). Of direct relevance to the mandate of the NPC, the guidelines direct project proponents to incorporate mitigation measures to those suggested in regional/national management and recovery plans — components of which (e.g., consideration of recovery objectives in a LUP) may be included in regional land use plans. Additionally, follow-up monitoring to ensure success of mitigation is mentioned specifically as a best management practice.

A.42 Reference 42

Name/Title: Strategic Environmental Assessment Cabinet Directive

Geographic Region: Canada

Type: Policy

Approach: make informed decisions in support of sustainable development

Bibliographic Citation(s) Reviewed:

- Strategic Environmental Assessment - The Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals. Canadian Environmental Assessment Agency.

Website URL(s):

- www.ceaa.gc.ca/016/directive_e.htm

A.42.1 Description

A.42.2 Summary

The Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals was developed to assist the Government of Canada to make informed decisions in support of sustainable development. In order to achieve this, the Government of Canada states in the directive that decision makers at all levels must be able to integrate economic, social and environmental considerations.

A.42.2.1 Approaches

The directive outlines the decision making context for strategic environmental assessment of policies, programs and plans and focuses on departmental goals in sustainable development. The directive provides the guidelines that officials, environmental assessment practitioners and managers can follow to implement the directive.

Analysis of environmental effects is outlined in the document and focuses on the following:

- Scope and nature of potential effects
- The need for mitigation or opportunities for enhancement
- Scope and nature of residual effects
- Follow-up
- Public and stakeholder concerns

Although the directive does not specifically deal with cumulative effects, conducting a strategic environmental assessment may help to identify if adverse impacts of the proposal or project can be mitigated and to identify the overall potential environmental effect of the proposal or project after mitigation has been applied. This may help to identify if the proposal or project can cause an effect likely to combine with other effects in the region in a way that could threaten the environment. The directive also outlines the specific roles and responsibilities of participants in the environmental assessment process.

A.43 Reference 43

Name/Title: Regional Approaches to Managing Cumulative Effects in Canada's North

Geographic Region: Arctic (Canada)

Type: Research Study

Approach: options to develop cumulative impact management frameworks

Bibliographic Citation(s) Reviewed:

- AXYS. 2000. Regional Approaches to Managing Cumulative Effects in Canada's North. Prepared by AXYS Environmental Consulting Ltd. for Department of Indian and Northern Affairs, Northern Affairs Program, Whitehorse, Yukon.

Website URL(s):

- http://www.ceamf.ca/ceam_documents/Regional_Approaches_to_Managing_CE_March_2000.pdf

A.43.1 Description

A.43.1.1 Summary

The report examines opportunities to manage cumulative effects in Canada's North (i.e., Yukon, Northwest Territories, Nunavut, Northern Quebec and Labrador). This report provided an overview of how to develop a cumulative impact management framework and conducted a review of cumulative impact management projects and initiatives occurring at the time of the report.

A.43.1.2 Approaches

The report analyzed and recommended the identification of options within a cumulative effects management Framework. The report also identified the nature of these effects, the urgency associated with these effects, and specific opportunities to manage these effects.

A total of 22 case studies from across Canada were reviewed in detail. The case studies were organized into four groups: regional development and assessment, regional land use planning, local land use planning, and regional monitoring and data collection. The case studies were evaluated using a standard set of criteria as a basis for identifying “lessons learned” which were then summarized. These lessons were evaluated in terms of the degree to which they could contribute to a regional framework. This review determined that the majority of cases were principally data collection and monitoring exercises without the subsequent steps necessary for a framework. No case study provided a complete framework. Northern case studies reviewed in the report are outlined below.

Beaufort Region Environmental Assessment and Monitoring Program

The Beaufort Region Environmental Assessment and Monitoring Program was initiated to provide a technical bases for the design, operation and evaluation of a comprehensive and defensible environmental research and monitoring program to accompany oil and gas development in the Beaufort Sea. The Beaufort Environmental Monitoring Project and Mackenzie Environmental Monitoring Project were combined and updated to reflect the Inuvialuit Final Agreement which required environmental assessment and monitoring of deficiencies identified by Inuvialuit institutions and regulatory authorities.

The program created a database that contained plans for shoreline clean-up, wildlife protection, wildlife habitat restoration and environmental assessment. The program also implemented monitoring and recovery plans for the region

West Kitikmeot/Slave Study

The West Kitikmeot/Slave Study collected environmental and socio-economic baseline information to enable better planning and decision making and to form a basis for assessing and mitigating cumulative effects of development. The study was supported by government, Dene and Inuit communities, environmental organizations and the mining industry.

Gwich'in Land Use Plan

The Gwich'in Land Use Plan is the only approved land use plan in the Mackenzie Valley. The plan contributes to the management of cumulative effects by using Traditional Environmental Knowledge and community involvement in the planning process, provides the legislative basis for cumulative effects assessment and examination, clear procedures for proponents to conform to the land use plan and provides for monitoring for effects of development to the environment.

Inuvialuit Community Conservation Plans

Inuvialuit Community Conservation Plans (CCPs) represent the conservation priorities for the Inuvialuit communities of Aklavik, Inuvik, Paulatuk, Sachs Harbour, Tuktoyaktuk and Holman. CCPs were developed by communities to assist Inuvialuit co-management institutions established under the Inuvialuit Final Agreement in meeting their conservation and resource management responsibilities. The plans emphasize community involvement and use of traditional knowledge.

BHP Monitoring Program

BHP Billiton is required to report annually on its environmental programs for the EKATI Diamond Mine and this is reviewed by the Independent Environmental Monitoring Agency (IEMA). Monitoring activities include water quality, aquatic effects, fisheries studies, construction phase wildlife monitoring, reclamation research and Traditional Knowledge studies. The program contributes to cumulative effects management by providing independent review of monitoring programs, utilizing adaptive management and collecting data and scientific research.

Coppermine River Basin Study

The Coppermine River Basin Study was completed by Environment Canada to assist in decision making for water use in the Coppermine River Basin. The study summarizes water quality and quantity information for the river basin with the majority of information collected by Water Survey of Canada hydrometric data stations. The study contributes to cumulative effect management by summarizing existing water quality and quantity data, recommends that conservation be the guiding principle for development in the basin and that more water quality and quantity data be collected to better characterize baseline conditions.

Mackenzie Valley Cumulative Impact Monitoring Program

The Mackenzie Valley Cumulative Impact Monitoring Program was a condition of the Mackenzie Valley Resource Management Act and the Gwich'in Land Claim Agreement. The program was to provide a framework and the information needed to facilitate the implementation of a cumulative effects monitoring and auditing program for the Mackenzie Valley. A working group has been designing the program since 1999 but has yet to be implemented.

Northern Rivers Basin Study

The Northern Rivers Basin Study was initiated by Northern River Basin Study Agreement, which was signed by the Alberta, Northwest Territories and Federal Governments. The purpose of the study was to conduct research and gather information to better understand cumulative effects impacts to the Peace, Athabasca and Slave River basins. The study compiled an extensive collection of baseline data from the river basins and made recommendations for future ecosystem monitoring.

Ecological Monitoring and Assessment Network

The Ecological Monitoring and Assessment Network was established by Environment Canada in 1994 to organize partnerships with other governments, universities, NGO's and industry to form a cohesive ecological monitoring and assessment network across Canada. The network mobilized the scientific community to address major policy issues like cumulative effects and contributed to forming a scientific basis for management considerations. It also provided a national perspective on how ecosystems are being affected and a scientifically defensible rationale for control and management activities.

Nunavut Land Use Planning and Mapping

This initiative was to develop land use plans, policies and objectives to guide resource use and development throughout Nunavut. This included addressing issues associated with land and water use, hunting, resource use and development, GIS mapping, Traditional Knowledge, and archaeological importance.

A.44 Reference 44

Name/Title: Cumulative Effects Assessment and Management Framework for Northeast British Columbia

Geographic Region: Canada (south), Northeast BC

Type: Framework

Approach: framework to assist government in addressing cumulative effects due to current and anticipated oil and gas development

Bibliographic Citation(s) Reviewed:

- AXYS 2003. A Cumulative Effects Assessment and Management Framework for Northeast British Columbia. Prepared by AXYS Environmental Consulting Ltd. for the BC Oil and Gas Commission and Muskwa-Kechika Management Board, BC.

Website URL(s):

- <http://www.ogc.gov.bc.ca/scek/projects-com.asp>

A.44.1 Description

A.44.1.1 Summary

The report proposed a Cumulative Effects Assessment and Management (CEAM) framework for Northeastern BC to assist the provincial government and BC Oil and Gas Commission (OGC) in addressing cumulative effects, largely due to current and anticipated oil and gas development.

A.44.1.2 Approaches

The project included four inter-related components:

- A CEA framework which outlined an overall approach, specific to northeast BC, for conducting project-specific and regional cumulative effects assessments. This included approaches for scoping cumulative effects assessments; analyzing cumulative effects; undertaking mitigation; determining impact significance (including thresholds); and identifying needs for follow-up and monitoring
- A baseline regional CEA which provided a spatial overview of existing cumulative effects in the region so that potential areas of concerns (e.g., "hot-spots") could be identified
- Cumulative effects case studies that showed how the CEA framework can be applied to existing situations in two representative areas of northeast BC
- A project application screening process to assist decisions on petroleum exploration, development, and production proposals, and on the management of cumulative effects

The proposed approach in the CEAM framework was based on the premise that many tools or options can each contribute individually in their own way or can work together collectively within the CEAM framework. Different tools and options provide an opportunity to address cumulative effects issues at earlier or later points in time depending on capacity and resources of relevant agencies and organizations and how they choose to participate in the process.

A.45 Reference 45

Name/Title: Cumulative Impact Management Screener (CIMS)

Geographic Region: Canada (south, northeast BC)

Type: Framework

Approach: screening-level review process

Bibliographic Citation(s) Reviewed:

- AXYS. 2003. A Cumulative Effects Assessment and Management Framework for Northeast British Columbia. Prepared by AXYS Environmental Consulting Ltd. for the BC Oil and Gas Commission BC.

Website URL(s):

- <http://www.ogc.gov.bc.ca/scek/projects-com.asp>

A.45.1 Description

A.45.1.1 Summary

The report developed a screening-level review process for the BC Oil and Gas Commission (OGC) to incorporate cumulative effects considerations in their application reviews of oil and gas projects.

A.45.1.2 Approaches

The CIMS was developed to assist OGC Resource Officers identify situations where projects may contribute to cumulative effects from oil and gas development. The CIMS asks a series of questions on paper that Resource Officers can answer while reviewing oil and gas applications. The purpose of the CIMS is to identify situations in which projects may be contributing to cumulative effects, and then to identify appropriate opportunities or mitigations to manage those effects. The report provides information for OGC staff, project applicants, First Nations, public stakeholders and provincial resource managers. Environmental Management Measures are suggested to help resource officers identify appropriate management options. CIMS was meant to evolve as the OGC application review process continues along its current path of improvement and adaptation to changing circumstances. The CIMS process is one initiative amongst many by the OGC and other organizations to address the growing concern of environmental implications of oil and gas development in British Columbia.

A.46 Reference 46

Name/Title: Fort Liard Area Cumulative Impacts Mapping Project

Geographic Region: Arctic (Canada), NWT

Type: Analytical Tool

Approach: futures mapping for cumulative effects assessment

Bibliographic Citation(s) Reviewed:

- Fort Liard Area Cumulative Impacts Mapping Project. Prepared by Cizek Environmental Services and McCullum Environmental Services for the Canadian Arctic Resources Committee, May 17, 2002.

Website URL(s):

- www.carc.org/sustainable_dev/Final_Fort_Liard_Technical_Report_May_17_2002.pdf

A.46.1 Description

A.46.1.1 Summary

The report prepared a map showing existing land use activities in the Fort Liard Area of NWT, used aerial photographs for the region to display land use patterns from pre 1960 up to 2001, and conducted an analysis of ecological impacts using Global Methodology for Mapping Human Impacts on the Biosphere (GLOBIO).

A.46.1.2 Approaches

The goal of the study was to apply a general and broad-based method (GLOBIO) for generalized cumulative effects assessment in a small region. The study used assumptions to conduct the analysis including: past growth as an accurate prediction of future growth, producing wells will be discovered at the same rates as historically, all future seismic will be 3-D, exploration and production technologies will remain the same and the total area impacted depends on how close new wells are placed together and to associated infrastructure (roads, pipelines).

The study concluded that cumulative effects associated with current and future seismic exploration are likely far greater than the cumulative effects of oil and gas production itself. The study also noted that the extent and associated cumulative effects of all activities emphasize the need to establish a cumulative effects assessment framework (including thresholds and limits of acceptable change), finalize land use planning and set up a network of protected areas.

The study also made the following recommendations for cumulative effects assessment:

- A real-time GIS database of all surface land dispositions needs to be developed.
- Indian and Northern Affairs Canada should digitize all manually drafted land dispositions and integrate into electronic database.
- Conduct analysis of Dehcho woodland caribou aerial survey to determine caribou abundance between developed and undeveloped areas.
- Replication of the northern Alberta woodland caribou study to quantify woodland caribou disturbance of industrial development.
- Evaluate re-vegetation of old seismic lines and well sites.
- Conduct songbird studies to quantify edge-effects of seismic lines and forestry cut blocks.
- Determine if low impact technologies and methods for oil and gas exploration can reduce cumulative effects.

A.47 Reference 47

Name/Title: West Kitikmeot/Slave Study

Geographic Region: Arctic (Canada), Nunavut

Type: Regional Study

Approach: information collection in support of decision making

Bibliographic Citation(s) Reviewed:

- West Kitikmeot/Slave Study – Final Report June 2001.

Website URL(s):

- <http://www.nwtwildlife.com/WKSS/project1.htm>

A.47.1 Description

A.47.1.1 Summary

In the 1990's, the area between Yellowknife and the Arctic coast was subject to intense development activity from mining exploration and development. This resulted in several operating mines and also raised awareness and concern about the potential for cumulative effects from development activities. The study was established to collect environmental and socio-economic information, enable better planning and decision making and contribute to a baseline for assessing and mitigating cumulative effects of development. The study was supported by government, Dene and Inuit communities, environmental organizations and the mining industry.

A.47.1.2 Approaches

The study focused on research and collection of baseline information and this was seen as the first step in developing a monitoring program for cumulative regional effects from development. Consultation with study partners identified priorities for research, including wildlife and wildlife habitat with an emphasis on caribou, physical environment and water resources and socio-economic issues.

This work from 1996 to 2001 culminated in the State of Knowledge report which presented all research and information collected and also identified additional areas where information is required. The study concluded that a great deal more research and information is required to establish adequate baseline information for the implementation of a monitoring program to identify regional cumulative effects of development. The study completed its work in 2001 and no alternate or continuing study has occurred since that time. While the study began the process of data collection and research and established a start towards a regional cumulative effects monitoring program, more work is required to bring this to fruition.

A.48 Reference 48

Name/Title: Cumulative Effects Management in the Deh Cho Territory

Geographic Region: Arctic (Canada), NWT

Type: Management Approach

Approach: cumulative effects indicators and thresholds

Bibliographic Citation(s) Reviewed:

- Salmo Consulting Inc. et al. 2004. Deh Cho Cumulative Effects Study, Phase 1: Management Indicators and Thresholds. Prepared for the Dehcho Land Use Planning Committee. Salmo Consulting Inc in association with AXYS Environmental Consulting Ltd, Forem Technologies and Wildlife Company Ltd, Calgary.
- Report on Cumulative Effects Management in the Deh Cho Territory - Preliminary Assessment and Results, Dehcho Land Use Planning Committee.

Website URL(s):

- http://www.dehcholands.org/reports_cumulative_effects_report.htm

A.48.1 Description

A.48.1.1 Summary

In 2004, the Deh Cho Land Use Committee (now the Dehcho Land Use Planning Board) contracted Salmo Consulting Inc. to complete research into cumulative effects indicators and thresholds and make recommendations for their application in the Dehcho Territory. The committee distributed copies of the research to communities and planning partners for comment and then established a set of indicators and thresholds to include in the Dehcho Land Use Plan.

A.48.1.2 Approaches

Based on this study the committee chose a set of indicators and thresholds to include in the land use plan and also completed a preliminary cumulative effects assessment. The assessment outlined how the indicators and thresholds would be implemented and the current level of cumulative effects in the region. The report explains the proposed cumulative effects indicators and demonstrates the results of the assessment using the selected indicators and thresholds. The report outlines thresholds or limits that specify the level of impact that can safely occur and thresholds are set by a combination of regional and scientific values. This is termed as 'limits of acceptable change'. Tiered thresholds are also discussed and consist of:

- Cautionary Threshold - development requires monitoring by regulatory authorities and represents the low end of the tiered thresholds
- Target Threshold - development should be subject to more intense scrutiny and should attempt to reduce impacts as much as possible
- Critical Threshold – no developments that will exceed this threshold can be permitted.

Seven indicators were selected by the Committee for application towards cumulative effects management. In the draft land use plan, only special management and general use zones can be used for development; therefore, the seven indicators for cumulative effects management are only used in these areas. The seven indicators consist of: corridor/ road density, habitat availability, minimum core area, minimum patch size, specialized habitat features, significant environmental features and stream crossing density. Valued ecosystem components selected through scientific research and community input each have specific thresholds set for each indicator which cannot be exceeded to minimize cumulative effects. The land use planning committee has determined that cumulative effects can best be managed through the draft land use plan and has committed to refining the process as the land use plan goes forward. Currently, the Dehcho Land Use Plan is still in draft format and has not been approved by the Federal and Territorial Governments.

A.49 Reference 49

Name/Title: Deh Cho Draft Land Use Plan

Geographic Region: Arctic (Canada), NWT

Type: Land Use Plan

Approach: land use plan

Bibliographic Citation(s) Reviewed:

- Final Draft Dehcho Land Use Plan. June 2, 2006.
- Dehcho Land Use Planning Update, April 2, 2008.

Website URL(s):

- <http://www.dehcholands.org/home.htm>

A.49.1 Description

A.49.1.1 Summary

The Deh Cho Land Use Planning Committee (DCLUPC) is a planning agency established under an Interim Measures Agreement between the federal and territorial governments and the Dehcho First Nations. The DCLUPC is working toward developing a land use plan that provides for the conservation, development and utilization of land, water and resources for residents of the Dehcho region and all Canadians. Dehcho First Nations have been in negotiations with the Federal Government to settle their land claim for some time, and as part of this, the DCLUPC was established in 2001 under the Dehcho First Nations Interim Measures Agreement.

A.49.1.2 Approaches

The Dehcho region contains a wealth of natural resources and has been an area of interest to both mining and oil and gas exploration for many years. The region contains existing mining developments (North American Tungsten, Canadian Zinc) extensive oil and gas development (Fort Liard and Cameron Hills Areas) in the southern area of the region and the potential Mackenzie Gas Project pipeline route. Through regulatory reviews and processes, Dehcho First Nations have expressed concern on the impacts of current and proposal future developments to the environment and associated cumulative effects. The draft land use plan has categorized lands into five different categories: conservation, protected areas, special management areas, general use areas and special infrastructure corridors. The draft plan proposes to set aside large areas of land where development cannot occur or may only occur under specific conditions. Under the land use plan, development will be allowed to occur where zoning classifications permit but sensitive or important areas identified by Dehcho First Nations can be set aside as protected or conservation areas.

From a cumulative effects perspective, lands especially vulnerable (e.g. calving areas) to development will be protected which reduces the overall cumulative effects impacts to the region as a whole. In areas where development is allowed, cumulative effects associated with multiple developments may still be of concern but will be confined to certain areas. To minimize these impacts from development, regulatory conditions and recommendations may help to minimize impacts.

The land use planning process helps to deal with cumulative effects from a regional perspective by setting aside lands that have special significance or ecological value from development. The Dehcho Land Use Plan must be approved by DCFN, the Federal Government and the Government of the Northwest Territories before it can be implemented. Ongoing negotiations will determine how the land use plan balances conservation and development in the Dehcho region.

A.50 Reference 50

Name/Title: Gwich'in Land Use Plan

Geographic Region: Arctic (Canada), NWT

Type: Land Use Plan

Approach: land use plan

Bibliographic Citation(s) Reviewed:

- Implementing the Gwich'in Land Use Plan, a five year work plan 2003 to 2008.
- Gwich'in Land Use Planning Board Annual Report 2006/2007.

Website URL(s):

- <http://www.gwichinplanning.nt.ca>

A.50.1 Description

A.50.1.1 Summary

The Gwich'in Land Use Planning Board (GLUPB) is a regulatory agency established under the Mackenzie Valley Resource Management Act (MVRMA) that is responsible for the development and implementation of a land use plan for the Gwich'in Settlement Region (GSR). The Gwich'in have a settled land claim agreement in place and currently the Gwich'in land use plan is the only approved land use plan in the Mackenzie Valley. The land use plan was approved in August of 2003 and established different land zones that outline which areas are open to development and how development can proceed within the GSR.

A.50.1.2 Approaches

The GSR contains a wealth of natural resources and has been an area of interest to both mining and oil and gas exploration for many years. The land use plan provides background information and establishes land use zones in the GSR and also identifies outstanding environmental issues and actions to be taken by the appropriate agencies in addressing the issues. The land use plan has categorized lands into three different categories: general use zones, conservation zones and special management zones. The land use plan allows multiple land uses in certain areas and controls or prohibits land uses in sensitive environmental or heritage areas with goal of balancing conservation and use of land, water and resources.

Applications for land and water use must go through a conformity check to determine if the activity is allowed under the land use plan and if specific conditions must be met to protect valued resources identified by communities and other stakeholders during the planning process. The GLUPB conducts the conformity check and notifies the applicant of its determination before the application proceeds further into the regulatory process. If the application does not conform to the plan, the application is rejected. The GLUPB does not specifically consider the potential for cumulative effects in its conformity decision, but if reviewers raise cumulative effects concerns during application review the appropriate regulatory authority could refer the application to environmental assessment. The Inuvialuit, Sahtu and Dehcho regions have experienced to varying degrees, pressures associated with applications for land and water use associated with development of oil and gas and minerals. Currently, the GSR has not been subject to similar levels of development interest so it remains to be seen how cumulative environmental effects will be dealt with in the long term.

From a cumulative effects perspective, lands especially vulnerable (e.g. calving areas) to development are protected or subject to certain conditions in the land use plan which reduces the overall cumulative effects impacts to the region as a whole. In areas where development is allowed, cumulative effects associated with multiple developments may still be of concern but will be confined to certain areas. To minimize these impacts from development, regulatory conditions and recommendations may help to minimize impacts.

A.51 Reference 51

Name/Title: Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Proponents

Geographic Region: Arctic (Canada), NWT

Type: Management Approach

Approach: cumulative effects assessment best practices

Bibliographic Citation(s) Reviewed:

- Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Proponents. January 2002. Prepared by Kavik AXYS Inc.

Website URL(s):

- <http://www.bmmda.nt.ca/downloads.htm>

A.51.1 Description

A.51.1.1 Summary

This report is a guide to assist proponents working in the Inuvialuit Settlement Region (ISR) to assess the potential contribution of a project to cumulative effects. At the time of the report (2002), increasing numbers of development applications were being submitted to do work in the ISR. This caused concern among communities and reviewers on the potential for cumulative effects from multiple projects and also emphasized the need to provide clear direction to proponents on the practice and concept of cumulative effects assessment.

A.51.1.2 Approaches

The report is intended to assist a proponent working in the ISR in addressing the potential for their project to contribute to cumulative environmental effects. The report also helps proponents identify measures to manage and mitigate these impacts. Proponents can utilize the report to identify best practices and approaches to deal with cumulative effects so that their application can be reviewed expeditiously.

The intent of the report was to help the EISC and EIRB in their reviews of cumulative environment effects of proposed developments. It was especially designed to assist the EISC in conducting screenings of developments by asking a series of questions to help with making a determination on cumulative effects.

To obtain an adequate preliminary assessment, the screener must provide clear requirements and expectations to proponents to ensure common understanding of the following:

- A definition of cumulative effects
- Agreements on the components of scoping (e.g., valued ecosystem component selection, temporal and spatial boundaries)
- Criteria on significance so that the proponent understands what will cause a determination of significance by the screener or reviewer

The report also notes current limitations and challenges including: lack of input of monitoring data into a common database; lack of follow-up on approved projects; limited information on thresholds; and limited capacity to manage cumulative effects because of shared jurisdictional responsibility among regulatory authorities.

The report provides questions for both the proponent and assessor/screener to ask towards the goal of making a determination for cumulative effects. Proponents must:

- Identify Valued Ecosystem Components (VECs) that may impacted by the project
- Assess impact of other projects in relation to their project
- Determine the significance of overall cumulative effects and identify mitigation measures to reduce or eliminate the projects effects to the VECs

Reviewers must ask if the project description provides a sounds basis and information regarding cumulative environmental effects, if the proponent has shown how the projects contribution to cumulative effects will mitigated, do other information sources contradict or cast doubt on the proponents conclusions.

By asking these questions, the EISC and EIRB can more effectively make a determination on potential cumulative effects and can increase their own capacity and knowledge of how cumulative effects can be mitigated or avoided to minimize environmental impacts.

A.52 Reference 52

Name/Title: Cumulative Effects Assessments in the Inuvialuit Settlement Region: Current and Potential Capability

Geographic Region: Arctic (Canada), NWT

Type: Policy

Approach: process and technical tools to influence cumulative effects assessment and management

Bibliographic Citation(s) Reviewed:

- Cumulative Effects Assessments in the Inuvialuit Settlement Region: Current and Potential Capability. January 2002. Prepared by Kavik AXYS Inc.

Website URL(s):

- <http://www.bmmda.nt.ca/downloads.htm>

A.52.1 Description

A.52.1.1 Summary

This report discusses process and technical tools that can be used to influence cumulative assessment and management in the ISR. Responsibility for cumulative assessment and management is spread through various government departments and co-management boards established under the IFA. This report presents and considers opportunities towards using an integrated approach to cumulative effects in the ISR.

A.52.1.2 Approaches

Although there are multiple participants with roles and responsibilities for environmental assessment and cumulative effects in the ISR, dealing with cumulative effects assessment and management is beyond the capacity of existing regulatory institutions and processes. Under the IFA, the Environmental Impact Screening Committee (EISC) and the Environmental Impact Review Board (EIRB) review proposed developments respectively for screening and review. The IFA has no specific requirements regarding cumulative environmental effects and the EISC and EIRB have developed their own requirements that dictate how proponents should address cumulative effects, including:

- Proponents are required in their project description to identify and assess the cumulative effects of the proposed development and other activities in the area.

- Proponents are expected to identify and assess the cumulative effects of the proposed development and other activities in the area to the best of their ability.
- When coming to a decision on the potential for 'significant negative environmental effects' the EISC will ask 'what are the cumulative effects of the proposed project'.

In the ISR, responsibility for assessment and management of cumulative effects is shared amongst government and institutions established under the IFA. The report notes that IFA institutions are not able access and manage cumulative effects alone but have tools they can utilize to advance cumulative effects and assessment. The report states that the EISC and EIRB can use the following tools to deal with cumulative effects:

- Increase cooperation with the National Energy Board regarding cumulative effects assessment and consider elaboration of the screening determination letter to ensure the responsible authority understands mitigation used in making the screening determination
- Ask for better project descriptions by clarifying requirements and expectations for the potential of a project to contribute to cumulative effects
- Develop thresholds for specific resources and inter-jurisdictional initiatives to develop cumulative effects assessment resources to improve the EISC and EIRB capacity to review effects of individual projects

Outside of the ISR, responsibility for assessment and management of cumulative effects is also shared by many government departments and institutions established through land claims. This highlights the importance of institutions like the Nunavut Planning Commission and others to develop tools and criteria to assist with cumulative effects.

A.53 Reference 53

Name/Title: Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Reviewers

Geographic Region: Arctic (Canada), NWT

Type: Policy

Approach: assist application reviewers in consideration of potential cumulative effects

Bibliographic Citation(s) Reviewed:

- Cumulative Effects Assessments in the Inuvialuit Settlement Region: A Guide for Reviewers. January 2002. Prepared by Kavik AXYS Inc.

Website URL(s):

- <http://www.bmmda.nt.ca/downloads.htm>

A.53.1 Description

A.53.1.1 Summary

This report is a guide to assist the Environmental Impact Screening Committee (EISC) and the Environmental Impact Review Board (EIRB) in their consideration of potential cumulative effects from a proposed development. At the time of the report (2002), increasing numbers of development applications were being submitted to do work in the Inuvialuit Settlement Region (ISR) which caused concern among communities and reviewers on the potential for cumulative effects from multiple projects.

A.53.1.2 Approaches

The focus of this report was to help the EISC and EIRB to structure their review of cumulative environment effects of proposed developments. It was especially designed to assist the EISC in conducting screenings of developments by asking a series of questions to help with making a determination on cumulative effects.

To obtain an adequate preliminary assessment, the screener must provide clear requirements and expectations to ensure common understanding of the following:

- A definition of cumulative effects
- Agreements on the components of scoping (e.g., valued ecosystem component selection, temporal and spatial boundaries)
- Criteria on significance so that the proponent understands what will cause a determination of significance by the screener or reviewer

The report also notes current limitations and challenges including: lack of input of monitoring data into a common database; lack of follow-up on approved projects; limited information on thresholds; and limited capacity to manage cumulative effects because of shared jurisdictional responsibility among regulatory authorities.

The report provides questions for both the proponent and assessor/screener to ask towards the goal of making a determination for cumulative effects. Proponents must identify Valued Ecosystem Components (VECs) that may be impacted by the project, assess impact of other projects in relation to their project, determine the significance of overall cumulative effects and identify mitigation measures to reduce or eliminate the project's effects to the VECs.

Reviewers must ask if the project description provides a sound basis and information regarding cumulative environmental effects, if the proponent has shown how the project's contribution to cumulative effects will be mitigated, do other information sources contradict or cast doubt on the proponent's conclusions.

By asking these questions, the EISC and EIRB can more effectively make a determination on potential cumulative effects and can increase their own capacity and knowledge of how cumulative effects can be mitigated or avoided to minimize environmental impacts.

A.54 Reference 54

Name/Title: EKATI Independent Environmental Monitoring Agency (IEMA)

Geographic Region: Arctic (Canada), NWT

Type: Monitoring

Approach: monitoring environmental performance

Bibliographic Citation(s) Reviewed:

- 2007/2008 Annual Report
- 2007 IEMA Ekati environmental workshop presentations on Wildlife Effects and Aquatic Effects.

Website URL(s):

- <http://www.monitoringagency.net/>

A.54.1 Description

A.54.1.1 Summary

IEMA is a public watchdog that monitors the environmental performance of the EKATI Diamond Mine to ensure that BHP Billiton respects and protects land, water and wildlife essential to the well-being of northern aboriginal peoples. IEMA was established under an Environmental Agreement negotiated in 1996 with BHP Billiton (mine operator), Indian and Northern Affairs, Government of the Northwest Territories and First Nations.

A.54.1.2 Approaches

IEMA's mandate is specific only to the EKATI project and IEMA does not have a role in cumulative effects assessment or management. Under various regulatory approvals (water license, land use permit, land leases) for the project, BHP Billiton is responsible for conducting various monitoring programs that are designed to detect and measure environmental impacts from the project. The programs monitor a variety of valued components, but some major programs consist of aquatic effects monitoring (fish, water quality and benthic invertebrates) and wildlife monitoring. These monitoring programs are reviewed by IEMA and other stakeholders to determine if and how the project is affecting the environment.

From a cumulative effects standpoint, BHP Billiton's monitoring programs do not measure or take into account how other developments in the area (e.g. nearby Diavik Diamond Mine) may be contributing to cumulative effects to the environment. Although both the EKATI and Diavik Diamond Mines are located on Lac de Gras and within the Coppermine River Watershed, each mine conducts monitoring for its own project only. The EKATI and Diavik Diamond Mines were constructed and became operational at different times, but they are now both operating and potentially contributing to cumulative effects in the area around Lac de Gras. If large scale mining projects are to be located in proximity to each other, cumulative effects need to be considered during the review of project applications so that a program can be implemented to monitor cumulative effects towards to the goal of managing cumulative effects for multiple projects with a region or ecosystem.

A.55 Reference 55

Name/Title: Diavik Environmental Monitoring Advisory Board (EMAB)

Geographic Region: Arctic (Canada), NWT

Type: Monitoring

Approach: monitoring environmental performance

Bibliographic Citation(s) Reviewed:

- 2007 Annual Report
- Water quality workshop report October 2003

Website URL(s):

- <http://www.monitoringagency.net/>

A.55.1 Description

A.55.1.1 Summary

EMAB monitors the environmental performance of the Diavik Diamond Mine to ensure that Diavik respects and protects land, water and wildlife essential to the well-being of northern aboriginal peoples. EMAB reviews management plans and monitoring programs and makes recommendations on issues relating to access in relation to wildlife harvesting, use of traditional knowledge in design and conducting of studies and making recommendations for participation of aboriginal peoples in environmental monitoring. EMAB was established under an Environmental Agreement negotiated in 2000 with Diavik Diamond Mines Inc. (DDMI), Indian and Northern Affairs, Government of the Northwest Territories and First Nations.

A.55.1.2 Approaches

EMAB's mandate is specific only to the Diavik project and EMAB does not have a role in cumulative effects assessment or management. Under various regulatory approvals (water license, land use permit, land leases) for the project, DDMI is responsible for conducting various monitoring programs that are designed to detect and measure environmental impacts from the project. The programs monitor a variety of valued components; major programs consist of aquatic effects monitoring (fish, water quality and benthic invertebrates) and wildlife monitoring. These monitoring programs are reviewed by EMAB and other stakeholders to determine if and how the project is affecting the environment.

From a cumulative effects standpoint, DDMI's monitoring programs do not measure or take into account how other developments in the area (e.g. nearby Diavik Diamond Mine) may be contributing to cumulative effects to the environment. Although both the Diavik and EKATI Diamond Mines are located on Lac de Gras and within the Coppermine River Watershed, each mine conducts monitoring for its own project only. The EKATI and Diavik Diamond Mines were constructed and became operational at different times, but they are now both operating and potentially contributing to cumulative effects in the area around Lac de Gras. If large scale mining projects are to be located in close proximity to each other, cumulative effects need to be considered during the review of project applications so that a program can be implemented to monitor cumulative effects towards to the goal of managing cumulative effects for multiple projects with a region or ecosystem.

A.56 Reference 56

Name/Title: NWT Environmental Stewardship Framework (ESF)

Geographic Region: Arctic (Canada), NWT

Type: Framework

Approach: multi-year, multi-disciplinary and multi-stakeholder framework

Bibliographic Citation(s) Reviewed:

- Environment Canada and Indian and Northern Affairs, 2008, NWT Cumulative Effects Assessment and Management Framework: Five-Year Review and Future Directions: Report on the Gathering, Prepared by Terriplan Consultants for DOE and DIAND, Yellowknife.
- NWT CEAM Steering Committee, 2007, A Blueprint for Implementing the Cumulative Effects Assessment and Management Strategy and Framework in the NWT and its Regions. Yellowknife.

Website URL(s):

- http://www.ceamf.ca/01_who/01_who.asp

A.56.1 Description

A.56.1.1 Summary

The NWT Environmental Stewardship Framework (ESF), formerly the NWT Cumulative Effects Assessment and Management Framework), is a multi-year, multi-disciplinary and multi-stakeholder initiative to assess and manage concerns in the NWT regarding the potential effects of emerging industrial activity. Conceptualized in the late 1990's in recognition of the then burgeoning diamond mining industry, it has continued in the anticipation of new oil and gas development and infrastructure developments. Coordinated by a Steering Committee, the ESF is one of the two current largest and long-lived such frameworks in Canada (the other being the CEMA initiative for the oil sands, with a geographical boundary that coincidentally extends to the NWT border). As such, the ESF is currently the "flagship" of northern initiatives to address cumulative effects.

A.56.1.2 Approaches

The ESF structure is based on the fundamental building blocks typical of any such framework:

- Audit and Reporting
- Planning and Environmental Programs
 - Vision and Objectives
 - Land Use and Conservation Planning
 - Baseline Studies and Long Term Monitoring
 - Research
- Assessment and Regulation
 - Environmental Assessment
 - Reclamation and Compliance
- Administration
 - Information Management
 - Capacity Building
 - Coordination

The ESF's evolving actions, priorities and overall direction are described by annual "Blueprint" updates, summarized by 19 "General Recommendations", each with their suite of "Specific Actions". The following lists these as presented in the most recent (2007) Blueprint. As would be expected from such a comprehensive approach, key themes include land use planning, information gathering and dissemination, and capacity of personnel to pursue the framework.

1. Ongoing development/refinement of vision

- 1.1 Develop a vision statement to be used in managing potential cumulative effects of development in the NWT
- 1.2 Review/refine CEAM Strategy and Framework Vision

2. Timely approval and implementation of land use plans in the Gwich'in, Sahtu, and Dehcho regions

- 2.1 Implementation of the Gwich'in Land Use Plan
- 2.2 Completion, approval, implementation – Sahtu Land Use Plan
- 2.3 Finalize the draft interim land use plan for the Dehcho region

- 3. Establishment of land use planning processes in other regions of the NWT**
 - 3.1 Options for land use planning – North Slave
 - 3.2 Timely completion, approval and implementation of a land use plan for Tlicho lands
 - 3.3 Identification of interim land use planning options – South Slave
- 4. Support for regional land use planning activities**
 - 4.1 Funding and expertise – land use planning
 - 4.2 Identify/advance candidate areas – NWT PAS
 - 4.3 Improve linkages – regional land use planning and other initiatives
- 5. Timely implementation of baseline studies and monitoring programs**
 - 5.1 Implement NWT Cumulative Impact Monitoring program (CIMP)
 - 5.2 Identify and fill gaps in baseline information
 - 5.3 Advance social, cultural and economic aspects of monitoring
- 6. Standardized approaches to monitoring/reporting/data management**
 - 6.1 Continue work towards consistent protocols
 - 6.2 Agreement upon and use of consistent social, cultural and economic protocols
- 7. Cumulative effects research plan**
 - 7.1 Develop and implement a cumulative effects research plan
- 8. Functional environmental audit and reporting system for the NWT**
 - 8.1 Environmental auditors aware of issues, and all organizations involved
 - 8.2 Organizations to review and implement audit recommendations
- 9. Guidance regarding Cumulative Effects Assessment**
 - 9.1 Review and update Cumulative Effects Assessment (CEA) guidance
 - 9.2 Regional Strategic Environmental Assessment
 - 9.3 Organizations to consider JRP recommendations regarding cumulative effects in their planning and priorities
- 10. Contribution to cumulative effects management**
 - 10.1 Develop intervener funding programs
- 11. Implementation of transboundary processes**
 - 11.1 Develop protocols to deal with screening, EA and review processes (projects in two or more regions within the NWT)
 - 11.2 Develop protocols to deal with screening, EA and review processes (NWT/adjacent jurisdictions)
 - 11.3 Understanding and clarification of the screening, EA and review process
 - 11.4 Transboundary liaison and comprehensive list of initiatives

12. Strengthen approach to cumulative effects management

- 12.1 Develop procedures, tools for cumulative effects management
- 12.2 Annual public reporting on existing/new permits and licenses

13. Strengthen inspection and enforcement

- 13.1 Improved frequency and quality of inspections

14. Establish and information management system

- 14.1 Continue efforts to develop the partnerships, infrastructure and capacity necessary to manage information

15. Effective leadership/coordination for implementation of Blueprint

- 15.1 Encourage the implementation of the Blueprint
- 15.2 Provide support to facilitate ongoing CEAM Blueprint implementation
- 15.3 Strengthen social, cultural and economic aspects of CEAM Framework

16. Completion of CEAM regional plans of action

- 16.1 Dehcho Region
- 16.2 Beaufort Sea/Mackenzie Delta
- 16.2 Gwich'in Regional Plan of Action

17. Implementation and Review of regional Plans of Action

- 17.1 Ongoing implementation and review of Regional Plans of Action

18. Integration of Traditional Knowledge

- 18.1 Support of TK projects (e.g., training, capacity building)
- 18.2 Inclusion of TK in CEAM Framework and in decision-making
- 18.3 Full, effective participation

19. Enhance community capacity to deal with cumulative effects assessment and management

- 19.1 Review/refine needs, prepare strategies
- 19.2 Increase community funding
- 19.3 Evaluate successful models and best practices
- 19.4 Education, training and mentorship
- 19.5 Enhance capacity for social, cultural and economic cumulative effects assessment and management
- 19.6 Lobbying/communication re: capacity

A subsequent review of the past five years of Blueprints (since the first in 2003) summarized the challenges faced by this initiative, including:

- lack of a future vision
- need for better information (TK and science) to support decision making
- need to complete land use plans
- establish network of protected areas

- continue development of baseline information
- implement regional monitoring programs (in Mackenzie Valley and Beaufort)
- development and use of landscape models of change
- development of best practices
- improving information access
- capacity building (education, training, etc.)

Of all these, regional plans and pilot projects were viewed as the most practical and priority means of progressing the ESF.

A.57 Reference 57

Name/Title: Regional Strategic Environmental Assessment (R-SEA)

Geographic Region: All

Type: Research Study

Approach: assessment of potential environmental and socio-economic implications of future human development

Bibliographic Citation(s) Reviewed:

- Noble, B. and J. Harriman. 2008. Regional Strategic Environmental Assessment in Canada: Principles and Guidance. Prepared by Aura Environmental Research and Consulting Ltd. for the Canadian Council of Ministers of Environment (CCME).
- Noble, B. 2003 Regional Cumulative Effects Assessment: Toward a Strategic Framework. Prepared by University of Saskatchewan Department of Geography for Canadian Environmental Assessment Agency (CEAA).
- Canada-Newfoundland Offshore Petroleum Board. 2003. Strategic Environmental Assessment (SEA) for the Laurentian Sub-basin. Prepared by Jacques Whitford Environment Limited for the Canada-Newfoundland Offshore Petroleum Board, St. John's, Newfoundland.

Website URL(s):

- http://www.ccme.ca/ourwork/environment.html?category_id=135
- <http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=570DC764-1&offset=1&toc=show>
- <http://www.cnlopb.nl.ca/news/nr20040123eng.shtml>

A.57.1 Description

A.57.1.1 Summary

A Regional Strategic Environmental Assessment (R-SEA) is an assessment of potential environmental and socio-economic implications of future human development. That development may be precipitated by a government plan, policy, program or industry interest in developing a certain resource in a certain geographic region. R-SEA borrows all the elements of conventional EIA and CEA but goes one step further by examining alternative future scenarios to assist the determination of the most acceptable development and management options.

A.57.1.2 Approaches

Regional Strategic Environmental Assessments have in the past few years been gaining greater interest by government and assessment practitioners as the next evolutionary step in EIA, largely in recognition of

the long understood need to break away from the confines of conventional project-based CEA. R-SEA, which has been also labelled by various similar derivations such as Regional Cumulative Effects Assessments, follows through the same progression of scoping, analysis, mitigation and follow-up as currently practiced. However, the defining fundamental differences of R-SEA are that it:

- May be triggered not by a “hard” development project subject to regulatory review, but by a “soft” intention to implement an initiative (i.e., plan, policy, program) that itself may lead to “hard” projects
- Is forward looking by predicting what future effects may be, but broadly both geographically and by cause-effect, not just from the point of view of incremental change by one project
- Examines alternatives amongst future scenarios
- Is conducted *prior* to the commencement of the initiative, and is therefore proactive by preparing land and resource managers for subsequent assessment and management of a resource and/or region, now equipped with the tools (such as land use plans, thresholds) to collaboratively and successfully fulfill their management obligations

The core principles of R-SEA include (Noble and Harriman, 2008):

- Strategic approach (i.e., forward looking)
- Futures-oriented (i.e., examining future outcomes)
- Early commencement (i.e., before decision making commences on individual projects)
- Cumulative effects focused
- Multi-tiered (i.e., involved all levels of decision making)
- Multi-scaled (i.e., analysis at different spatial scales)
- Multi-sectoral
- Participatory
- Opportunistic (i.e., seeks and implements most appropriate solutions)
- Adaptive

The classic implementation of R-SEA is when a “basin opening opportunity” is identified for the energy industry and government is seeking information and guidance on how best to proceed with regulatory applications therein. This has been mostly done for off-shore regions, noticeably in the North Sea, Beaufort and Laurentian Basin (Canada east-coast).

The Government of Canada has, in its Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals, has mandated federal departments to conduct SEAs to meet the government’s intent regarding sustainable development practices. As a relatively recent innovation, best practice and precedence is only now being established.

A.58 Reference 58

Name/Title: Cumulative Impact Monitoring Program (CIMP)

Geographic Region: Arctic (Canada), NWT

Type: Monitoring

Approach: multi-year, multi disciplinary community based monitoring of environmental indicators of change

Bibliographic Citation(s) Reviewed:

- Traditional Knowledge Practitioners Working Group (TKPWG), 2008. Our Responsibility to Keep the Land Alive: Workshop Report: Traditional Knowledge and Cumulative Impact Monitoring Practitioners Workshop. Prepared for the NWT Cumulative Impact Monitoring Program by SENES Consultants Ltd.

Website URL(s):

- <http://www.nwtcimp.ca/index.asp>

A.58.1 Description

A.58.1.1 Summary

The NWT CIMP is a multi-year and multi disciplinary community based initiative to monitor environmental indicators of change. Active since the 1990's, the program is expected to be fully implemented in 2009.

A.58.1.2 Approaches

The NWT CIMP is a statutory requirement of various land claims agreements and the MVRMA. The program was developed amongst a Working Group from NWT Aboriginal governments, Government of Canada and Government of the Northwest Territories. A Working Group workshop in 2008 resulted in the identification of seven monitoring priorities (TKPWG, 2008, p. ix):

- Caribou and animal cycles
- Habitat for animals and spiritual beings
- Plants and medicines
- Indigenous language, names of places and animals
- Traditional survival skills
- Community wellness
- TK monitoring practices

Challenges in meeting these priorities were identified, including use of TK, education, capacity and funding.

The NWT CIMP has identified 14 Valued Ecosystem Components organized within seven groups as follows:

- Water
 - Water and Sediment Quality
 - Water Quantity
 - Snow, Ground Ice and Permafrost
- Wildlife
 - Caribou
 - Moose
 - Land Mammals
- Birds and Insects
 - Birds
- Plants
 - Vegetation
- Fish and Marine Life
 - Fish Habitat, Populations, and Harvest
 - Fish Quality
 - Marine Life/Marine Mammals

- Air and Climate
 - Climate
 - Air Quality
- People
 - Human Health and Community Wellness

Indicators (measurable attributes) of each VEC have been identified. For example, indicators for caribou are:

- number harvested
- pregnancy rates
- levels of contaminants
- population size and trends
- movements and distribution

A.59 Reference 59

Name/Title: Great Bear Lake Watershed Management Plan

Geographic Region: Arctic (Canada), NWT

Type: Land Use Plan

Approach: community-based plan to protect resources and cultural values of a watershed

Bibliographic Citation(s) Reviewed:

- Great Bear Lake Working Group. May 31, 2005 with Caveat of February 7, 2006. "The Water Heart": A Management Plan for Great Bear Lake and its Watershed. Directed by the Great Bear Lake Working Group and facilitated and drafted by Tom Nesbitt

Website URL(s):

- http://www.srrb.nt.ca/publications/reports/31.05.05_GBLMgmtPlanCa.pdf
- <http://www.cpaws.org/chapters/nwt/work/greatbear/watershed-initiative.php>

A.59.1 Description

A.59.1.1 Summary

The Great Bear Lake Watershed Management Plan (GBLWMP) is a community-based plan to protect the resources and cultural values of Great Bear Lake and its watershed.

A.59.1.2 Approaches

The Great Bear Lake Working Group, a coalition of members of the Déline community and various government representatives, developed the Plan to become part of the Sahtu Land Use Plan. The Plan's principal approach is to restrict certain land and water based activities and establish Special Management and Exclusion zones in which development is either subject to the precautionary principle or excluded for cultural reasons. The Plan's outcome was influenced by both traditional and scientific knowledge in anticipation of possible further mineral and oil and gas exploration and development.

Additional initiatives include baseline information gathering and mapping.

In comparison to other land use planning exercises, this plan is of interest because of its “made in the north” grass-roots origins, focused on a specific geographic area and resource (fish). As such, its approach may serve as a model to be replicated elsewhere in the north.

Appendix B Draft Referral Criteria Summary

Appendix B: Summary – Draft Referral Criteria

This appendix is intended to provide a quick and easily accessible summary of the draft referral criteria presented in Section 4 of the report.

Draft Referral Criteria

A project proposal is referred by the NPC to NIRB for screening if:

1. The project does not contravene any specific condition in an applicable land use plan or has received a variance; or
2. The project contribution to cumulative effects results in the exceedance of a threshold, if available and the application of the threshold is applicable and defensible; or
3. Where no threshold is available that applies to any of the potential project effects and/or no land use plan condition exists or no condition is applicable, if:
 - a) the Schedule 12- 1 project proposal or water application is located within a zone of ecological or socio-cultural importance; and
 - b) evoke public and political concern because of many existing demands on the same resources (e.g., many uses of water from the same waterbody), or
 - c) the project proposal will or may:
 - i) involve other activities beyond the footprint of the project?; or,
 - ii) have the potential to induce activity (e.g., its implementation has the potential to lead to further activity in the region)?

Known Areas of Ecological and Socio- Cultural Importance

Examples of areas of *ecological* concern include:

- Areas of Ecological Interest without protection status:
 - Important Bird Areas
 - International Biological Program sites
 - Key Migratory Bird Terrestrial Habitats
 - Known/Suspected Areas of Polar Bear Concentration
 - Marine Mammal Areas of Concentration
 - Wetlands of International Importance
 - Wildlife Areas of Special Interest
- Caribou Protection Areas
- Conservation Areas (i.e., National Parks, National Wildlife Areas)
- Critical Wildlife Areas
- Migratory Bird Sanctuaries
- National Historic Sites, Heritage Rivers)
- Proposed National Parks

Appendix B: Referral Criteria Summary (DRAFT)

- Territorial Game Sanctuary
- Territorial Parks
- Territorial Wildlife Preserves
- Territorial Wildlife Sanctuaries

For a complete listing of areas of ecological importance, refer to “Nunavut Wildlife Resource and Habitat Values” (Nunami Jacques-Whitford. October 2008). Also refer to maps prepared by the Nunavut Department of Environment (2005) for “Known Ecological Areas of Interest in Nunavut” and “Nunavut Terrestrial Conservation Areas”. Other agencies (e.g., Inuit agencies and the Nunavut Department of Culture, Languages, Elders and Youth may have information on areas of socio-cultural importance in Nunavut).

Schedule 12- 1 Land Uses raising Potential Cumulative Effects Concerns

The following Schedule 12-1 project proposals, selected from those identified in section 4.2 *may* in particular raise such cumulative effect's concerns, based on the potential for project activities to occur beyond the footprint and the potential to induce future activity, for the NPC:

- Small scale exploration projects triggering only a Type B Water Licence under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and a Class B Land Use Permit under the *Territorial Land Use Regulations*. (*Note*: The transitional provision in Section 173 of the NWNSRTA states that Type B licences do not require hearings and are therefore exempt from NIRB screening under Schedule 12-1(5).)
- Municipal projects that require only a Type B Water License such as sewage lagoons, wastewater treatment facilities, solid waste disposal facilities, structures across watercourses that are less than 5m wide, water course training, water course diversion. (*Note*: Only Iqaluit has required a Type A Water Licence, all other communities are Type B.)
- Abstractions of water or deposits of waste requiring only a Type B Water Licence and no land use permit, this could include very small exploration projects with thresholds for explosive use, camp size and drill size below the threshold for a Class B Land Use permit under the *Territorial Land Use Regulations*.
- Extraction of aggregate from existing quarries (*Note*: NIRB and GN-CGS have agreed that only proposals for new quarries will be screened by NIRB based on correspondence between Robert Chapple (CGS) and NIRB, August 13, 2007).
- Game outfitting and wildlife observation operations (*Note*: Cumulative effects concerns on these projects may be more an issue for NWMB)
- Construction of small hotels and tourist facilities of 20 beds or less, where thresholds for water use and land use and below levels defined in Schedule 12-1 (2) and (5) respectively, and where there are no other government permit requirements triggering a screening.