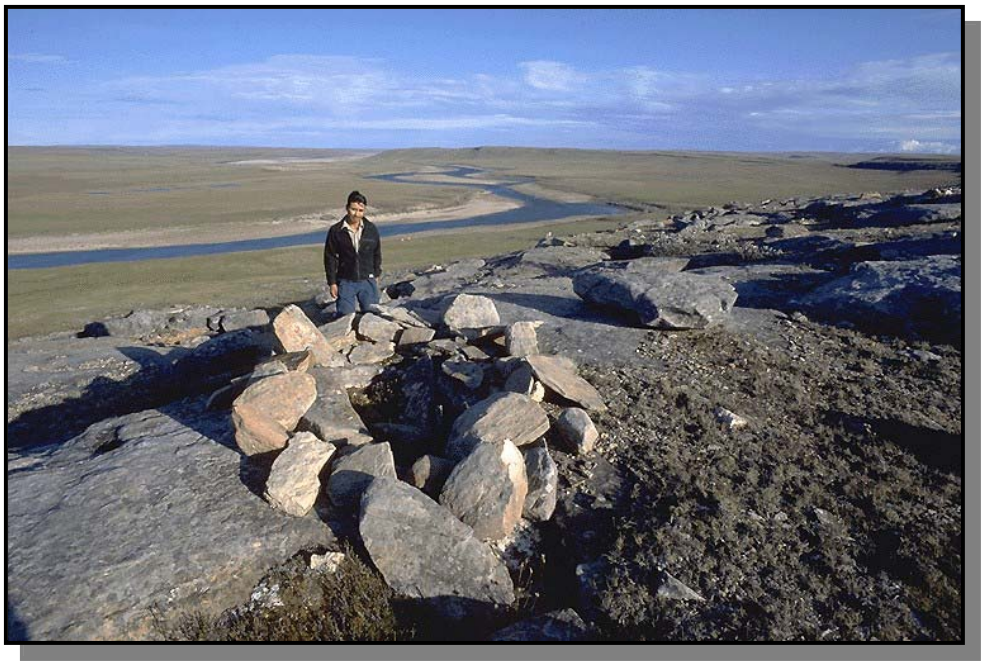
Replacement Class Screening For Aircraft Landings

In

Aulavik National Park of Canada, Auyuittuq National Park of Canada, Ivvavik National Park of Canada, Kluane National Park and Reserve of Canada, Quttinirpaaq National Park of Canada, Sirmilik National Park of Canada, Tuktut Nogait National Park of Canada, and Ukkusiksalik National Park of Canada



Parks Canada Agency
December 2004

Parks Canada Parcs Canada

Canada

Replacement Class Screening Report for Aircraft Landings in the Northern National Parks of Canada

Aulavik National Park of Canada, Auyuittuq National Park of Canada, Ivvavik National Park of Canada, Kluane National Park and Reserve of Canada, Quttinirpaaq National Park of Canada, Sirmilik National Park of Canada, Tuktut Nogait National Park of Canada, and Ukkusiksalik National Park of Canada

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Glossary

CEA – Cumulative Effects Assessment

CEAA – Canadian Environmental Assessment Agency

CEAR – Canadian Environmental Assessment Registry

COSEWIC - Committee on the Status of Endangered Wildlife in Canada

EA – Environmental Assessment

ESA – Ecologically Sensitive Area

ESS – Ecologically Sensitive Site

FA – Federal Authority

LMU – Land Management Units

RA – Responsible Authority as defined under the *Canadian Environmental Assessment Act*

RCS – Replacement Class Screening

The Act – The *Canadian Environmental Assessment Act*

WCSC – Western Canada Service Centre

1. Introduction

Eight northern national parks created over the past 28 years in the Yukon Territory, Northwest Territories and Nunavut Territory are not accessible by road or have large areas that are distant from roads. In order to participate in recreational activities, helicopters or fixed-wing aircraft have been used to bring visitors to these parks or remote areas of the parks. Since activities described in this report are referred to in the *Inclusion List Regulations* and require the issuance of business licences authorizing aircraft operation and landing for recreational purposes in national parks, an assessment under the *Canadian Environmental Assessment Act (*the *Act)* is required. The class screening process under the *Act* provides an appropriate, efficient, fair, flexible and consistent approach to the environmental assessment of aircraft landings in national parks. This replacement class screening (RCS) will address aircraft landing activities for recreation purposes in the northern national parks. The introduction of this replacement class screening provides the national parks context (1.1), the link to the *Act* (1.2), and the rationale for using the replacement class screening approach (1.3).

1.1. National parks context

National parks are "dedicated to the people of Canada for their benefit, education and enjoyment ... and shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations" *(Canada National Parks Act* 1998). This assessment must be conducted in the context of the purposes and policies associated with national parks. Sections 1.1.1 to1.1.4 outline the most relevant legislative and policy requirements for national parks to provide context for the rest of the replacement class screening.

1.1.1. Managing for ecological integrity

The *Canada National Parks Act* section 8(2) identifies the importance of protecting park resources in relation to visitor use by stating "the maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks."

The *Canada National Parks Act* section 2(1) states "ecological integrity means, with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes."

In operational terms ecosystems can be characterized in terms of composition, structure and process. An ecosystem can be considered to have integrity when native components (plants, animals and other organisms), physical structure (such as habitat connectivity or vegetation patterns) and processes (such as interspecies competition and predation) remain intact and function unimpaired by human activities. Conversely a loss in ecological integrity can be characterized by changes to physical structure, or interference with ecosystem processes as a result of human activity, that result in a loss of native species biodiversity.

Indicators of, and stressors affecting, ecological integrity as identified in park management plans were reviewed to identify the environmental components most likely to be affected by commercial guiding activities.

1.1.2. Managing for cultural resources

The protection of cultural resources is a priority for Parks Canada, with the highest obligation being to protect and present those resources of national historic significance in order to retain their historic value and extend their physical life (Canadian Heritage Parks Canada 1994). The protection of cultural resources also involves the consideration of the cumulative impacts of any proposed actions concerning the historic character of cultural resources, the goal being to preserve cultural integrity.

A cultural resource is defined as "a human work, or a place that gives evidence of human activity or has spiritual or cultural meaning, and that has been determined to be of historic value" (Canadian Heritage Parks Canada 1994). Within national parks cultural resources are inventoried and assigned a value based on the particular qualities and features that make up their historic character. Resources are evaluated for their historical associations, their aesthetic and functional qualities and their relationships to social and physical environments (Canadian Heritage Parks Canada 1994). National Historic Sites are assessed for their cultural integrity, the wholeness of the site's resources that represent its national significance. National historic sites located within the national parks and other cultural resources are considered to be potentially sensitive sites for the purposes of the environmental assessment of commercial guiding activities.

1.1.3. Managing for visitor experience

The *Canada National Parks Act* states that "The national parks of Canada are hereby dedicated to the people of Canada for their benefit, education and enjoyment...". To fulfill Parks Canada's mandate of facilitating the education and enjoyment of national parks by the public, a variety of outdoor recreation opportunities are permitted consistent with direction provided by *Parks Canada Guiding Principles and Operational Policies* (Canadian Heritage Parks Canada 1994). Outdoor activities that promote the appreciation of a park's purpose and objectives, and respect the integrity of the ecosystem, are intended to serve visitors of diverse interests, ages, physical capabilities and skills. The private sector and non-governmental organizations are encouraged under park policy to provide skills development programs that will increase visitor understanding, appreciation and enjoyment of the national parks. Individual park management plans specify the types and ranges of both new and existing appropriate outdoor recreation activities and their supporting facilities. Parks Canada, working in cooperation with others, is committed to offering high-quality visitor services by ensuring that park resources do not deteriorate and that quality visitor experiences are not diminished.

1.1.4. Cooperative management

All of the parks covered by this environmental assessment have a cooperative management agreement in place. These agreements provide formal mechanisms for Aboriginal people to be involved in park management. Usually a cooperative management board of Aboriginal and/or community representatives provides advice and guidance for management direction. The agreements also provide for access for Aboriginal people participating in traditional activities and subsistence harvesting (see individual agreements for details). As a result of these provisions, the use of "visitor" in this report does not refer to Aboriginal people covered by the land claim for that park. Another provision that is common in the agreements is for business opportunities in the park to be offered to Aboriginal people first or to have a certain percentage of licences reserved for Aboriginal people (provisions vary, please check the individual agreements for details).

1.2. Class screening and the Canadian Environmental Assessment Act (the Act)

The *Canadian Environmental Assessment Act* (the *Act*) and its regulations set out the legislative basis for federal environmental assessments. The legislation ensures that the environmental effects of projects involving the federal government are carefully considered early in project planning. The *Act* applies to projects which require a federal authority (FA) to make a decision or take an action, whether as a proponent, land administrator, source of funding or regulator (issuance of a permit or licence). The FA then becomes a responsible authority (RA) and is required to ensure that an environmental assessment of the project is carried out prior to making its decision or taking action.

Most projects are assessed under a screening type of assessment. A screening systematically documents the anticipated environmental effects of a proposed project, and determines the need to modify the project plan or recommend further mitigation to eliminate or minimize these effects. Screenings are conducted for projects which are not on the *Exclusion List Regulations* or the *Comprehensive Study List Regulations* and have not been identified as requiring mediation or an assessment by a review panel.

The screening of some routine projects may be streamlined through the use of a class screening report. This kind of report presents the accumulated knowledge of the environmental effects of a given type of project and identifies measures that are known to reduce or eliminate the likely adverse environmental effects. The Canadian Environmental Assessment Agency (CEAA) may declare such a report appropriate for use as a class screening after taking into account comments received during a period of public consultation.

A replacement class screening consists of a single report that defines the class of projects and describes the associated environmental effects, design standards and mitigation measures for projects assessed within the report. It includes a conclusion of significance of environmental effects for all projects assessed by the replacement class screening.

Once the Agency declares a replacement class screening report, no further environmental assessment is required for projects within the class.

1.3. Replacement class screening and the candidate class

Aircraft landings are a well-defined class of projects. All businesses involving aircraft landings in a national park require abusiness licences authorization to operate. The activities conducted by operators are limited to management of solid waste, management of human waste, management and handling of fuel, flight and operation of the aircraft including approach and landing. The business licence authorizes aircraft use and landings in a specific national park, with most landings occurring at designated locations.

Aircraft landings take place in a well-understood environmental settings within the 8 national parks included in the RCS. As most aircraft landings occur in the same locations, the local environmental setting is known (See Section 5).

Aircraft landings are unlikely to cause significant adverse environmental effects, taking into account mitigation measures. Aircraft operators have experience operating planes in northern national parks. Parks Canada has experience with monitoring the effects of activities associated with aircraft landings and as a result has developed standard mitigation to ensure that significant environmental effects do not occur. Any site-specific variation in environmental effects is well understood and site-specific mitigation measures have been established to address sensitive sites. Given the common characteristics of these activities and minimal impacts after mitigation is implemented, the adverse environmental effects are not likely to be significant.

Aircraft landings do not require follow-up because there is no new/unproven mitigation measures, the setting is familiar, and there is no new technology.

Aircraft landings are subject to the management planning process as established by the *Canada National Parks Act*. This process is used to provide management direction for all activities within a national park and addresses cumulative effects at the park scale. The management plan sets limits or restrictions on aircraft use, if they are necessary to protect ecological integrity or visitor experience. All projects are required to comply with management plan directions and restrictions.

Public concerns are unlikely because the management planning process includes an extensive public consultation program and provides the management context for this activity.

Furthermore, these activities take place on federal land administered by Parks Canada and do not require referrals to other Federal Departments for authorization. Also, species at risk, as defined in the *Species at Risk Act* , are not negatively affected by the activities within the RCS and therefore there are no referrals required . Aircraft landings are well suited to the application of the class screening process because of the common characteristics, overlapping geographic and temporal scope, and the generally predictable and mitigable environmental effects.

1.4. Consultation

Consultation was conducted with Federal Departments and Agencies, other environmental assessment regimes, stakeholders and the general public.

1.4.1. Review and comments by Federal Departments and Agencies and other Environmental Assessment Regimes

Transport Canada, Department of Fisheries and Oceans, and Canadian Wildlife Service all reviewed a draft of the document. A draft of the RCS was also provided to the Environmental Impact Screening Committee (established under the Inuvialuit Final Agreement) and Nunavut Impact Review Board. Comments were incorporated into the final version of the RCS.

1.4.2. Public consultation during development of RCS

Public consultation took place at two stages during the development of the RCS: consultation conducted by Parks Canada as part of the development of the RCS, and consultation at the declaration stage conducted by the CEAA. The intent of consultation during the development of the RCS was to create awareness of the proposed replacement Class Screening process, to offer the opportunity to review the draft RCS, and to provide comments and suggestions to Parks Canada prior to their submission to the CEAA for declaration. Subsequently, the CEAA offered the public the opportunity to review the proposed RCS as part of the declaration process.

Aboriginal groups and cooperative management boards were consulted as part of the review of the draft replacement class screening. The stakeholder group considered most likely to have an interest in the class screening process was aircraft operators. Aircraft operators were concerned with the potential for additional restrictions and operational requirements that could be applied as mitigations. As a result of these concerns, additional opportunities for consultation were offered through the RCS development process to allow for early identification of issues.

1.5. Canadian Environmental Assessment Registry

The purpose of the Canadian Environmental Assessment Registry (the Registry) is to facilitate public access to records relating to environmental assessments and to provide notice in a timely manner of assessments. The Registry consists of two components – an Internet site and a project file.

The Internet site is administered by the Agency. The responsible authority and the Agency are required to post specific records to the Internet site in relation to a class screening report.

Upon declaration of the class screening report, the *Act* requires responsible authorities to post on the Internet site of the Registry, every three months, a statement of projects for which a replacement class screening report was used. The statement should be in the form of a list of projects, and will include:

- the title of each project for which the replacement class screening report was used;
- the location of each project; and
- the date when it was determined that the project falls within the category of projects covered by the report.

Further information regarding the Canadian Environmental Assessment Registry can be found in "The Canadian Environmental Assessment Registry", prepared by the CEAA.

2. Projects subject to the class screening

The scope of the class screening report includes aircraft landings businesses in eight northern national parks: Aulavik National Park of Canada (hereafter Aulavik), Auyuittuq National Park of Canada (hereafter Auyuittuq), Ivvavik National Park of Canada (hereafter Ivvavik), Kluane National Park and Reserve of Canada (hereafter Kluane), Quttinirpaaq National Park of Canada (hereafter Quttinirpaaq), Sirmilik National Park of Canada (hereafter Sirmilik), Tuktut Nogait National Park of Canada (hereafter Tuktut Nogait) and Ukkusiksalik National Park of Canada (hereafter Ukkusiksalik) (Figure 1). The aircraft include:

- Float plane landings
- Fixed-wing plane landings (skis and wheels)
- Helicopter landings

The following associated activities are included in this project: management of solid waste, management of human waste, management and handling of fuel, flight and operation of aircraft including approach and landing.

2.1. Projects subject to the Act

All businesses providing air access to national parks require a business licence in accordance with direction provided by section 4.1 of the *National Parks of Canada Businesses Regulations*. Section 13.1 of the *Inclusion List Regulations* under the *Act* defines recreational activities that take place outdoors in a national park, outside of a town or visitor centre, as projects under the *Act.* Aircraft landings are the major part of some recreational activities and enable other recreational activities to take place in these parks. Because a permit is required pursuant to subsection 5.1 of the *National Parks of Canada Businesses Regulations* (included in section 24.1 (Schedule I, Part II) of the *Law List Regulations* under the *Act*), the issuance of this authorization triggers the *Act* and an environmental assessment is required.

2.2. Projects excluded under the Act

The *Exclusion List Regulations* under the *Act* make no provision for excluding any type of business licences for companies offering aircraft access for recreational purposes.

2.3. Projects subject to replacement class screening

Projects subject to the RCS include business licences authorizing aircraft landings in Aulavik, Auyuittuq, Ivvavik, Kluane, Quttinirpaaq, Sirmilik, Tuktut Nogait and Ukkusiksalik.

2.4. Projects that require referrals to federal or territorial departments

As a result of land claim agreements, additional environmental assessment regimes apply in a number of the parks included in this RCS. Tuktut Nogait and Ivvavik are within the Inuvialuit Settlement Area. Therefore the "The Western Arctic Claim: The Inuvialuit Final Agreement" (IFA) (Indian and Northern Affairs Canada 1984) requires an environmental assessment in Tuktut Nogait for "every proposed development or consequence to the Inuvialuit Settlement Region that is likely to cause a negative environmental impact" section 13(7). In Ivvavik any "development activity" proposed within the park must undergo an environmental impact screening under the IFA. Business licences covered by this RCS are required to undergo an environmental assessment through the IFA process as well.

Auyuittuq, Quttinirpaaq, Ukkusiksalik and Sirmilik are all within the Nunavut Settlement Area. As a result, all project proposals submitted to the Nunavut Planning Commission that are consistent with the land use plan are forwarded to the Nunavut Impact Review Board for review.

2.5. Projects not subject to the RCS

Any activity not listed in Section 2.3 is not included within the scope of the RCS and must undergo an individual environmental assessment under the Act. An individual assessment is required if the business licence includes more activities than management of solid waste, management of human waste, management and handling of fuel, flight and operation of aircraft including approach and landing. The RCS may not be used if Parks Canada feels the proposed project does not fit the intent of the RCS for routine, easily mitigable projects.

Projects that are not suitable for application of the replacement class screening also include those that may adversely affect species at risk, either directly or indirectly (for example by adversely affecting their habitat). For the purposes of this document, species at risk include:

- Species identified on the List of Wildlife Species at Risk set out in Schedule 1 of the *Species at Risk Act (SARA*), and including the critical habitat or the residences of individuals of that species, as those terms are defined in Subsection 2(1) of the *Species at Risk Act;* and
- Species that have been recognized as "at risk" by COSEWIC or by provincial or territorial authorities or are identified on Schedule 2 or 3 of *SARA* (these species have been classified as at risk by COSEWIC, but prohibitions under *SARA* do not apply to them).

Proposed physical activities that have been previously assessed either under the *Act* or under the *Federal Environmental Assessment and Review Process Guidelines Order* may be exempted from further environmental assessment in accordance with conditions of section 13.1 of the *Inclusion List Regulations*.

Kluane is within the jurisdiction of the *Yukon Environmental And Socio-economic Assessment Act* (YESAA) which was given Royal Assent May 13, 2003 and came into force on November 13, 2004; however, the YESAAenvironmental assessment process will not be applied in the Yukon until the regulations are in place. Therefore, prior to the YESAA regulations the Canadian Environmental Assessment Act (the Act)will apply and following implementation of the regulations the Act will no longer apply and YESAA will apply in Kluane.

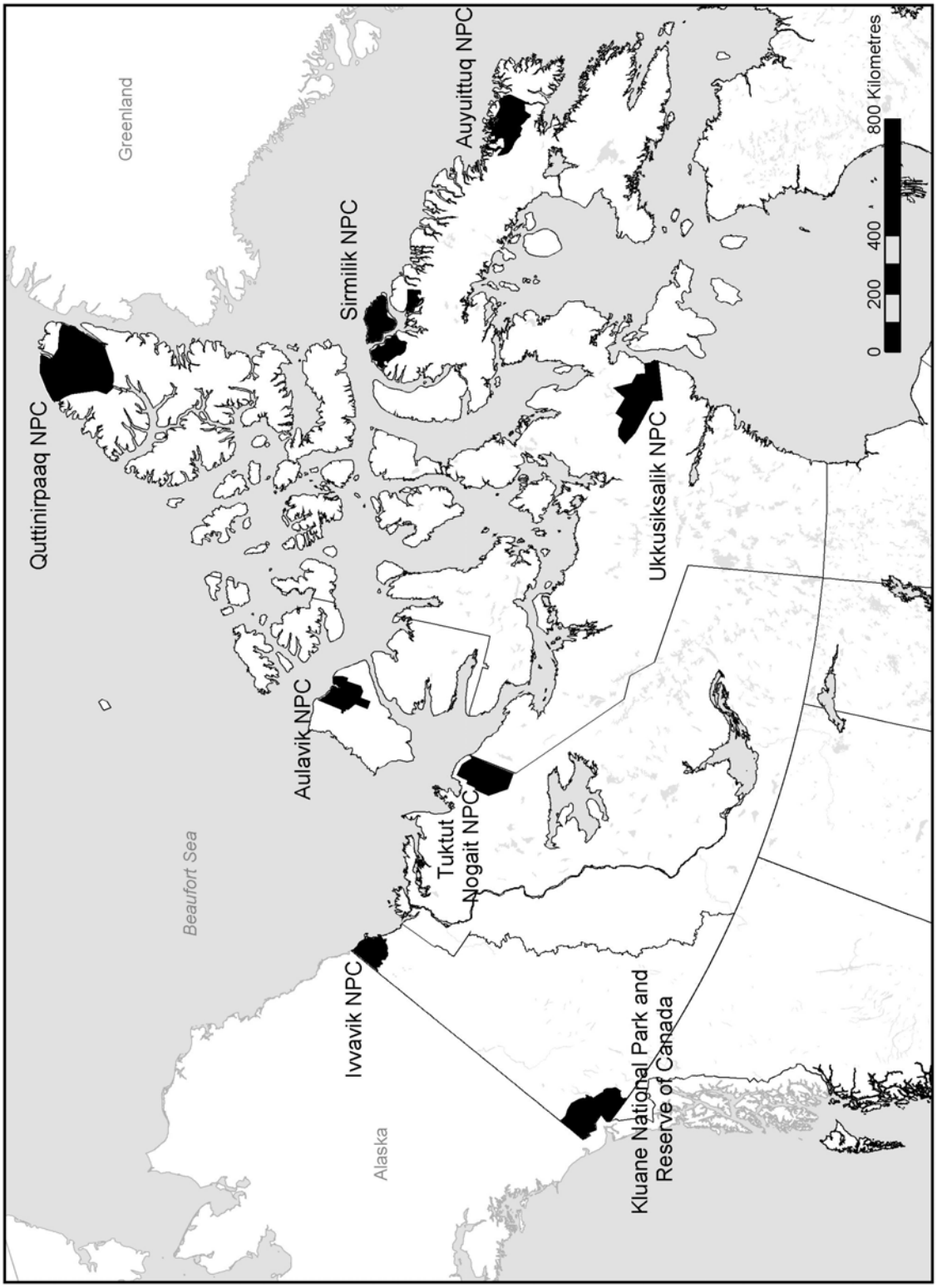

Figure 1. Location Map (NPC = National Park of Canada).

3. Project description

All the parks covered by this RCS, except Kluane, do not have road access. As a result, air access is the primary means of access to Aulavik, Ivvavik, Quttinirpaaq, Tuktut Nogait and Ukkusiksalik. Auyuittuq and Sirmilik are more commonly accessed by water, but air access is occasionally used. Many areas in Kluane are accessible by road; however, the park is very large and as a result some areas, particularly the icefields are more easily accessed by air. Aircraft access has been used in all of these parks since their creation (Kluane and Auyuittuq in 1976; Ivvavik in 1984; Quttinirpaaq in 1988; Aulavik in 1992; Tuktut Nogait in 1996; Sirmilik in 1993; Ukkusiksalik in 2003).

Three types of aircraft can operate in these parks, helicopters, fixed-wing floatplanes, and fixed-wing planes with wheels or skis. Typical activities associated with business licences for aircraft landings include the following: management of solid waste, management of human waste, management and handeling of fuel, flight and orientation of aircraft, approach and landing The geographical scope of the activities is limited to Aulavik National Park of Canada, Auyuittuq National Park of Canada, Ivvavik National Park of Canada, Kluane National Park and Reserve of Canada, Quttinirpaaq National Park of Canada, Sirmilik National Park of Canada, Tuktut Nogait National Park of Canada and Ukkusiksalik National Park of Canada (Figure 1). Some components of the environment may be affected beyond park boundaries, therefore those components will be assessed at larger scales as described in Section 5.3. All associated activities conducted under business licences for aircraft landings for recreational purposes in these parks will be assessed under this class screening.

Management of solid waste

Garbage can be produced from activities inside the aircraft on route to the park or immediately outside the aircraft. Typical garbage would be packaging around food products.

Management of human waste

Passengers or pilots may need to defecate and/or urinate while on the ground in the park. In most cases there are no washroom facilities at the landing site. Limited soil in arctic environments, slow decomposition rates in the north and the concentration of people around landing sites make this a significant concern.

Management and handling of fuel

At times it will be necessary to transport fuel into the park. Refuelling of aircraft may be necessary in Ivvavik, Quttinirpaaq, Aulavik, and Ukkusiksalik. This involves bringing in 45 gallon drums for refuelling. These drums are stored for a few months in the park, the fuel is used and the drums are removed before winter.

Flight and operation of the aircraft

This activity involves running the aircraft engine and flight over the park. Aircraft operations are under the jurisdiction of Transport Canada and all applicable regulations must be followed. In addition, a recommendation is made in the Aeronautical Information Publication for Canada that flights be at least 2000 ft above national parks.

Approach and landing

This activity involves the aircraft descending to a lower altitude to approach the landing area or take-off from the landing area. It also involves landing on water with a floatplane or landing on a landing strip for helicopters and fixed-wing aircraft with wheels or skis. Other typical activities on the ground could include unloading/loading gear and people, walking around and having lunch. Aircraft are not allowed to land in Zone 1 areas as designated in the park management plan. The vast majority of landings occur at 22 designated landing sites located in five of the parks; however, a few will occur at other locations. In Tuktut Nogait, aircraft are allowed to land on any water body and no sites have been designated in Sirmilik and Auyuittuq because flights are not as common. Aircraft landing areas are typically:

- Well drained, and not susceptible to erosion;
- Level, smooth and firm;
- Not covered with thick vegetation;
- At least about 250m in length; and
- Near hiking/water sites of interest (Elliot and Elliot 1978).

Typically fewer than 500 aircraft landings for visitor use occur in each park each year.

3.1. Typical seasonal scheduling and duration of projects

Due to the extreme weather and seasonal nature of visitation to the northern national parks, aircraft landings are generally between March and November, with the majority in the summer months. Aircraft landings usually involve minimal amounts of time on the ground. In most cases, the aircraft drops people off and then leaves while they participate in the recreational activity. In some cases, the aircraft may wait several hours while visitors explore the site.

3.2. Effects of the environment on the project

Reduced visibility due to cloud, snow and dust, extreme winds, icing conditions, storms, and unstable landing areas (shallow or short water landing areas, avalanches, icefalls, rockfalls, and crevasses in glaciers), could all affect the ability of the aircraft operator to implement the mitigation and to fly and land safely. Accidental plane landings are possible as a result of the effects of the environment and the environmental effects analysis will be addressed as accidents/malfunctions in Section 4.5.

3.3. Accidents/malfunctions

Two types of accidents and/or malfunctions could occur. Aircraft landing, taking-off and flying could involve malfunctions or accidents. Accidents could also occur when refuelling, spilling fuel. Emergency planning and mitigation will prevent most accidents.

4. Environmental effects assessment

The approach of the environmental assessment must remain consistent with management directions already initiated with respect to ecological and cultural integrity and the quality of visitor experience as outlined and assessed in individual park management plans. Existing management direction is used to focus the environmental assessment on the most relevant management issues. The mitigation identified within the RCS will be consistent with the management plans, human use strategies and any other appropriate guiding documents.

Mitigation was identified based on an analysis of the interaction of the project activities with environmental components. Potential impacts and mitigations were identified through searches of literature and best practices in other areas. Parks Canada staff in the field units and Parks Canada guidance documents provided further mitigation. Site-specific mitigation has been identified for areas sensitive to aircraft overflights and landing locations. The mitigation identified within the RCS will be consistent with the management plans, human use strategies and any other appropriate guiding documents.

4.1. Land use and management in the national parks

An understanding of the land use and management system in the national parks is fundamental to the analysis and evaluation of environmental impacts. The discussion on land use and management in the northern national parks is divided into discussions on Aboriginal land use, national park zoning and visitor use of the parks.

4.1.1. Aboriginal land use

Under the land claim agreements with authority in these parks, Aboriginal people are given access to the parks for traditional activities (see individual agreements for details). Traditional activities can include travel, camping, gathering, hunting and trapping. In some cases these activities take place near areas used by visitors. Informal communication between Aboriginal groups and park staff is used to try to minimize the number of conflicts between visitors and traditional users. References to “visitors” within this environmental assessment do not refer to Aboriginal people.

4.1.2. National park zoning system

The national parks zoning system is an integrated approach to the classification of land and water areas in the national parks. Areas are classified according to the need to protect the ecosystem and the parks’ cultural resources. The capability and suitability of areas in terms of providing visitor use opportunities is also a consideration in making decisions about zoning. The zoning system has five categories, four of which are applicable in the northern parks (Canadian Heritage Parks Canada 1994).

As the zoning system generally addresses the appropriate types and intensity of visitor use in a given area it is relevant and should be considered in the assessment and management of commercial guiding activities.

Zone I – Special Preservation
Zone I lands deserve special preservation because they contain unique, threatened, or endangered natural or cultural features and are excellent examples of representative natural regions. Aircraft access is not permitted in these small areas.

Zone II – Wilderness
Zone II contains extensive areas that are good representations of a natural region and are conserved in a wilderness state. The perpetuation of ecosystems with minimal human interference is the key consideration. Motorized access is not permitted, with the possible exception of strictly controlled air access in remote northern parks. Zone II covers most of the parks involved in this RCS.

Zone III – Natural Environment
In Zone III areas, visitors experience the park's natural and cultural heritage through outdoor recreational activities that require minimal services and facilities of a rustic nature. Only small areas in the parks in this RCS are Zone III.

Zone IV – Outdoor Recreation
Zone IV accommodates a broad range of opportunities for understanding, appreciation and enjoyment of the park's heritage. Direct access by motorized vehicles is permitted. Zone IV generally includes frontcountry facilities and the rights-of-way along park roads. Zone IV nodes also exist at various locations with intensive tourism and recreation facility development such as campgrounds, visitor centers and day use areas. Of the northern national parks, Zone IV only occurs in Kluane.

Ecologically Sensitive Sites
The Environmentally Sensitive Site or Area (ESS, ESA) designation applies to areas with significant and sensitive features that require special protection.

4.1.3. Visitor use

Kluane, the most visited northern park, has been known as a premier wilderness destination for the past twenty years, offering hiking and mountaineering opportunities in spectacular locations (Table 1). Water-based activities have included rafting, kayaking and boating. These activities will be further encouraged in the future. Winter activities include cross-country skiing, backcountry ski touring and dogsledding. Recently there has been a greater emphasis on cultural tourism and the park expects this aspect to further develop over time. Visitors come to the park for a portion of a day or for multi-day trips. The frontcountry areas can be accessed by the highway through the park. Visitors enter some backcountry areas by air (Parks Canada 2002a).

Other northern parks receive less visitation. Auyuittuq visitation is the second highest in the parks covered by this screening, with most visitor hiking the Akshayuk Pass (Table 2). In Ivvavik most visitor use is rafting, kayaking and hiking in the Firth River corridor. The other northern parks are beginning to develop hiking and some canoeing visitation. In Nunavut tourism is expected to continue to grow and eventually become the second

most important economic sector in the territory. Consequently, an increase in the number of visitors to the national parks in Nunavut is also likely (Vail and Clinton 2002).

Table 1. Total number of visitors to parks.

Park	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Ukkusiksalik[a]	-	-	-	-	-
Tuktut Nogait	0	2	21	14	1
Aulavik	55	30	72	88	88
Ivvavik	210	128	155	165	150
Sirmilik[b]	-	-	-		328
Quttinirpaaq	508	192	192	192	435
Auyuittuq	1191	467	364	413	508
Kluane[c]	62737	59501	49437	48385	47512

[a] Ukkusiksalik was designated a national park in 2003.

[b] Sirmilik was designated a national park in 2000.

[c] Kluane total for 2001-2002 includes estimated numbers for three months of the year (Parks Canada 2002d)

4.2. Description of natural and cultural resources

The description of natural and cultural resources is divided into vegetation and soil, wildlife, aquatic resources and cultural resources. Within each of these categories the discussion will be separated by park.

4.2.1. Vegetation and soil

Vegetation in the northern national parks of this class environmental assessment varies from boreal to arctic. The parks will be described individually based on the description of the ecoregion they fall within. The descriptions of ecoregions are taken from *A National Ecological Framework for Canada* (Ecological Stratification Working Group 1996). There are no vegetation species at risk in these parks.

4.2.1.1. Aulavik

Aulavik is found in the Banks Island Lowland ecoregion. Moss with low growing herbs and shrubs such as purple saxifrage, *Dryas spp.*, arctic willow, kobresia, sedge and arctic poppy is the main vegetation cover. Turbic Cryosols soils cover hills of glacial deposits. The permafrost is deep and continuous with high ice content. Wetlands include fens, elevated peat mound bogs and marshes along the coast.

4.2.1.2. Auyuittuq

Auyuittuq is mainly found in the Baffin Mountains ecoregion. Vegetation is sparse with discontinuous mosses, lichens, sedge and cotton grass. Bare bedrock is common. The permafrost is deep and continuous with low ice content. Turbic Cryosols are found on colluvial, alluvial and morainal deposits.

4.2.1.3. Ivvavik

Ivvavik is mainly found in the British-Richardson Mountain ecoregion, but also has parts in the Old Crow Basin ecoregion and the Yukon Coastal Plain ecoregion. The alpine areas of the British Richardson Mountains have tundra composed of lichens, mountain avens and others. The subalpine areas have woodland vegetation with stunted white spruce, willow and other shrubs. The Yukon Coastal Plain is covered by shrubby tundra vegetation (dwarf birch, willow, Labrador tea etc.). The Mackenzie Delta has ground cover consisting of dwarf birch, willow, ericaceous shrubs, cottongrass, lichen and moss. Localized impacts on vegetation may be found in the Firth corridor due to trampling by people.

Most of Ivvavik was not covered with glaciers during the last glaciation. As a result the mountains have been shaped by river and stream erosion and soils have been weathered for millions of years. Continuous permafrost covers the area from 50 cm to many hundreds of metres in depth.

4.2.1.4. Kluane

Kluane is mainly found in the St. Elias Mountains ecoregion, but also has parts in the Mount Logan, Yukon-Strikine Highlands, and Ruby Ranges ecoregions. Kluane is dominated by two major mountain ranges: St. Elias Mountains and the Kluane Ranges. These spectacular mountains include the highest mountain in Canada and one of the youngest mountain ranges in North America. The northern and eastern parts of the park are in the lee of these mountains making the climate more arid. Glaciers and icefields influence ecological processes in the whole area. Continuous permafrost underlies the northern portion of the park, with the majority of the park having discontinuous permafrost (Environment Canada 1987).

Approximately 18% of the park is vegetated. The vegetation can be divided into 3 major zones: the montane zone, the subalpine zone and the alpine zone. The montane zone covers 7% of the park including the valleys and land up to 1080 or 1100 m in elevation. The vegetation is predominantly white spruce with some marshes, fens, shrubs and herb communities. The subalpine zone is between 1080 and 1370-1400 m in elevation. Tall shrubs, mainly willow, are most common with occasional white spruce. In the alpine zone above 1400 m in elevation, low krummholz shrub communities, dwarf vascular plants and alpine tundra are found (Environment Canada 1987).

4.2.1.5. Quttinirpaaq

Quttinirpaaq is found in the Eureka Hills, Ellesmere Mountains and Ellesmere Ice Caps ecoregions. Vegetation is sparse. Moss, lichen and cold-hardy vascular plants such as sedge and cottongrass are found in clumps. Occasionally arctic willow, *Dryas spp*., kobresia, sedge and arctic poppy are found. Regosolic static, regosolic turbic cryosols, and orthic turbic crosols are found on colluvial, alluvial and marine deposits. Ice fields and nunataks are common.

4.2.1.6. Sirmilik

Sirmilik is primarily found in the Borden Peninsula Plateau and Baffin Mountain ecoregions. Sparse vegetation includes moss, low-growing herbs and shrubs. Common species include purple saxifrage, *Dryas spp.,* arctic willow, kobresia, sedge and arctic poppy. Other areas have a discontinuous cover of mosses and lichens with some sedges and cottongrass. Deep continuous permafrost covers the area with medium ice content. The soils are regosolic turbic cryosols with regosolic static cryosols on glacial deposits. Bedrock is also common.

4.2.1.7. Tuktut Nogait

Tuktut Nogait is found in the Coronation Hills and Bluenose Lake Plain ecoregions. Dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium spp.* form an almost continuous vegetation cover. Warmer sites can have tall dwarf birch, willow and alder and wetter sites have willow and sedges. Continuous permafrost with medium ice content underlies the area. Organic Cryosols and Turbic Cryosols cover undulating glacial tills, fluvioglacial and marine deposits.

4.2.1.8. Ukkusiksalik

Ukkusiksalik is located in the Wager Bay Plateau Ecoregion. The vegetation is a discontinuous cover of dwarf birch, willow, northern Labrador tea, *Dryas spp.* and *Vaccinium spp.* Warmer sites have taller shrubs and wet sites mainly are covered by willow and sedges. Permafrost is continuous with low ice content. The soils are turbic and static cryosols on thin, sandy moraine and alluvial deposits. Regosolic static cryosols are found along the coast.

4.2.2. Wildlife

Wildlife in the national parks in this class environmental assessment can be harvested by Aboriginal people for subsistence use. The regulation of this activity and the management of wildlife populations is the responsibility of cooperative management boards established under land claim agreements (except in Kluane). In the Western Arctic, the Wildlife Management Advisory Council and Fisheries Joint Management Committee have these responsibilities for Ivvavik, Aulavik and Tuktut Nogait; in the Eastern Arctic the Nunavut Wildlife Management Board has these responsibilities. In all cases the boards work cooperatively with hunters and trappers committees/associations, the territorial government, other federal departments and Parks Canada. In Kluane, Parks Canada has jurisdiction over the wildlife in the park, but works cooperatively with the cooperative management board and surrounding land management agencies to establish no harvest zones and manage wildlife populations.

The birds and mammals will be described for each park. Species at risk are found in each park and identified in the following sections. Marine mammals will be described in Section 5.2.3.1, Marine Aquatic Resources.

4.2.2.1. Aulavik

Aulavik is home to a large population of muskox that has grown exponentially in the latter part of the 20th century. Populations of muskox on Banks Island approach one animal per square kilometre with Aulavik representing the major portion of habitat use. Peary caribou during this same period have shown a sharp decline in population to about 1196 individuals. The Banks Island population of Peary caribou has been listed as endangered on Schedule 2 of *SARA*. Visitors to the Thomsen River corridor commonly see arctic wolves. Other common mammal species include lemmings, arctic fox, and arctic hares. The only mammal species of special concern in Aulavik is the polar bear on Schedule 3 of *SARA*.

As with mammals, bird species in Aulavik may be limited in diversity but high in density. There are a total of 43 known species recorded for Aulavik of which only the raven and the ptarmigan are year-round residents. The most significant bird population is lesser snow geese. The largest concentration of lesser snow geese in the Western Arctic breed and moult in the area. The Thomsen River and Castel Bay area was created as a bird sanctuary for protection in 1961 (Grayhound Information Services 1997). Other common species include: loons, gulls, brant geese, sandhill cranes, ptarmigan, and Lapland longspur. The only bird species of special concern in Aulavik is the peregrine falcon (*Falco peregrinus tundrius*), Schedule 3 of *SARA*.

4.2.2.2. Auyuittuq

Small mammals such as lemmings, arctic foxes, arctic hare and ermine live in Auyuittuq. Barren-ground caribou, polar bears (listed as species of special concern on Schedule 3 of *SARA*) and arctic wolves can also be found in the park. The limited amount of suitable breeding habitat and low biological productivity restrict the number of birds found in Auyuittuq (40 species of birds are found in Auyuittuq) (Canadian Parks Service 1989). The Ivory gull is listed as "special concern" on Schedule 1 of *SARA*, migrates through Auyuittuq.

4.2.2.3. Ivvavik

Four key wildlife species in Ivvavik, Yukon, are given special management: peregrine falcons, grizzly bears, Porcupine caribou, and muskox. The grizzly bear is considered "a species of special concern" on Schedule 3 of *SARA* and is of particular concern because of the potential dangers to visitors. The Porcupine caribou herd contains approximately 123 000 animals using the park on the coast for calving and post-calving. Muskox were extirpated from the Yukon and Alaska North Slope between 1858 and 1865, but reintroduced in 1935, 1936 and 1969. The muskox is considered a specially protected wildlife species under the *Yukon Wildlife Act*. Today approximately 700 live in the Yukon and Alaska North Slope. Approximately 143 bird species, moose, Dall's sheep, and numerous other species of wildlife also live in the area (Weerstra 1997). Short-eared owls, wolverines, peregrine falcons (*Falco peregrinus tundrius*), grizzlies and polar bears are species of special concern according to Schedule 3 of *SARA*.

4.2.2.4. Kluane

A wide variety of wildlife species live in Kluane, Yukon, including: grizzly bears, Dall's sheep, mountain goats, wolves, lynx, wolverines, coyotes, and a small population of woodland caribou. Grizzly bears, wolverines and woodland caribou are considered species of special concern (grizzly bears and wolverines are on Schedule 3 of *SARA*, woodland caribou will be added to Schedule 1 following public consultation). The current status and vulnerabilities of grizzly bears, Dall's sheep, mountain goats, and moose are documented in a recent cumulative effects analysis with the populations considered stable, although in some cases vulnerable to specific disturbances in certain areas (Slocombe et al. 2002). Mule deer, cougars, gyrfalcons, and peregrine falcons are specially protected by the *Yukon Wildlife Act*. Over 180 species of birds are present in the park, including threatened peregrine falcons (*Falco peregrinus anatum*), (listed on Schedule 1 of *SARA*) and short-eared owls (listed as a species of special concern on Schedule 3 of *SARA*).

4.2.2.5. Quttinirpaaq

Smaller mammals such as lemmings, arctic fox, arctic hare and ermine are found in the park. Endangered Peary caribou (listed on Schedule 2 of *SARA*), muskoxen, and occasionally polar bears (listed as special concern on Schedule 3 of *SARA*) or arctic wolves are found in the park. Quttinirpaaq is north of the typical range for many bird species and has less regularly open sea water than other arctic areas. As a result, only 22 species are regularly observed there. Only the rock ptarmigan and occasionally the black guillemot winter in the park (Parks Canada 1994). The ivory gull, considered of "special concern" on Schedule 1 of *SARA*, is seen in Quttinirpaaq, but has not been seen nesting in the park.

4.2.2.6. Sirmilik

Smaller mammals such as lemmings, arctic fox, arctic hare, and ermine live in Sirmilik. Polar bears (listed as special concern on Schedule 3 of *SARA*) are found in the park, and arctic wolves, red fox and wolverines (listed as special concern on Schedule 3 of *SARA*) may be occasionally found in the park. Large colonies of waterfowl/sea birds are a distinctive feature of this area. More than 70 species of birds can be found in Sirmilik. A large population of greater snow geese nest in Sirmilik. The geese that nest in this area are estimated to be more than 35% of the total breeding population. The largest colony of black-legged kitiwakes is located near Cape Hay, with a second one near by. Similarly Cape Hay has one of the four largest colonies of thick-billed murres in Canada (Zoltai et al. 1983). The most diverse avian community north of 70^{o}N lat. lives in the park and area. Bylot Island, within the park, is a designated bird sanctuary. The ivory gull, considered "special concern" and protected by *SARA*, migrates through Sirmilik.

4.2.2.7. Tuktut Nogait

Tuktut Nogait was created to protect the calving grounds of the Bluenose herd of barren ground caribou. A recent population estimate of the herd is 75 000 adults. Wolverine, grizzly bear, fox, lemming, and voles are also common to the park.

There are 74 known bird species for Tuktut Nogait with a wide variety of waterfowl, shorebirds, raptors, and songbirds. The Park is known for concentrations of raptor nesting habitat along the canyon and cliff walls. Species of special concern on Schedule 3 of *SARA* in Tuktut Nogait include the grizzly bear, wolverine, short-eared owl and peregrine falcon (*Falco peregrinus tundrius*).

4.2.2.8. Ukkusiksalik

Numerous smaller mammals live in the park from arctic hare and lemmings to furbearers such as red fox. Barren ground caribou, polar bears (listed as special concern on Schedule 3 of *SARA*), wolverines (listed as special concern on Schedule 3 of *SARA*) and arctic wolves are also found in the park. Raptors such as peregrine falcons (listed as special concern on Schedule 3 of *SARA*), gyrfalcons and rough legged hawks live in the areas with a wide range of tundra birds totalling 69 species. Common eider and Black guillemot colonies and numerous other sea birds are found in Wager Bay (Zoltai et al. 1987).

4.2.3. Aquatic resources

The boundaries of Aulavik, Auyuittuq, Ivvavik, Sirmilik, Quttinirpaaq and Ukkusiksalik contain salt-water bays and other marine components. Marine mammals, anadromous fish and marine fish live in these waters. Both the western arctic population of bowhead whales found in Ivvavik and the high arctic population found in Sirmilik, Auyuittuq and Ukkusiksalik are listed as endangered on Schedule 2 of *SARA*; the eastern high arctic population of beluga whales is found in Sirmilik is of special concern on Schedule 3 of *SARA*. The northeast pacific transient population of killer whales found in Ivvavik is threatened and protected under *SARA* (Schedule 1). Several species of seals are found in Aulavik, Auyuittuq, Quttinirpaaq, Sirmilik, and Ukkusiksalik. Walruses are found in Sirmilik and may be found in Auyuittuq.

Fresh water resources are limited in many of the parks due to low precipitation and permafrost that prevent groundwater storage. Ponding and imperfect drainage are common in areas such as the Arctic Coastal Plain of Ivvavik, Aulavik, Tuktut Nogait and the Hazen Plateau in Quttinirpaaq. Rivers and streams are often fed by glacier melt or snowmelt and therefore have the largest volume in the spring and can vary dramatically in volume.

Growth rates and sexual maturity of northern fish populations are often retarded due to short growing season and low nutrient levels. However, seasonal abundance of insects and low metabolic requirements can create an older population of large fish. There is limited diversity of species although there can be large concentrations of resources in specific habitats. Important habitat types include estuaries, aufeis areas, fish holes, and deep lakes. Areas of fish congregation are often also areas of local concern for traditional use and continued success of migratory populations.

The fourhorn sculpin found in Aulavik is considered a species of special concern. Kluane also has important populations of landlocked Kokanee salmon (Parks Canada 2002a). Ivvavik has landlocked populations of Dolly Varden in areas which escaped the

last period of glaciation and may prove genetically important. Specific aquatic sites commonly used for aircraft landings will be described in Section 5.2.5.

4.2.4. Cultural resources

The most vulnerable cultural resources in these parks consist of a few remnant buildings, and surficial features such as graves and caches in parks other than Kluane. Cultural resources would only be affected if they were present at the landing sites. Only a few common landing locations are located near cultural resources. These will be described in Section 5.2.5.

4.2.5. Site specific

In many of the parks, designated landing sites will be the most commonly used areas for landing. As a result, each of these designated landing sites will be further described below. For each of the sites it is indicated whether the site is used by fixed-wing aircraft landing on land (wheels) or water (floats). Helicopters can land at any of the sites described below. Sirmilik and Auyuittuq do not have any designated landing sites.

Ivvavik

Stokes Point (wheels) and Komakuk Beach (wheels)

These airstrips have been modified to provide gravel landing surfaces. They are located on the coast at former Dew Line sites which are heavily impacted. There is still an operational radar facility at Stokes Point operated by the Department of National Defence. The airstrips are located in the coastal plain which is a special protection area for protection of waterfowl (staging, moulting and breeding) and the protection of the Porcupine caribou herd which calve throughout the plain between mid-May and mid-June. Grizzly and polar bears are frequently encountered in coastal areas.

Nunaluk Spit (wheels and floats)

The airstrip is located on a gravel spit adjacent to the ocean with only occasional plants. Polar bears and occasionally grizzly bears wander along the spit. The lagoon is identified as critical habitat for cisco and least cisco (Canadian Parks Service 1993). The spit is prone to storm surges and has been proposed as a site for a cabin (See Parks Canada Environmental Assessment #IN-03-01 for more information).

Margaret Lake (wheels and floats)

This landing area is within the treeline in an open area with dryas and occasional willow. It is an old riverbed and is subject to erosion and flooding.

Sheep Creek (wheels)

This site is an elevated fluvial deposit that is well drained and within the treeline. It is open with tundra vegetation. A heavily impacted facility area located here predates the park establishment.

Babbage Strip (wheels)

The landing strip is located on an exposed ridge-top composed of gravel and non-soil with only 10% vegetative cover. Caribou move into this area during mid-July to late

August to escape insects. Grizzly bears, foxes, peregrine falcons, and other birds are found in the area (see Parks Canada Environmental Assessment #IN-03-03 for more information).

Kluane
Five landing locations are on glaciers: Quintino Sella Glacier, Hubbard Glacier, Cathedral Glacier, South Arm Kaskawulsh Glacier and Dusty Glacier. The landing areas are ice and snow and rock. They are located near the popular climbing areas and bigger peaks. They are further away from productive areas, but wolverines, birds and other wildlife do move through these areas. Nunataks are home to pikas, bears and Dall's sheep.

The following locations are within the green belt.

Bighorn Lake (wheels or floats)
Fixed-wing aircraft land on water or on a gravel bar. Helicopters land in a dry meadow near a warden's cabin. The shoreline is shallow, therefore people must get out of the plane and walk to shore. Red throated phalaropes and other ducks are found along the shore. A wolf den is located within approximately 5 km. It is a productive area for Dall's sheep and average for grizzlies.

Lowell Lake and Lowell Lake Bar (wheels)
Landings occur on a gravel bar, most often to support rafting on the Alsek River, although sometimes also for hiking. The lake has a high sediment load. The Lowell Lake area is a grizzly bear movement corridor and near mountain goat habitat protected by a Zone 1 area.

Onion Lake (floats)
Helicopters land on an old landing strip and fixed wing aircraft land on the water. Currently, no recreational use occurs at this airstrip. There is a moose rutting area near this airstrip, from approximately the second week in September. Gyrfalcons and mountain goats are also found in this area. This is the northern edge of the mountain goat range and they give birth to their young mid May to mid June. The vegetation is willow, onion, hummocky grass, around this receding lake.

Aulavik
All of the landing sites in Aulavik are for aircraft with wheels. There is little species specific information known about these sites.

South Boundary Landing Site (wheels)
This site has tundra vegetation on till. Ponding is common in the area.

Polar Bear Cabin (wheels)
This site is a gravel terrace with sparse vegetation. It has been heavily impacted due to operations that predate park establishment.

Muskox River Junction with Thomsen (wheels)
This site is on the gravel of river shoreline below the high water mark. There is sparse vegetation.

Castel Bay (wheels)
This site is located on a river island. Tundra vegetation covers well drained soils.

Green Cabin (wheels)
This site has tundra vegetation on till. Ponding is common in the area.

Quttinirpaaq
Tanquary Fiord Warden Station
There is a high level of use of this site by the Canadian Department of National Defence. This site consists of a large fuel cache, multiple buildings (weather havens, Quonset Hut), a large airstrip, and power generation through wind, solar and generator.

Lake Hazen Warden Station
This site consists of limited park facilities, two landing sites, and a limited fuel cache. Located in the most ecologically sensitive part of the park, activity here has the potential to seriously impact ecological resources. Standards for human use management in the Lake Hazen Basin will be established. Base campers will have specific conditions attached to any permit.

Ward Hunt Island Camp
This site consists of a landing site, small fuel cache and historic buildings.

Tutktut Nogait
All designated landing sites in Tuktut Nogait are on the water and are accessed by float planes. The following waterbodies are used for aircraft landings: Canoe Lake (outside the park but in an area that may become part of the park), Brock Lake, Hornaday Lake, Cache Lake (raptors nest in this area), Long Lake and Seven Island Lake. Shoreline effects or other impacts have not been noted at any of these locations. These landing sites are presently seeing only occasional use and are rarely visited each year.

Ukkusiksalik
Sila Lodge
Landing site for aircraft. Caribou utilize this area during the summer time.

4.3. Valued ecosystem components and boundaries

The environmental assessment of aircraft landings is based on the factors outlined in section 16(1) of the *Act*. However, in order to focus the assessment, valued ecosystem components (VECs) were selected. Park management plans are developed with extensive consultation and describe indicators of ecological integrity and an ecological vision of the park for the future. These indicators and ecological vision indicate that wildlife, vegetation/soils, water quality, and air quality are valued for their contributions to the maintenance of ecological integrity in all of the northern parks covered by the RCS. As

described below, each of these also has the potential to be affected by the aircraft landing activities. In addition to the ecological VECs, cultural resources, Aboriginal land use, and visitor experience will be considered as described below.

Vegetation and soils
Aircraft landings cause soil compaction and associated changes to the vegetative cover of designated landing strips. These impacts are local in nature and their extent depends upon the soil or non-soil being directly affected. There are no vegetation species at risk in the areas affected by this class screening. Vegetation and soils will be assessed within the park boundaries.

Wildlife
Impacts to all wildlife species will be considered, although special consideration will be given to species highlighted in management plans and species at risk. Wildlife can be negatively affected by aircraft noise, disturbing behaviour and displacing wildlife. Waste could attract wildlife, and changes to water quality may decrease habitat quality for wildlife. Effects to wildlife will be assessed at the population scale which can include wildlife beyond park boundaries.

Water quality
The activities covered by the RCS are not expected to have direct impacts on aquatic species. However, water quality could be impacted by pollution from garbage, human waste or erosion from aircraft landings. Impacts to water quality may result in subsequent impacts to aquatic wildlife and vegetation species. Large effects to water quality could move beyond park boundaries. These effects would only occur in the case of a large accident, a very rare occurrence.

Air quality
Aircraft operation involves the release of emissions that could harm air quality. Air quality could be affected beyond the park boundary, therefore effects will be assessed in the global context.

Cultural resources
Parks Canada policy states that "Parks Canada will assess effects on cultural resources whether or not they flow from bio-physical effects" (Parks Canada 1998). To address both the requirements of the *Act* and of Parks Canada's policies, direct impacts to cultural resources will be assessed in addition to indirect impacts caused as a result of changes in the environment. Cultural resources could be affected by aircraft landings and by people on the ground within park boundaries.

Aboriginal land use
Traditional activities are protected by land claims and valued as part of these national parks. As a result, direct and indirect effects will be considered. Aircraft landing activities could directly affect Aboriginal land use if visitors interfered with use or indirectly affect Aboriginal use (for example negatively affect wildlife populations; therefore, decreasing hunting opportunities) within national park boundaries.

Visitor experience
As described in Section 1.1.3, Parks Canada has a mandate to facilitate the education and enjoyment of the parks by the public. To address this mandate, direct impacts to visitor experience will be assessed in addition to indirect impacts caused as a result of changes in the environment. Aircraft overflights could disturb the wilderness experience of visitors within national park boundaries.

4.4. Analysis of effects and mitigation

Table 2 identifies potential environmental effects of project activities. For each of the project activities the environmental effects identified in Table 2 are described below. Mitigation is identified to minimize environmental effects.

4.4.1. Management of solid waste

Improperly managed solid waste can attract wildlife; contaminate vegetation, soil and water when it decomposes; and, diminish the experience for visitors and Aboriginal people using the land.

4.4.1.1. Environmental effects

Wildlife attraction
Improperly managed solid waste can attract wildlife. Wildlife attracted repeatedly to human garbage and activity can become habituated. Animals and birds may beg for or steal food at lunch. This type of behaviour may lead to animals becoming a nuisance and altering their natural feeding habits. Wildlife that become threats to public safety (black bears, grizzly bears and polar bears) may be removed, relocated or destroyed.

Contamination of vegetation, soil and water
The decomposition of garbage on the soil or in the water could release toxic chemicals that would be harmful.

Diminished visitor experience and Aboriginal land use experience
The presence of garbage can detract from the wilderness experience visitors seek in these parks. Similarly, Aboriginal land use experience could be diminished. Litter in an Arctic environment does not biodegrade readily and may be visible for several years. The problem could increase if visitor use increases.

Table 2. Potential environmental effects of project activities.

	Project Activities					
VEC	**Management of solid waste**	**Management of human waste**	**Management and handling of fuel**	**Flight and operation of the Aircraft**	**Approach and landing**	**Accidents/Malfunctions**
Wildlife	Wildlife Attraction	Negative secondary impacts on wildlife health	Contamination	Wildlife disturbance	Wildlife disturbance	Wildlife destruction or damage from fuel spill or aircraft accident
Vegetation and Soil	Contamination		Contamination		Soil compaction, soil erosion, damage/ destruction of vegetation	Vegetation destruction or damage and soil contamination from fuel spill or aircraft accident
Water Quality	Contamination	Contamination	Contamination			Contamination from fuel spill or aircraft accident
Air Quality				Global air pollution and global warming		
Cultural Resources					Damage/ removal of cultural resources	Cultural resources damage or destruction from fuel spill or aircraft accident
Aboriginal Land Use	Decreased quality of land use experience	Decreased quality of land use experience		Reduced hunt success, Decreased quality of land use experience	Decreased quality of land use experience	Aboriginal land use experience could be diminished by a fuel spill.
Visitor Experience	Diminished Visitor Experience	Diminished Visitor Experience		Reduced wilderness experience and quiet Positive experience from viewing the park from aircraft	Decreased and increased visitor experience	Visitor experience could be diminished by a fuel spill.

4.4.1.2. Mitigation

Operators shall:

- Remove all solid waste brought into the park on the same trip as it was brought in.
- Refrain from burning solid waste as this is not allowed.

4.4.2. Management of human waste

If human waste is not properly disposed of, water quality can be negatively affected and the experience of visitors and Aboriginal people on the land can be diminished.

4.4.2.1. Environmental effects

Contamination of water quality (including disease distribution) and secondary impacts on human health, aquatic species, and land wildlife
Potential impacts of human waste on water quality can be chemical and bacteriological. They may include impacts to water clarity, water quality, aquatic species populations and distribution, and habitat change (Parks Canada 2002b). Sources for drinking water and human waste disposal are concerns as they can impact both human health and the environment. There are also potential impacts to aquatic species such as fish, amphibians, birds and mammals that use the aquatic environment as a food source.

Drinking water can be contaminated directly or from runoff from human feces, which may carry bacteria, giardia, hepatitis and other diseases. Bacterial action is much slower in the arctic and human waste can take a long time to decompose. This is especially true where permafrost is just below the surface. Since there are few trees in northern national parks, visitors often seek privacy in small drainages to deposit human waste. Drainages are more likely to collect water, therefore water quality is more likely be affected.

Diminished visitor experience and Aboriginal land use experience
Improperly disposed human waste detracts from visitor experience and Aboriginal land use experience if in obvious locations and/or large quantities.

4.4.2.2. Mitigation

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to follow these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urine in healthy people is sterile. Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Remember to pack out all toilet paper, hand tissues and other personal human waste products.

In Kluane and Ivvavik

- Carry a small spade, toilet paper, hand wipes, and plastic garbage bags to ensure proper disposal of human waste and garbage.
- Bury solid human waste when possible at least 50 m (164 feet) from watercourses in a cathole covered with between 10-15cm (4-6 inches) of mineral soil.

- In areas where no active soil exists, cover solid human waste but leave near the surface to facilitate desiccation and dispersal.

In Auyuittuq

- If near the emergency shelters, use the outhouses at those locations for feces. A separate container is located in the outhouse for toilet paper.
- Canisters for the safe holding and transport of human waste will soon be available for backcountry groups in Auyuittuq National Park.

In Winter

- Please also urinate outside the outhouse, away from watercourses. Urine is sterile in healthy people; keeping it out of outhouses reduces our costs of transporting waste out of the park.

In Quttinirpaaq, Sirmilik, Ukkusiksalik

- Pack out solid human waste or bury it under rocks away from trails, campsites and any fresh water source. As a very last resort feces can be deposited under rocks 50 meters from campsites, travel routes and water bodies. Avoid disturbing plant communities.
- If near a body of *salt water* (i.e. one of the coastal areas of the park) it is acceptable to deposit your feces in a shallow pit below the high water mark.

In Tuktut Nogait,

- Leave solid human waste exposed on the ground, preferably on a south-facing slope and at least 50 m. above the high water mark of any water body. Smearing the faeces will accelerate decomposition.

In Aulavik

- Select a level site well away from any water sources.
- Dig a small hole within the active layer of the soil. If possible, choose an organic area.

Glaciers

- Pack out, concentrate urine in one area on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow

Move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

4.4.3. Management and handling of fuel

Improperly managed fuel can contaminate soil, water and wildlife. Refuelling of aircraft may be allowed in Ivvavik, Quttinirpaaq, Aulavik, and Ukkusiksalik.

4.4.3.1. Environmental effects

Contamination of soil, water or wildlife

Occasionally it is necessary to store fuel drums in the park for refuelling of aircraft. Spills from refuelling, transporting the fuel or the operation of the floatplanes would negatively affect the environment. The fuel drums may also leak. The effects of small amounts of fuel or other toxic substances on the environment can be dramatic. For example, ingestion of oil and oil products by caribou can cause abnormal physiological conditions (Thurlow and Associates Environmental Control Consultants 1984). Petroleum products degrade slowly in the arctic and as a result, animals and plants are exposed to the contaminant for longer. Spills in an arctic environment take longer to degrade due to reduced biological action, snow cover, and limited energy input for evaporation. The effects of spills in the water can be severe for aquatic animals, and waterfowl (Resources Wildlife and Economic Development 1998). In addition, some pollutants spilled from aircraft landing on glaciers or near to water could melt or wash into waterbodies.

4.4.3.2. Mitigation

Operators shall:

- Ensure absorbent material is available to soak up any small spills during refuelling.
- Use a hand nozzle with a trigger to minimize spillage when refuelling.
- Use an environmentally safe fuel purge system to keep fuels in the aircraft.
- If fuel storage is allowed in the permit:
    - Fuel caches must be a minimum of 12 m away from the nearest high water and if not servicing float planes, 100 m is the minimum distance.
    - Fuel drums must be in temporary portable berms that are effective to the temperatures expected in the park. The berm must contain 110% of the volume of the fuel stored in it.
    - All fuel drums and berms must be removed before winter. A bond must be provided to Parks Canada for the cost of fuel drum removal prior to bringing the fuel drums into the park. The bond is returned if the drums are removed (proof of removal provided to Parks Canada) and no significant environmental damage remaines.
    - Pilots must be trained in monitoring drums and detecting leaks.
    - Pilots must be trained in emergency spill response procedures and materials for spill containment must be available.

4.4.4. Flight and operation of the aircraft

The operation of aircraft can negatively affect air through global air pollution and global warming. Aircraft overflights can negatively affect wildlife by disturbing them. Aboriginal hunt could be reduced if aircraft overflights frightened target wildlife. Aircraft overflights can also diminish the experience of visitors and Aboriginal people on the land.

4.4.4.1. Environmental effects

Global air pollution and global warming

Aircraft engines emit carbon monoxide, nitrogen oxides, volatile organic compounds, and unburnt hydrocarbons during flying, landing and take-off. These gases can contribute to global air pollution problems such as acid rain. Combustion gases such as carbon monoxide, water vapour, nitrogen oxides and methane contribute to global warming (Nicell and Cornish 1996). There is growing evidence that global warming may already be affecting the arctic. For example, ice thickness and cover has been shown to decrease over the past couple of decades (Mitchell 2000). Impacts on the arctic could include: longer growing season, longer ice-free season, increased erosion due to permafrost thaw, and reduction of habitat suitable for cold climate species (Cohen 1997). The contribution of aircraft flying visitors into northern national parks towards the global problems of acid rain and global warming is minute due to the relatively small number of flights conducted within northern national parks.

Wildlife disturbance by aircraft noise

The general effects of aircraft noise on wildlife species are summarized. Unless otherwise specified this information is taken from a technical report for the *Environmental Impact Statement On Military Flying Activities in Labrador and Quebec* titled *A Review of the Literature Pertaining to the Effects of Noise and Other Disturbance on Wildlife* (Renewable Resources Consulting Services Limited 1994). No research was found on the effects of noise on fish or other aquatic organisms.

Research on the effects of aircraft noise on wildlife is still relatively rare. In some cases, the effects of other noises on animals must be extrapolated to estimate the effects of aircraft noise. Research specifically on the effects of aircraft is often focused on short term responses and not long term population responses, which are the ultimate concern. Research indicates that wildlife are affected by noise in three ways, physiologically, behaviourally and socially.

Physiologically, an animal's ability to hear can be affected, particularly after repeated exposure. The physiological effects of the startle and stress of an aircraft overflight include activation of neural and endocrine systems which may change the blood flow patterns and hormone levels. Hormonal changes may also be caused by the noise.

Behavioural responses to aircraft include escape responses and avoidance responses. Escape responses can occur because of a sudden exposure to the loud sound of an aircraft. Increased energy expenditures and a higher probability of accidents/death are associated with the escape response. Wildlife can also avoid the noise by reducing or abandoning the use of an area close to the source of noise. When wildlife are forced from these areas, they may have to live in marginal habitat, overpopulate the remaining habitat, or be at risk of higher predation. In some cases, wildlife are able to habituate to the noise and continue to live near the noise.

Communication with other individuals is often an important part of social behaviour. For example, locating a mate and advertising a territory are activities that may rely on

auditory communication. Furthermore, hearing is important to be able to detect predators or prey quickly. Interruption of communication may ultimately lead to decreased population sizes through decreased reproductive success or increased predation.

These physiological, behavioural and social effects of aircraft noise on wildlife can be intensified based on several factors. First, the type of sound influences an animal's response. The characteristics of sound that are most important when evaluating the effects on wildlife are the duration, intensity, frequency and the speed of the onset of the sound. Second, the acoustic sensitivity of animals influences the degree to which they are affected. If acoustic communication is very important or they are very sensitive and more easily startled, a species may be more affected. In general, mammals have a higher sensitivity to noise than birds. Third, there may be seasonal changes in sensitivity. Often animals are more sensitive when breeding or migrating or expending high energy (lactating or gestating). Fourth, animals in aggregations may be more sensitive. If one animal reacts, the whole group may react. Being in a group, they may have an increased probability of injuries as a result of escape responses. Fifth, other pressures on the populations may increase the sensitivity of the animal to an additional stress. For example, if the population is already subject to high predation or low food supplies, aircraft disturbance may be more likely to harm individuals or the population. Finally, harassment of animals instead of simple overflights impacts the response of animals to aircraft in general. If animals are harassed by aircraft they are less likely to habituate to the noise.

The effects of aircraft overflights can be minimized by habituation or reduction of noise. Some animals may habituate to the noise and then would be less affected by the overflights. Furthermore, the noise may be reduced by the environment, specifically the topography, atmospheric conditions and the type of vegetation. However, even if the animal is habituated, a sudden noise may still cause some startle response.

Aboriginal hunt success reduced
Local Aboriginal people use some parks for hunting and trapping. Aircraft noise may affect the actual hunt for animals by scaring them away. Furthermore, any effects on wildlife that change their behaviour, distribution or abundance would also affect the local hunters and trappers.

Reduced quality of Aboriginal land use experience
Aboriginal people participating in sacred ceremonies or travelling may require quiet, or may find aircraft noise annoying.

Reduced visitor wilderness experience and quiet
Aircraft flying overhead can decrease the wilderness experience of visitors. In a survey of backcountry users of Tonquin Valley in Jasper National Park, visitors ranked "quiet, peace" as the second highest reason for their visit. When asked about the effect of encountering Parks Canada staff, dogs, horseback riders, aircraft or hikers on the trail, only aircraft failed to enhance their experience (on average people encountered aircraft twice in their trip) (McVetty 1998). Visitors to remote northern Canadian national parks

are seeking a "wilderness" experience. The presence of aircraft can interfere with their enjoyment of the "wilderness". However, since aircraft are the only practical means of access to some of these parks there may be a higher level of acceptance amongst visitors who have been required to use aircraft themselves. Visitors in the aircraft get a unique perspective on the park and are able to appreciate the beauty and vastness from above.

4.4.4.2. Mitigation

The following actions will mitigate the impacts of aircraft noise and disturbance on wildlife and Aboriginal hunt success. The following mitigations will also minimize impacts on Aboriginal land use experience and visitor experience by decreasing the amount of noise.
Operators shall:

- Minimize use of fuel and emissions by reducing the time the aircraft runs on the ground, minimizing the number of flights, and minimizing the amount of time circling before landing.
- Ensure certification of noise compliance, if applicable, is current.
- Educate visitors about current and appropriate behaviour of aircraft to wildlife.
- Provide visitors with information about the park that is consistent with Parks Canada messages.
- Never circle, chase, hover over, dive bomb, pursue or in any other way harass wildlife. Aircraft landing permits are not to be used for wildlife viewing or photography. Do not alter the flight path to approach wildlife, avoid flying directly over animals. For passengers requesting photographic opportunities, pilots should explain that disturbance of wildlife could result in loss of business licence or charges under the CNPA.
- Avoid congregations of animals.
- Maintain a normal flying altitude of 2000 feet when in the air space over the park except for approach to land, take-off or for safety reasons.
- Maintain an altitude of 3500 ft above bird sanctuaries and areas with bird concentrations (colonies or moulting areas).
- In Kluane, food and/or gear drops, without landing, will only be allowed at designated landing sites and only if someone is at the site at the drop time.

Certain areas in northern national parks have been identified as being sensitive to aircraft overflights. Further mitigation is identified. Sensitive areas were not identified in all parks.

Ivvavik Coastal Plain
This area is identified in the management plan as a sensitive area for waterfowl (staging, moulting and breeding). Also the Porcupine Caribou herd calve throughout the plain between mid-May and mid-June.

- Operators must not disturb caribou herd during calving period.

Auyuittuq
Aircraft should maintain an above ground altitude of at least 2000 ft above the following sensitive areas:

- Greenshield Lake Area caribou wintering ground.
- Areas where traditional harvesting is identified as occurring at the time.
- Akshayuk Pass and any other flat areas in the park to minimize impacts on goose nesting sites.
- Akshayuk Pass to minimize disturbance to visitor experience.

Sirmilik
Aircraft should maintain an above ground altitude of at least 3500 ft above the following sensitive areas:

- Cape Hay Area: This area has seabird cliffs with high concentrations of nesting birds.
- South Bylot Island: The lowlands of South Bylot Island are important snow goose nesting areas.

Ukkusiksalik
Paliak Islands
These islands have high concentrations of polar bears, including mothers with cubs. Beluga whales are also common.

- Aircraft are not to land or take off from these islands. The actual landing site is close to Paliak Islands on the South side of Wager Bay. It is not on the islands themselves.
- Low-level flying is not permitted.

4.4.5. Approach and landing

The environmental effects on wildlife of aircraft approaching and landing are similar to overflights, but intensified. Soil may be compacted or eroded and vegetation may be damaged or destroyed at the landing site. Cultural resources could be disturbed or damaged at the landing site. Visitor experience and Aboriginal land use experience near the landing site could be diminished. Visitor experience for passengers on the aircraft would increase with the access to a remote area.

4.4.5.1. Environmental effects

Disturbance of wildlife
The effects of aircraft noise on wildlife described in Section 5.4.4.1 are more likely to occur in the areas where the aircraft approaches the landing area and takes off because aircraft are at a lower altitude and are noisier. Wildlife on the landing area at the time would be disturbed from the area.

Soil compaction
Aircraft landing, float planes running up on shore, movement of equipment and the people associated with these events may compact the soil and/or destroy vegetation. Elliot and Elliot (1978) reported that tire tracks in Auyuittuq from 5 years earlier were

still visible in the vegetation, although the vegetation was not dead or torn up. Effects may be more severe immediately after rain when the soil is softer (Elliot and Elliot 1978). In the north these activities affect the permafrost and can cause further damage. Compaction of permafrost soil changes the way the soil transfers heat. As a result, the active layer becomes deeper in the summer and cold temperatures can penetrate deeper in the winter. If water from the deep thawing is able to drain away, the ground surface can be permanently altered. If drainage is impeded, ponding may develop. Landing strips adjacent to slopes may hasten erosion, soil creep or mass wasting. The intensity of the impact also varies based on the terrain conditions such as slope, aspect, soil material, vegetation and the moisture or ice content of the ground (Heginbottom 1973).

Damage/destruction of vegetation
Small areas of vegetation may be damaged or destroyed when aircraft land or by people walking around. The landing strips usually have minimal vegetation (see Section 5.2.5) to be damaged when aircraft land. Vegetation around waterways with float planes landing may be damaged, but only in limited areas. Pedestrian traffic could impact vegetation if repeated in the same area.

Soil erosion
Wave action caused by floatplanes could cause shore erosion. Erosion around the shore may impact cultural resources. Waterways were important areas for people in the past and so evidence of their presence needs to be protected. Erosion can also lead to increased turbidity in the water and/or deposits on the bottom, which can affect aquatic organisms. The increase in human use and trampling at the shoreline may also have localized erosive effects, especially if pilots chose the same location repeatedly. Erosion can also occur on softer landing strips (Elliot and Elliot 1978).

Damage or removal of cultural resources and context
Cultural resources could be affected by soil compacting activities. Often the location of good landing strips are near cultural resources sites. Natural linear features such as beach ridges, eskers and Aeolian features often provide good landing strips. These same features have a high potential for cultural remains because they are good locations for travel or camping, particularly if they are near river edges, rims of bluffs, canyons, high coastal shores, or edges of lakes (also important visitor locations). The potential to find cultural resources may decrease if the landing sites selected are on a flat coastal plain or a high flat plateau.

In the northern climates where soil accumulates slowly, archaeological remains are often near the surface. Aircraft tire ruts can tear up the soil and artifacts, removing them from their context. Also, when float planes run up on the shore to unload, they will probably choose the same locations as earlier populations and introduce a great deal of disturbance to the site. If airstrips are surfaced with sand or gravel from a nearby source, the material may contain cultural resources (Gary Adams, pers. comm.). Furthermore, if heavy equipment is used to extract and spread this material, the compaction could destroy artifacts or displace them (Stephen Savauge, pers. comm.). Exposed artifacts may also be scavenged by visitors.

Decrease in wilderness visitor experience and Aboriginal land use experience
Visitors and Aboriginal people in the approach line of the aircraft may find their wilderness experience is interrupted by the aircraft (see Section 5.4.4.1).

Increase in visitor experience
The visitors arriving on the plane will be able to see parts of parks or whole parks that they would not be able to otherwise without aircraft access.

4.4.5.2. Mitigation

Operators shall:

- Obtain an aircraft access permit to allow for all aircraft landings
- As part of a pretrip briefing, ensure that all clients are aware of National Parks regulations on picking or removing vegetation. Clients should be briefed on travel procedures including potential impacts to vegetation and soils prior to departure.
- Request that clients check for and remove any bur-like seedpods or mud from boots, clothing and pets and dispose in garbage containers prior to departure to reduce risk of new weed infestations.
- Ensure people gathering around the aircraft choose locations on the most durable surfaces whenever possible. Rock, talus, gravel, sand, and gravel stream bottoms are considered to be the most durable surfaces.
- Not make markers, cairns or inukshuks; never blaze trees or otherwise damage vegetation to mark a site.
- Report the discovery of an artifact or cultural site to Parks Canada – do not remove or otherwise disturb the site.
- Not remove or disturb any rocks from any features that look – even remotely – like an archaeological site. These sites include cairns, tent rings, fox traps and food caches and almost indiscernible to the untrained eye.
- Not land in Zone 1 areas.
- Manage speed, approach distance, rate of descent to minimize noise to wildlife, visitors and Aboriginal people using the land.
- If wildlife are on the landing area, not land until they are well away from the airstrip.
- Use tundra tires if required by landing permit.

In many of the parks, designated landing sites will be the most commonly used areas for landing. As a result, each of these designated landing sites were further evaluated below for any site specific mitigation that would be required. Not all sites required additional mitigation. For descriptions of all sites, see Section 5.2.5. For each of the sites it is indicated whether the site is used by fixed-wing aircraft landing on land (wheels) or water (floats). Helicopters can land at any of the sites described below.

Ivvavik

Babbage Strip (wheels)
Caribou move into this area during mid-July to late August to escape insects.

- Use of the area will not be permitted to interfere with caribou migration.

Kluane
Five landing locations are on glaciers: Quintino Sella Glacier, Hubbard Glacier, Cathedral Glacier, South Arm Kaskawulsh Glacier and Dusty Glacier.

- Landings are allowed only on the glaciated areas of the Icefields and only to within 5 km. of the toes of the major valley glaciers.
- Landings on mountain peaks or ridges above the major glaciers are not allowed.

Day use landings will be allowed, but the aircraft must remain with the visitors. If any amount of travel away from the aircraft is involved, knowledge of glacier travel techniques is necessary and having a qualified mountain guide on site is advised.

- For landing locations in the green belt, visitors are only allowed to fly one direction. For example, they can fly in and hike out, but not fly in and fly out.
- In the green belt, to help ensure opportunities for solitude, two days spacing is required between parties being issued landing permits and no day use landings are allowed.

Onion Lake (floats)

- Landings will not be allowed from mid May to mid June or after the first weekend in September.

Quttinirpaaq
Tanquary Fiord Warden Station

- Aircraft access permits will be issued for the Tanquary Fiord Warden Station by the Superintendent.

Ukkusiksalik
Sila Lodge

- Exercise caution and minimize the number of flights at the site. Caribou utilize this area during the summer time.

4.5. Accidents and malfunctions

Accidents and malfunctions could endanger the aircraft or cause spills in fuel. Aircraft flight and landings have some risk of malfunction or action that could cause a crash. The location of the crash would influence the environmental effects, but they could include destruction of vegetation, soil compaction, destruction of wildlife, pollution of soil and water, diminished Aboriginal land use experience and diminished visitor experience. The probability of an aircraft accident is very low because regulatory measures under Transport Canada's authority are designed to ensure aircraft safety. Aircraft safety is of primary importance; therefore, in the event that aircraft safety is threatened, all decisions will be based primarily on safety.

Accidents could occur during refuelling. Accidents during refuelling could contaminate soil, vegetation and water. Wildlife could also be contaminated or damaged. Visitor and Aboriginal land use experience could also be diminished by the presence of a fuel spill. The company operating the aircraft in the park should have an emergency response plan for accidental spills. Operators should be aware of who to contact in an emergency and who will respond with appropriate environmental protection measures. There should also be materials for clean-up readily available as described in Section 4.4.3.2.

4.6. Analysis and prediction of significance of residual environmental effects

Responsible Authorities are required to make a decision on the significance of adverse environmental effects of a proposed project pursuant to section 20 of the *Act*. A determination of the significance of effects is required for all VECs identified in Section 5.3.

Significant adverse environmental impacts to ecological integrity are considered to be those likely to threaten the continued existence of native species or biological communities. The significance of adverse impacts to cultural resources is evaluated in terms of risk to the integrity and context of the site in consultation with Parks Canada cultural resources experts. Potential impacts to the use of cultural resources or impacts to related functions of other governments, communities or Aboriginal peoples will also be considered. (National Historic Sites Directorate et al. 1993). The significance of adverse impacts to Aboriginal land use will be evaluated in terms of potential effects to harvest success rates and traditional use experience. Adverse impacts to visitor experience are evaluated in terms of potential effects to visitor satisfaction.

The criteria of magnitude, geographic extent, duration, frequency, reversibility and ecological context will be used to evaluate the significance of environmental impacts (Table 3).

Positive residual effects from aircraft landings in northern national parks include the education and increased respect for environmental and cultural resources that clients gain from the aircraft operator. Clients may also experience new activities in new locations that they would not have been able to otherwise.

Given the regulatory measures already put in place by Transport Canada (for reducing the potential for accidents) and the experience of aircraft pilots, it is highly unlikely that aircraft operations will result in accidents that will have significant effects on ecological or cultural resources or on visitor safety and experience.

Table 3: Significance Criteria Description

	Rating		
Criterion	**Negligible**	**Minor**	**Considerable**
Magnitude	Effect results in disturbance	Effect results in damage	Effect results in destruction
Geographic Extent	Effect is limited to the activity footprint and adjacent areas	Effect is likely to have impacts at an ecosystem scale	Effect is likely to have impacts at a regional scale
Duration of Activity	Minutes to hours	Days to weeks	Months or longer
Frequency	Effects occur on a monthly basis or less	Effects occur on a weekly basis	Effects occur on a daily basis or more often
Reversibility	Effects are reversible over a short period of time without active management	Effects are reversible with active management over a short period of time; or if active management is not possible, effects are reversible over a season	Effects are reversible with active management over an extended period of time; or if active management is not possible, effects are permanent
Ecological Context	Areas other than Ecologically Sensitive Sites and Zone 1 Areas	Ecologically Sensitive Sites (see 4.1.2 for definition)	Zone 1 Areas (see 4.1.2 for definition)

The criteria of magnitude, geographic extent, duration, frequency, reversibility and ecological context will be used to evaluate the significance of potential adverse environmental effects (see Table 3 for definitions). The evaluation of each of these criteria and the ecological context for them are discussed below. Each VEC will be evaluated for the significance of residual effects after mitigation, and the results are summarized in Table 4.

Soils and vegetation

Although aircraft landings could destroy some vegetation and cause some soil compaction, the area affected will be very small. Any secondary impacts or impacts to rare plants are highly unlikely. The risk of soil contamination is relatively low and, if it occurred would impact a small geographic area. Landing strips that are already in use will have very few additional impacts to vegetation and soil. Given the implementation of standard mitigation measures, aircraft landings are not likely to threaten the existence of native vegetation populations and as a result not likely to result in significant impacts to native vegetation.

Wildlife
Impacts to wildlife are expected to be of short duration, small magnitude and highly reversible. A limited number of landing strips may have more frequent landings, but the use of minimum flight altitudes should minimize the wildlife disturbed by aircraft. Implementation of the mitigation measures for the management of solid waste and human waste will minimize the likelihood of wildlife attraction and habituation. Similarly, the mitigation measures will minimize the risk of contamination and negative effects on wildlife health. Although some vulnerable species populations exist in this area, there is no evidence that aircraft overflights and landings would contribute to their decline. The aircraft landing operations are not likely to threaten the continued existence of any wildlife species in any location in the parks; therefore the impacts are not likely to be significant.

Water quality
Given the implementation of standard mitigation measures, it is not expected that the impacts of aircraft landings will have any measurable residual effects on water quality. As a result, secondary impacts to aquatic species are unlikely. Impacts to water quality are not likely to be significant.

Air quality
Although some operations may have more frequent flights, the magnitude of the effect on air quality is very small. Given the implementation of standard mitigation measures it is not expected that the impacts of aircraft landings will result in residual effects on air quality.

Cultural resources
Aircraft landings occur on very small areas of land, minimizing the potential for impacts to cultural resources. Given the implementation of standard mitigation measures it is not expected that the impacts of aircraft landings will result in residual effects on the integrity or context of cultural resources or sites. Therefore, significant effects on cultural resources are not likely.

Aboriginal land use
Given the implementation of the standard mitigation measures it is not expected that the wildlife or vegetation populations will be affected; therefore, traditional harvest would not be affected. Aircraft use is restricted geographically and occurs for a short duration, and are therefore not likely to result in a significant effect on traditional harvest.

Visitor experience
Given the implementation of standard mitigation measures, the impacts of aircraft landings are not likely to cause significant adverse impacts to levels of visitor satisfaction. Aircraft use is restricted geographically and occurs for a short duration, making decreases in experience not likely to be significant.

Table 4. Evaluation of the significance of adverse residual effects on VECs after consideration of cumulative effects.

VEC	Aspect	Geographic Extent	Duration	Frequency	Reversibility	Magnitude	Ecological Context	Significance
Vegetation & Soils	Contamination	Neg.	Neg.	Neg.	Con.	Minor	Neg.	Not Significant
	Soil erosion/ compaction	Neg.	Neg.	Neg. to Minor	Neg. to Con.	Neg. to Con.	Neg.	Not Significant
	Vegetation destruction/ damage	Neg.	Neg.	Neg. to Minor	Neg.	Neg. to Con.	Neg.	Not Significant
Wildlife	Attraction	Neg.	Neg.	Neg. to Con.	Neg.	Neg.	Neg.	Not Significant
	Contamination	Neg.	Neg.	Neg.	Neg. to Con.	Neg.	Neg.	Not Significant
	Disturbance	Neg.	Neg.	Neg.	Neg.	Neg. to Minor	Neg.	Not Significant
Water Quality	Contamination	Neg.	Neg.	Neg. to Minor	Neg.	Neg.	Neg.	Not Significant
Air Quality	Air pollution and global warming	Neg.	Neg.	Con.	Neg.	Neg.	Neg.	Not Significant
Cultural Resources	Damage or removal	Neg.	Neg.	Neg.	Con.	Neg.	Neg.	Not Significant
Aboriginal Land Use	Diminished experience	Neg.	Neg.	Neg. to Con.	Neg.	Neg.	Neg.	Not Significant
	Reduced hunting success	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Not Significant
Visitor Experience	Diminished experience	Neg.	Neg.	Neg. to Con.	N/A	Neg.	Neg.	Not Significant

[a] Neg. means negligible.
[b] N/A means not applicable.
[c] Con. means considerable.

4.7. Cumulative effects analysis

In order for cumulative effects to be possible, there must be residual effects on a VEC. No residual effects were identified on water quality, air quality and cultural resources; therefore no analysis of cumulative effects is necessary for these VECs.

Cumulative effects may result from multiple projects covered by this RCS and/or the interaction of projects covered by this RCS and other past, present and future projects inside or outside of a park. In national parks, management plans are the most important tool for managing cumulative effects. Management plans are developed for each park and

reviewed every five years in order to fulfill the mandates for ecological integrity, cultural resources and visitor experience. These documents are tabled in Parliament and contain "a long-term ecological vision for the park, a set of ecological integrity objectives and indicators and provisions for resource protection and restoration, zoning, visitor use, public awareness and performance evaluation" *Canada National Parks Act* section 11(1). Management plans provide the direction for all activities within the park by stating what uses are appropriate in the park, restrictions on use to protect ecological integrity and messages and experiences for visitors. Restrictions on flight and landing locations and/or number of licences or flights approved for specific areas could be identified as part of the management planning process to address cumulative impacts. An environmental assessment is conducted for each of the management plans to ensure cumulative effects are not considered significant.

The cumulative effects on soils and vegetation, wildlife, Aboriginal land use and visitor use will be analyzed below in the context of the direction provided by management plans.

Soils and vegetation

Minimal residual effects on vegetation and soil may occur, but past, present and future aircraft landings are the only projects in the geographic area of the landing strips that could cumulatively impact soil and vegetation. All aircraft landings, with a few exceptions, occur on the designated landing strips identified in the Schedule of the *National Parks Aircraft Access Regulations* for the *Canada National Parks Act*. These sites are described in Section 4.2.5 and are on durable substrates that have been able to withstand all past and future aircraft landings. Occasional landings at other locations are not likely to cause cumulative effects because they are rare and unlikely to be at the same locations. With the implementation of the mitigation measures in the RCS and the management plans, the adverse cumulative environmental effects on soils and vegetation are not expected to be significant.

Wildlife

The analysis of cumulative effects on wildlife will be organized based on the type of projects in and around each park. Kluane and Quttinirpaaq will be discussed individually because of the unique projects around these parks. The other parks will be discussed together because they have similar projects that may affect wildlife.

Projects that could cumulatively impact wildlife in and around Kluane are: visitor activities, research activities, aircraft landings under the RCS, settlement activity (highways, town etc.) around the park and Aboriginal land use. In 2002, "Kluane National Park and Reserve CEA Update" was produced to analyze the cumulative effects on wildlife of activities proposed by the Kluane park management plan and projects around the park. An assessment of the cumulative effects on wildlife in Kluane found the following conclusions specifically relating to aircraft use: aircraft use in the park's green zone will not adversely affect the long-term viability of wildlife VECs; aircraft and watercraft use along the Alsek River Valley will not adversely affect grizzly bear survival through behavioural changes and habitat alienation; and, aircraft use over Sheep Mountain will not adversely affect Dall sheep survival through behavioural changes and

habitat alienation (Slocombe et al. 2002). Furthermore the report found that overall wildlife VECs will likely not be significantly adversely affected by the activities in the park and regional activities within the next five to ten years.

In and around Quittinirpaaq the following projects may affect wildlife: aircraft landings under the RCS, visitor and researcher use of the park, Aboriginal land use, and military activities. The military station Alert is located 44 km west of the park and some operations occur in the park. The station was established in 1956 and had over 200 personnel stationed there from 1970 to the late 1990s. Currently approximately 65 personnel are stationed at Alert. Parks Canada works cooperatively with the Department of Defence to minimize the impacts of their activities on the park, including flying at acceptable heights to protect wildlife. Although some vulnerable species populations exist in this area, there is no evidence that aircraft overflights and landings, that have been ongoing for many years, would contribute to their decline.

In the other six parks, projects in and around the parks affecting wildlife include: aircraft landings under the RCS, visitor activities, research activities and Aboriginal land use. As described by the introduction to Section 4.2.2, wildlife are managed cooperatively by external agencies who ensure that harvest by Aboriginal people is sustainable. As described in Table 1, the visitor use of these parks is very low. Park management plans identify any mitigation necessary to prevent adverse cumulative environmental effects of visitors and researchers.

Therefore, aircraft landing operations are not likely to threaten the continued existence of any wildlife species in any location in the parks; therefore the adverse cumulative environmental effects are not significant. Since there are no expected significant adverse cumulative environmental effects on wildlife, there will be no significant adverse cumulative environmental effects on Aboriginal hunt success.

Aboriginal land use

Multiple aircraft landing business licences under this RCS could cumulatively decrease Aboriginal land use experience. Visitor use in the parks may also contribute to decreased Aboriginal land use experience. As described in Table 1 most parks have very low visitation making conflicts with visitors and decreased Aboriginal land use experience very unlikely. As described in Section 1.1.4 each of the parks is managed cooperatively with Aboriginal groups who address this issue as necessary. Furthermore, park management plans, developed with Aboriginal groups, identify appropriate activities, appropriate locations for activities and approaches to minimize conflicts between Aboriginal land use, aircraft and visitors. With the implementation of the mitigation measures in the RCS and the management plans, aircraft landings are not likely to have significant adverse cumulative environmental effects on Aboriginal land use

Visitor experience

Multiple aircraft landing business licences under this RCS could cumulatively decrease visitor experience. Aboriginal land use in the parks may also contribute to decreased visitor experience. As described in Section 1.1.4 each of the parks is managed cooperatively with Aboriginal groups who address conflicts between visitors and

Aboriginal groups as necessary. Furthermore, park management plans, developed with Aboriginal groups, identify appropriate activities, appropriate locations for activities and approaches to minimize conflicts between Aboriginal land use, aircraft and visitors. As described in Table 1 most parks have very low visitation making decreased visitor experience due to overcrowding or encounters with Aboriginal people unlikely because people in very remote locations are more likely to enjoy encountering other groups. The management plan for Kluane, which has the highest visitation of the parks in the RCS, identified indicators of wilderness character including visitors hearing no more than three aircraft in two days on the Alsek River (Parks Canada 2002c). These indicators will be monitored and management actions taken, as necessary, to ensure the targets are met. The Kluane management plan also identifies other mitigation for aircraft landing affecting visitor use such as restricting aircraft access in the green belt to one direction of the trip (i.e. hike in and fly out or fly in and hike out). With the implementation of the mitigation measures in the RCS and the management plans, aircraft landings are not likely to have significant adverse cumulative environmental effects on visitor experience.

5. Roles and responsibilities

Parks Canada is the sole responsible authority involved in the RCS. Federal authorities are Canadian Wildlife Service, Transport Canada and Department of Fisheries and Oceans. Other environmental assessment regimes in the RCS area are under the Inuvialuit Final Agreement and the Nunavut Impact Review Board.

5.1. Responsible authorities

Parks Canada will be responsible for determining whether a project fits within the class. Parks Canada will be responsible for recording the number of assessments conducted under the RCS and updating the CEAR as described in Section 1.5. Parks Canada will provide a list of the mitigation required under the RCS to the business license applicant. The mitigation is repeated in Appendix A and organized for easy distribution to business license applicants . Business license applicants will be given all the general mitigation and the mitigation for the specific parks they are operating in. They will be responsible for implementing the described mitigation. Parks Canada will be responsible for reviewing and amending the report as described in Section 6.

Parks Canada is the sole responsible authority for aircraft landing in National Parks of Canada and is the sole authority for enforcement of the *Canada National Parks Act*. Under the *Species at Risk Act* (*SARA*) the Minister of Environment is responsible for all species at risk in national protected heritage areas administered by Parks Canada including national parks and national historic sites.

5.2. Federal authorities

Transport Canada is a Federal Authority because of their jurisdiction over aircraft operations in Canada as a result theyreviewed the RCS during the preparation of the document. Environment Canada is a Federal Authority because of their interest in migratory birds and the bird sanctuaries in two of the national parks. Also the Minister of Environment is a competent minister for *SARA*.

5.3. Coordination with other EA regimes

As a result of land claim agreements, additional environmental assessment regimes have been put in place in most of the parks included in this RCS. Tuktut Nogait and Ivvavik are within the Inuvialuit Settlement Area. Therefore *The Western Arctic Claim: The Inuvialuit Final Agreement* (IFA) (Indian and Northern Affairs Canada 1984) requires an environmental assessment in Tuktut Nogait for "every proposed development or consequence to the Inuvialuit Settlement Region that is likely to cause a negative environmental impact" section 13(7). In Ivvavik any "development activity" proposed must undergo an environmental impact screening under the IFA. Business licences covered by this RCS are required to undergo a separate environmental assessment through the IFA process as well.

Kluane is within the jurisdiction of the *Yukon Environmental And Socio-economic Assessment Act* (YESAA) which was given Royal Assent May 13, 2003 and came into force on November 13, 2004; however, the YESAA environmental assessment process will not be applied in the Yukon until the regulations are in place. Therefore, prior to the YESAA regulations the Canadian Environmental Assessment Act (the Act)will apply and following implementation of the regulations YESAA will apply in Kluane.
Auyuittuq, Quttinirpaaq, Ukkusiksalik and Sirmilik are all within the Nunavut Settlement Area. As a result, all project proposals submitted to the Nunavut Planning Commission that are consistent with the land use plan are forwarded to the Nunavut Impact Review Board for a separate review.

6. Procedures for amending the replacement class screening report

The amendment procedure for the RCS will allow for regular review and modification as experience is gained with its application and effectiveness. Amendments may be undertaken to:

- clarify ambiguous areas of the document and procedures;
- modify and revise the scope of the assessment to reflect new or changed regulatory requirements, policies or standards;
- account for changing environmental conditions and human use pressures and new information on best management practices; and,
- extend the application of the RCS to projects that were not previously included but are analogous to projects included in the class definition.

6.1.1. Term of application

The term of the Class Screening will be for 5 years, until 2010. However, as part of the management plan review for each individual park, the Class Screening process will be reviewed and amended as required. The coordination of the park management plan review and the review of the Class Screening process will provide the policy and human use strategy context for managing commercial guiding activities over the subsequent five year period.

6.1.2. Review and amendment procedures

The purpose of an amending procedure is to allow the modification of the RCSR after experience has been gained with its operation and effectiveness. The reasons for such modification may include:

- clarification of ambiguous areas of document and procedures;
- streamlining or modifying the planning process in areas where problems may have arisen;
- minor modifications and revisions to the scope of assessment to reflect new or changed regulatory requirements, policies or standards; and
- new procedures and environmental mitigation practices that have been developed over time.

The responsible authority will notify the Agency in writing of its interest to amend the RCSR. It will discuss the proposed amendments with the Agency and affected federal government departments and may invite comment from stakeholders and the public on the proposed changes. The responsible authority will then submit the amended RCSR to the Agency, along with a request that the Agency amend the RCSR and a statement providing a rationale for the amendment.

The Agency may amend the RCSR without changing the declaration period if the changes:

- are minor;
- represent editorial changes intended to clarify or improve the screening process;
- do not materially alter either the scope of the projects subject to the RCSR or the scope of the assessment required for these projects; and
- do not reflect new or changed regulatory requirements, policies or standards.

The Agency may initiate a new declaration for the RCSR for the remaining balance of the original declaration period or for a new declaration period if the changes:

- are considered to be substantial; or
- represent modifications to the scope of the projects subject to the class or the scope of the assessment required for these projects.

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Appendix A

All operators will be given the general mitigation in Section 1. In addition they will be given the mitigation specific to the park(s) they will be operating in found in Section 2. Mitigation for the management and handling of fuel has been included in the park specific mitigation because this activity is only permitted in Ivvavik, Quttinirpaaq, Aulavik, and Ukkusiksalik. This mitigation is the same mitigation identified in the main document, but organized for easier distribution to operators.

1. General mitigation for all parks

1.1. Management of solid waste

Operators shall:

- Remove all solid waste brought into the park on the same trip as it was brought in.
- Refrain from burning solid waste as this is not allowed.

1.2. Flight and operation of aircraft

Operators shall:

- Minimize use of fuel and emissions by reducing the time the aircraft runs on the ground, minimizing the number of flights, and minimizing the amount of time circling before landing.
- Ensure certification of noise compliance, if applicable, is current.
- Educate visitors about current and appropriate behaviour of aircraft to wildlife.
- Provide visitors with information about the park that is consistent with Parks Canada messages.
- Never circle, chase, hover over, dive bomb, pursue or in any other way harass wildlife. Aircraft landing permits are not to be used for wildlife viewing or photography. Do not alter the flight path to approach wildlife, avoid flying directly over animals. For passengers requesting photographic opportunities, pilots should explain that disturbance of wildlife could result in loss of business licence or charges under the CNPA.
- Avoid congregations of animals.
- Maintain a normal flying altitude of 2000 feet when in the air space over the park except for approach to land, take-off or for safety reasons.
- Maintain an altitude of 3500 ft above bird sanctuaries and areas with bird concentrations (colonies or moulting areas).

1.3. Approach and landing

Operators shall:

- As part of a pretrip briefing, ensure that all clients are aware of National Parks regulations on picking or removing vegetation. Clients should be briefed on travel procedures including potential impacts to vegetation and soils prior to departure.

- Request that clients check for and remove any bur-like seedpods or mud from boots, clothing and pets and dispose in garbage containers prior to departure to reduce risk of new weed infestations.
- Ensure people gathering around the aircraft choose locations on the most durable surfaces whenever possible. Rock, talus, gravel, sand, and gravel stream bottoms are considered to be the most durable surfaces.
- Not make markers, cairns or inukshuks; never blaze trees or otherwise damage vegetation to mark a site.
- Report the discovery of an artifact or cultural site to Parks Canada – do not remove or otherwise disturb the site.
- Not remove or disturb any rocks from any features that look – even remotely – like an archaeological site. These sites include cairns, tent rings, fox traps and food caches and almost indiscernible to the untrained eye.
- Not land in Zone 1 areas.
- Manage speed, approach distance, rate of descent to minimize noise to wildlife, visitors and Aboriginal people using the land.
- If wildlife are on the landing area, not land until they are well away from the airstrip.
- Use tundra tires if required by landing permit.

2. Park Specific Mitigation

2.1. Aulavik National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to follow these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Select a level site well away from any water sources.
- Dig a small hole within the active layer of the soil. If possible, choose an organic area.

Snow

Operators shall ensure that groups move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Management and handling of fuel

Operators shall:

- Ensure absorbent material is available to soak up any small spills during refuelling.
- Use a hand nozzle with a trigger to minimize spillage when refuelling.
- Use an environmentally safe fuel purge system to keep fuels in the aircraft.

- Pilots must be trained in monitoring drums and detecting leaks.
- Pilots must be trained in emergency spill response procedures and materials for spill containment must be available.

2.2. Auyuittuq National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- If near the emergency shelters, use the outhouses at those locations for feces. A separate container is located in the outhouse for toilet paper.
- Canisters for the safe holding and transport of human waste will soon be available for backcountry groups in Auyuittuq National Park.

Winter

- Please also urinate outside the outhouse, away from watercourses. Urine is sterile in healthy people; keeping it out of outhouses reduces our costs of transporting waste out of the park.

Glaciers

- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow

Operators shall ensure that groups move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Site Specific

Aircraft should maintain an above ground altitude of at least 2000 ft above the following sensitive areas:

- Greenshield Lake Area caribou wintering ground.
- Areas where traditional harvesting is identified as occurring at the time.
- Akshayuk Pass and any other flat areas in the park to minimize impacts on goose nesting sites.
- Akshayuk Pass to minimize disturbance to visitor experience.

2.3. Ivvavik National Park of Canada

Management of human waste
Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Carry a small spade, toilet paper, hand wipes, and plastic garbage bags to ensure proper disposal of human waste and garbage.
- Bury solid human waste when possible at least 50 m (164 feet) from watercourses in a cathole covered with between 10-15cm (4-6 inches) of mineral soil.

In areas where no active soil exists solid human waste should be covered but left near the surface to facilitate desiccation and dispersal.

Snow
Operators shall ensure that groups move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Management and handling of fuel
Operators shall:

- Ensure absorbent material is available to soak up any small spills during refuelling.
- Use a hand nozzle with a trigger to minimize spillage when refuelling.
- Use an environmentally safe fuel purge system to keep fuels in the aircraft.

Pilots must be trained in monitoring drums and detecting leaks. Pilots must be trained in emergency spill response procedures and materials for spill containment must be available.

Site Specific
Babbage Strip (wheels)
Caribou move into this area during mid-July to late August to escape insects.

- Do not use this area if caribou are present.

Ivvavik Coastal Plain
This area is identified in the management plan as a sensitive area for waterfowl (staging, moulting and breeding). Also the Porcupine Caribou herd calve throughout the plain between mid-May and mid-June.

- Operators must not land in this area during caribou calving period.

2.4. Kluane National Park and Reserve of Canada

- In Kluane, food and/or gear drops, without landing, will only be allowed at designated landing sites and only if someone is at the site at the drop time.
- No fuel caches or refuelling of aircraft will be allowed in the park

Human Waste Mitigation
Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Carry a small spade, toilet paper, hand wipes, and plastic garbage bags to ensure proper disposal of human waste and garbage.
- Bury solid human waste when possible at least 50 m (164 feet) from watercourses in a cathole covered with between 10-15cm (4-6 inches) of mineral soil.
- In areas where no active soil exists solid human waste should be covered but left near the surface to facilitate desiccation and dispersal.

Glaciers

- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow
Operators shall ensure that groups move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Site Specific
Five landing locations are on glaciers: Quintino Sella Glacier, Hubbard Glacier, Cathedral Glacier, South Arm Kaskawulsh Glacier and Dusty Glacier.

- Landings are allowed only on the glaciated areas of the Icefields and only to within 5 km. of the toes of the major valley glaciers.
- Landings on mountain peaks or ridges above the major glaciers are not allowed.
- Day use landings will be allowed, but the aircraft must remain with the visitors. If any amount of travel away from the aircraft is involved, knowledge of glacier travel techniques is necessary and having a qualified mountain guide on site is advised.

- For landing locations in the green belt, visitors are only allowed to fly one direction. For example, they can fly in and hike out, but not fly in and fly out.
- In the green belt, to help ensure opportunities for solitude, two days spacing is required between parties being issued landing permits and no day use landings are allowed.

Onion Lake (floats)

- Landings will not be allowed from mid May to mid June or after the first weekend in September.

2.5. Quttinirpaaq National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Pack out human solid waste or bury it under rocks away from trails, campsites and any fresh water source. At the very last resort feces can be deposited under rocks 50 meters from camp sites, travel routes and water bodies. Avoid disturbing plant communities.
- If near a body of *salt water* (i.e. one of the coastal areas of the park) it is acceptable to deposit your feces in a shallow pit below the high water mark.

Glaciers

- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow

Guides shall ensure that groups move well off a main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Management and handling of fuel

Operators shall:

- Ensure absorbent material is available to soak up any small spills during refuelling.
- Use a hand nozzle with a trigger to minimize spillage when refuelling.
- Use an environmentally safe fuel purge system to keep fuels in the aircraft.
- If fuel storage is allowed in the permit:
    - Fuel caches must be a minimum of 12 m away from the nearest high water and if not servicing float planes, 100 m is the minimum distance.
    - Fuel drums must be in temporary portable berms that are effective to the temperatures expected in the park. The berm must contain 110% of the volume of the fuel stored in it.
    - All fuel drums and berms must be removed before winter. A bond must be provided to Parks Canada for the cost of fuel drum removal prior to bringing the fuel drums into the park. The bond would be returned if the

drums were removed (proof of removal provided to Parks Canada) and no significant environmental damage remained.
    - Pilots must be trained in monitoring drums and detecting leaks.
    - Pilots must be trained in emergency spill response procedures and materials for spill containment must be available.

Tanquary Fiord Warden Station

- Aircraft access permits will be issued for the Tanquary Fiord Warden Station by the Superintendent.

2.6. Sirmilik National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Pack out human solid waste or bury it under rocks away from trails, campsites and any fresh water source. At the very last resort feces can be deposited under rocks 50 meters from camp sites, travel routes and water bodies. Avoid disturbing plant communities.
- If near a body of *salt water* (i.e. one of the coastal areas of the park) it is acceptable to deposit your feces in a shallow pit below the high water mark.

Glaciers

- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow

Operators shall ensure that groups move well off a main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Site Specific

Aircraft should maintain an above ground altitude of at least 3500 ft above the following sensitive areas:

- Cape Hay Area: This area has seabird cliffs with high concentrations of nesting birds.
- South Bylot Island: The lowlands of South Bylot Island are important snow goose nesting areas.

2.7. Tuktut Nogait National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Human waste is best disposed of by leaving it exposed on the ground, preferably on a south-facing slope and at least 50 m. above the high water mark of any water body. Smearing the faeces will accelerate decomposition.
- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

2.8. Ukkusiksalik National Park of Canada

Management of human waste

Operators should use the following mitigation to avoid visual and aesthetic impacts as well as to protect water sources from contamination. As appropriate, encourage passengers to following these mitigation measures as well.

- Encourage clients to use washrooms before boarding the aircraft.
- Urinate 50 meters away from the aircraft landing site, travel routes, camping areas and water bodies. Urine in healthy people is sterile. Remember to pack out all toilet paper, hand tissues and other personal human waste products.
- Pack it out or bury it under rocks away from trails, campsites and any fresh water source. At the very last resort feces can be deposited under rocks 50 meters from campsites, travel routes and water bodies. Avoid disturbing plant communities.
- If near a body of *salt water* (i.e. one of the coastal areas of the park) it is acceptable to deposit your feces in a shallow pit below the high water mark.

Glaciers

- Pack out, concentrate urine in one areas on the periphery of camp, cover stains with snow if possible.
- To lessen the chance of contamination, especially in more popular areas, human feces should be buried as deep as possible in pit privies or deposited into crevasses.

Snow

Operators shall ensure that groups move well off main trail or landing area for bathroom breaks. Latrine areas should be located in sites not likely to be traveled through by others, well away from water bodies and buried deeply when leaving.

Management and handling of fuel

Operators shall:

- Ensure absorbent material is available to soak up any small spills during refuelling.
- Use a hand nozzle with a trigger to minimize spillage when refuelling.
- Use an environmentally safe fuel purge system to keep fuels in the aircraft.
- If fuel storage is allowed in the permit:
    - Fuel caches must be a minimum of 12 m away from the nearest high water and if not servicing float planes, 100 m is the minimum distance.
    - Fuel drums must be in temporary portable berms that are effective to the temperatures expected in the park. The berm must contain 110% of the volume of the fuel stored in it.
    - All fuel drums and berms must be removed before winter. A bond must be provided to Parks Canada for the cost of fuel drum removal prior to bringing the fuel drums into the park. The bond would be returned if the drums were removed (proof of removal provided to Parks Canada) and no significant environmental damage remained.
    - Pilots must be trained in monitoring drums and detecting leaks.
    - Pilots must be trained in emergency spill response procedures and materials for spill containment must be available.

Sila Lodge

- Exercise caution and minimize the number of flights at the site. Caribou utilize this area during the summer time.

Paliak Islands

These islands have high concentrations of polar bears, including mothers with cubs. Beluga whales are also common.

- Aircraft are not to land or take off from these islands. The actual landing site is close to Paliak Islands on the South side of Wager Bay. It is not on the islands themselves.
- Low-level flying is not permitted.