GAHCHO KUÉ PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SECTION 11.9

SUBJECT OF NOTE: WASTE MANAGEMENT AND WILDLIFE

December 2010 09-1365-1004

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF TABLES

LIST OF FIGURES

11.9 SUBJECT OF NOTE: WASTE MANAGEMENT AND WILDLIFE

11.9.1 Introduction

11.9.1.1 Context

This section of the Environmental Impact Statement (EIS) for the Gahcho Kué Project (Project) consists solely of the Subject of Note: Waste Management and Wildlife. Impacts related to waste management and wildlife were recorded in the Report of Environmental Assessment for the Project prepared by the Mackenzie Valley Environmental Impact Review Board (MVEIRB 2006). The Terms of Reference for the Gahcho Kué Environmental Impact Statement (Terms of Reference), issued on October 5, 2007 by the Gahcho Kué Panel (2007), required that the interaction between waste management and wildlife be addressed as a subject of note.

This subject of note provides a summary of the effects of waste management on wildlife. The primary in-depth assessments of impacts of the Project on wildlife species are included in the following key line of inquiry and subjects of note:

- Caribou (Section 7);
- Carnivore Mortality (Section 11.10);
- Other Ungulates (Section 11.11); and
- Species at Risk and Birds (Section 11.12).

This subject of note also comments on the capacity of the receiving environment for sewage disposal and air emissions from the waste incinerator. The primary in-depth assessment of the impacts of sewage disposal and air emissions on the receiving environment quality is provided in the following key line of inquiry and subject of note:

- Water Quality and Fish in Kennady Lake (Section 8); and
- Air Quality (Section 11.4).

Where there is overlap between this subject of note and another key line of inquiry or subject of note, information will be provided in both locations to the extent required by the Terms of Reference.

11.9.1.2 Purpose and Scope

The purpose of the Subject of Note: Waste Management and Wildlife is to meet the Terms of Reference for the EIS issued by the Gahcho Kué Panel. The Terms of Reference for this subject of note are shown in Table 11.9-1. The entire Terms of Reference document is included in Appendix 1.I of Section 1, Introduction to the EIS.

The scope of this subject of note includes the management of sewage, camp waste, automotive fluids, and other waste generated during construction, operation, and closure. The management and disposal of mine rock and processed kimberlite are addressed in Section 11.5, Mine Rock and Processed Kimberlite. The potential for groundwater contamination is addressed in Section 11.6, Permafrost, Groundwater, and Hydrogeology.

The EIS provides an overview of the Project's proposed waste management plan (Section 3.7). This plan considers the experiences at existing diamond mines (e.g., Ekati Diamond Mine, Diavik Diamond Mine, and Snap Lake Mine). The waste management approach for the Project has adopted the practices from those mines that have reduced wildlife attraction to the sites (e.g., immediate incineration of wastes), and avoided the practices that have been problematic (e.g., waste storage in fenced enclosures). A more detailed waste management plan will be developed when detailed Project engineering information is available. The plan will address the construction, operation, and closure phases.

Sewage treatment and disposal of treated waste water address the capacity of the aquatic receiving environment. The waste incinerator will meet air emission standards for furans and dioxins (CCME 2001).

11.9.1.3 Study Area

11.9.1.3.1 General Location

The Project is located north of the East Arm of Great Slave Lake in the Northwest Territories (NWT) at Longitude 63° 26' North and Latitude 109° 12' West. The Project site is about 140 kilometres (km) northeast of the nearest community, Łutselk'e, and 280 km northeast of Yellowknife (Figure 11.1-1).

Table 11.9-1 Terms of Reference Pertaining to Waste Management and Wildlife

Final Terms of Reference Requirements		Applicable EIS Sub-section
Section	**Description**	
5.2.10 Biophysical Subjects of Note: Waste Management and Wildlife	General requirements pertaining to waste management and wildlife include:	
	The EIS must include a discussion of alternatives to the proposed waste management plan that have been considered and any adaptive management options.	11.9.3.8
	The waste management plan must take into consideration experiences of the existing diamond mines as well as the capacity of the receiving environment (e.g., for sewage disposal).	8, 11.9.2.6, 11.9.3
	The EIS must show that Yellowknife is capable and willing to accept the materials, particularly hazardous material.	11.9.3.3, 11.9.3.4
	The EIS must provide a plan of waste management during construction, operation, and closure including:	11.9.3
	- camp sewage;	11.9.3.5
	- camp refuse;	11.9.3.4, 11.9.3.6
	- automotive fluids or other hydrocarbons at the mine site and on the access route from Yellowknife, including handling of hydrocarbon contaminated soil;	11.9.3.4, 11.9.3.7
	- scrap metal and other discarded machinery or parts;	11.9.3.3, 11.9.3.4, 11.9.3.6.3
	- discarded construction material;	11.9.3.4, 11.9.3.6.3, 11.9.3.7
	- any hazardous materials; and	11.9.3.4, 11.9.3.7
	- any other waste generated.	11.9.3
3.2.7 Follow-up Programs	The EIS must include a description of any follow up programs, contingency plans, or adaptive management programs the developer proposes to employ before, during, and after the proposed development, for the purpose of recognizing and managing unpredicted problems. The EIS must explain how the developer proposes to verify impact predictions. The impact statement must also describe what alternative measures will be used in cases were a proposed mitigation measure does not produce the anticipated result.	11.9.2.6.3

Final Terms of Reference Requirements		Applicable EIS Sub-section
Section	**Description**	
3.2.7 Follow-up Programs (continued)	The EIS must provide a review of relevant research, monitoring and follow up activities since the first diamond mine was permitted in the Slave Geological Province to the extent that the relevant information is publicly available. This review must focus on the verification of impact predictions and the effectiveness of mitigation measures proposed in previous diamond mine environmental impact assessments. In particular the developer must make every reasonable effort to verify and evaluate the effectiveness of any proposed mitigation measures that have been used, or are similar to those used at other diamond mining projects in the Mackenzie Valley.	11.9.2.6.3, 11.9.4.2, 11.9.4.3

Source: Terms of Reference for the Gahcho Kué Environmental Impact Statement (Gahcho Kué Panel 2007).

EIS = Environmental Impact Statement.

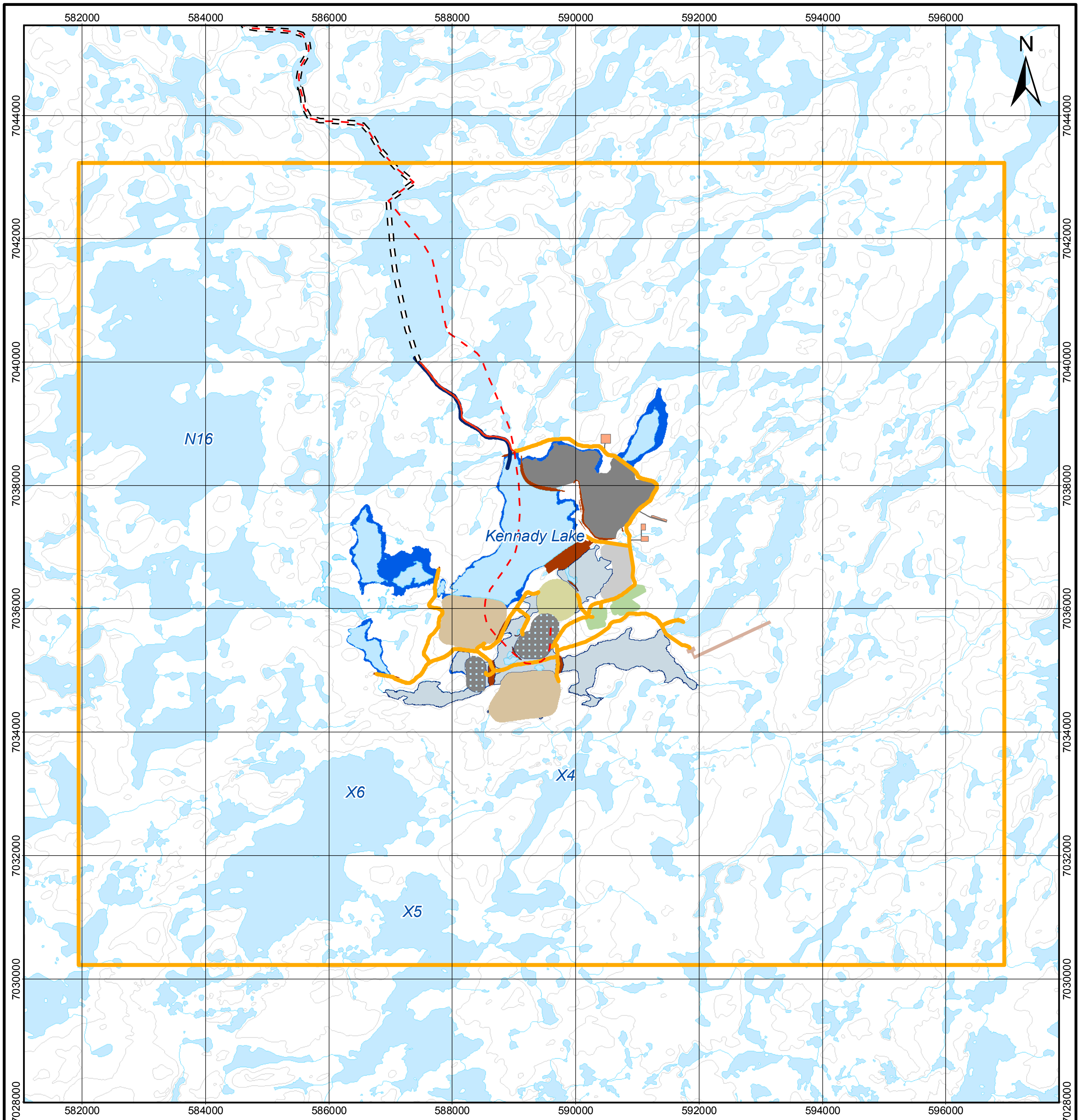
11.9.1.3.2 Study Area Selection

The study area used to assess the potential effects of the Project's waste management practices on wildlife were the same as those defined for the assessment of effects of the Project on wildlife. A Local Study Area (LSA) was selected to assess the immediate direct and indirect effects of the Project on individual animals and wildlife habitat. The LSA measures about 200 square kilometres (km^2), centred on Kennady Lake (Figure 11.9-1). This study area was used to assess the effects of waste management on wildlife because the interaction between Project waste materials and wildlife is expected to be limited to the area within and immediately adjacent to the Project footprint.

11.9.1.4 Content

The following briefly describes the content under each heading of this subject of note:

- **Existing Environment** summarizes relevant baseline information. It describes the general environmental setting in which the Project occurs and the major wildlife species that occur in the vicinity of the Project. It also describes the waste management practices, incidents and adaptive management strategies at existing diamond mines (Section 11.9.2).
- **Waste Management Plan for the Gahcho Kué Project** summarizes the proposed plans for handling and managing sewage, camp waste, plastics, automotive fluids, hazardous materials, scrap metal, and other wastes generated during construction and operation of the Project. It highlights features of the Project's waste management plan that are intended to mitigate effects on wildlife and comments on atmospheric emissions related to the incinerator, and water emissions from wastewater releases (Section 11.9.3).
- **Pathway Analysis** describes the process used to identify and evaluate the pathways through which the Project could affect the environment, and the environmental design features and mitigation which will be applied to reduce or remove pathways (Section 11.9.4).
- **Capacity of the Receiving Environment** summarizes the effects to water quality that will result from release of treated sewage from the Project (Section 11.9.5).
- **References** lists all documents and other material used in the preparation of this section (Section 11.9.6).
- **Glossary, Acronyms, and Units** explains the meaning of scientific, technical, or other uncommon terms used in this section. In addition, acronyms and abbreviated units are defined (Section 11.9.7).



LEGEND

- Winter Access Road
- Proposed Winter Access Road
- Watercourse
- Waterbody
- Contour (10m interval)
- Local Study Area

Project Footprint

- Service Road
- Site Road
- Water Pipeline
- Airstrip
- Back-filled Pit
- Building
- Coarse PK Pile
- De-watered Lake Bed
- Dyke or Berm
- Fine PK Containment Facility
- Flooded Area
- Mine Rock Pile
- Open Pit
- Plant Site
- Water

NOTES

Base data source: National Topographic Base Data (NTDB) 1:50,000
PKC = Processed Kimberlite Containment
SW = Southwest

GAHCHO KUÉ PROJECT

Waste Management and Wildlife Study Area

PROJECTION: UTM Zone 12		DATUM: NAD83	DE BEERS CANADA
Scale: 1:90,000 — 1,000 500 0 1,000 Metres			
FILE No: SON-11.8-001-GIS			DATE: October 14, 2010
JOB NO: 09-1365-1004	REVISION NO: 3		**Figure 11.9-1**
OFFICE: GOLD-SAS	DRAWN: MK	CHECK: JV	

G:\2009\1365\09-1365-1004 De Beers Gahcho Kue EA Support\GIS\maps\SON\SON-11.8-001-GIS.mxd

11.9.2 Existing Environment

11.9.2.1 General Setting

The Project is located in the Slave Geological Province (SGP). Currently, there are four permitted diamond mines located in the SGP:

- the Snap Lake Mine;
- the Diavik Diamond Mine;
- the Ekati Diamond Mine; and
- the Jericho Diamond Mine.

The Project is situated within the transition zone between the tundra and the treeline. Wildlife species characteristic of both ecozones may occur within the Kennady Lake area. Shrubs of willow (*Salix*) and birch (*Betula*) occur in drainages, which in some areas may reach over 2 metres (m) in height. Heath tundra covers most upland areas. Conifer stands occur in patchy distribution above the treeline, in lowland sheltered areas, and riparian habitats.

Wildlife habitats within the LSA (i.e., 200 km^2 area centred on Kennady Lake), include eskers and other glaciofluvial deposits, wetlands, riparian habitats, lakes, and vegetation that is typical of the tundra. Terrain is characterized primarily by low relief with rolling hills, boulder fields, and a few bedrock outcrops.

The Project is accessed in the winter by a 120-km-long Winter Access Road that extends from the Tibbitt-to-Contwoyto Winter Road at MacKay Lake to Kennady Lake. The tundra landscape along the Winter Access Road is characterized by low-growing vegetation such as lichens, mosses, and stunted shrubs. Along some stretches of the Winter Access Road, the habitat includes extensive boulder fields, steep cliffs, and esker complexes.

Baseline studies on wildlife species and wildlife habitat were completed from 1996 to 2005, 2007, and 2010. Ground and aerial surveys were designed to provide estimates of the natural variation in wildlife presence, abundance, distribution, and movement. Information on several wildlife species (caribou *[Rangifer tarandus]*, grizzly bear *[Ursos arctos*], wolf [*Canis lupus*], fox [*Vulpes*], wolverine *[Gulo gulo]*, moose *[Alces alces]*, muskoxen *[Ovibos moschatus]*, upland breeding birds, waterbirds, and raptors) was collected.

Experience at existing diamond mines has not detected adverse interactions between waste management practices and caribou (and other ungulates)

(BHPB 2010; Tahera 2008; De Beers 2010; DDMI 2010). Although gulls and ravens (*Corvus corax*) are commonly reported at the landfill at mine sites, direct and indirect effects on these species, and negative interactions between gulls and ravens and other birds also have not been detected. Because previous data have shown that carnivores are most susceptible to the effects related to waste management, this subject of note focuses on grizzly bear, wolf, fox, and wolverine. A brief description of the status of these four species is provided below.

Traditional knowledge was included in the study of baseline conditions because many valued components (VCs) are vital to the culture and health of the communities in the NWT. Traditional knowledge information was obtained from the research, experience, and expertise of the Elders of Aboriginal people. This information was used to help describe wildlife and wildlife habitat near the Project. Details of the baseline data collection study methods and results for all wildlife are provided in Annex F.

11.9.2.2 Grizzly Bear

11.9.2.2.1 Methods

Habitat surveys were completed in 2005, 2007, and 2010 to determine the natural variation in the relative use of seasonally preferred habitat by grizzly bears in the Regional Study Area (RSA). The study design and survey protocols followed the methods used at several projects in the NWT, including the Diavik Diamond Mine, Ekati Diamond Mine, and the Snap Lake Mine (BHPB 2004, 2007; DDMI 2007; De Beers 2006a, 2007; Golder 2008a,b). Surveys focused on ground searches for bear sign within sedge wetlands and riparian habitats.

Baseline studies were also completed to identify den sites used for winter hibernation, and to assess the importance of potential den habitats within the LSA. Caribou aerial surveys completed from 1999 to 2005, recorded bear observations and bear den locations. Survey efforts focused on all mapped and many unmapped esker complexes and glaciofluvial deposits to locate and determine the status (active or inactive) of historical and new grizzly bear den sites. Surveys for grizzly bear sign along eskers and esker complexes that were identified as possible sources of gravel material within 35 km of the Project were completed in 2007.

11.9.2.2.2 Results

Grizzly bears in the SGP have the largest home ranges and likely the lowest population density of grizzly bears studied in North America (McLoughlin et al. 1999). Currently, the grizzly bear population in the SGP appears stable, but increased losses associated with illegal hunting or the killing of nuisance bears may place the population at risk of decline (McLoughlin et al. 2003). Grizzly bears also may be at risk of population decline because they have low production rates and live in areas of low forage productivity and extreme environmental conditions. However, factors other than adaptation to natural conditions appear to govern the life history of central arctic populations, such as harvest biased towards male bears (McLoughlin 2000), and limited ability for range expansion because of increased human development (McLoughlin et al. 1999). As a result, population size and distribution may be affected by both natural and human factors. Grizzly bears in the NWT are listed as sensitive (Working Group on General Status of NWT Species 2006), and as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2007).

The wildlife baseline for grizzly bear, defined a 5,600 km^2 area centred on Kennady Lake as its RSA. Based on global positioning system (GPS)-collared grizzly bear data from 1995 to 1999 (McLoughlin et al. 1999), two grizzly bears maintained home ranges and den sites close to the RSA. Based on density estimates of 3.5 bears per 1,000 km^2 (McLoughlin and Messier 2001), up to 20 individual bears may inhabit portions of the RSA.

Grizzly bears and bear sign have been documented in the RSA from 1999 through 2005. Although no bears were observed within the RSA in 1998 or 1999, three sets of grizzly bear tracks were identified in 1999. In 2004, eight different grizzly bears (five adults and three cubs) were observed within the RSA and at least six different grizzly bears were present in 2005. In the RSA, most sightings occurred during the spring, with observations decreasing during the late summer and fall. No negative encounters with exploration personnel or field survey crews occurred.

Grizzly bear habitat selection depends on the availability and quality of den locations and foraging resources. Grizzly bears tend to select home ranges that contain more riparian habitat, habitats that support upland tundra vegetation growth (i.e., shrub land habitats), and esker habitat (McLoughlin et al. 1999, 2002).

Surveys for grizzly bear sign along eskers completed in the RSA in 1999 located 14 grizzly bear den sites (13 inactive and 1 active) on eskers, while most of the

24 den sites (19 inactive; 3 active, and 2 test dens) recorded during the 2004 and 2005 surveys were located adjacent to an esker. Of the four active dens recorded since 1999, one was located in heath tundra, one in tussock-hummock, one in heath-boulder, and one adjacent to the esker. The test den identified in 2004 was located in tussock-hummock, while the test den located in 2005 was found in a small glaciofluvial deposit located adjacent to a lake. Esker use surveys completed in the RSA in 2007 documented 59 observations of grizzly bear sign on eskers, resulting in 0.76 sign per kilometre surveyed.

11.9.2.3 Wolf

11.9.2.3.1 Methods

A baseline study was completed to determine the natural variation in the occurrence and distribution of wolves (*Canis lupus*) and wolf dens within the RSA, and to assess the importance of potential den habitats within the LSA. Caribou aerial surveys completed from 1999 to 2005, recorded wolf observations and wolf den locations within the RSA, LSA, and along the Winter Access Road. Survey efforts focused on esker complexes and glaciofluvial deposits to locate and determine the status (active or inactive) of historical and new den sites. Surveys for wolf along eskers and esker complexes that were identified as possible sources of gravel material within 35 km of the Project were completed in 2007.

11.9.2.3.2 Results

The abundance of wolves within the RSA is expected to vary annually and seasonally in response to factors such as prey availability and suitability of den habitat. At the regional scale, home ranges are established based on food availability (McLoughlin et al. 2004). As predators of migratory caribou, wolves in the arctic have larger home ranges and less territorial behaviour than other wolves of North America (Walton et al. 2001). At the local scale, wolves select areas with suitable den habitat, such as eskers, kames, and other glaciofluvial deposits (Johnson et al. 2004). Wolves in the NWT are secure (Working Group on General Status of NWT Species 2006), and are considered not at risk by COSEWIC (2007).

Wolves occur seasonally in the RSA from March through October, coinciding with the caribou movements through the region. A total of 46 adults (likely includes subadults) and 9 pups were recorded from 1999 to 2007. Results are similar to monitoring results from the Ekati Diamond Mine, where 47 incidental observations of wolves were documented in 2006 and 54 to 58 wolves in other years (BHPB 2007). Wolf surveys completed by Environment and Natural

Resources (ENR), reported few active dens and low counts of pups and adults at dens in 2006, suggesting that wolf numbers are down on a regional scale.

Within the LSA, relative activity levels were determined from track count surveys completed in the late winter of 2004 and 2005. In 2004 and 2005, wolf track densities in the LSA were 0.07 and 0.05 tracks per kilometre per day (TKD), respectively. Mean wolf track densities calculated during baseline studies at the Diavik Diamond Mine were 0.11 TKD (DDMI 1998).

Similar to grizzly bears, wolves also use eskers for den sites, foraging, and travel. Wolf sign surveys completed in 2007 on eskers within 35 km of the Project, recorded 34 observations on eskers, resulting in 0.44 sign per kilometre surveyed. Active wolf den sites within the RSA ranged from 6 to 37 km from the Project site. McLoughlin et al. (2004) recommended that disturbance of esker habitat should be limited to within 2 to 3 km of active wolf dens to avoid den abandonment.

11.9.2.4 Fox

11.9.2.4.1 Methods

A baseline study was completed to determine the natural variation in the occurrence and distribution of foxes and fox dens within the RSA, and to assess the importance of potential den habitats within the LSA. Caribou aerial surveys completed from 1999 to 2005, recorded fox observations and fox den locations within the RSA, LSA, and the Winter Access Road. Esker surveys completed for grizzly bears and wolves also identified historic and active fox dens in the RSA. Survey efforts focused on all mapped and many unmapped esker complexes and glaciofluvial deposits to locate and determine the status (inactive or active) of historical and new den sites. Surveys for fox sign along eskers and esker complexes that were identified as possible sources of gravel material within 35 km of the Project were completed in 2007.

11.9.2.4.2 Results

The Arctic fox (*Alopex lagopus*) and red fox (*Vulpes vulpes*) are the most abundant carnivores in the arctic tundra and are listed as secure in the NWT (Working Group on General Status of NWT Species 2006). Arctic and red fox are not listed federally (COSEWIC 2007). The ranges of Arctic fox and red fox potentially overlap in a relatively narrow strip in the southern arctic regions. The Arctic fox's southern limit of distribution is the treeline, although they may venture into the boreal forest when prey densities on the tundra are limited (ENR 2007, internet site).

The red fox is distributed throughout North America; however, it does not penetrate into the high arctic (ENR 2007, internet site). Interspecific competition between these species will influence distribution, as Arctic fox are less likely to occur where red fox are common (Elmhagen et al. 2002). Arctic and red fox have similar home range sizes, generally up to 35 km^2 (ENR 2007, internet site).

Observations of fox and fox sign have been documented in the RSA since 1998. During these surveys, no Arctic fox were observed within the RSA. Red fox, in contrast, were relatively common year-round residents within the RSA. In 2004 and 2005, red fox were observed regularly near the Project site, and one was thought to be living near the storage buildings.

Track count surveys completed within the LSA in May, 2004 recorded 114 fox tracks. Track density was calculated to be 0.13 TKD. In March 2005, 68 fox tracks were recorded for a density of 0.14 TKD. One red fox was observed. In April 2005, 41 tracks were recorded for a density of 0.11 TKD. Due to the lack of historical tracking data in the region, results from other baseline studies are not available for comparison.

Although information regarding general habitat requirements is limited, the physical characteristics of den sites and their surrounding areas have been used to identify critical fox habitat requirements in the arctic tundra (Prestrud 1992; Smits and Slough 1993; Anthony 1996). Dens are most often associated with well-drained upland terrain, which is typically associated with eskers, hummocks, or moraines (Jones and Theberge 1982; Garrott et al. 1983; Smits and Slough 1993; Anthony 1996). Both fox species often select historically favoured den locations and den site fidelity is high (Garrott et al. 1983; Smits and Slough 1993; Anthony 1996; Landa et al. 1998).

Since 1999, 24 active fox dens were identified in the RSA. Dens were established on eskers or other glaciofluvial deposits such as kames, and ranged from 2 to 38 km from the Project. Similar to the Project, the eight den sites recorded within the Snap Lake Mine study area (3,000 km^2) during baseline studies in 1999 and 2000 ranged from 8 to 30 km from the Snap Lake Mine footprint (De Beers 2002).

11.9.2.5 Wolverine

11.9.2.5.1 Methods

A baseline study was completed to determine the natural variation in the relative annual activity and abundance of wolverine (*Gulu gulu*) within the RSA. Observations of wolverine and wolverine sign within the RSA, LSA, and the

Winter Access Road were recorded during aerial surveys completed for other wildlife species from 1999 to 2005. Incidental observations were also recorded during the 2007 esker surveys.

Ground-based winter track count surveys were completed in 2004 and 2005 to determine wolverine presence in the LSA. A track density index (expressed as TKD) was calculated to determine the relative abundance of wolverines in the LSA for each survey period.

To estimate the annual changes in abundance of wolverines in a study area, the ENR has developed and implemented a program for estimating the abundance, density, and demographic parameters of wolverine at several mining projects in the NWT (Boulanger and Mulders 2007; Mulders et al. 2007). The study design uses baited posts, arranged in a sampling grid, to capture wolverine hair, which are then analyzed using deoxyribonucleic acid (DNA) finger printing techniques. The method has been incorporated into the wildlife effects monitoring programs for the Ekati Diamond Mine and the Diavik Diamond Mine in the NWT, and the Tahera and Doris North projects in Nunavut, and was part of the baseline studies for the Project.

The wolverine DNA hair snagging program was completed within a circular 1,600 km^2 study area centred on the Project site. Scent posts were wrapped in barbed wire and positioned within a 3 by 3 km grid cell, based on similar protocols used for Ekati Diamond Mine and Diavik Diamond Mine. Following the initial set-up period, each post was sampled twice during two 10-day sessions. Hair samples collected from the barbed wired were submitted for DNA analysis.

11.9.2.5.2 Results

Wolverines are annual residents in the RSA. The western Canada population (including the NWT and Nunavut) is listed as a species of special concern by COSEWIC (2007) and sensitive by the Working Group on General Status of NWT Species (2006). This western Canada population currently has no status under the *Species at Risk Act* (SARA 2007, internet site).

Wolverines are highly adaptable, tending to change their location and distribution over time. Satellite-collared wolverine studies on the central Canadian Arctic barrens estimated that adult female wolverines had a home range of 126 km^2, while the home range of adult males was 404 km^2 (Mulders 2000). Wolverines occur primarily where there are large ungulate populations. From 1998 through 2005, 27 wolverines were documented in the RSA. Wolverine activity and frequency of sightings coincided with the major spring and fall caribou migrations.

Habitat use typically depends on adequate food resources and den site availability. In tundra habitats, the availability and quality of reproductive den sites is not likely a limiting factor in wolverine production. Wolverine dens can vary from simple resting sites to complex dens with extensive tunnel networks that are frequently associated with rocky outcrops and deep snowdrifts.

Habitat within the RSA appears to provide adequate availability of potential den locations. Bedrock outcrops are relatively common, particularly farther south and west in the RSA. During spring, areas of deep snow are available along the base of eskers, in conifer stands, and in terrain depressions. The LSA is less varied in terrain features; however, den habitat does not appear to be limiting in this area. Since 1999, four wolverine dens were located within the RSA, ranging from 7 to 15 km from the Project site.

Den site fidelity is not clearly understood, although wolverines have been observed to reoccupy den sites or habitats for consecutive years. One active den site located in the RSA showed signs of long-term use with an abundance of feeding sign, including scattered caribou antlers that were of varying ages and stages of decay.

Wolverine snow track data were used to provide an annual index of abundance within the LSA, and to determine if annual changes in wolverine distribution around Kennady Lake could be detected. Track count surveys completed in May 2004, recorded 73 wolverine tracks over 237 km. Standardized (normalized for days since last snowfall) track density was 0.08 wolverine TKD. Wolverine track density in 2005 was 0.01 and 0.12 TKD for March and April, respectively. In 2004, fewer tracks were located near the Project than in 2005 suggesting an annual change in distribution around the Project. Habitat use in the LSA also was similar between the two years.

The results from the track counts completed in May 2004 and April 2005 are similar to track count density reported during baseline and monitoring studies at the Snap Lake Mine from 1999 through 2004 (De Beers 2005). Monitoring studies at the Diavik Diamond Mine and Ekati Diamond Mine also generated similar estimates of wolverine activity using snow track methods. From 2003 through 2006, average annual TKD in the Diavik study area ranged from 0.05 to 0.07 (Golder 2007). In the Ekati study area, wolverine track density ranged from 0.04 to 0.13 TKD from 1997 through 2003 (BHPB 2004).

The use of genetic markers such as DNA to study wolverine populations in the NWT has provided insight into the distribution and connectivity of these populations (Kyle and Strobeck 2002). Wolverine DNA hair snagging completed near Daring Lake from 2004 to 2006, identified between 33 to 53 individual wolverine in a 2,500 km^2 study (Boulanger and Mulders 2007). Similar studies at the Diavik Diamond Mine and the Ekati Diamond Mine each sampled an area of 1,300 km^2 in 2005, and identified 24 wolverines and 21 wolverines, respectively. In 2006, 22 wolverines were identified at the Diavik Diamond Mine, and 14 wolverines (9 females, 5 males) were detected at the Ekati Diamond Mine (Boulanger and Mulders 2007).

Similar studies were completed for the Project in 2005 and 2006 within a 1,600 km^2 sampling area that covered the LSA and part of the RSA. In 2005, nine female and eight male wolverines were identified. Results from 2006 detected 17 individuals (Boulanger and Mulders 2007). Population estimates for the Project suggest that the number of wolverine in the area of the Project is lower than the Lac de Gras region.

11.9.2.6 Waste Management at Existing Diamond Mines

11.9.2.6.1 Waste Management Practices

This discussion of waste management practices at existing diamond mines in the NWT is focused on those practices that are intended to eliminate or reduce the effect of mine wastes on wildlife. The wastes that are of concern are:

- camp refuse (food garbage and containers used to store food);
- sewage;
- hazardous wastes such as waste oil, chemicals, and diesel fuel; and
- inert scrap metals, plastics, discarded machinery, and discarded construction materials.

The waste management systems at the diamond mines have evolved and are now similar throughout the NWT. It has become evident that all food wastes must be incinerated as they are produced and that workers must be strongly discouraged from feeding wildlife. This emphasis on the reduction of the food available to wildlife at the mine sites has reduced the number of carnivores at the mines and the interactions between mining operations and animals.

All of the operating diamond mines treat their sewage. The treated effluent is released to the ambient surface waters or it is used as process water. The sewage sludge has the potential to attract wildlife. To reduce the accessibility of the sludge, some mines bury the dried sewage sludge under the mine rock. Others incinerate the sewage sludge and bury the ashes.

Hazardous wastes are stored temporarily at secure locations at the mines and transported to off-site hazardous waste facilities for recycling and disposal. The inert waste will not serve as a source of food for wildlife, but there is a possibility that some smaller animals might find shelter within the waste material. Generally, the diamond mines are moving towards burying their inert waste under mine rock during ongoing operations, thereby making this waste inaccessible to wildlife.

11.9.2.6.2 Wildlife Incidents

There have been no reported incidents of caribou or other ungulates in the landfills at existing mines. Therefore, the effect from waste management practices on wildlife appears to be mostly related to carnivores.

Toxic substance spills and toxic substance storage have not caused carnivore mortalities at the Snap Lake, Diavik, Ekati, or Jericho mines. Toxic substance spills are usually localized, and are quickly reported and managed. Environmental design features will be in place to limit the likelihood and consequence of toxic substance spills at the Project site.

Table 11.9-2 summarizes the carnivore incidents that have occurred at the Snap Lake, Diavik, Ekati, and Jericho mine sites from 1996 to 2009. Incidents include all occasions when there was an interaction between the mine and the carnivore, and some action was required (e.g., deterrent, re-location, or report of damage). Here, an incident does not include mortality. The cause of wildlife mortality is clear for cases where problem wildlife are deliberately destroyed, or when an accidental event was witnessed (such as the wolf pup that was struck by a vehicle at Ekati in 2002). However in other cases, such as when an animal is found dead within the mine property with no physical injury, the cause of death (natural or mine-related) may not be known.

Some of the carnivore incidents and mortalities have been directly associated with waste management. One source of attraction that has been problematic for wildlife is the feeding of wildlife by mine staff, which has occurred deliberately and accidentally. For example, at the Ekati Diamond Mine in 1997, lunch bags were found at a local fox den on several occasions, and staff reported seeing fox traveling with food scraps (Golder 1998). In 1999, a fox became habituated to staff at the Ekati truck shop, presumably due to availability of food scraps. The fox was live-captured and relocated (BHPB 2001). The most effective means of managing this pathway is through continuing education of mine staff, and providing garbage cans labelled for food waste in areas where people eat.

Table 11.9-2 Carnivore Incidents and Mortality at the Ekati, Diavik, Jericho, and Snap Lake Diamond Mines, 1996 to 2009

Site	Year	Phase	Species	Incidents[a]	Mortalities		
					Intentional[b]	Non-intentional[c]	Found Dead[d]
Diavik	1996 to 1999	exploration	wolverine	1	1	-	-
	2000	construction	-	-	-	-	-
	2001	construction	wolverine	2			1
	2001	construction	grizzly bear	3	-	-	-
	2002	construction	-	-	-	-	-
	2003	production	grizzly bear	1	-	-	-
	2004	production	grizzly bear	20	1	-	-
	2005	production	grizzly bear	43	-	-	-
	2005	production	wolverine	5	-	-	-
	2006	production	grizzly bear	21	-	-	-
	2006	production	wolverine	2	-	-	-
	2007	production	grizzly bear	20	-	-	-
	2007	production	wolverine	1	-	-	-
	2008	production	-	-	-	-	-
	2009	production	-	-	-	-	-
Ekati	1998 to 2001	construction-production	wolverine	3	2	-	
	2000	production	grizzly bear	-	1	-	-
	2001	production	fox	-	9	-	-
	2001	production	wolverine	7	2	-	-
	2002	production	wolf	-	-	1	-
	2002	production	fox	-	1	1	-
	2003	production	grizzly bear	5	-	-	-
	2004	production	wolf	4	-	-	-
	2004	production	wolverine	3	-	-	-
	2004	production	grizzly bear	3	-	-	-
	2005	production	fox	6	-	1	-
	2005	production	grizzly bear	18	2	-	-
	2005	production	wolverine	23	1	-	1
	2005	production	wolf	5	-	-	-
	2006	production	grizzly bear	15	-	-	-
	2006	production	wolf	4	-	-	1
	2006	production	fox	13	-	-	-
	2007	production	fox	-	6	-	2
	2008	production	wolf	5	1	-	-
	2008	production	fox	2	-	-	4
	2008	production	grizzly bear	15	-	-	-
	2008	production	wolverine	4	-	-	-
	2009	production	wolf	1	-	-	-
	2009	production	fox	11	-	1	1
	2009	production	grizzly bear	19	-	-	-
Jericho	2000 to 2004	exploration	-	-	-	-	-
	2005	construction	wolverine	-	1	-	-
	2006	production	-	-	-	-	-
	2007	production	wolverine	1	-	1	-

Table 11.9-2 Carnivore Incidents and Mortality at the Ekati, Diavik, Jericho, and Snap Lake Diamond Mines, 1996 to 2009 (continued)

Site	Year	Phase	Species	Incidents[a]	Mortalities		
					Intentional[b]	Non-intentional[c]	Found Dead[d]
Snap Lake	1999 to 2003	exploration	-	-	-	-	-
	2004	exploration	fox	1	-	-	-
	2005	construction	fox	1	-	-	-
	2005	construction	grizzly bear	1	-	-	-
	2006	construction	wolverine	2	-	-	-
	2006	construction	fox	41	-	-	-
	2007	construction	fox	36	-	-	-
	2007	construction	black bear	2	-	-	-
	2008	production	-	-	-	-	-
	2009	production	wolverine	-	-	1	-
	2009	production	fox	-	-	-	1

Sources: BHBP 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010; De Beers 2002, 2003, 2004, 2005, 2006a, and 2007; DDMI 1998, 2003, 2004, 2005, 2006, 2007, 2008, and 2010; Golder 2008a; Tahera 2000, 2006, 2007a, 2007b, and 2008).

(a) Each occasion where animals are deterred, relocated, or a damage report was filed. General observations and mortalities are not included. The number of different individuals involved may not be known.

(b) Animal intentionally destroyed by mine or government personnel.

(c) Accidental mine-related mortality (e.g., vehicle collision).

(d) Animal found dead, mortality could not be directly linked to mine activities.

Carnivore Incidents

At the Diavik, Ekati, Jericho, and Snap Lake mine sites, 370 carnivore incidents were recorded from 1996 through 2009. Although the definition of a wildlife incident varies, this statistic generally includes all occasions where there was some kind of direct interaction between an animal and the mine. Examples include the use of deterrents, wildlife gaining access to areas where they present a risk to themselves or to humans and are re-located, or causing damage to property.

Less than five percent of the incidents reported at mine sites involved wolves. Most of the recorded incidents have involved grizzly bears, probably because the presence of a bear is considered more of a threat than other carnivore species. The predominance of grizzly bear incidents at the Diavik Diamond Mine is likely due to the location of the mine on an island, which makes deterring animals away from the mine particularly difficult. There have also been relatively high numbers of grizzly bear and wolverine incidents at the Ekati Diamond Mine, and fox incidents at the Snap Lake Mine. In some cases, the frequency of incidents appears cyclic (i.e., periods associated with a high number of incidents interspersed with years with fewer incidents). This may be indicative of cycles in populations of the carnivores or the availability of prey. Associated with the 370 incidents, there were 34 confirmed mine-related mortalities of various causes, suggesting a ratio of 1 mortality for every 11 recorded incidents.

Carnivores Intentionally Destroyed

Wildlife species that have been intentionally destroyed at existing diamond mines have included wolf, wolverine, grizzly bear, and fox (Table 11.9-2). Of the 28 individuals destroyed, one was a wolf, four were grizzly bear, seven were wolverine, and 16 were fox. Ninety percent of the foxes were destroyed in 2001 at the Ekati Diamond Mine. No wildlife has been intentionally destroyed at the Snap Lake Mine from 1999 through 2009 (exploration through current operation).

All of these removals occurred with the permission of ENR, usually following an extended period of habituation to the site and multiple deterrent attempts with the same individual animal. Since 2008, no animal has been intentionally destroyed at any of the four mine sites, which is likely related to improvement in mitigation practices that limit attraction, and the management of problem animals.

Carnivores Accidentally Destroyed

All six occasions where wildlife were accidentally destroyed at a project, and where the cause of death was clearly attributable to the mine, were a result of vehicle collisions. Three fox and one juvenile wolf were killed by vehicles at the Ekati Diamond Mine. On October 9, 2002 a wolf pup carcass was found on the Misery road, 5 m from the shoulder. Fog and blowing snow resulted in poor visibility at the time. A necropsy revealed that cause of death was due to a blow to the back of the head, which broke the skull. A red fox mortality was reported in 2002 due to a vehicle collision on the Misery road. A fox pup and adult mortality occurred at Ekati in 2005 and in 2009, respectively, were due to a vehicle collision. A wolverine was accidentally hit by a vehicle at the Jericho site in 2005. A wolverine was accidentally hit by a vehicle at Snap Lake in 2009.

Carnivores Found Dead

There have been 11 carnivores (two wolverine, one wolf and eight fox) found dead among the four mines (Table 11.9-2). This category includes wildlife found dead, and for which the cause of death could not be directly linked to mine activities. For example, a wolf apparently died from starvation at Ekati in 2006. The carcass was found underneath a building at Misery Camp. A wolverine was found dead at Ekati in 2005, and the cause of death was not determined. One fox was found dead at each of the Snap Lake and Ekati sites during 2009.

11.9.2.6.3 Adaptive Management

Waste management plans for the existing diamond mines in the SGP have been adapted to respond to issues related to wildlife incidents. For example, the Diavik Diamond Mine, the Ekati Diamond Mine, and Snap Lake Mine have a Waste Management Plan that identifies each waste stream at the site, and how each should be managed. For example, food wastes from the kitchens are handled differently than used oil or batteries. Each mine has a clearly defined waste management protocol, which includes labelled garbage cans and waste bins for each waste stream and dedicated waste management staff. The waste management plans provide strategies to manage hazardous waste, recyclable waste, and waste that may attract scavengers. Another key strategy is the rapid disposal of all waste to reduce holding time.

Regardless of these practices, misdirected waste has been shown to persist within each of the waste streams. Monitoring and adaptive management are used to manage misdirected wastes. Examples of how monitoring and adaptive management have been applied to waste at the Diavik and Ekati diamond mines include the following, and are described in detail below:

- monitoring of waste streams;
- landfill re-design;
- enclosure of incinerators; and
- continuing staff education.

The Snap Lake Mine is a smaller operation with a shorter history and has been able to benefit from the lessons learned at the Diavik and Ekati diamond mines.

Waste Stream Monitoring

At both the Diavik and Ekati diamond mines, the waste management systems are monitored regularly to identify the amount and source of misdirected waste. Monitoring generally occurs at several stages: the waste bins around the mine camp, the waste transfer area, the incinerator enclosure, and the inert solid waste landfill.

The primary stage of waste management occurs at the waste bins. Separate bins are provided for incinerator waste (e.g., food waste and packaging), landfill waste (all inert, non-reactive waste such as wood, metal and cardboard), recyclable waste (including batteries, aerosol cans, oil filters and oil) and hazardous waste. These bins are monitored to identify wildlife attractants and misdirected waste at the source. The principles of adaptive management are implemented, and when environmental technicians find inappropriate waste in a waste bin, they are often able to speak to the area supervisor directly and immediately to correct the situation.

Monitoring of wildlife activity and attractants also occurs at the incinerator, waste transfer area, and landfill. At each of these areas, environmental technicians are able to monitor the level and type of misdirected waste, and speak directly to the local supervisor to correct any infractions of the waste management protocols.

Inert Solid Waste Landfill Re-design

A major improvement in waste management at the diamond mines in the SGP has been the enclosing of the inert solid waste landfill within the mine rock pile. In 2002, the inert solid waste landfill at the Ekati Diamond Mine was re-designed to be incorporated in the mine rock pile. The landfills are regularly covered with mine rock to make any attractants in the landfill unavailable to wildlife. Rather than transporting mine rock to the landfill, the landfill was moved so that it could be enclosed by the mine rock pile. This had the effect of providing more cover for the waste, leaving only a single entrance to the dumping area, and allowing for more frequent coverings. As a result of this action, the frequency of attractants at the landfill in 2002 dropped from 100 to 68 percent (%) (BHPB 2003), and a similar landfill design was adopted at the Diavik Diamond Mine, Jericho Diamond Mine, and Snap Lake Mine. Although attractants and wildlife continue to be present at the landfill (BHPB 2010), this mitigation is regarded as effective.

Enclosed Incinerators

Food waste, food packaging, and other attractants are incinerated, and the ash is then deposited in the inert solid waste landfill. Generally, the incinerators used are stand-alone units that are fired by diesel. Two problems that have arisen with the use of incinerators have been the continued presence of attractants in the incinerator area (i.e., food waste waiting to be incinerated), and the burning temperature of incinerator operation during cold temperatures.

The first issue, the presence of waste awaiting incineration acting as an attractant, has been managed through enclosing the incinerator in a fenced area, and frequently and regularly incinerating waste to reduce attractant holding time. To mitigate problems of incinerator burning temperature during cold temperatures, the incinerators are operated for longer periods, although this strategy has not always been effective with some incinerator models.

A new strategy to deal with these two issues is being tested at the Diavik and Ekati diamond mines. Both mines will be enclosing new incinerators in a purpose-built and heated building. This will allow un-incinerated waste to be stored indoors (and therefore less available to scavengers), and will provide consistency in the incinerator burning temperatures throughout the year. The new incinerators were recently installed at the Ekati Diamond Mine, and have not yet been installed at the Diavik Diamond Mine, so it is as yet unclear what improvements will be realized through this change.

Staff Education

Improvements to waste management at the existing mines has occurred through a number of notable changes in waste management practices, but substantial resources have also been invested in on-going employee education on the hazards of feeding wildlife. Due to seasonal and year-to-year changes in carnivore presence, and hence the number of scavenging animals, as well as staff turnover, a continuous program of employee education is required. In general there are three stages to this program:

- during site orientation, all new employees and contractors are educated on the hazards of feeding wildlife and the disciplinary consequences of doing so;
- signage and other reminders are posted around camp; and
- site environmental technicians offer regular job-site presentations to mine employees, particularly following waste management infractions.

11.9.3 Waste Management Plan for the Gahcho Kué Project

11.9.3.1 Introduction

The Waste Management Plan for the Project addresses the recycling, storage, handling, and disposal of all wastes, excluding those that are generated by ore extraction and processing. For the purposes of this section, domestic waste is defined as kitchen, biological, and general camp waste. Industrial waste includes inert bulk wastes other than mining wastes. Hazardous waste is residual waste from hazardous substances as defined by *Transportation of Dangerous Goods Act* and Regulations.

Experience at mines in the NWT and Nunavut has shown that careful management of wastes can prevent wildlife from being attracted to mine sites, which reduces the number of wildlife incidents and associated mortality. Waste management practices for the Project will incorporate practices that have been proven to be effective and have been used at the Snap Lake Mine and other diamond mines in the NWT.

11.9.3.2 List of Typical Wastes

Typical wastes that will be generated from construction and operations are listed below:

- Domestic Wastes:

- food waste (i.e., any food remains or wastes that have been in direct contact with food such as containers, napkins, wrappers);
- biological waste from sewage treatment plant and first aid operations;
- paper and cardboard;
- some plastics; and
- general camp and office wastes, such as used office supplies and linens.

• Inert Bulk Waste:

- conveyor belts, tires;
- crusher and chute liners, screen elements;
- motors, v-belts;
- piping and fittings;
- rebar;
- building and bulk debris, cladding, carpeting, drywall, light bulbs, broken glass, insulation, and lumber;
- incinerator ash; and
- scrap metals.

• Hazardous Wastes:

- oil and grease (and original supply containers);
- de-icing fluid (and original supply containers);
- contaminated soils and snow;
- solvents (and original supply containers);
- paints (and original supply containers);
- chemicals (and original supply containers);
- non-recyclable empty chemical/reagent sacs, such as cement, lime, and ferric sulphate; and
- batteries.

11.9.3.3 Waste Recycling

Wastes that can be recycled are:

- paper and cardboard;
- printer and copier cartridges;
- some plastics;
- some batteries;
- scrap metal;
- glass bottles and jars;
- aluminum and tin cans;
- de-icing fluid; and
- waste oil (if not incinerated at site).

The Yellowknife Solid Waste Site currently accepts the following materials for recycling:

- tin cans;
- corrugated cardboard (non-waxed and dry);
- newsprint;
- white and coloured office paper;
- computer paper;
- glass; and
- scrap metal.

Materials such as waste oil, de-icing fluid, and batteries will be transported to suitable facilities outside of the NWT for recycling. Table 11.9-3 lists some of the facilities used by diamond mines in the NWT. Where Yellowknife recycling facilities do not have the capacity or willingness to accept waste materials from the Project, De Beers will transport the materials to appropriate alternate sites for recycling and/or disposal.

Table 11.9-3 Waste Disposal Facilities Used by Northwest Territories Diamond Mines

Company	Address	Telephone
E.I.L Environmental Services	16041-132 Avenue Edmonton, AB T5V 1H8	780-448-0866
Hazco Environmental Services Ltd.	10501 Barlow Trail, SE Calgary, AB T2C 4M5	800-667-0444
Kavanaugh Waste	PO Box 1108 Yellowknife, NWT X1A 2N8	867-873-2811
Newalta Corporation	6110-27 Street Edmonton, AB T6P 1J9	780-440-6780
Univar Canada Ltd.	16911-118 Avenue Edmonton, AB T5T 1H3	780-447-8229
Wasteco Environmental Services	1000, 441-5th Avenue SW Calgary, AB T2P 2V1	403-427-5837

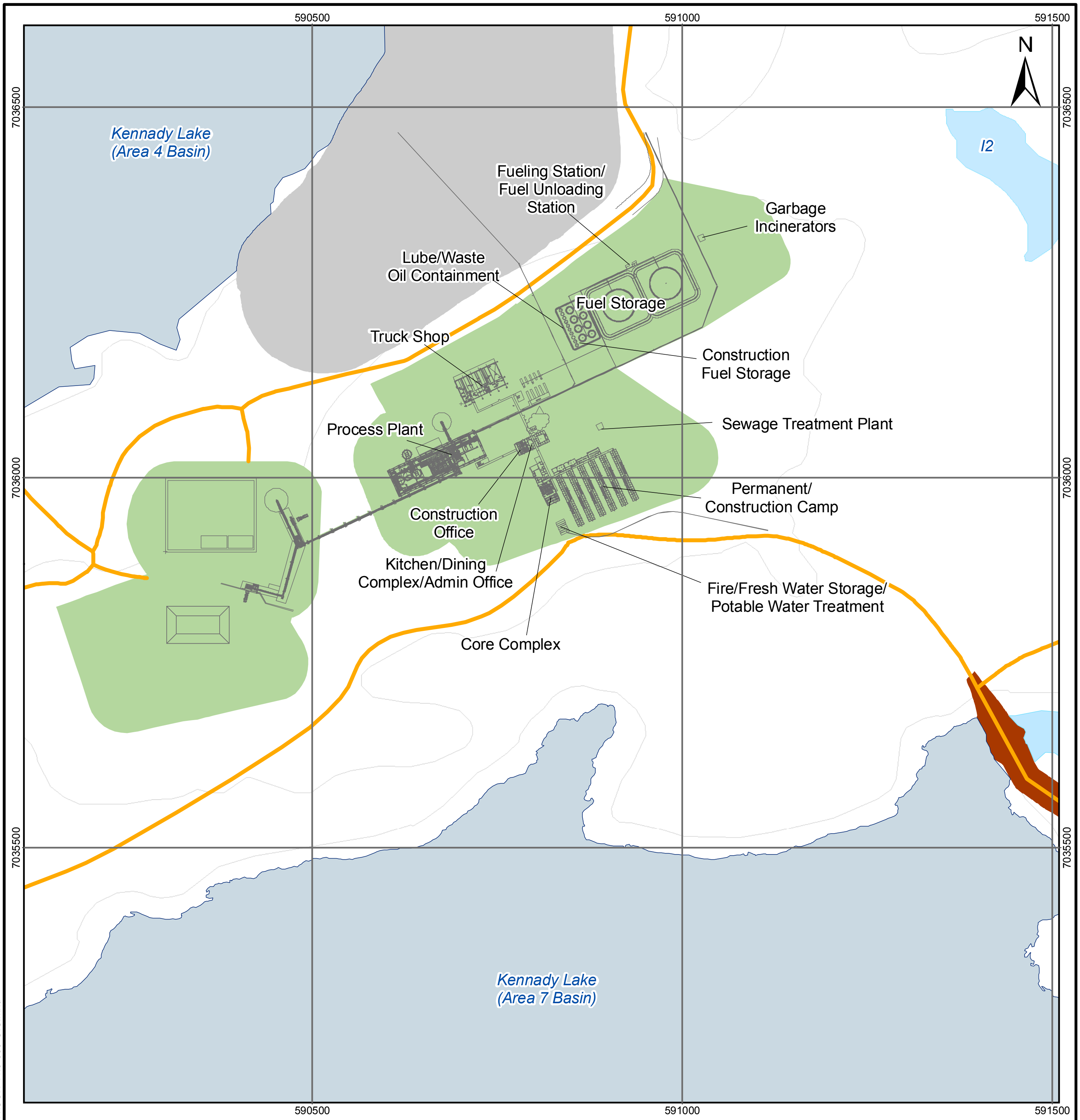
Source: De Beers 2006b.

11.9.3.4 Solid Waste Management Facilities

A number of facilities will be provided on-site to contain and store solid wastes (Figure 11.9-2):

- a landfill for inert solid wastes;
- a waste transfer storage area that will include a lined and enclosed pad for the collection and subsequent return of hazardous waste to suppliers or to an off-site hazardous waste disposal facility;
- an incinerator for kitchen wastes; and
- a landfarm for petroleum-contaminated soils.

The landfill will receive inert bulk waste such as conveyor belts, tires, chute liners, pipes, motors, building debris, scrap metals, and the incinerator ash from the combustion of kitchen and office waste. The landfill will be located within a small area of the mine rock pile or the Fine Processed Kimberlite Containment (PKC) Facility. Landfill waste will be buried to limit exposure to wind, and care will be taken to prevent the inclusion of wastes that could attract wildlife. The landfill in the mine rock piles will represent a single landfill in operation at any given time, which will likely will be covered and buried from year to year to coincide with the mine rock pile developments. As the landfill area(s) would be located in the mine rock piles or the Fine PKC Facility, any potential runoff and seepage from the landfill area will be contained within the Project site.



G:\2009\1365\09-1365-1004 De Beers Gahcho Kue EA Support\GIS\maps\SON\SON-11.9-006-GIS.mxd

LEGEND

- Watercourse
- Waterbody
- Contour (10m interval)
- Facilities

Project Footprint

- Site Road
- Coarse PK Pile
- De-watered Lake Bed
- Dyke or Berm
- Plant Site

NOTES
Base data source: National Topographic Base Data (NTDB) 1:50,000

GAHCHO KUÉ PROJECT

Waste Management Facilities

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:7,500 (150 75 0 150 Metres)		DE BEERS CANADA
FILE No: SON-11.9-006-GIS		DATE: October 14, 2010
JOB NO: 09-1365-1004	REVISION NO: 2	**Figure 11.9-2**
OFFICE: GOLD-SAS	DRAWN: MK	CHECK: JV

A fenced area will be established for the handling and temporary storage of wastes. Fencing will be 2 m high, slatted-type, and partially buried to prevent animals from burrowing underneath. Non-food waste products that are not incinerated or placed in the landfill immediately will be collected, sorted, and placed in designated areas within the fenced area.

Two dual-chamber, diesel-fired incinerators will be provided for the incineration of combustible waste, including kitchen waste. The incinerators can also be used to burn waste oil. Incinerator ash will be collected in sealed, wildlife-resistant containers, and transported to the landfill. Each modular unit will be pre-assembled and will be housed in a pre-engineered module located near the accommodation complex.

Should a spill will occur, a landfarm for the bioremediation of hydrocarbon-contaminated solids from spills may be constructed if appropriate. This dyke bounded cell would be located adjacent to the fuel storage area and would consist of an arctic geo-membrane liner placed under fill material. Hydrocarbon-contaminated soils will be placed in the landfarm and spread during summer months. Any soil that has subsequently reached acceptable levels of hydrocarbon degradation will be removed and reused or transferred to the landfill.

Arctic conditions may impede the remediation of contaminated soil through natural microbiological processes. If remediation of hydrocarbon-contaminated soils in the landfarm proves to be ineffective, and no other remediation system has been proved effective in northern climates, the contaminated soils will be collected and shipped to suitable off-site disposal facilities.

The waste transfer storage area will be established for the handling and temporary storage of wastes. Non-food waste products that are not incinerated or placed in the landfill immediately will be collected, sorted, and placed in designated areas within the storage area. Depending on the nature of the waste (hazardous, recyclable), it will be placed in sealed, wildlife-resistant containers and stored for backhaul to off-site disposal, recycle facilities, or transported to the incinerator or landfill.

The waste transfer storage area will include a lined and enclosed pad for the collection and subsequent return of hazardous waste to suppliers or to a hazardous waste disposal facility. Toxic materials will be stored in sealed steel or plastic drums. Waste oil will be collected in waste oil storage tanks. Chemicals such as de-icing fluid, acids, solvents, battery acids, and laboratory agents will be collected in lined trays and drums, and stored in suitable sealed containers in the waste transfer area. These chemicals will be shipped off-site for disposal or recycling. Some of the waste will be transferred to the Yellowknife Solid Waste Site. Other recyclable waste such as waste oil, de-icing fluid, and batteries will transferred to waste facilities outside of the NWT.

11.9.3.5 Domestic Sewage and Greywater

A modular sewage treatment system to handle a peak load of 432 people will be provided as part of initial construction. Treated effluent will be discharged to the Area 3 of Kennady Lake initially and later, during operations, added to the fine Processed Kimberlite (PK) slurry pipeline. Sewage sludge will be dewatered and disposed of in the landfill on-site. If possible, the sludge may be composted or used as a soil treatment. All domestic sewage and grey water discharged to the environment will be treated to meet the required discharge criteria, including the Northwest Territories Water Board's *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories* (NWT Water Board 1992).

11.9.3.6 Domestic and Non-Hazardous Waste Handling

Waste handling includes sorting waste and transporting it to appropriate facilities for treatment and/or storage.

11.9.3.6.1 Sorting

Waste must be sorted at the source before it can be disposed of in, or transported to, specific designated areas for proper disposal. The following practices will be implemented for sorting:

- Separate bins will be located throughout the accommodations complex, service complex, process plant, underground shops, and other facilities on-site for immediate sorting of domestic waste.
- Steel bins and dumpsters will be located at each major facility for the collection of burnable and non-burnable materials and recyclable wastes such as scrap metal, timber, tires, and unsalvageable equipment.

11.9.3.6.2 Food Waste Handling

Food wastes will be collected from the food waste bins in the accommodations complex, service complex, and other facilities and immediately placed and sealed in plastic bags. The plastic bags will then be stored in sealed containers at each facility before transport directly to the incinerator storage area for immediate incineration.

11.9.3.6.3 Inert Industrial Wastes

Non-toxic, non-food solid wastes will be sorted into four types: combustible, non-combustible, recyclable, and reusable. Combustible items will be burned in the incinerator (if suitable for disposal), while non-combustible items will be placed in the designated landfill area or recycled if practical. Aerosol cans will be punctured and drained prior to disposal. Inert bulk wastes that cannot readily be recycled or re-used, such as general debris or incinerator ash, will be transferred to the landfill.

11.9.3.7 Toxic and Hazardous Materials Handling

Toxic materials will be stored in sealed steel or plastic drums in the waste transfer area and shipped off-site for proper disposal. All other hazardous, non-combustible waste and contaminated materials not identified above will be temporarily stored in the waste storage transfer area in sealed, steel, or plastic drums, and shipped off-site for disposal or recycling. Waste oil will be collected and stored in the waste oil storage tank and subsequently incinerated for heat generation or used with explosives (if not shipped off-site for recycling).

Chemicals such as de-icing fluid, acids, solvents, battery acids, and laboratory agents will be collected in lined trays and drums and stored in suitable sealed containers in the waste transfer area. Chemicals that cannot be incinerated will be shipped off-site for disposal or recycling.

11.9.3.7.1 Spill Response

Should a spill, hazardous materials will be cleaned up immediately in accordance with the Emergency Response and Contingency Plan provided as an attachment to Section 3, Appendix 3.I, Attachment 3.I.1, and are not expected to have an effect on wildlife in and around the Project site. A brief description of the emergency spill response plan is outlined below.

On-Site Spill Response

During construction, operations and closure, the Project will maintain a fully equipped emergency response team to respond to any spills of hazardous materials. Although the transfer of diesel fuel and oil will be carefully controlled to limit the likelihood of spills, the potential for spills still exists. Where such spills occur, any pooled liquids on the surface and hydrocarbon-contaminated snow will be cleaned up immediately and transferred into drums designated for that purpose. Contaminated soil will be removed and transferred to the landfarm for remediation through natural microbiological processes or shipped off-site.

Off-Site Spill Response

The Tibbitt-to-Contwoyto Winter Road is operated by the Tibbitt-to-Contwoyto Winter Road Joint Venture (Joint Venture), a partnership between the various mining companies. Nuna Logistics (primary road) and RTL Enterprises Ltd. (secondary road) are responsible for the annual construction, maintenance, dispatching, and camp catering for the winter road. Security on the road is currently provided by SecureCheck.

The Joint Venture maintains a fully integrated emergency response plan for any emergency including spills of hazardous materials. An emergency response would be coordinated by the Joint Venture and could include the road maintenance crews, the Yellowknife fire department, and the emergency response teams from the nearest mines sites. The clean up of hazardous materials spilled on the winter road would proceed in a manner similar to the protocols used for spills at a Project site. The Emergency Response and Contingency Plan is provided as an attachment to Section 3, Appendix 3.I, Attachment 3.I.1.

11.9.3.8 Waste Disposal Alternatives

A number of disposal alternatives were considered for organic wastes, and were rejected. The rejected disposal alternatives included:

- **Composting**: composting would retain food wastes on-site in a form that would be attractive to wildlife.
- **Truck all wastes to Yellowknife or Edmonton**: winter road access is limited to a short period of the year (typically 8 to 12 weeks). Wastes generated for the remainder of the year would need to be stored on-site where a large area resistant to wildlife access would be required.
- **Landfill all solid wastes**: the landfill would need to be fenced to prevent wildlife access, and the risk of wildlife attraction to the area would occur throughout the period of Project construction, operations, and closure.

Experience from other diamond mine projects in the SGP indicates that preventing wildlife attraction to stored food wastes is problematic. Even if a storage area can be fenced and managed so that wildlife does not gain access to the site, they can still be attracted by the odours. The most effective method of preventing carnivore attraction to the Project site is to destroy food wastes as soon as the waste is generated.

11.9.4 Pathway Analysis

11.9.4.1 Methods

Pathway analysis identifies and assesses the issues and linkages between the Project components or activities (e.g., waste management), and the correspondent potential residual effects to carnivores (e.g., grizzly bear, wolf, wolverine, and fox). A pathway analysis was completed for carnivores to determine if the interaction between the Waste Management Plan for the Project (Section 11.9.3) and carnivores is considered as primary, secondary, or if there is no linkage. Potential pathways through which waste management activities at the site could influence carnivores were identified from a number of sources including:

- potential pathways identified in the Terms of Reference for the Gahcho Kué Environmental Impact Statement (Gahcho Kué Panel 2007) and the Report of Environmental Assessment (MVEIRB 2006);
- a review of the Project Description and scoping of potential effects by the environmental assessment and Project engineering teams for the Project; and
- consideration of potential effects identified for the other diamond mines in the NWT and Nunavut.

The first part of the analysis is to produce a list of all potential effects pathways resulting from Project's waste management activities. Each pathway is initially considered to have a linkage to potential effects on carnivores. This step is followed by the development of environmental design features and mitigation that can be incorporated into the Project to remove the pathway or limit (mitigate) the effects to carnivores from waste management activities. Environmental design features include Project designs and environmental best practices, and management policies and procedures (such as those associated with the waste management plan). Environmental design features were developed through an iterative process between the Project's engineering and environmental teams to avoid or mitigate effects.

Knowledge of the ecological system and environmental design features and mitigation is then applied to each of the pathways to determine the expected amount of Project-related changes to the environment and the associated residual effects (i.e., after mitigation) on the persistence of carnivore populations, and the continued opportunity for traditional and non-traditional use of these species. For an effect to occur, there has to be a source (e.g., traffic, roads) and a correspondent effect on carnivore populations.

Project activity → change in environment → effect on VC

Pathway analysis is a screening step that is used to determine the existence and magnitude of linkages from the initial list of potential effects pathways for Project-related waste management activities. This screening step is largely a qualitative assessment, and is intended to focus the effects analysis on pathways that require a more comprehensive assessment of effects on the persistence of carnivore populations, and the continued opportunity for traditional and non-traditional use of these species. Pathways are determined to be primary, secondary (minor), or as having no linkage using scientific and traditional knowledge, logic, and experience with similar developments and environmental design features. Each potential pathway is assessed and described as follows:

- no linkage – pathway is removed by environmental design features and mitigation so that the Project results in no detectable environmental change and, therefore, no residual effects to a VC relative to baseline or guideline values;
- secondary – pathway could result in a measurable and minor environmental change, but would have a negligible residual effect on a VC relative to baseline or guideline values; or
- primary – pathway is likely to result in a measurable environmental change that could contribute to residual effects on a VC relative to baseline or guideline values.

Primary pathways require further effects analysis and impact classification to determine the environmental significance from the Project-related waste management activities on the persistence of carnivore populations, and the continued opportunity for traditional and non-traditional use of these species. Pathways resulting from waste management activities with no linkage to carnivores or that are considered minor (secondary) are not analyzed further or classified because environmental design features and mitigation will remove the pathway (no linkage) or residual effects can be determined to be negligible through a simple qualitative evaluation of the pathway. Pathways resulting from waste management activities that are determined to have no linkage to effects, or those that are considered secondary are not predicted to result in environmentally significant effects on the persistence of carnivore populations, and the continued opportunity for traditional and non-traditional use of these species.

11.9.4.2 The Waste Management Plan

The Waste Management Plan for the Project (Section 11.9.3) closely follows the procedures and practices presently in place at the Diavik, Ekati, and Snap Lake mine sites, and incorporates lessons-learned from those projects. In addition, a Wildlife Effects Mitigation and Management Plan (Section 7, Appendix 7.I), which was designed according to the Wildlife Effects Mitigation and Management Plan for the Snap Lake Mine, is expected to further reduce the potential effects from the Project on carnivores. The following wildlife-specific environmental design features are included in the Waste Management Plan and the Wildlife Effects Mitigation and Management Plan to reduce the numbers of carnivores attracted to the Project and limit human-wildlife interactions and the associated risks of injury/mortality to people and wildlife.

- Assigning designated contained areas for lunch and coffee breaks for construction and outdoor operations.
- Separation of food waste and non-food waste at source.
- Identifying all food waste storage containers (i.e., bins, drums, and plastic receptacles) as “Food Waste Only”; a label stating “No Food Waste” will be applied to all containers not designated for this purpose.
- Food waste and other attractants will be incinerated prior to depositing in landfill.
- Inert solid-waste landfill will be contained within the mine rock pile and regularly covered with mine rock.
- Waste management awareness and incentive programs will be implemented, which include rewards for compliance.
- Quick disposal of waste will reduce holding time.
- Hazardous material will be shipped south for recycling.
- Waste streams will be monitored and the sources of misdirected waste will be identified and managed.
- Waste facilities will be fenced.
- Incinerators will be enclosed in a building.
- Training will be provided to on-site personnel about wildlife awareness and safety including the dangers of improper food waste disposal and feeding wildlife.
- No foil-lined drinking boxes will be permitted on-site (drink boxes were a commonly-found attractant at the Ekati landfill).
- Ongoing review of the efficiency of the waste management program and improvement through adaptive management.

The most important element in reducing interactions between the Project and wildlife is preventing carnivores from being attracted to food and food wastes. To reduce this problem, food wastes will be collected from the food waste bins in the accommodations complex, service complex, and other facilities and placed in sealed plastic bags. The plastic bags will be stored in sealed containers and transported directly to the incinerator storage area for immediate incineration. Dual-chamber, diesel oil-fired incinerators will incinerate combustible waste. Each modular unit will be pre-assembled complete with a diesel fuel storage tank and will be housed in a pre-engineered module attached to the accommodations complex.

Inert solid waste will be deposited into a landfill that will be located within a small area of the mine rock piles or Fine PKC Facility. Waste will be buried to limit exposure to wind and care will be taken to prevent the inclusion of wastes that could potentially attract wildlife.

Environmental design features to reduce air and water emissions that could affect the receiving environment include:

- screening waste bound for the incinerator for metal containing and chlorinated organic waste to minimize the combustion of material that could lead to potentially harmful emissions;
- engineering and operating the waste incinerator to meet the CCME emission standards for dioxins and furans (CCME 2001); and
- a sewage treatment plant sized to handle the needs of 650 people will be installed as part of the initial construction infrastructure. It will be adapted as necessary so that effluent meets all discharge criteria.

11.9.4.3 Results

Carnivores have a keen sense of smell and can be attracted from long distances to a Project if food items are frequently present. Carnivores are also attracted to aromatic waste material such as oil and aerosols, in addition to infrastructure that can serve as a temporary refuge to escape extreme heat or cold. Environmental design features have been established to reduce the attraction of wildlife to the Project, and limit the frequency of interactions that may result in mortality to individual animals and risk to humans.

Based on the results from monitoring programs for other mining projects in the NWT and Nunavut, it is anticipated that some animals will still be attracted to the Project. For example, wildlife effects monitoring programs completed at the Ekati Diamond Mine (1998 through 2009), Diavik Diamond Mine (2002 through 2009), Jericho Diamond Mine (2000, 2005 through 2007), and the Snap Lake Mine (2001 through 2009) have reported attractants (e.g., non-burned food items, oil products, and food packaging) and animal sign in the landfill. Much of the wildlife sign observed during landfill surveys were associated with foxes, but grizzly bear, wolverine, and wolf tracks were occasionally observed.

If wildlife became habituated to a food or shelter source, then there is the potential for animals to threaten human life and property. These wildlife-human interactions can encompass a range of events, from the feeding of wildlife to the intentional destruction of animals determined as “nuisance” individuals. With the permission of ENR, wildlife species have been intentionally destroyed or relocated at existing diamond mines. In other cases, the presence of animals on-site can lead to accidental death, typically from vehicle collisions.

For example, one wolf, nine wolverine, four grizzly bear, and 19 foxes have been intentionally or accidentally destroyed from 1998 to 2009 among the existing mine sites (Table 11.9-2). Intentional destruction of individuals was generally associated with habituation to the mine site over an extended period of time, and after multiple deterrent attempts failed with the same individual. Increased diligence in the implementation of waste management practices and staff education have resulted in decreasing the frequency of attractants at mine sites. Since 2004, no carnivores have been destroyed at the Diavik Diamond Mine. No carnivores have been intentionally destroyed at the Ekati Diamond Mine since 2008.

At the Snap Lake Mine, one wolverine has been accidently destroyed during the nine years of exploration through current operation (Table 11.9-2). No carnivores have been intentionally destroyed from 1999 through to 2009. This result demonstrates that the implementation and enforcement of the Snap Lake Waste Management and Wildlife Effects Mitigation and Management plans has been successful at limiting the risk of mortality to wildlife and humans. Similar waste management and wildlife effects mitigation plans will be implemented by the Project. Although some animals will be attracted to the Project, the change in the number of individuals that may be intentionally and accidentally destroyed is predicted to be minor relative to baseline conditions. Natural mortality agents and harvesting of animals will likely have a larger influence on population abundance and distribution than direct Project-related mortality. Therefore, mortality of individuals as a result of attraction to Project is expected to have a negligible effect on the persistence of carnivore populations.

11.9.5 Capacity of the Receiving Environment

The waste incinerator will meet CCME Canada Wide Standards for Dioxins and Furans (CCME 2001), and so air emissions are expected to be within the capacity of the environment.

Sewage treatment plant effluent will meet stringent water quality criteria to limit the effect to water quality. Nutrient inputs, particularly phosphorous, will be managed through the restriction of phosphate-based cleaning products used on-site. Treated effluent will be discharged to Area 3 of Kennady Lake initially and later, during operations, added to the PK slurry pipeline. The sewage sludge will be dewatered and disposed in the landfill on site. If possible, the sludge may be composted or used as a soil treatment.

11.9.6 References

Anthony, R.M. 1996. Den Use by Arctic foxes (*Alopex lagopus*) in a Subarctic Region of Western Alaska. Canadian Journal of Zoology 74:627-631.

BHPB (BHP Billiton Diamonds Inc). 2001. 2000 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc. by Golder Associates Ltd. January, 2001.

BHPB. 2002. 2001 Wildlife Effects Monitoring Program, Ekati Diamond Mine. Prepared by Golder Associates Ltd. for BHP Billiton Diamonds Inc.

BHPB. 2003. 2002 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc. by Golder Associates Ltd. January, 2003.

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

BHPB. 2005. 2004 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc. by Rescan Environmental Services Ltd. January, 2005.

BHPB. 2006. 2005 Wildlife Effects Monitoring Program. Prepared for BHP Billiton Diamonds Inc. by Rescan Environmental Services Ltd. March 2006.

BHPB. 2007. Ekati Diamond Mine 2006 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd. for BHP Billiton Diamonds Inc. May 2007.

BHPB. 2008. Ekati Diamond Mine 2007 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd. for BHP Billiton Diamonds Inc. February 2007.

BHPB. 2009. Ekati Diamond Mine 2008 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd. for BHP Billiton Diamonds Inc. March 2009.

BHPB. 2010. Ekati Diamond Mine 2009 Wildlife Effects Monitoring Program. Prepared by Rescan Environmental Services Ltd. for BHP Billiton Diamonds Inc. March 2010.

Boulanger, J. and R. Mulders. 2007. Analysis of 2005 and 2006 Wolverine DNA Mark-recapture Sampling at Daring Lake, Ekati, Diavik, and Kennady Lake, Northwest Territories. Draft Report prepared for Environment and Natural Resources, Government of the Northwest Territories by Integrated Ecological Research.

CCME (Canadian Council of Ministers of the Environment). 2001. Canada-Wide Standards for Dioxins and Furans. Endorsed by CCME Council of Ministers, April 30-May 1, 2001, Winnipeg, Manitoba.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. Canadian Species at Risk, November 2007. Committee on the Status of Endangered Wildlife in Canada.

DDMI (Diavik Diamond Mines Inc.). 1998. Environmental Effects Report, Wildlife. Prepared by Diavik Diamond Mines Inc.

DDMI. 2003. 2002 Wildlife Effects Monitoring Report. Prepared by Diavik Diamond Mines Inc., March 2003.

DDMI. 2004. Diavik Diamond Mines Inc. 2003 Wildlife Monitoring Report. Prepared by Diavik Diamond Mines Inc.

DDMI. 2005. 2004 Wildlife Monitoring Report, Prepared by Diavik Diamond Mines Inc.

DDMI. 2006. Diavik Diamond Mines Inc. 2005 Wildlife Monitoring Report. Prepared by Diavik Diamond Mines Inc., March 2006.

DDMI. 2007. 2006 Wildlife Monitoring Report. Prepared by Diavik Diamond Mines Inc. March 2007.

DDMI. 2008. 2007 Wildlife Monitoring Program. Prepared by Diavik Diamond Mines Inc. April 2008.

DDMI. 2009. 2008 Wildlife Monitoring Program. Prepared by Diavik Diamond Mines Inc. April 2009.

DDMI. 2010. 2009 Wildlife Monitoring Program. Prepared by Diavik Diamond Mines Inc. April 2010.

De Beers (De Beers Canada Inc). 2002. Baseline Wildlife Monitoring: Snap Lake Diamond Project 1999 to 2001. Prepared by Golder Associates Ltd. for De Beers Canada Mining Inc.

De Beers. 2003. Baseline and Interim Wildlife Monitoring, Snap Lake Diamond Project 2002. Prepared by Golder Associates Ltd. for De Beers Canada Mining Inc.

De Beers. 2004. Wildlife Baseline Studies for the Snap Lake Project, 1999 to 2003. Prepared for De Beers Canada Mining Inc. by Golder Associates Ltd. Yellowknife, NWT.

De Beers. 2005. Wildlife Baseline Studies for the Snap Lake Project, 1999 to 2004. Prepared for De Beers Canada Mining Inc. by Golder Associates Ltd. Yellowknife, NWT.

De Beers. 2006a. Snap Lake Project Wildlife Effects Monitoring Program. 2005 Annual Report. Prepared for De Beers Canada Inc. by Golder Associates Ltd. Yellowknife, NWT. March 2006.

De Beers. 2006b. Snap Lake Project: Wildlife Safety Plan. December 2006.

De Beers. 2007. Snap Lake Project Wildlife Effects Monitoring Program. 2006 Annual Report. Prepared for De Beers Canada Inc. by Golder Associates Ltd. Yellowknife, NWT. September 2007.

De Beers. 2009. Snap Lake Mine: Wildlife Effects Monitoring Program. 2008 Annual Report. Prepared for De Beers Canada Inc. by Golder Associates Ltd. Yellowknife, NWT.

De Beers. 2010. Snap Lake Mine: Wildlife Effects Monitoring Program. 2009 Annual Report. Prepared for De Beers Canada Inc. by Golder Associates Ltd. Yellowknife, NWT.

Elmhagen, M., M. Tannerfeldt, and A. Anderbjorn. 2002. Food-niche Overlap between Arctic and Red Foxes. Canadian Journal of Zoology 80:1274-1285.

ENR (Environment and Natural Resources). 2007. Department of Environment and Natural Resources website. Available at: http://www.enr.gov.nt.ca/_live/pages/wpPages/home.aspx. Accessed: September 29, 2007 and October 1, 2007.

Gahcho Kué Panel. 2007. Terms of Reference for the Gahcho Kué Environmental Impact Statement. Mackenzie Valley Environmental Impact Review Board. Yellowknife, NWT.

Garrott, R.A., L.E. Eberhardt, and W.C. Hanson. 1983. Arctic Fox Den Identification and Characteristics in Northern Alaska. Canadian Journal of Zoology 61: 423-426.

Golder (Golder Associates Ltd.). 1998. 1997 Wildlife Monitoring Porgram Construction Phase NWT Diamonds Project – BHP. Prepared for BHP Diamonds Inc. Yellowknife, NWT.

Golder. 2007. A Comparison of Methods for Monitoring Abundance and Distribution of Wolverine at the Diavik Diamond Mine. Prepared for Diavik Diamond Mines Inc. Yellowknife, NWT.

Golder 2008a. Snap Lake Mine: Analysis of Environmental Effects on Wildlife, 1997 to 2007. Prepared by Golder Associates Ltd. for De Beers Canada Mining Inc.

Golder. 2008b. Analysis of Environmental Effects from the Diavik Diamond Mine on Wildlife in the Lac de Gras Region. Prepared for Diavik Diamond Mines Inc. Yellowknife, NT.

Johnson, C.J., M.S. Boyce, R. Mulders, A. Gunn, R.J. Gau, H.D. Cluff, and R.L. Case. 2004. Quantifying Patch Distribution at Multiple Scales: Applications to Wildlife-habitat Models. Landscape Ecology 19(8): 869-882.

Jones, D.M. and J.B. Theberge. 1982. Summer Home Range and Habitat Utilization of the Red Fox (*Vulpes vulpes*) in a Tundra Habitat, Northwest British Columbia. Canadian Journal of Zoology 60:807-812.

Kyle, C. and C. Strobeck. 2002. Connectivity of Peripheral and Core Populations of North American Wolverines. Journal of Mammalogy 83:1141-1150.

Landa, A., O. Strand, J.D.C. Linnell, and T. Skogland. 1998. Home-range Sizes and Altitude Selection for Arctic Foxes and Wolverines in an Alpine Environment. Canadian Journal of Zoology 76(3): 448-457.

McLoughlin, P.D., F. Messier, R.L. Case, R.J. Gau, R. Mulders, and D. Cluff. 1999. The Spatial Organization and Habitat Selection Patterns of Barren ground

Grizzly Bears (*Ursus arctos*) in the Northwest Territories and Nunavut: Final Report to the West Kitikmeot/Slave Study Society.

McLoughlin, P.D. 2000. The Spatial Organization and Habitat Selection Patterns of Barren-ground Grizzly Bears in the Central Arctic. Ph.D. Thesis, University of Saskatchewan, Saskatoon, SK.

McLoughlin, P.D. and F. Messier. 2001. The Demography of Barren-ground Grizzly Bears (Ursus arctos) in Nunavut and the Northwest Territories. Prepared for the Department of Resources, Wildlife, and Economic Development, Government of the Northwest Territories, Yellowknife, NWT.

McLoughlin, P.D., R.L. Case, R.J. Gau, H.D. Cluff, R. Mulders, and F. Messier. 2002. Hierarchical Habitat Selection by Barren-ground Grizzly Bears in the Central Canadian Arctic. Oecologica 132:102-108.

McLoughlin, P.D., M.K. Taylor, H.D. Cluff, R.J. Gau, R. Mulders, R.L. Case, and F. Messier. 2003. Population Viability of Barren-ground Grizzly Bears in Nunavut and the Northwest Territories. Arctic 56(2):185-190.

McLoughlin, P.D., L.R. Walton, H.D. Cluff, P.C. Paquet, and M.A. Ramsay. 2004. Hierarchical Habitat Selection by Tundra Wolves. Journal of Mammalogy 85(3):576–580.

Mulders, R. 2000. Wolverine Ecology, Distribution and Productivity in the Slave Geological Province. Final Report. Submitted to the West Kitikmeot/Slave Study Society.

Mulders, R., J. Boulanger, and D. Paetkau. 2007. Estimation of Population Size for Wolverines (*Gulo gulo*) at Daring Lake, Northwest Territories, using DNA-based mark-recapture methods. Wildlife Biology 13: (in press).

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2006. Reasons for Decision and Report of Environmental Assessment for the De Beers Gahcho Kué Diamond Mine, Kennady Lake, NT. Mackenzie Valley Environmental Impact Review Board. Yellowknife, NWT.

NWT Water Board (Northwest Territories Water Board). 1992. Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories. Available at:

http://www.nwtwb.com/Discharge_of_Treated_Municipal_Water__1990.pdf. Accessed: September 2010.

Prestrud, P. 1992. Physical Characteristics of Arctic Fox (*Alopex lagopus*) Dens in Svalbard. Arctic 45(2):154-158.

Smits, C.M.M. and B.G. Slough. 1993. Abundance and Summer Occupancy of Arctic Fox, *Alopex lagopus*, and Red Fox, *Vulpes vulpes*, Dens in the Northern Yukon Territory, 1984-1990. Canadian Field Naturalist 107(1):13-18.

SARA (*Species at Risk Act*). 2007. Species at Risk Public Registry. Available at: http://www.sararegistry.gc.ca/default_e.cfm. Accessed: December 2007.

Tahera (Tahera Corporation). 2000. Jericho Project Environmental Monitoring and Management Plan. Tahera Corporation, Vancouver, BC. November 2000.

Tahera. 2006. 2005 Wildlife Monitoring Data Summary, Jericho Diamond Project. Prepared for the Tahera Corporation by Golder Associates Ltd. Available at http://ftp.nunavut.ca/nirb/

Tahera. 2007a. Jericho Diamond Project 2006 Wildlife Monitoring Data Summary. Prepared for the Tahera Corporation by Golder Associates Ltd. Available at http://ftp.nunavut.ca/nirb/

Tahera. 2007b. Wildlife Mitigation and Monitoring Plan for the Jericho Diamond Project. Prepared for the Tahera Diamond Corporation by Golder Associates Ltd. Available at http://ftp.nunavut.ca/nirb/

Tahera. 2008. Jericho Diamond Project 2007 Wildlife Monitoring Program Data Summary. Prepared by Golder Associates Ltd. For Tahera Diamond Corporation, March 2008.

Transportation of Dangerous Goods Act. 1992. Available at: http://laws.justice.gc.ca/PDF/Statute/T/T-19.01.pdf. Accessed: September 2010.

Transportation of Dangerous Goods Regulations. 2010. Available at: http://laws.justice.gc.ca/PDF/Regulation/S/SOR-2001-286.pdf. Accessed: September 2010.

Walton, L.R., H.D. Cluff, P.C. Paquet, and M.A. Ramsay. 2001. Movement Patterns of Barren-ground Wolves in the Central Canadian Arctic. Journal of Mammalogy 82(3):867–876.

Working Group on General Status of NWT Species. 2006. NWT Species 2006 2010: General Status Ranks of Wild Species in the Northwest Territories, Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, N.W.T. III pp.

11.9.7 Acronyms and Glossary

11.9.7.1 Acronyms

BHPB	BHP Billiton Diamonds Inc.
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DDMI	Diavik Diamond Mines Inc.
De Beers	De Beers Canada Inc.
DNA	deoxyribonucleic acid
e.g.	for example
EIS	Environmental Impact Statement
ENR	Department of Environment and Natural Resources
et al.	group of authors
GIS	geographic information system
GPS	global positioning system
i.e.	that is
LSA	Local Study Area
MVEIRB	Mackenzie Valley Environmental Impact Review Board
NWT	Northwest Territories
PK	processed kimberlite
PKC	processed kimberlite containment
Project	Gahcho Kué Project
RSA	Regional Study Area
Tahera	Tahera Corporation
TKD	tracks per kilometre per day
SGP	Slave Geological Province
VC	valued component

11.9.7.2 Units of Measure

%	percent
km	kilometre
km^2	square kilometres
m	metre

11.9.7.3 Glossary

Air Emission Standard	The maximum legal quantity of pollutant permitted to be discharged from a single source.
Air quality	A measure of substance concentrations in ambient air. The less the concentration of a particular substance the better the air quality.
Baseline	The case that includes existing environmental conditions as well as existing and approved projects or activities, prior to the construction of the Project in question, acts as reference against which data from construction and operational phases of development will be compared.
Bioreactor	An apparatus, such as a large fermentation chamber, for growing organisms such as bacteria or yeast that are used for the bioconversion of organic waste.
Bioremediation	A term for the process of applying microbial inoculants for the acceleration of the natural fate of organic pollutants during the remediation of contaminated soil, sludge, and groundwater.
Carnivore	An animal that preys on other animals; especially any mammal of the Order Carnivora including wolves, bears and wolverine.
Domestic Waste	Kitchen, biological, and general camp waste.
Drumlins	A long narrow hill, made up of till, which points in the direction of the glacier movement.
Ecosystem	An ecological system consisting of all the organisms in an area and the physical environment within which they interact.
Environmental Impact Statement	A report that documents the information required to evaluate the environmental impact of a project.
Esker	Linear structures of loose sand and gravel, formed by glacial rivers. They provide critical habitat for carnivores and ungulates in the arctic.
Glaciofluvial	Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.
Hazardous Substance (Material)	A substance that is potentially damaging to the environment and harmful to humans and other living organisms because of its quantity, concentration, or physical, chemical, or infectious characteristics when improperly treated, stored or disposed of, or otherwise mismanaged.
Hazardous Waste	Residual waste from hazardous substances as defined by *Transportation of Dangerous Goods Act* and Regulations
Heath Tundra	A closed mat plant community that grows on moderate to well drained soils, covering most of the upland areas. Plants generally belong to the heath family, the Ericaceae. The vegetation layer forms a mat of low shrubs dominated by dwarf birch and Labrador tea.
Hummock	A low, rounded hill.
Industrial Waste	Includes inert bulk wastes other than mining wastes.
Inert Waste	Wastes that are largely nonbiodegradable, non-flammable, and not chemically reactive.
Key Line of Inquiry	Areas of the greatest concern that require the most attention during the environmental impact review and the most rigorous analysis and detail in the Environmental Impact Statement. Their purpose is to ensure a comprehensive analysis of the issues that resulted in significant public concern about the proposed development.
Landfarm	The application of wastes on or just below the surface of the land and the materials are subsequently degraded naturally by microorganisms
Landscape	A mosaic where a cluster of local ecosystems is repeated in similar form over an area.

Mesotrophic	Trophic state classification for lakes characterized by moderate productivity and moderate nutrient inputs (particularly total phosphorus).
Moraine	An accumulation of boulders, stones, and other materials (sands, silts, clays) carried and deposited by a glacier.
Oligotrophic	Trophic state classification for lakes characterized by low productivity and low nutrient inputs (particularly total phosphorus).
Resource	Any biotic and abiotic factor directly used by an organism.
Riparian	Refers to terrain, vegetation or simply a position next to or associated with a stream, floodplain, or standing waterbody.
Sedge	Any plant of the genus *Carex*, which are perennial herbs, often growing in dense tufts in marshy places. They have triangular jointless stems, a spiked inflorescence, and long grass-like leaves which are usually rough on the margins and midrib. There are several hundred species.
Study area	An arbitrary spatial extent chosen by the investigator within which to conduct a study.
Toxic Substance (Material)	A substance that, when ingested, inhaled, absorbed, injected into, or developed within the body, will cause damage to structures of the body and impair or destroy their function.
Traditional Knowledge	The knowledge, innovations and practices of indigenous people; refers to the matured long-standing traditions and practices of certain regional, indigenous, or local communities.
Traditional Land Use	The practices and traditions of land use and resource harvesting by regional, indigenous, and local communities.
Trophic Status	The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.
Tundra	A vast, mostly flat, treeless Arctic region of Europe, Asia, and North America in which the subsoil is permanently frozen. The dominant vegetation is low-growing stunted shrubs, mosses, lichens.
Tussock - Hummock	A tussock is a tuft of grass or grasslike plants like sedges. Tussock –hummock refers to a type of tundra consisting of acre upon acre of sedge tussocks, usually located on flat, poorly drained land or gentle slopes.
Ungulate	A hoofed, grazing mammal (e.g., caribou, muskox, deer, moose).
Upland Area	Ground elevated above the lowlands along rivers or between hills; highland or elevated land; high and hilly country.
Valued Component	Represent physical, biological, cultural, and economic properties of the social-ecological system that are considered to be important by society.
Vegetation Type	Habitat types classified based on the plant community present.
Zone of Influence	The surrounding area of a development site in which animal occurrence is reduced, possibly due to avoidance of sensory disturbances or low-quality habitats.