DE BEERS
CANADA
GAHCHO KUÉ PROJECT

April 4, 2012 File: S110-01-08

Chuck Hubert
Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
P.O. Box 938
Yellowknife NT X1A 2N7

Dear Mr. Hubert:

Environment Canada - Information Request
Responses - Gahcho Kué Project Environmental Impact Review

De Beers is pleased to provide the Mackenzie Valley Environmental Impact Review Board with responses to Information Requests submitted by Environment Canada.

Sincerely,

Veronica Chisholm

Veronica Chisholm
Permitting Manager

Attachment

c: D. Ash, A/Regional Director, Environment Canada
L. Lowman, Senior EA Coordinator, EA & Marine Programs Division, EC

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_1

Source: Environment Canada (EC)

Subject: Upland Bird Baseline Data

EIS Section: EIS Sections 11.12.2.1 to 11.12.2.3

Terms of Reference Section: 3.1.3 Existing environment – Birds and Bird Habitat and Biologically Vulnerable Species

Preamble

The Proponent conducted breeding bird surveys in 10 control and 10 mine plots, and states that each plot was 0.25 km^2 in size. Plots were classified according to three broad habitat types: Sedge Wetland, Heath Tundra and Riparian. It is unclear whether plot locations were selected randomly or if they were pre-selected on the basis of habitat composition. Eleven (11) of the 20 plots were sampled in 2004, and all 20 plots were sampled in 2005 for a total of 31 samples. Sixteen (16) plots were in Sedge Wetland habitat, 14 were in Heath Tundra habitat and 1 was in Riparian habitat. It is later stated in Section 11.12.2.3.1 (pg. 11.12-28) that the plot in riparian habitat was much smaller (0.01 to 0.02 km^2) than the other plots, and that the smaller plot size resulted in an overestimate of bird density in this habitat type. This plot nonetheless had the highest recorded species richness, and, according to Table 11.12-3, contained two species, Lincoln's Sparrow and Rusty Blackbird, that were only detected in this habitat type. The riparian plot appears to have been included in Table 11.12-4 under "All plots" (n=31), but the upper value of the range of bird density recorded for all plots in Table 11.12-4 (173 birds/0.25 km^2) does not correspond to the density estimate for Riparian habitat which was 230-294 birds/0.25 km^2. It is also unclear why a range in plot size and bird density was reported for the riparian plot when it is stated that only one plot was surveyed in this habitat type. Was the riparian plot surveyed in both 2004 and 2005? Was the plot size varied from year to year? This needs to be clarified.

The riparian plot was not included in the calculation of bird density estimates used to assess direct impacts due to habitat loss and indirect habitat loss due to sensory disturbance and dust deposition. Given that riparian habitat will be one

of the main habitat types impacted by the project due changes in water level in Kennady Lake and surrounding lakes (A3, D2, D3, E3, N11), it is difficult to assess whether the density and diversity of birds using riparian habitats might have been adequately captured in the 16 plots conducted in the "Sedge Wetland" habitat without knowing the spatial distribution of the three broad habitat types sampled in the LSA and RSA. The map indicating the location of the breeding bird plots provided in the EIS (Figure 11.12-3) is at too broad a scale to visualize the range of habitat types sampled in each plot and the location of the smaller plot Riparian Habitat.

Request

Environment Canada requests that De Beers Canada Inc. (DeBeers) provide the following:

1. An explanation of whether plot locations were randomly assigned or pre-selected on the basis of habitat composition.

2. Two maps, one at the scale of the local study area (LSA) and one at the scale of the RSA showing the distribution of the three broad habitat categories used to classify Upland Bird plots - Heath Tundra, Sedge Wetlands and Riparian Habitat used for bird plots in the LSA before project implementation and after project implementation. Please include the boundaries of Upland Bird plots on these maps.

3. A map that shows "Wetland" vs. "Upland" habitat types, also referred to as "community types" in Table 11.12-17, using one colour for all habitat types classified Wetland Community (WC) types and a different colour for all habitat types classified as Upland Community (UC) types.

4. Answers to the following questions about the Riparian Plot:

    - Why there was only one Upland Breeding Bird plot in riparian habitat and why this plot was smaller than other plots? Specifically:
    - Does this plot represent an individual plot or merely part of one of the larger 0.25 km^2 plots?
    - What was the exact size of this plot (i.e. why was a size range for the plot reported when there is only one plot)?

- Was it surveyed in a manner similar to the larger plots?
- Which of the habitat types used in the impact assessment does the riparian habitat correspond to?

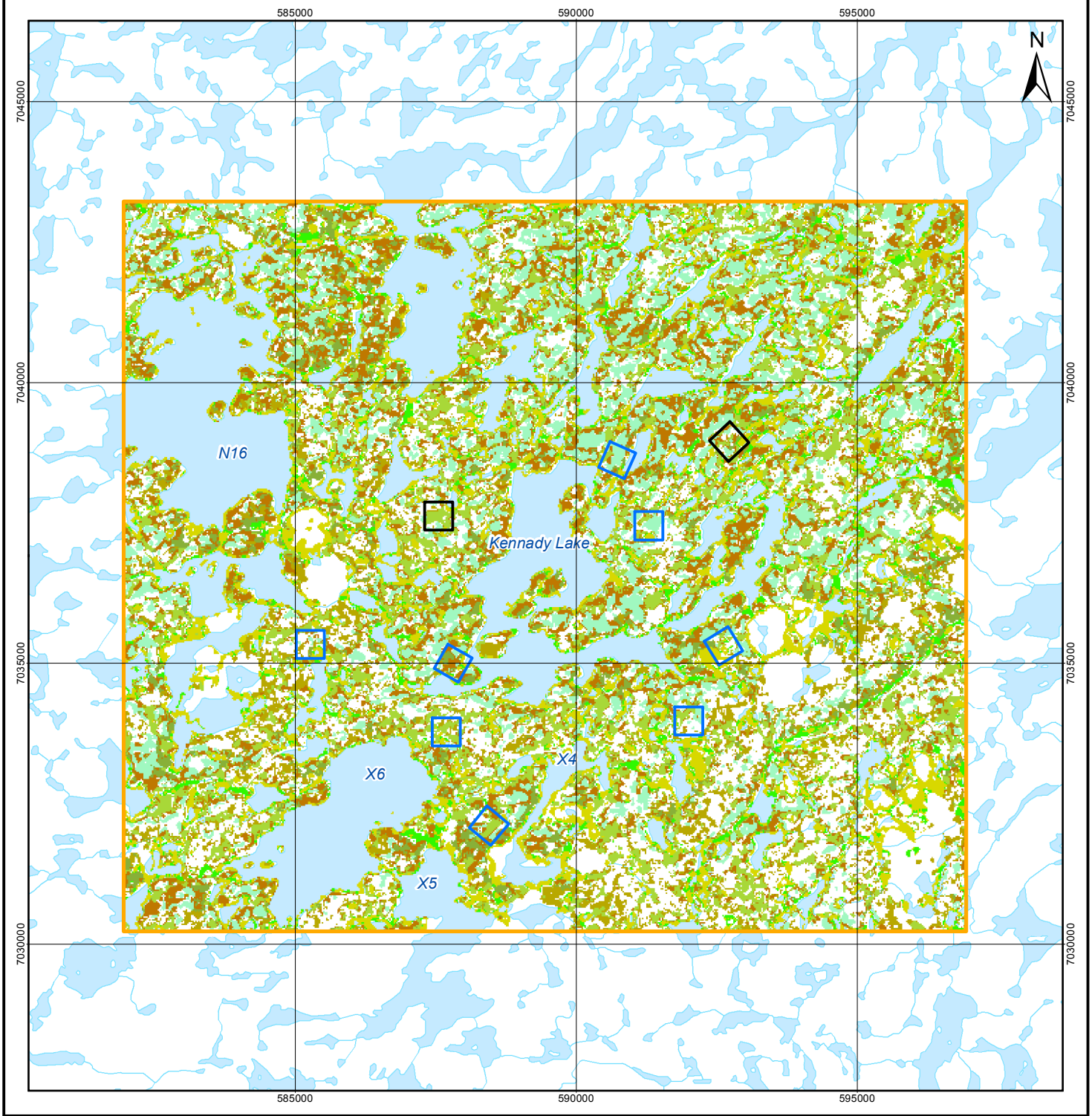
5. A rationale for not including data from the Riparian plot in the impact assessment presented in section 11.12.4.2.

Response

1. Plots were selected within habitats known to contain the distribution of species of upland breeding birds on arctic tundra landscapes, such as heath tundra and sedge wetlands (De Beers 2002; Smith et al. 2005; BHPB 2010). Plot location was based on habitat patches associated with heath tundra (upland) and sedge wetland (wetland) communities, logistics, and distance from the anticipated mine footprint for potential future monitoring objectives (i.e., before-after-control-impact study design). After meeting these initial conditions for habitat and distance from the anticipated mine, twenty plots were randomly selected in 2004, but only 11 were surveyed due to weather conditions (De Beers 2010, Section 11.12.2.2.1, page 11.12-15). All 20 plots were sampled in 2005. During the two years, plots occurred in sedge wetlands (N=16 plots), heath tundra (N=14 plots), and riparian (N=1 plot) habitats (De Beers 2010, Annex F; Section F3.2.8).

2. Figures EC_1-1a and EC_1-1b show the location of upland breeding bird survey plots before and after construction of the Project in the local study area (LSA). The primary habitat types contained within heath tundra and sedge wetlands plots are also illustrated. Figure EC_1-2 illustrates the distribution of heath tundra, sedge wetlands, and riparian plots across the regional study area (RSA). The distribution of primary habitat types comprising these plots is also provided.

3. Figure EC_1-3 shows the distribution of upland and wetland community types across the RSA, and the location of survey plots.



LEGEND

- Watercourse
- Waterbody
- Local Study Area

Survey Plot
- Heath Tundra
- Sedge Wetland

Broad Ecosytem Unit
- Sedge Wetland
- Heath Boulder
- Tall Shrub
- Peat Bog
- Tussock-hummock
- Birch Seep
- Heath Tundra

NOTES
Base data source: National Topographic Base Data (NTDB) 1:250,000

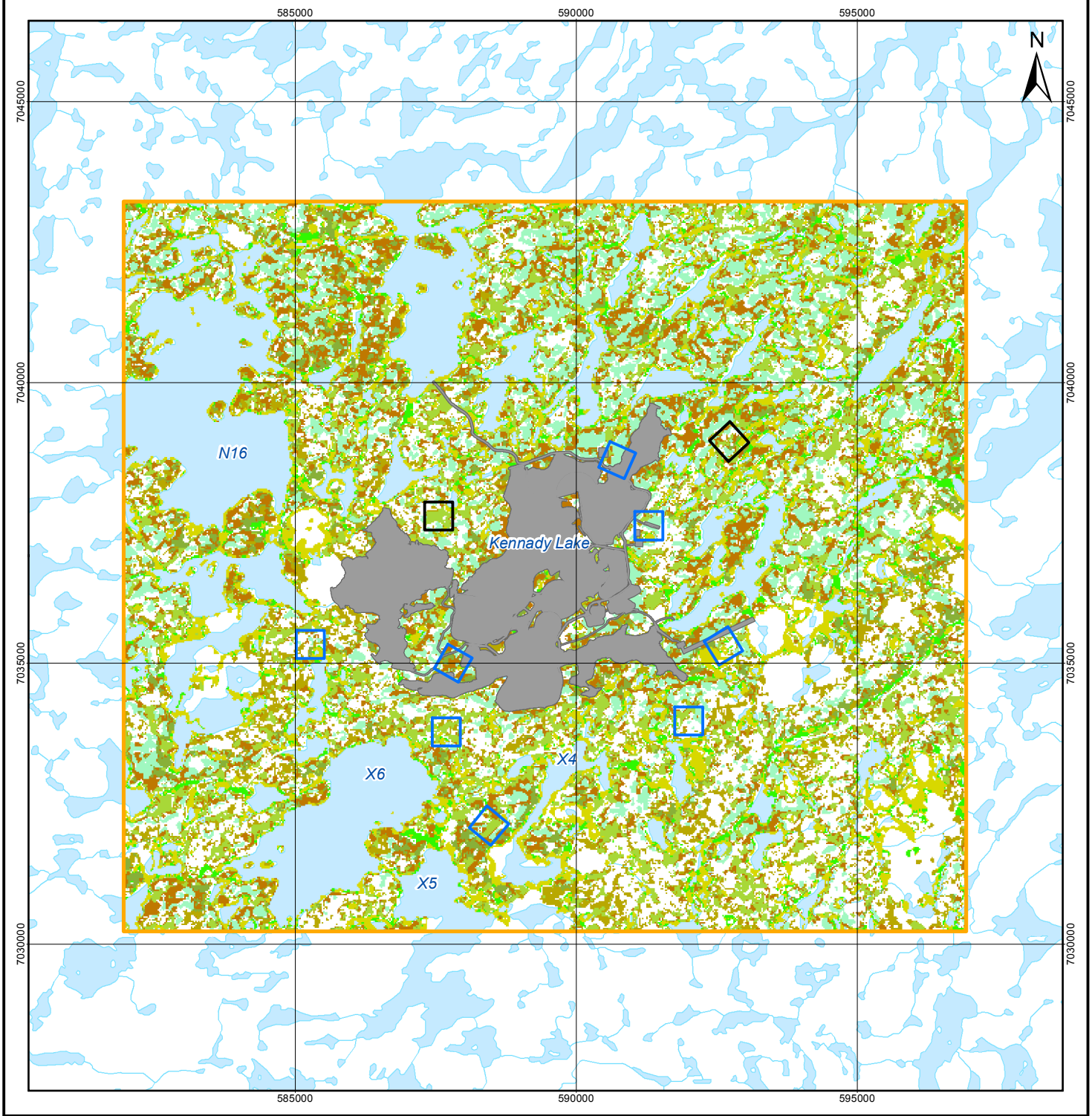
GAHCHO KUÉ PROJECT

Location of Upland Breeding Bird Survey Plots in the Local Study Area Prior to Application of the Project

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:100,000 (2 1 0 2 Kilometres)		
FILE No: IR-Wild-001-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0001	REVISION NO: 2	Figure EC_1-1a
OFFICE: GOLD-SAS	DRAWN: ANK / CHECK: JV	

De Beers Canada

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-001-GIS.mxd



LEGEND

- Watercourse
- Waterbody
- Local Study Area
- Mine Footprint

Survey Plot
- Heath Tundra
- Sedge Wetland

Broad Ecosytem Unit
- Sedge Wetland
- Heath Boulder
- Tall Shrub
- Peat Bog
- Tussock-hummock
- Birch Seep
- Heath Tundra

NOTES
Base data source: National Topographic Base Data (NTDB) 1:250,000

GAHCHO KUÉ PROJECT

Location of Upland Breeding Bird Survey Plots in the Local Study Area After Application of the Project

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:100,000		
2 1 0 2 Kilometres		
FILE No: IR-Wild-006-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0001	REVISION NO: 1	
OFFICE: GOLD-SAS	DRAWN: ANK / CHECK: JV	Figure EC_1-1b

De Beers Canada

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-006-GIS.mxd

LEGEND

- Gahcho Kué Project
- Watercourse
- Waterbody
- Local Study Area
- Regional Study Area

Survey Plot
- Heath Tundra
- Riparian Shrub
- Sedge Wetland

Broad Ecosytem Unit
- Sedge Wetland
- Heath Boulder
- Tall Shrub
- Peat Bog
- Tussock-hummock
- Birch Seep
- Heath Tundra

NOTES
Base data source: National Topographic Base Data (NTDB) 1:250,000

GAHCHO KUÉ PROJECT

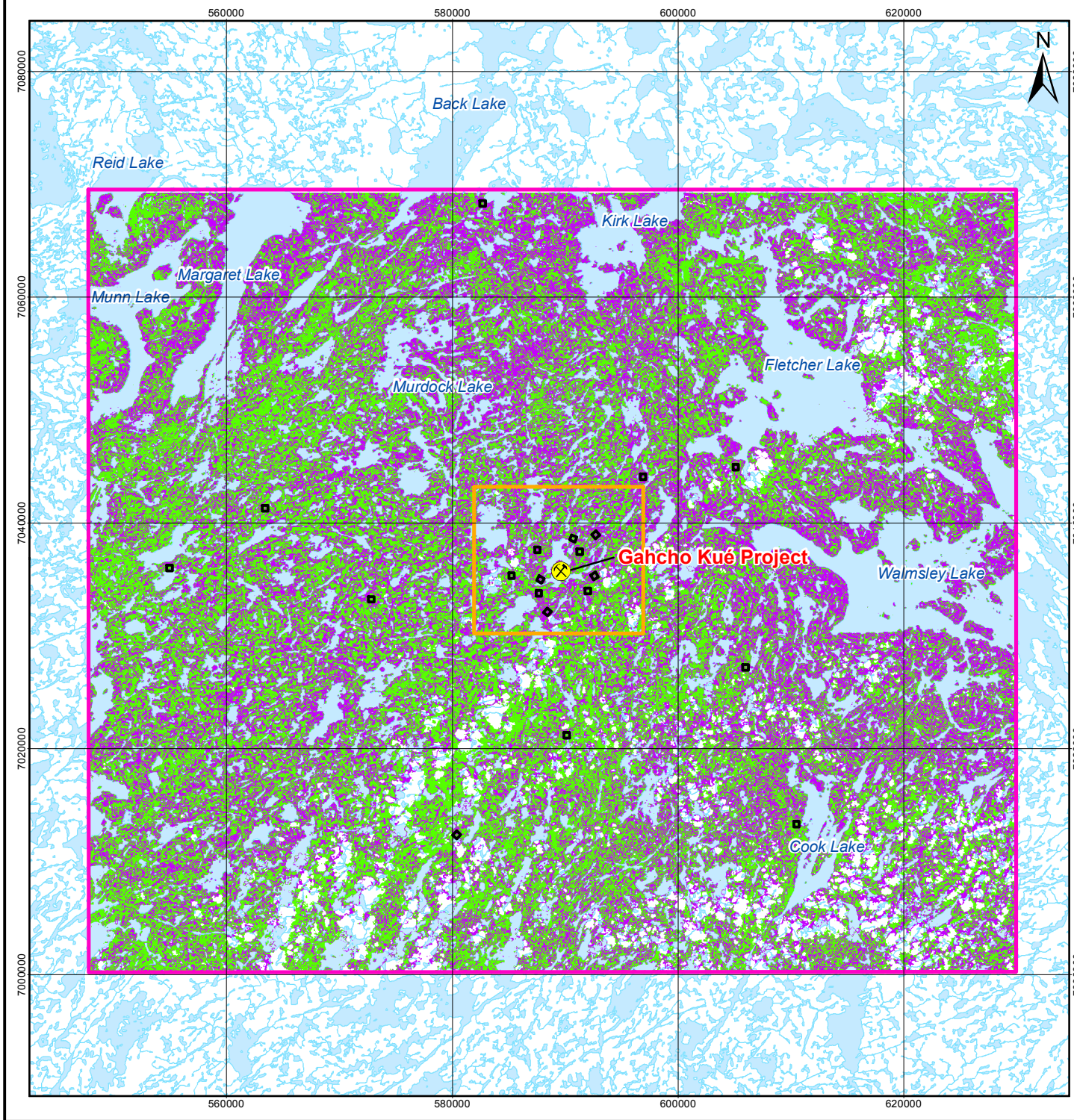
Location of Upland Breeding Bird Survey Plots in the Regional Study Area

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:500,000 (10 5 0 10 Kilometres)		
FILE No: IR-Wild-002-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0012	REVISION NO: 1	
OFFICE: GOLD-SAS	DRAWN: ANK	CHECK: JV

De Beers Canada

Figure EC_1-2

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-002-GIS.mxd



LEGEND

- Gahcho Kué Project
- Watercourse
- Waterbody
- Local Study Area
- Regional Study Area
- Survey Plot

Community

- Upland
- Wetland
- Unclassified

NOTES

Base data source: National Topographic Base Data (NTDB) 1:250,000

GAHCHO KUÉ PROJECT

Vegetation Community Types for Upland Breeding Bird Plots

PROJECTION: UTM Zone 12	DATUM: NAD83	De Beers Canada
Scale: 1:500,000 (10 5 0 10 Kilometres)		
FILE No: IR-Wild-003-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0001	REVISION NO: 0	Figure EC_1-3
OFFICE: GOLD-SAS	DRAWN: ANK / CHECK: JV	

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-003-GIS.mxd

4. All heath tundra, sedge wetland and riparian plots were approximately 500 metres (m) x 500 m, or 0.25 square kilometres (km^2) (De Beers 2010, Annex F; Section F3.2.8 and Section 11.12.2.2.1, page 11.12-15). There was no overlap among plots (see Figure EC_1-2), so each plot, including the riparian plot, represents an individual sample.

   The size of the riparian plot was 0.25 km^2. For clarification, the following text in Section 11.12.2.3.1 of the 2010 Environmental Impact Statement (De Beers 2010, page 11.12-28) refers to results from the baseline studies for the Snap Lake Project (De Beers 2002).

   > *"Species richness was highest in riparian habitat (7 to 8 species), and similar between heath tundra and sedge wetlands (5 to 7 species). Density in riparian habitat also was greatest (230 to 294 birds/0.25 km^2), but likely over-estimated due to small plot size (0.01 to 0.02 km^2)".*

   The values were intended to be used as a comparison to the baseline results in Table 11.12-4 for the Gahcho Kué Project (De Beers 2010). However, the text is not clear on which study the densities are from, and should have been appropriately referenced with De Beers (2002).

   All sedge wetland, heath tundra and riparian plots were sampled using the same method of walking five 100-m-wide by 500-m-long transects over a minimum period of 2.5 hours, so that the entire plot was surveyed (De Beers 2010, Section 11.12.2.2.1, page 11.12-17).

   Habitat types contained within the riparian plot included heath boulder, sedge wetland, tall shrub, birch seep, and peat bog. Large patches of adjacent habitats primarily associated with riparian communities (e.g., tall shrub adjacent to birch seep and/or peat bog) that could be sampled using a 0.25 km^2 area are uncommon and widely dispersed across the study area (Figure EC_1-2). Maintaining equivalent sampling areas across survey plots was a key element of the study design (along with logistical constraints of efficiently sampling habitats over a large area), and subsequently, only one (1) riparian plot was surveyed.

5 Data from the riparian plot were not included in the impact assessment completed in Section 11.12.4.2 (De Beers 2010) primarily because the information would not have resulted in a measurable change to effects sizes and confidence in the impact predictions. The riparian plot detected two

additional species (rusty blackbird and Lincoln's sparrow; De Beers 2010, Table 11.12-3; Section 11.12.2.3.1) not found in the heath tundra and sedge wetland plots. Habitat types sampled in the riparian plot (heath boulder, tall shrub, sedge wetland, birch seep, peat bog) were also sampled in the heath tundra and sedge wetland plots, which are represented by upland and wetland communities (De Beers 2010, Table 11.12-17; Section 11.12.4.2.1).

In addition, the mean and range of minimum to maximum values for relative abundance (density) and richness of species including the riparian plots (i.e., all plots) were within the distribution of measured estimates for sedge wetlands and heath tundra plots (De Beers 2010, Table 11.12-4; Section 11.12.2.3.1). For example, the mean (range) relative abundance of species using all plots was 69.8 (24-173) birds per 0.25 km^2, and the estimates for sedge wetlands and heath tundra were 81.7 (54-173) and 56.9 (24-101) birds per 0.25 km^2, respectively. Thus, applying the density estimates for sedge wetlands and heath tundra plots (De Beers 2010, Table 11.12-18; Section 11.12.4.2.1) to the wetland and upland community types in the RSA (De Beers 2010, Table 11.12-17; Section 11.12.4.2.1) was considered more appropriate for capturing variation between wetland and upland habitats than using an overall mean value. As stated above, including the data from the riparian plot would not have resulted in a measurable change in the calculated effects sizes, particularly since a 30% coefficient of variation was also added to effects sizes (De Beers 2010, Section 11.12.4.2.1; page 11.12-105).

References

BHPB (BHP Billiton Canada Inc.). 2010. 13-Year Breeding Bird Monitoring Program Summary. Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.

De Beers (De Beers Canada Mining Inc.). 2002. Snap Lake Diamond Project Environmental Assessment Report. Prepared for De Beers Canada Mining Inc. by Golder Associates Ltd. Yellowknife, N.W.T. February 2002.

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

Smith, A.C., J.A. Virgl, D. Panayi, and A.R. Armstrong. 2005. Effects of a diamond mine on tundra-breeding birds. Arctic 58:295-304.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_2

Source: Environment Canada (EC)

Subject: Changes to lake levels in Lake N11 and areas downstream during dewatering and refilling of Kennady Lake

EIS Section: EIS Section 11.12.3.2.2 (pg. 11.12-80)

Terms of Reference Section: 4.1.3 - Downstream water effects

Preamble

Section 11.12.3.2.2 of the EIS states that changes to downstream habitat quantity (i.e. riparian vegetation) during de-watering and refilling of Kennady Lake are expected to be minor. However, the EIS provides no quantitative estimates of temporary habitat loss from this pathway to support this conclusion. It is stated that pumping will not increase discharges in downstream lakes and channels above the baseline 2-year flood levels during dewatering of Kennady Lake, or below the 1 in 5-year dry conditions during re-filling of Kennady Lake. Changes in lake elevation in lake N11 and further downstream during 1 in 2-year flood levels or 1 in 5-year dry conditions are not provided.

Request

EC requests that DeBeers provide a quantitative estimate of riparian habitat that will be affected around Lake N11 and further downstream, to the extent feasible, due to changes in water levels during de-watering and refilling of Kennady Lake respectively.

Response

Anticipated elevation changes in Lake N11 are provided in Table 9.7-15 of the Environmental Impact Statement (EIS) (De Beers 2010). This table illustrates how the elevation changes are best described as an extension of freshet, rather than a change in absolute water level. This table shows, for example, that in a year with median water levels and assuming a 1 in 2 year flood, dewatering would cause an increase in the elevation of Lake N11 from 0.800 metres (m) to

0.821 m (or 21 millimetres [mm]). This is still below the 1 in 10 year flood level of 0.862 m.

Anticipated water elevations at the outlet of Kennady Lake (stream K5) are provided in Table 8.7-9 of the EIS (De Beers 2010). Similarly, the anticipated water elevation changes are minor and should not cause a noticeable difference to downstream riparian habitat.

Changes to downstream habitat quantity during de-watering and refilling of Kennady Lake were quantified in Section 9.10 of the EIS (De Beers 2010). Tables 9.10-15, 9.10-18 and 9.10-20 (De Beers 2010) are reproduced below with updated quantities to be featured in the 2012 EIS Supplement (De Beers 2012). Note that these quantities are based on median (i.e., 2-Year return period) conditions.

Thus, the increase in drainage flows and surface water elevations associated with the dewatering and refilling of Kennady Lake is localized and expected to have a minor influence on habitat quantity for birds and species at risk relative to baseline conditions.

Table EC_2-1 Projected Changes in Water Depth and Lake Area in Lakes in the N Watershed during the Dewatering of Kennady Lake, Compared to Baseline Conditions (De Beers 2010, Table 9.10-15)

Lake	June		July		August		September		October	
	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]
N11	0.02	0.25	0.12	1.31	0.17	1.85	0.10	1.09	0.01	0.16
N1	0.01	0.16	0.06	1.19	0.09	1.73	0.06	1.12	0.01	0.22

Table EC_2-2 Projected Changes in Water Depth and Lake Area in Lakes in the N Watershed during Operations, Compared to Baseline Conditions (De Beers 2010, Table 9.10-18)

Lake	June		July		August		September		October	
	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]
N11	0.01	0.10	0.05	0.50	0.07	0.72	0.06	0.61	0.04	0.38
N1	0.01	0.10	0.02	0.42	0.03	0.62	0.03	0.54	0.02	0.38
N6	0.02	0.32	0.01	0.12	0.01	0.18	0.01	0.15	0.00	0.05
N17	0.04	0.54	0.03	0.45	0.03	0.39	0.02	0.35	0.02	0.26

Table EC_2-3 Projected Changes in Water Depth and Lake Area in Lakes in the N Watershed during Closure, Compared to Baseline Conditions (De Beers 2010, Table 9.10-20)

Lake	June		July		August		September		October	
	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]	Change in Depth [m]	Change in Area [%]
N11	-0.03	-0.38	-0.09	-0.94	-0.01	-0.11	0.00	0.00	0.00	0.00
N1	-0.01	-0.29	-0.04	-0.75	-0.01	-0.13	0.00	-0.01	0.00	0.00

Reference

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_3

Source: Environment Canada (EC)

Subject: Disturbance/destruction of nests during de-watering

EIS Section: EIS Section 11.12.3.2.1

Terms of Reference Section: 4.1.3 - Downstream water effects, 5.2.4 - Species at Risk and Birds

Preamble

The EIS identifies injury/mortality to animals from changes in downstream flows and water levels associated with dewatering of Kennady Lake as a pathway with "No Linkage". The Proponent anticipates that bird and species at risk mortality from stream flooding will not increase beyond the number of animals drowning that occurs naturally, yet no estimate of natural mortality from drowning is provided. The Proponent intends to begin pumping water from Kennady Lake in June immediately after ice-out. Many birds may have established their nests in riparian areas downstream of Kennady Lake before ice-out occurs. Section 6 (a) of the Migratory Birds Regulations prohibits the disturbance or destruction of the nests or eggs of migratory birds. What measures will be taken to ensure that nests and eggs established in riparian areas around Lake N11 and downstream are not destroyed due to rising water levels during dewatering of Kennady Lake?

Request

EC requests that DeBeers provide a description of adaptive management measures or monitoring that could be used to prevent destruction of nests and eggs of migratory birds and species at risk in riparian habitat around Lake N11 and areas further downstream during dewatering of Kennady Lake in the event that birds establish nests in these areas before dewatering begins.

Response

The migratory bird breeding season in the Project region occurs between May 14 and July 30. Effects to migratory bird nests are not anticipated as a result of dewatering given that pumping will commence following the onset of freshet

when peak flows and water levels are already occurring in the regional study area (RSA). Based on the controlled pumping rates, bird nests around Area 8, Lake N11 and downstream are not at risk of flooding. Please also see the response to EC_2, and Table 9.7-15 of the Environmental Impact Statement (EIS; De Beers 2010). Elevation changes in Lake N11 are best described as an extension of freshet, without exceeding historic levels.

However in Year 1, perimeter dyke F will cause Lake D2 to rise from elevation 424.2 metre (m) to 426.5 m (2.3 m change), and Lake D3 to rise from 425.4 m to 426.5 m (1.1 m change). Lakes D2 and D3 will thus merge. Dyke G will cause Lake E1 to rise from 425.2 m to 426.0 m (0.8 m change) in about one year (Table EC_3-1). In years 1 to 3 Lakes D2 and D3 are expected to rise further, and stabilize at 427.0 m after three years (a further 0.5 m change, or 2.8 m above the original level of D2). This will result in 53.31 ha of flooded land around D2/D3, and 6.83 ha of flooded land around E1.

Table EC_3-1 Summary of Predicted Water Level Changes

Watershed	Year	Increase in June [m]	Increase in July [m]	Entire Year [m]
D	1	1.40	0.17	1.74
D	2	0.46	0.13	0.72
D	3	0.34	0.00	0.34
E	1	0.65	0.09	0.79

Mitigation options to reduce the risk of flooding bird nests and mortality to eggs/young include pumping to raise water levels outside of the breeding season, nest sweeps, bird deterrents (such as noise makers) to discourage birds from nesting, and identify any nests that are present.

Reference

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_4

Source: Environment Canada (EC)

Subject: Areas Subject to Flooding

EIS Section: EIS sections 8.6.2.3 and 11.7.4 (subsection 11.7.4.1.2)

Terms of Reference Section: 5.2.4 - Species at Risk and Birds

Preamble

Sections 8.6.2.3 and 11.7.4.1.2 provide different estimates for the area of terrestrial habitat that will be flooded due to changes in water flow following construction of dykes around Kennady Lake. On page 8-222 it states that "Approximately 22.8 ha of riparian habitat around Lake A3 will be inundated permanently, with 53.1 ha and 6.8 ha of riparian habitat temporarily inundated as a result of raising Lakes D2 and D3, and E1, respectively."

Table 11.7-16 on page 11.7-58 to 11.7-60 states that the Flooded Area for lakes D2, D3 and E1 is 87 ha. This area is about 27 ha larger than that reported in section 8.6.2.3. In contrast, the estimated flooded area around Lake A3 in Table 11.7-16 (22.7ha) is similar to that provided in Section 8.6.2.3. The estimated area subject to flooding forms an important component of the estimated loss of terrestrial habitat for birds and species at risk and therefore merits further clarification.

Request

EC requests that DeBeers:

1. Clarify which of the two estimates for the flooded area surrounding lakes D2, D3, and E1 is correct.

2. Clarify which of the two estimates was used in the calculation of terrestrial habitat loss in the impact assessment for birds and species at risk.

Response

1. The 2010 Environmental Impact Statement (EIS; De Beers 2010) predicted that water levels in lakes D2, D3 and E1 would increase resulting from construction of Dyke F and Dyke G and flood a total of 87 ha of terrestrial landscape adjacent to these lakes. The area of 87 ha of terrestrial landscape was included in the estimate of direct habitat loss for species at risk and upland birds. The estimates provided in Section 8 refer only to loss of riparian habitats.

2. Environment Canada is referred to the 2012 EIS Supplemental Information Submission Section 11.12 (De Beers 2012) regarding changes to the Fine Processed Kimberlite Containment (PKC) Facility that affect habitat loss for Species at Risk and Birds. The change to the Fine PKC Facility involves the removal of Area 1 resulting in a reduction in the area of the Fine PKC Facility. The removal of Area 1 from the Fine PKC Facility also means that Dyke C, a permanent saddle dam that would isolate lakes A1 and A2 in Area 1 from Lake A3 to the north, will no longer be required. As a result of the changes to the Fine PKC Facility, the flooding of 22.7 ha of terrestrial habitat adjacent to Lake A3 will no longer occur.

References

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_5

Source: Environment Canada (EC)

Subject: Waterbird Habitat Suitability Index Model Assumptions and Analysis

EIS Section: EIS section 11.12.5

Terms of Reference Section: 5.2.4 - Species at Risk and Birds

Preamble

In Section 11.12.5.2 a Habitat Suitability Index model is used to predict indirect changes to habitat for waterbirds. The model considers a 1000 m zone of influence (ZOI) around active disturbances that reduces areas rated as Low to High suitability habitat to a rating of Poor. The assumption is made that, at baseline, all terrestrial habitat that is >100 m from a waterbody is of Poor suitability. Although Shallow and Deep water habitat types were considered as High suitability habitat in the model, according to Figures 11.12-11 to 11.12-14 it also appears as though aquatic habitat (i.e. Shallow and Deep water) that are >100 m from shorelines are classified as Poor suitability habitat in the HSI model.

This is inconsistent with Section 11.12.5.1.2 of the EIS which qualifies Shallow and Deep water habitat types as “highly suitable habitat”, irrespective of the distance from the shoreline (page 11.12-112). This would suggest that the HSI model underestimates the quantity of High suitability habitat available in the RSA, and thus limits the area over which the 1,000 m ZOI modifies habitat suitability, since all areas >100 m from a shoreline are already considered Poor suitability habitat. The end result appears to be that the estimate for direct loss of high suitability habitat for waterbirds due to application of the project (1.2% of the RSA – page 11.12-112) is higher than the estimate for indirect loss of high and good quality habitat due to the 1000 m ZOI around active disturbances (<0.5% of the RSA – page 112.12-114). This seems counterintuitive, as one would expect that the extent of indirect impacts to habitat would exceed direct loss of habitat.

Request

EC requests that De Beers Canada Inc.:

1. Clarify how areas of Shallow and Deep water within lakes and other waterbodies were considered in the HSI model.

2. If areas within waterbodies >100 m from the shoreline were considered as Poor suitability habitat in the model, please provide a justification for this assumption.

3. For comparison, please provide a re-calculation of changes in availability of High suitability habitat in the RSA from active disturbances associated with the project and other foreseeable developments using an HSI model that considers all areas within waterbodies as initially High suitability habitat.

Response

1. All habitats (terrestrial and aquatic, which includes shallow and deep water) greater than 100 metres (m) from a shoreline were designated as poor quality (De Beers 2010, Table 11.12-22; Section 11.12.5.2.1).

2. The Habitat Suitability Index (HSI) model was principally developed to determine the area of preferred (high and good quality) nesting and brood rearing habitat for water birds. Aquatic habitat greater than 100 m from a lake shoreline typically does not provide the forage and cover (from predators and weather) necessary for successfully hatching and raising young. This is why waterbodies greater than 100 m from shoreline were classified as poor quality habitat. This important aspect of the HSI model was not explicitly stated in the Environmental Impact Statement (EIS).

3. After classifying all areas within water bodies as high quality habitat, the total amount of suitable habitat (i.e., low, good, and high) in the Regional Study Area (RSA) for water birds is approximately 37%, which is 10% more than in the EIS (De Beers 2010, Section 11.12.5.2.2). The cumulative decrease of high and good quality habitat for water birds from reference conditions through potential future developments in the RSA is predicted to be about 1.6% (see Table EC_5-1). The decrease from the Gahcho Kué Project is less than 0.5% (does not change from the EIS). In the EIS, the cumulative

decrease in high and good quality habitat from the Project and other previous, existing and future developments was calculated to be 1.4% (De Beers 2010, Table 11.12-23; Section 11.12.5.2.2). Habitat suitability modelling for reference conditions and the future case are shown in Figure EC_5-1 and Figure EC_5-2, respectively.

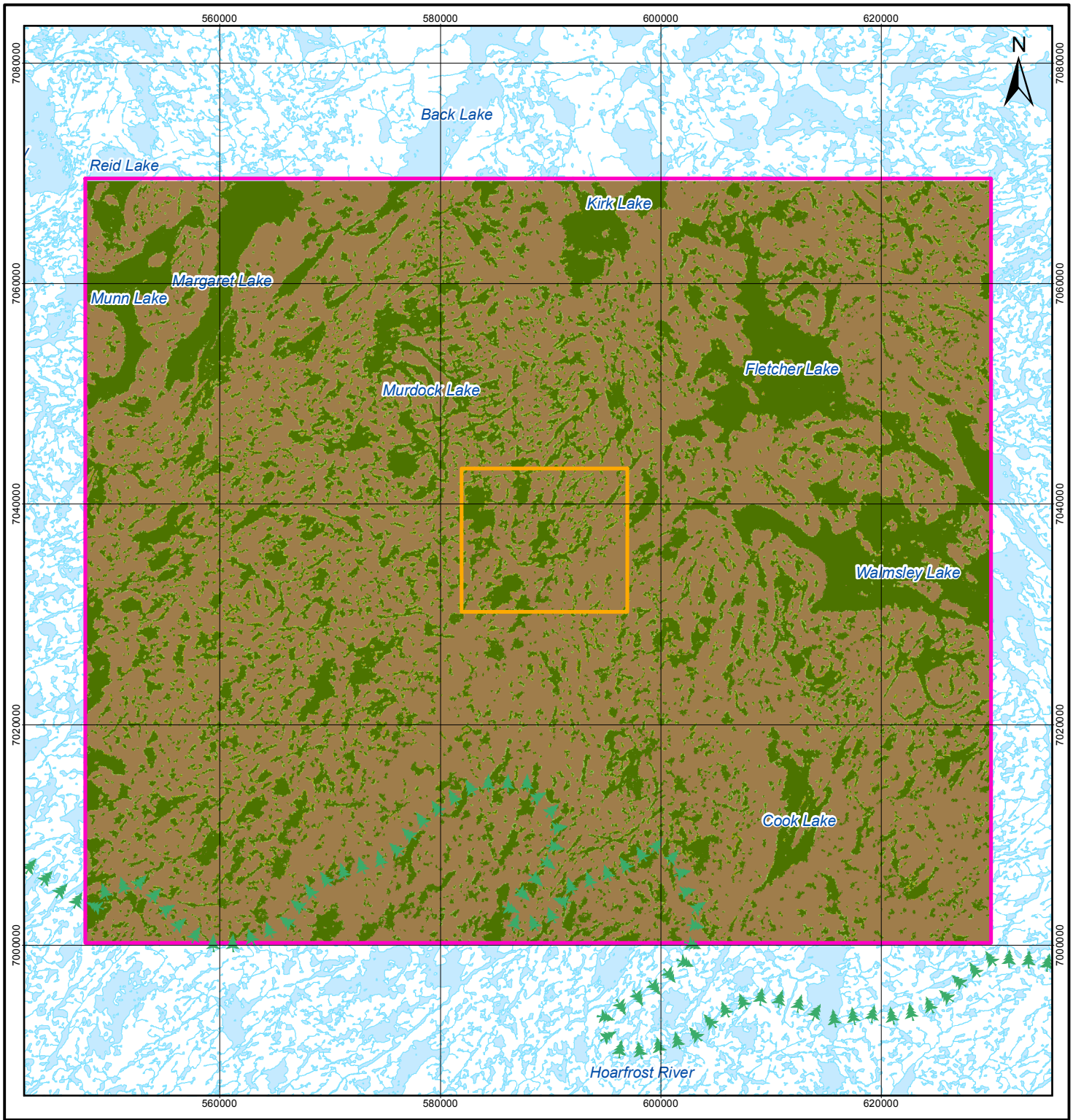
To clarify, the calculation of direct loss of high quality habitat (i.e., shallow water, deep water, sedge wetland) in the EIS (1.2% of the RSA; De Beers 2010, page 11.12-112) is incorrect as it was based on summing the habitat-specific changes in Table 11.12-16 (De Beers 2010). The value for direct loss from the Project should be 0.17% (992 hectares (ha) / area of RSA), which is lower than the direct and indirect change provided in the EIS (0.22%; De Beers 2010, Table 11.12-23). Most of the change in habitat quality is due to the physical disturbance from the Project footprint on Kennady Lake, and little influence on adjacent waterbodies.

Table EC_5-1 Relative Changes in the Availability of Different Quality Habitats in the Regional Study Area for Water Birds from Reference to Reasonably Foreseeable Projects (using a model with all open water classified as high quality habitat)

Habitat Category	Reference [ha]	Cumulative % Change Reference to Future
High	167,765	-1.25
Moderate	28,109	-0.34
Low	14,755	1.38
Poor	357,915	0.22
Total	**568,544**	

Reference

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.



LEGEND

- Watercourse
- Waterbody
- Treeline

Habitat Suitability Index

- High
- Good
- Low
- Poor
- Local Study Area
- Regional Study Area

NOTES

Base data source: National Topographic Base Data (NTDB) 1:250,000

GAHCHO KUÉ PROJECT

Habitat Suitability for Water Birds: Reference Conditions

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:500,000 (10 5 0 10 Kilometres)		
FILE No: IR-Wild-004-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0001	REVISION NO: 3	
OFFICE: GOLD-SAS	DRAWN: ANK / CHECK: JV	Figure EC_5-1

De Beers Canada

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-004-GIS.mxd

LEGEND

- Gahcho Kué Project
- Watercourse
- Waterbody
- Treeline
- Proposed Taltson Transmission Line
- Development Footprint

Habitat Suitability Index

- High
- Good
- Low
- Poor
- Local Study Area
- Regional Study Area

NOTES

Base data source: National Topographic Base Data (NTDB) 1:250,000

GAHCHO KUÉ PROJECT

Habitat Suitability for Water Birds: Future Case

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:500,000 (10 5 0 10 Kilometres)		
FILE No: IR-Wild-005-GIS		DATE: March 29, 2012
JOB NO: 11-1365-0001	REVISION NO: 0	
OFFICE: GOLD-SAS	DRAWN: ANK / CHECK: JV	

De Beers Canada

Figure EC_5-2

G:\2011\1365\11-1365-0001 Gahcho Kue EIS Post-Submission\Mapping\MXD\Wildlife\IR-Wild-005-GIS.mxd

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_6

Source: Environment Canada (EC)

Subject: Incinerator Complex and Incineration Storage Area

EIS Section: EIS 11.9

Terms of Reference Section: 5.2.3 – Carnivore mortality, 5.2.4 - Species at Risk and Birds, 5.2.10 – Waste Management and Wildlife

Preamble

Section 11.9 identifies incineration as the primary method for disposal of food wastes and other combustible wildlife attractants. As well, Section 11.9.2.6.3 (pg. 11.9-21) states that the two main problems encountered with incineration of food wastes at other diamond mines in the area are continued presence of attractants in the incinerator area and the burning temperature of incinerator operation during cold temperatures. To deal with this problem, both the Ekati and Diavik mines will enclose incinerators in purpose-built heated buildings, allowing unincinerated wastes to be stored indoors and a greater consistency in burning temperatures. Section 11.9.3.4 states that incinerators will be housed in a pre-engineered module located near the accommodations complex. Further on, Section 11.9.4.2 states that incinerators will be enclosed in a building attached to the accommodations complex. In contrast, Figure 11.9-2 shows the incinerators as being located beside the fuel storage facility, with no direct connection to the accommodations complex. Furthermore, it is also unclear whether food waste containers and the incinerator storage area will be indoor or outdoor facilities.

Request

EC requests that DeBeers:

1. Clarify whether incinerators will be housed within an enclosed building and if this building will be directly attached to the accommodations complex.

2. Clarify whether food waste storage containers and the incinerator storage area are indoor or outdoor facilities, and, if they are outdoors, whether they will be contained within a fenced-in area.

3. Provide a revised map of the camp layout that indicates the expected position and configuration of the incinerator complex and storage area.

4. Describe the capacity of the incinerator storage area and what measures will be used to limit wildlife attraction in the event that food wastes cannot be immediately incinerated.

Response

1. The incinerators will be housed within an enclosed building (pre-engineered module) near the accommodation complex as described in the Sections 11.9.3.4 and 3.8.3 of the 2010 EIS. The building will not be attached directly to the accommodations complex. The statement in Section 11.9.4.2 of the 2010 EIS is incorrect (De Beers 2010, pg 11.9-34).

2. Food waste bags are collected and stored indoors at a dedicated storage room facility within the accommodations complex. This allows transport to the incinerator facility for immediate incineration (De Beers 2010, Section 11.9.4.2).

3. The proposed camp layout, including the correct location of the incinerator, is presented in Figure 3.10-1 and 11.9-2 of the 2010 EIS (De Beers 2010). The statement in Section 11.9.4.2 indicating that the incinerators will be attached to the accommodations complex is incorrect.

4. Two incinerators will be installed to provide backup. The incinerator module will have a transfer room capable of storing a truckload of garbage prior to burning.

References

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_7

Source: Environment Canada (EC)

Subject: Design Features to Limit Denning Sites for Carnivores and Roosting and Nesting Sites for Avian Predators and Scavengers

EIS Section: EIS section 11.9 and 11.10

Terms of Reference Section: 5.2.3 – Carnivore mortality, 5.2.4 - Species at Risk and Birds, 5.2.10 – Waste Management and Wildlife

Preamble

Sections 5.2.3 of the Terms of Reference for the Gahcho Kue project requires that the EIS provide information on the creation of habitat in the camp for carnivores and potential impacts to prey species from carnivore attraction. Section 5.2.4 of the TOR also requires that the EIS provide information on the creation of new habitat for birds and species at risk and the potential for increased predation facilitated by development. Finally, Section 5.2.10 of the TOR requires the Proponent to describe waste management practices in relation to other Key Lines of Inquiry and Subjects of Note such as carnivore mortality.

Although the EIS provides a description of waste management practices to limit the attraction of predators and scavengers to the project site, the EIS does not discuss the potential for project development and infrastructure to provide additional nesting, roosting, or denning sites for predators and scavengers. This could potentially increase predation pressure on local bird populations as well as increase the potential for wildlife-human interactions and carnivore mortality.

Request

- Please provide a description of design features, adaptive management and monitoring that will be incorporated into the project to limit the provision of nesting, denning and roosting sites for predators and scavengers such ravens, gulls, fox, and wolverine on or under buildings and infrastructure associated with the project.

Response

An outline of design features, adaptive management, and monitoring that will be incorporated into the Gahcho Kué Project to limit the provision of nesting, denning, and roosting sites for predators and scavengers such ravens, gulls, fox, and wolverine on or under buildings and infrastructure associated with the project is provided in Appendix 7.I - Wildlife Effects Mitigation and Management Plan (De Beers 2010).

The Wildlife Effects Mitigation and Management Plan is conceptual at this stage and input from communities and regulators, along with lessons learned from other operating mines in the region, will be used to provide complete details on the plan. The final plan will include detailed written instructions on monitoring and mitigation practices and procedures for environmental staff (i.e., similar to the current De Beers Safety, Health and Environment department's Operating Procedures for the Snap Lake Mine).

Initial design features, adaptive management, and monitoring that will be incorporated into the Project to limit the provision of nesting, denning, and roosting sites for predators and scavengers are included below (see also De Beers 2010, Appendix 7.I).

Design Features

- The entire complex, including dormitories and central kitchen facilities, will be supported on cribbing placed on a prepared ground surface surrounded by skirting to limit opportunities for animals to find suitable shelter. Similar recommendations were provided in a response by the Government of the Northwest Territories to Information Request from the Gahcho Kué Panel #20.

Monitoring and Procedures

- Environment staff will complete regular surveys for wildlife presence around the Project site, including regular inspections of the landfill, waste storage and transfer areas, asking site staff about wildlife observations, and walking inspections of the Project site to record wildlife and wildlife sign.

- All site staff will be instructed to report all relevant observations of wildlife (caribou, moose, muskoxen, fox, wolverine, wolf, and bear) to environmental technicians on-site.
- Wildlife will be actively deterred from site by trained individuals.
- Birds will be prevented from nesting on mine infrastructure and man-made structures. If a nest is found and eggs are present, then the nest will be monitored and efforts will be made to avoid the area.

Adaptive Management

- Regular review of the mitigation and Operating Procedures during feedback from communities, government, environmental staff, and the results of the wildlife effects monitoring, and subsequent implementation of changes to current procedures and/or additional mitigation will occur.
- Regular monitoring and communication with staff will provide early-warning of wildlife presence on-site, and the opportunity to manage and mitigate situations as they develop to prevent incidents.

Recommendations provided in Environment Canada's *Preventing Wildlife Attraction to Northern Industrial Sites* (CWS 2007) document will be consulted while completing the final Wildlife Effects Mitigation and Management Plan.

References

CWS (Canadian Wildlife Service) 2007. Preventing Wildlife Attraction to Northern Industrial Sites. Environment Canada. 30 pp. Unpublished Report.

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

Government Northwest Territories, Round 1 IR Response # 20, EIR0607-001, Gahcho Kue Diamond Mine Project, March 8, 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_8

Source: Environment Canada (EC)

Subject: Acid Rock Drainage/Metal Leaching (ARD/ML)

EIS Section: EIS Sections 3.7.3.2 & 3.7.3.3

Terms of Reference Section: 3.1.3 Existing Environment

Preamble

The assessment of the material which is prone to ARD is relatively weak in that the Proponent does not indicate how much waste rock material is potentially acid generating. The median concentrations of sulphide sulphur have been provided in weight percentage. The Proponent has stated that *"Based on the testing completed, some (less than 6%) of the mine rock extracted through open pit mining will have to be managed as being potentially acid generating (PAG) with metal leaching potential as a precaution, even at very low levels of sulphur".* However, the Proponent does not go on to identify the amount of PAG material in terms of tonnages.

The Proponent is planning to dispose of the PAG rocks within the mine rock piles surrounded by non-PAG rocks because there is a potential that acidic leachate could be generated in some rocks, which could potentially contaminate the entire mine rock piles if these PAG rocks are not stored properly. The Proponent has also stated that any PAG mine rock, as well as any barren kimberlite, will either be sequestered within the interior of the mine rock piles in areas that will allow permafrost to develop or they will be placed underwater when Kennady Lake is re-filled. The till material from ongoing pit stripping will be used to cover PAG rock placed within the interior of the structure to keep the water from penetrating into that portion of the repository. Further, the PAG rock will be enclosed within enough non-PAG rock to prevent the active zone from extending into the enclosed material. The above scenario could be successfully achieved only if PAG material could be properly segregated. However, the Proponent does not provide any indication of the certainty with which the PAG material could be segregated.

Request

The Proponent is requested to provide the amount of PAG materials in tonnages that are to be produced and stored. The Proponent is also requested to provide information related to the potential for the segregation of PAG waste rock that is to be encountered during the mining, and the certainty with which this can be achieved.

Response

Appendix 8.II of the Environmental Impact Statement (EIS; De Beers 2010) presented metal leaching and acid/alkaline rock drainage characteristics of 1,274 samples of kimberlite, processed kimberlite, and mine rock for the Gahcho Kué Project. The geochemical properties of mine rock, including the static and kinetic geochemical test results, were presented in Section 8.II.4.3 (De Beers 2010). The major findings of the tests are as follows:

- The acid potential of a sample is generally a function of sulphide mineral content. In comparison to other diamond mining projects in the North, mine rock from the Project has very low sulphur content (average 0.04%). The Project granitic kinetic leaching results are most similar to the mine rock from Ekati Diamond Mine and low sulphur granites from Snap Lake Mine (e.g., with low amounts of metavolcanic) [De Beers 2010, page of 8.II-89, Section 8.II.5.1, Appendix 8.II].
- The typical screening level sulphur criterion for classifying potentially acid generating (PAG) rock at mine sites is 0.3% (Price 1997). Approximately 1.5% of the mine rock samples in the geochemistry dataset have total sulphur concentrations greater than 0.3 wt% (De Beers 2010, page 8.II-92).
- Most samples of granite, granodiorite and gneissic granite have total sulphur concentrations less than 0.1%. Granite will be the dominant mine rock lithology at the Project, comprising at least 95% of all mine rock (De Beers 2010, page 8.II-92).
- A small fraction (less than 1.5%) of the mine rock has some limited potential to generate acidity, however the likelihood of significant amounts of acidic water to be released from the project is low (De Beers 2010, page 8.II.97).

These findings suggest that the potential geochemical loadings from the PAG mine rock would be relatively low. The implications of these loadings based on the amount of PAG rock potentially exposed are considered within the context of mine rock seepage source inputs to the water quality predictive model used to determine Project effects to Kennady Lake and downstream waterbodies (De Beers 2010, Appendix 8.I, page 8.II.90). As stated in page 8-306 of the 2011 EIS Update Section 8 (De Beers 2011), projections of water quality in Kennady Lake did not include the development and persistence of permafrost conditions within the mine rock piles, the Coarse Processed Kimberlite (PK) Pile, and the Fine Processed Kimberlite Containment (PKC) Facility.

Even though less than 1.5% of the mine rock has some limited potential to generate acidity, it was conservatively assumed in EIS (De Beers 2010) that less than 6% of mine rock extracted through open pit mining will have to be managed as being PAG with metal leaching potential as a precaution, even at very low levels of sulphur (De Beers 2010, page 3-35). Approximately 6% of the mine rock is equivalent to 13.6 million tonnes of mine rock.

Rock characterization/classification procedures will be implemented during all phases of the project. The site specific mine rock characterization/ classification criteria are discussed in Section 8.II.5.1.1 of Appendix 8.II (De Beers 2010). The following procedures will be undertaken to identify, manage and ensure that PAG rock are segregated in the field:

- Lithological and/or geochemical criteria will be defined to segregate non-reactive mine rock from potentially reactive mine rock.
- A detailed plan for achieving segregation of non-reactive vs. potentially reactive mine rock will be developed for implementation as part of the mine plan. Such plans are in place for Diavik and Ekati and commonly include the following activities:
  - sample the blast hole cuttings for geochemical testing prior to the blast or removal of blasted rock;
  - prepare maps showing the geochemical data, rock type designation, and designated mine rock disposal locations;

- trained mine geology personnel will map out the rock type limits practical for segregation;
- visually inspect the muck pile to confirm layout after the blast;
- demarcate rock type area(s) using colour coded flagging or other similar scheme; and
- inform drivers of the rock type they will be hauling; drivers will be made aware of the different dump locations for each rock type.

These procedures are similar to those used in many other surface mines and will be a positive way to identify and quantify any PAG material that may be present, so that it can effectively segregated.

References:

De Beers (De Beers Canada Inc.). 2010. *Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N*. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

De Beers. 2011. *Environmental Impact Statement for the Gahcho Kué Project. Volumes 3a Revision 2, 3b Revision 2, 4 Revision 2, and 5 Revision 2*. Submitted to the Mackenzie Valley Environmental Impact Review Board in Response to the Environmental Impact Statement Conformity Review. July 2011.

Price, W.L. 1997. Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia. British Columbia Ministry of Employment and Investment, Energy and Minerals Division: Victoria, BC, Canada.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_9

Source: Environment Canada (EC)

Subject: Incineration Management Plan

Preamble

The Proponent will use incineration as a waste management option. The EC Technical Document for Batch Waste Incineration provides guidance on appropriate incineration equipment and management practices. The Proponent should develop an incineration management plan that incorporates the guidance provided in the technical document.

Request

EC requests that the Proponent develop and implement an Incineration Management Plan that incorporates guidance provided in the EC Technical Document for Batch Waste Incineration.

Response

De Beers is committed to the preparation of an Incineration Management Plan for the Gahcho Kué Project, and will consult the guidance outlined in the Environment Canada Technical Document for Batch Waste Incineration (Environment Canada 2010). The Incineration Management Plan will be included in the Gahcho Kué Project Monitoring and Adaptive Management Framework (AMRF, *in preparation*) as a component of the Air Quality Management Plan. The Plan will incorporate the incinerator model specifications, and operation and maintenance protocols for an incinerator that is adequately sized for the Project once selected.

Reference

Environment Canada. 2010. Technical Document for Batch Waste Incineration. Available at: http://www.ec.gc.ca/gdd-mw/default.asp?lang=En&n=B8DA5596-1#cn-tphp. Accessed March 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_10

Source: Environment Canada (EC)

Subject: Phosphorous Released from Mine Waste Facilities Post-Closure

EIS Section: EIS Section 10.5.3

Terms of Reference Section: 4.1.4

Preamble

The concentrations of phosphorus being flushed from the mine waste piles into the lake water are projected to increase until reaching a steady state during post-closure, but one must assume that at some point in the future all the phosphorous in the waste piles will become depleted and the concentration of phosphorous will decrease. With the additional phosphorus being the cause of changing the system from its current oligotrophic state to that of mesotrophic, what effect will the loss of the additional phosphorus have on the system?

Request

Please provide details on how long it is expected to take to flush all the phosphorus from the mine waste piles. As well, please discuss the implications of losing this source of phosphorus.

Response

The depletion of phosphorous from the material is estimated to occur over a time scale of hundreds of years or more, which will allow the aquatic ecosystem within Kennady Lake to transition back to the observed baseline conditions.

The projections of phosphorus concentrations in the long term have been modified based on the results of additional geochemical testing, including humidity cell testing and submerged column testing, in the update to Appendix 8.III in the 2012 EIS Supplement (De Beers 2012). Based on the results of the supplemental program, a very small fraction of the total phosphorus in each sample, less than 0.1%, has mobilized after more than 40 weeks of

testing. Laboratory kinetic testing was designed to model the accelerated weathering of a material exposed to a set of environmental conditions. The time scale of results is generally scaled up on a site-specific basis. Additionally, the rate of depletion of phosphorus from each sample is anticipated to decrease in the long term, as the availability of liberated and soluble phosphorus minerals decreases.

Since the submission of the 2011 EIS Update (De Beers 2011), the mine plan has been updated to reflect supplemental mitigation associated with the deposition of fine processed kimberlite (PK) to reduce potential loading of phosphorus. As a result, the long-term steady state total phosphorus (TP) concentration in Kennady Lake based on revised source term inputs in the absence of permafrost is now projected to be 0.009 milligrams per litre (mg/L) (De Beers 2012) from a background concentration of 0.005 mg/L. With the long term steady state TP concentrations remaining below 0.010 mg/L, the trophic state of Kennady Lake would not change and remain oligotrophic. Source depletion in the long-term would be expected to be gradual with the aquatic ecosystem within Kennady Lake transitioning back towards it baseline condition.

References

De Beers (De Beers Canada Inc.). 2011. Environmental Impact Statement for the Gahcho Kué Project. Volumes 3a Revision 2, 3b Revision 2, 4 Revision 2, and 5 Revision 2. Submitted to the Mackenzie Valley Environmental Impact Review Board in Response to the Environmental Impact Statement Conformity Review. July 2011.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_11

Source: Environment Canada (EC)

Subject: Closure Milestones

EIS Section: EIS Sections 10.4.1.1.3

Terms of Reference Section: 4.1.4

Preamble

Table 10.14-1 provide estimations for when progressive reclamation will begin for various activities, such as the mine rock piles, but not when they are expected to be completed.

Request

Please provide a more comprehensive estimate of all estimated closure activity timelines.

Response

Table EC_11-1Key Activities and Milestones in the Conceptual Closure and Reclamation Schedule

Activity/Milestone	Year
Begin progressive reclamation of Fine PKC Facility	3
Begin reclamation cover completed areas with coarse PK	3
Backfill open area behind dyke L with waste rock and /or coarse PK	6
Complete coarse PK cover layer and grade surface	7
Complete mine rock cover and achieve interim closure for his area	8
Begin progressive reclamation of South Mine Rock Pile	5
Finish final grading	6
Begin progressive reclamation of West Mine Rock Pile	7
Finish final grading	8
Begin progressive reclamation of 5034 Pit	5
Initiate backfill with fine PK and mine rock Achieve interim closure - Begin final flooding	5 11

Table EC_11-1Key Activities and Milestones in the Conceptual Closure and Reclamation Schedule (continued)

Activity/Milestone	Year
Begin progressive reclamation of Hearne Pit	7
Initiate backfill with fine PK	7
Achieve interim closure - Begin final flooding	11
Begin progressive reclamation of Coarse PK Pile	6
Complete mine rock cover and achieve interim closure for this area	9
Finish mining in the Tuzo pit	11
Complete backfill with demolition material	11
Breach Dyke B, begin re-flooding of pits	11
Breach Dykes K and N	11
Decommission explosives storage and manufacturing facilities	11
Complete construction of fish enhancements structures	11
Start to decommission processing plant and service shop	12
Complete decommissioning of processing plant and maintenance complex	12
Decommission main power plant	12
Remove main fuel storage tanks	12
Remove permanent accommodation complex	13
Achieve interim closure status	13
Reclaim site roads not required for reclamation monitoring	13
Breach Dyke A	19+
Complete the refilling of Kennady Lake	19+
Final demobilization from site	19+
Monitor post-closure conditions in Kennady Lake	20+

Source: Adapted from Table 3.12-1 in Section 3 of the 2010 Environmental Impact Statement (EIS; De Beers 2010, pg 3-102).

Reference

De Beers (De Beers Canada Inc.). 2010. Environmental Impact Statement for the Gahcho Kué Project. Volumes 1, 2, 3a, 3b, 4, 5, 6a, 6b, 7 and Annexes A through N. Submitted to Mackenzie Valley Environmental Impact Review Board. December 2010.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_12

Source: Environment Canada (EC)

Subject: Closure of Contaminated Soils

EIS Section: EIS Sections 10.2 & 10.4.1.7.1

Terms of Reference Section: 4.1.4

Preamble

One of the general components given on page 10-13 for the reclamation program was to remove all potentially hazardous materials from site. However, on page 10-69 one of the closure options for contaminated soils is encapsulation.

Request

Please clarify closure options for contaminated soils, and if encapsulation is still a possibility, please clarify how it fits into the general components for reclamation listed on page 10-13.

Response

De Beers would like to clarify the statement on page 10-69 of the 2011 Environmental Impact Statement (EIS) Update (De Beers 2011). Sequestration through encapsulation alone is not being considered as an option for management of contaminated soils. Sequestration will be used together with treatment to remediate the soils. If the treatment is not effective, the soils will be stored in appropriate sealed containers for off-site shipment and disposal.

As stated in the update to the Project Description in the 2012 EIS Supplement, Section 3.8.3, encapsulation and treatment of contaminated soil on the Project site is still a possibility (De Beers 2012). The proposed method for soil remediation at closure is the use of microbiological remediation in a landfarm:

"A landfarm for the bio-remediation of hydrocarbon-contaminated solids from spills may be constructed depending on the need. 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 would be placed in the landfarm and spread during summer months. Any soil that has subsequently reached acceptable levels of hydrocarbon degradation would be removed and reused, or transferred to the landfill."

The method will be evaluated at the site, and soil will be removed if the process is ineffective. As listed in Section 3.8.3 of the 2012 EIS Supplement (De Beers 2012):

"Arctic conditions when combined with the type of contaminated soil 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 proved effective in northern climates, the contaminated soils will be collected and shipped to suitable disposal facilities in Alberta."

References

De Beers (De Beers Canada Inc.). 2011. Environmental Impact Statement for the Gahcho Kué Project. Volumes 3a Revision 2, 3b Revision 2, 4 Revision 2, and 5 Revision 2. Submitted to the Mackenzie Valley Environmental Impact Review Board in Response to the Environmental Impact Statement Conformity Review. July 2011.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_13

Source: Environment Canada (EC)

Subject: Mine Waste Inundated with Water During Post-Closure

EIS Section: EIS Sections 10.4.2.1.2

Terms of Reference Section: 4.1.4

Preamble

It is noted that mine waste material will be inundated with lake water during post-closure, however it is not clear what specific contribution this aspect of closure will have on water quality. Given the potential impacts on water quality of the weathering of waste material at the edge of the lake it is of interest if alternate designs were considered, taking into account differing impacts to water quality.

Request

Please provide specific details on the impacts of mine waste being inundated with lake water and the long-term impacts of this design. As well, details on this design compared to other design possibilities would be beneficial.

Response

The assessment of the potential effects of mine rock and processed kimberlite material storage to the water quality of Kennady Lake was determined through consideration of runoff and seepage from the mine rock piles and processed kimberlite facilities, contact with the inundated area of these facilities, and diffusive flux from in-pit disposal (Section 8.8 of the 2011 Environmental Impact Statement (EIS) Update [De Beers 2011]). Taking into account the water quality predictions, the Gahcho Kué Project is expected to have low or negligible effects on aquatic health in Kennady Lake during closure and post-closure from changes in the chemical constituents of water quality (Section 8.9 of the 2011 EIS Update). As a result, the projected impacts of the Project on the suitability of water within the Kennady Lake watershed to support a viable and self-sustaining

aquatic ecosystem are considered to be not environmentally significant (Section 8.14 of the 2011 EIS Update).

A description of methods used to predict the effects from mine rock and processed kimberlite material storage, including the water quality modelling, to the water quality of Kennady Lake follows below.

As per the waste management plan, as presented in the Project Description, Section 3 of the 2012 EIS Supplement (De Beers 2012), coarse processed kimberlite (PK) will be placed in the Coarse PK Pile located on land adjacent to the Area 4 basin and mine rock will be stored permanently in the West and South Mine Rock Piles located adjacent to Area 5 and Area 6, respectively. A portion of these materials will be deposited on land and a portion will be submerged.

Since the submission of the 2011 EIS Update, the mine plan has been updated to reflect supplemental mitigation associated with the deposition of fine PK to reduce potential loading of phosphorus. This change has resulted in a lower volume of fine PK that will be deposited to the Fine Processed Kimberlite Containment (PKC) Facility. Therefore, the Fine PKC Facility's footprint has been reduced to Area 2, which will be separated from Kennady Lake by a permeable dyke (Dyke L). The reduction in the size of the facility reduces the surface area of the Fine PKC Facility by approximately half as it no longer includes Area 1. As part of this supplemental mitigation, a larger volume of fine PK will also be deposited to the 5034 and Hearne pits. The updated Project Description that details the supplemental mitigation is provided in Section 3 of the 2012 EIS Supplement (De Beers 2012).

Effects to water quality in Kennady Lake from these facilities were assessed through the evaluation of surface drainage and seepage estimates, and potential geochemical loading through water contact with the waste rock materials. Drainage volumes from these facilities were calculated based on the land surface area of the facility during mining and post-closure phases (EBA 2011). All runoff and seepage from the Coarse PK and Mine Rock Piles to Kennady Lake were assigned the source term water quality representative of coarse PK and mine rock, respectively. A description of the source water quality assigned to these

materials is provided in Appendix 8.III of the 2012 EIS Supplement. (De Beers 2010)

For the Fine PKC Facility, seepage modelling (EBA 2012) indicates that a component of the total drainage from the Fine PKC Facility will flow through saturated fine PK and part of the cover, which is also expected to be saturated. In the Kennady Lake water quality assessment, flow through saturated mine materials was assigned a source term based on the results of saturated column tests. These tests allow the measurement of drainage chemistry resulting from weathering and leaching of the saturated material (MEND 2009). Details of the saturated column tests are provided in Appendix 8.III of the 2012 EIS Supplement. The source water quality assigned to unsaturated and saturated fine PK is provided in Appendix 8.III of the 2012 EIS Supplement (De Beers 2012).

The waste management plan also indicates that potentially acid generating (PAG) mine rock will be placed in the two mine rock piles above the restored Kennady Lake water elevation of 420.7 metres (m). However, less than 1.5% of the mine rock has some limited potential to generate acidity based on both sulphide concentration exceeding 0.3% and neutralization potential/acid potential (NP/AP) ratios of less than 3 (Section 3 and Appendix 8.III of the 2012 EIS Supplement). There is sufficient till material from the pit development available for use as cover/encapsulation material over and around the PAG storage cells within the mine rock piles. The use of fine material, such as till, to encapsulate the PAG cells not only limits water infiltration, but more importantly limits oxygen availability to the PAG rock. The use of alternate cover/encapsulation materials to inhibit oxidation, such as coarse PK, which is planned to be placed in the mine rock piles, will also form part of the acid rock drainage (ARD) control program. Coarse PK would not only limit oxygen availability to the PAG rock, but also exhibits an excess of neutralizing potential. As a result, the water quality modelling assumed that there would be no ARD to Kennady Lake.

Hydrodynamic modelling developed as part of the 2012 EIS Supplement (De Beers 2012) was used to determine the potential for diffusive flux of exposed fine PK material deposited in Hearne pit at a depth greater than 100 m from the

lake surface. This model was similar to that developed for Tuzo pit, detailed in Appendix 8.II of the 2012 EIS Supplement. The modelling projects that meromixis will occur in the Hearne pit, isolating any potential diffusive flux from the fine PK placed in the bottom of the pit.

Water quality in Kennady Lake in closure and post-closure was derived using a flow and mass-balance water quality model, developed in GoldSim™, for a range of water chemistry parameters. Updated water quality modelling provided in the 2012 EIS Supplement (De Beers 2012) is based on the updated mine plan that reduces the size of the Fine PKC Facility and on-going geochemical testing results of mine rock and PK material. The water quality model input values for Kennady Lake during closure and post closure assume that:

- runoff and seepage from mine rock piles and process kimberlite facilities occur in the absence of permafrost (i.e., completely thawed conditions); and
- more conservative higher-end (higher concentration) geochemistry test results have been applied to the water quality model to determine chemical loads from the storage facilities and in-pit disposal.

While conservative assumptions were used in the assessment to provide confidence that changes to water quality will not be worse than projected in Kennady Lake, they also provide an upper bound in order to develop adequate mitigation. In addition, operational conditions are such that permafrost is expected to aggrade into the piles and decrease contact and reactivity with air and water, thereby providing natural mitigation to potential geochemical loading to Kennady Lake.

Predicted water quality is based on several inputs (i.e., surface flows, groundwater flows and seepage, background water quality and geochemical characterization), all of which have inherent variability and uncertainty. As such, it is suggested that water quality predictions should not be used to predict absolute concentrations, but rather as a planning tool and to develop monitoring plans (Appendix 8.I, Attachment 8.I.5; De Beers 2011). It is anticipated that runoff and seepage from the reclaimed facilities will be monitored during

operations to compare to EIS predictions. If it is identified that the quality of runoff or seepage is worse than predictions, adaptive management strategies will be triggered to address the problem.

Additional options considered for the placement of mine rock and PK material are included in the Alternatives Analysis, Section 2 of the 2012 EIS Supplement (De Beers 2012). Various design options were considered that included the development of on-land facilities for mine rock and PK material, deposition of material into reclaimed basins within Kennady Lake, and in-pit disposal of waste material.

The current mine plan, including the deposition of waste material generated by the Project, was selected because it allows for a more compact disturbance footprint and the sequestering of mine waste in the available mined out pits. This design minimises long term impact on water quality through closure and post-closure. The design also includes smaller rock piles than on-land alternatives through the efficient use of mine rock and PK as pit backfill and the effective use of local topography to form part of the boundary of the Fine PKC Facility. The backfilling of the 5034 pit with mine rock and PK, and the partial backfilling of Hearne pit with fine PK, will also shorten the refilling time for Kennady Lake at closure. Backfilling also provides an effective means of disposing of potential PAG rock. The design includes the progressive reclamation of the Fine PKC Facility and Coarse PK Pile during mine operations.

References

De Beers (De Beers Canada Inc.). 2011. Environmental Impact Statement for the Gahcho Kué Project. Volumes 3a Revision 2, 3b Revision 2, 4 Revision 2, and 5 Revision 2. Submitted to the Mackenzie Valley Environmental Impact Review Board in Response to the Environmental Impact Statement Conformity Review. July 2011.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.

EBA. 2011. Updated Summary of Water Management and Balance during Mine Operation, Gahcho Kué, NWT (for updated fine PK disposal plan – Option 2). EBA File: E14101143.

EBA. 2012. Seepage Analysis for Fine PK in Area 2 (Updated Fine PK Management Plan – Option 2) Gahcho Kué Diamond Project. EBA File: E14101143.

MEND. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

April 2012

GAHCHO KUÉ PROJECT ENVIRONMENTAL IMPACT STATEMENT
INFORMATION REQUEST RESPONSES

Information Request Number: EC_14

Source: Environment Canada (EC)

Subject: Fine Processed Kimberlite Facility Design

EIS Section: EIS Sections 10.4.2.2

Terms of Reference Section: 4.1.4

Preamble

The current design for the fine processed kimberlite facility incorporates permafrost formation by the encouragement of air circulation. However it is of interest what impact this design could have on the amount of seepage from the facility and the likelihood of acid rock drainage and metal leaching formation in the event that permafrost does not form or if it degrades in the future. It is noted that weathering of the cover material will occur over time, however there is no estimate of the length of time this process would take to occur or what impact this will have on potential seepage from the facility.

Request

Please provide further details on the long-term impacts of the fine processed kimberlite facility design on the amount of seepage from the facility.

Response

As stated in Page 8-306 of the 2011 Environmental Impact Statement (EIS) Update Section 8 (De Beers 2011), projections of water quality in Kennady Lake did not include the development and persistence of permafrost conditions within the mine rock piles, the Coarse Processed Kimberlite (PK) Pile, and the Fine Processed Kimberlite Containment (PKC) Facility. It was assumed that seepage quantities from these facilities would be representative of no permafrost conditions, and provide seasonal geochemical loading to Kennady Lake after closure. It is recognized that frozen layers will establish during the development of these facilities and that permafrost will likely continue to develop following closure, which will result in lower rates of seepage through the facilities and geochemical loading to Kennady Lake than simulated in the EIS assessment.

However, as the assessment of impacts to the suitability of the water quality to support aquatic life includes time periods that extend into the long-term (i.e., 200 years), the assessment was designed to represent potential future climatic conditions where there would be no permafrost.

As summarized in Section 3.7.4.4 of the 2012 EIS Supplement (De Beers 2012), all of the 61 PK samples submitted for geochemical analyses are non-acid generating with substantial excess neutralization capacity. For the samples tested, a maximum sulphide concentration of 0.09 wt% sulphide was observed. The pH of the PK humidity cell leachate was neutral to alkaline and the samples were not expected to release acidity over time.

The main objective of the closure cover over the fine PK facility is to reduce surface erosion and prevent dust generation. This cover may also help permafrost development in the fine PK. However, this would be an added benefit. Natural weathering of the granite mine rock cover would be very slow (e.g., millenniums).

Further details on the seepage and water quality from the fine PK are discussed in the 2012 EIS Supplement Section 8 and Appendix 8.II (DeBeers 2012).

References

De Beers (De Beers Canada Inc.). 2011. Environmental Impact Statement for the Gahcho Kué Project. Volumes 3a Revision 2, 3b Revision 2, 4 Revision 2, and 5 Revision 2. Submitted to the Mackenzie Valley Environmental Impact Review Board in Response to the Environmental Impact Statement Conformity Review. July 2011.

De Beers. 2012. Environmental Impact Statement Supplemental Information Submission for the Gahcho Kué Project. Submitted to the Mackenzie Valley Environmental Impact Review Board. April 2012.