BHP DIAMONDS INC.

CONFORMITY

RESPONSE

BHP Diamonds Inc. Yellowknife, NT July, 2000	BHP

Table of Contents

Item 1 – Conformity Letter

1. **The Review Board agrees with government reviewers, the Independent Environmental Monitoring Agency (IEMA) and its staff that BHP did not provide information about**
   a) **the temporary shut down of facilities,**
   b) **migratory birds,**
   c) **kimberlite composition and toxicity,**
   d) **use of the development for future exploration activities,**
   e) **Sable Lake vegetation classification, and**
   f) **IEMA's comments regarding s.4.2.2 and temporal boundaries.**

a) Temporary Shutdown of Facilities, Line 166 of ToR

In responding to temporary shutdown of facilities, BHP Diamonds Inc. makes use of two documents previously published by BHP Diamonds Inc. that adequately address this requirement.

The first is the Environmental Impact Statement (EIS)(BHP, 1995) and the second is the Interim Abandonment and Restoration Plan (BHP 2000). The latter plan is a component of the Operating Environmental Management Plan, previously provided to the Review Board. The Interim Abandonment and Restoration Plan is a requirement of BHP's Water Licence, N7L2-1616, Part K. As stated in the EAR, the management procedures and plans that are in place for the existing operations will be adapted to integrate the development of Sable, Pigeon, and Beartooth.

To reduce redundancy of reports and information, BHP has opted to provide excerpts of these reports to the Review Board.

EIS Excerpt

Volume III - 9.7.3 Temporary Shutdown
"Temporary shutdown" is sometimes also called "planned shutdown". By definition, temporary shutdown means stoppage of mining and milling operations at a mine due to economic or operational requirements. At the same time, it is also assumed that mining operations will recommence when the problems are resolved.

In the present case, the progressive reclamation program will ensure that, should market conditions dictate a temporary shutdown of the mine, all outstanding reclamation liabilities are minimized and the condition of most disturbed areas is such that a period of inactivity will not result in environmental degradation. By incorporating reclamation needs into the design and construction of facilities, not only will the reclamation be enhanced (more microsites and more biological activity in freshly worked soils) and environmental values maintained (less erosion/siltation potential), but these sites will be left in a stable condition in the event of a temporary shutdown.

Many of the design features of the mine, including the construction of the tailings [1]disposal cells in Long Lake and of the waste rock dumps in progressive stages, will serve to ensure that reclamation of these sites can be completed in a timely manner. This will minimize the potential for adverse impacts associated with unreclaimed sites. For example, the waste rock stripped from the initial mining of the Panda open pit will be used to construct the northern portion of the Panda dump to the ultimate limit and thereafter to advance the active dump face south to the contiguous Koala dump, allowing the northern portion of the dump to be reclaimed early in the life of the mines. This strategy will buffer the effects of a temporary shutdown on the surrounding environment.

In addition to the built-in design features as mentioned above, the following steps will be undertaken in the event of a temporary shutdown:

- All mine openings that may be a safety concern will be protected from inadvertent access.
- Access to the property and all associated facilities will be restricted to authorized personnel only.
- All mechanical and hydraulic systems will be left in a no-load condition.
- Specific monitoring programs will be continued as deemed necessary. This will be determined prior to the shutdown period.
- All hazardous and non-hazardous substances, other than tailings and waste rock, will be made secure.

Interim Abandonment and Restoration Plan Excerpt

9. Shutdown Strategies

There are a number of factors, both internal and external, that may influence a decision to shutdown mining operations. These include market conditions, economics of ore recovery, ore reserves, and ongoing exploration programs. The strategies outlined below are dependent on the duration of the shutdown.

9.1 Temporary Shutdown

A temporary shutdown is a halt of mining and processing operations for economic, operational, or regulatory reasons. These shutdowns generally are of short-term duration and full operation will resume when the cause of the shutdown has been remedied. During these periods, the only mining activities that occur are equipment and site maintenance. In addition, all environmental monitoring and administrative duties continue to maintain licence and permit agreements.

9.2 Long-Term Shutdown

[1] Processed kimberlite has replaced the use of the word "tailings" as used in the EIS.

A long-term shutdown occurs when all planned reserves have been recovered for processing and additional mining is not perceived to be sufficiently economical to maintain operations. The facilities may be used, however, for the processing of satellite operations or bulk sampling of additional pipes. Consequently, complete closure is not being considered at this stage.

The environmental monitoring program outlined in existing regulatory documents will be maintained during this period. In addition, the following strategies will be undertaken at the time of shutdown:

- all mine openings that are a safety concern will be secured,
- access to the property and all associated facilities will be restricted to authorized personnel only,
- all mechanical and hydraulic systems will be left in a no-load condition, and
- all hazardous and non-hazardous substances, other than tailings and waste rock, will be secured.

Because reclamation will be completed progressively throughout the mine life, all outstanding liabilities will be minimized and the condition of most disturbed areas will be left in a stable condition at the time of the shutdown. In addition, the mine development design allows reclamation to be completed in a progressive manner up to the time of closure. For example, the construction of the tailings containment area by cells allows reclamation to be conducted progressively. Progressive reclamation minimizes the potential for adverse environmental impacts to occur in unreclaimed areas at shutdown.

b) Migratory Birds, Line 439-441 ToR

Migratory Birds and Their Habitats

Direct effects of development on migratory birds and their habitats refer to physical and behavioural disturbance, including displacement and habituation, and may take place throughout all project phases, from construction through post-decommissioning. Habitat effects refer to the loss and degradation of habitat, including losses due to roads and construction. Habitat loss results primarily during the construction phase. Degradation of habitat is a secondary effect of habitat loss during construction and operation and results in reduced habitat effectiveness. Neutral or positive habitat effects, such as development or enhancement of nesting habitat, occur primarily during construction, but may be temporally buffered by disturbance from industrial activity and thus be unavailable for exploitation until post-commissioning.

Potential effects of the proposed development of the Beartooth, Pigeon, and Sable kimberlite pipes on migratory birds and their habitats can be predicted and evaluated based on experience and empirical knowledge gained through previous and current operations at EKATI™, as well as inferences drawn from published literature. These effects include direct mortality, displacement, and changes in behavioural patterns as a result of disturbance. This is critical particularly during migration, nesting and moulting.

Noise may exclude birds from feeding habitats and increased energy expenditure while trying to avoid noise.

Approach

Potential effects of the proposed development on migratory birds and their habitats were assessed using data collected during the initial EIS process and the ongoing WEMP at EKATI™. Data collected during field surveys of permanent breeding bird census plots in 1995-1999 were reviewed. Raptors, corvids (common raven), and Galliformes (rock and willow ptarmigan) were excluded from this assessment.

The area of each habitat type affected by the proposed development of the Sable, Pigeon and Beartooth pipes was determined using GIS. Three areas were calculated:

- Footprint of the proposed development, including roads, pits, waste rock piles, and associated structures, which represents habitat directly and permanently affected by construction;
- 50-m buffer around the footprint of all developments to represent an area of potentially high-intensity disturbance; and
- 300-m buffer to represent an area of lower-intensity disturbance which corresponds to the primary dustfall zone.

Buffers were measured from the perimeter of the development footprint. The buffered areas represent habitat which may be reduced in its effectiveness for birds (concurrent with operations), but where habitat alterations are temporary and are unlikely to persist beyond decommissioning.

Within the footprint and the disturbance buffers, the areas, by habitat type, directly and indirectly affected by the proposed development were compared to the habitat rankings to quantify the relative importance of habitats altered by construction and operation. These areas were also compared to areas available within the entire BHP habitat-mapped area to place context on the magnitude of habitat alteration.

Results

Habitat data were recorded for 6,645 observations during bird surveys, which was reduced to 5,036 observations after observations of raptors, corvids, and Galliformes and those without complete habitat descriptions were excluded. Habitat data were provided for observations of 60 species, which were grouped into:

- waterbirds (*e.g.*, ducks, geese, gulls, terns, loons);
- shorebirds (*e.g.*, sandpipers, plovers); and
- passerines(Table 1).

Table 1. Groupings for bird species from survey observations with habitat associations in the Lac de Gras area, 1995 to 1999.

Waterbirds	Shorebirds	Passerines
American Green-winged Teal	Baird's Sandpiper	American Pipit
Arctic Tern	Common Snipe	American Robin
Canada Goose	Dunlin	American Tree Sparrow
Common Merganser	Least Sandpiper	Blackpoll Warbler
Dark Goose	Lesser Golden Plover	Common Redpoll
Duck species	Lesser Yellowlegs	Gray-Cheeked Thrush
Glaucus Gull	Long-billed Dowitcher	Harris' Sparrow
Goose species	Pectoral Sandpiper	Hoary Redpoll
Greater Scaup	Plover species	Horned Lark
Greater White-Fronted Goose	Red-Necked Phalarope	Lapland Longspur
Gull species	Sandhill Crane	Passeriformes species
Herring Gull	Sandpiper species	Redpoll species
Long-Tailed Jaeger	Semipalmated Plover	Savannah Sparrow
Loon species	Semipalmated Sandpiper	Sparrow species
Mallard	Shorebird species	White-Crowned Sparrow
Merganser species	Spotted Sandpiper	Yellow Warbler
Northern Pintail	Stilt Sandpiper	Yellow-rumped Warbler
Oldsquaw		
Pacific Loon		
Parasitic Jaeger		
Red-breasted Merganser		
Red-throated Loon		
Surf Scoter		
Thayer's Gull		
Tundra Swan		
Yellow-billed Loon		

Habitat associations were determined for each bird group. (Figures 1, 2 and 3). Generalized rankings of habitat importance were inferred for each species group based on these observations.

Table 2. Availability of habitat types within the EKATI™ study area, and their use by migratory birds. SPB refers to the proposed Sable, Pigeon, and Beartooth development. EPD refers to existing and permitted developments at EKATI™.

	Prevalence (percent) within							Habitat association (percent) by		
Habitat Type	Study Area	SPB Footprint	SPB 50m Buffer	SPB 300m Buffer	EPD Footprint	EPD 50m Buffer	EPD 300m Buffer	Waterbirds	Shorebirds	Passerines
Heath tundra	49.8	85.5	86.5	69.8	61.4	67.2	62.0	22.9	24.8	56.0
Boulder field	2.5	1.0	1.8	0.5	4.3	7.3	7.0	0.3	0.8	2.2
Birch hummock	1.8	0.8	2.1	4.3	3.0	2.1	1.9	2.4	3.8	6.8
Wetland complex	10.1	4.6	3.2	5.2	16.9	11.6	14.6	0.0	11.8	8.5
Sedge fen	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	0.0	1.7	0.5
Sedge meadow	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	20.8	22.3	5.9
Birch seep	0.7	0.0	0.1	0.4	3.0	2.0	1.3	0.3	0.2	2.3
Cotton-grass tussock	0.7	0.0	0.1	0.6	0.3	1.2	1.0	2.1	15.2	8.6
Disturbed	n/a[2]	n/a[2]	n/a[2]	n/a[2]	n/a[2]	n/a[2]	n/a[2]	1.3	5.1	1.0
Water, Ice	32.4	6.9	1.6	14.2	10.3	4.3	10.8	29.3	1.5	0.1
Esker complex	1.6	1.1	4.6	4.9	0.7	4.1	1.0	4.3	3.8	2.7
Riparian tall shrub	0.3	0.0	0.0	0.1	0.1	0.2	0.4	3.7	2.7	5.0
Unclassified	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoreline	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	n/a[1]	12.5	6.3	0.5
Total	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Values included in other wetland types.
[2] Values included in pre-disturbed habitat types.

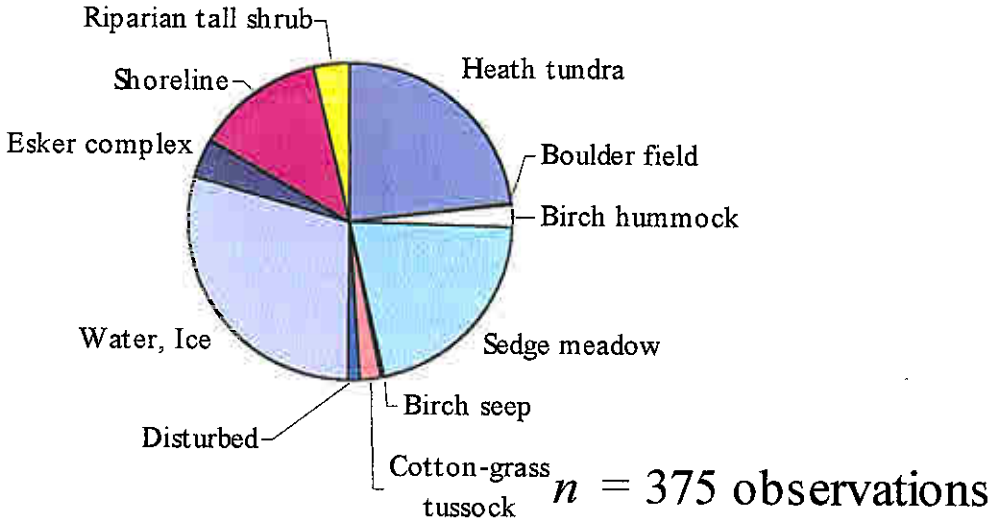


Figure 1. Habitat association for observations of waterbirds during surveys in the Lac de Gras area, 1995 to 1999.

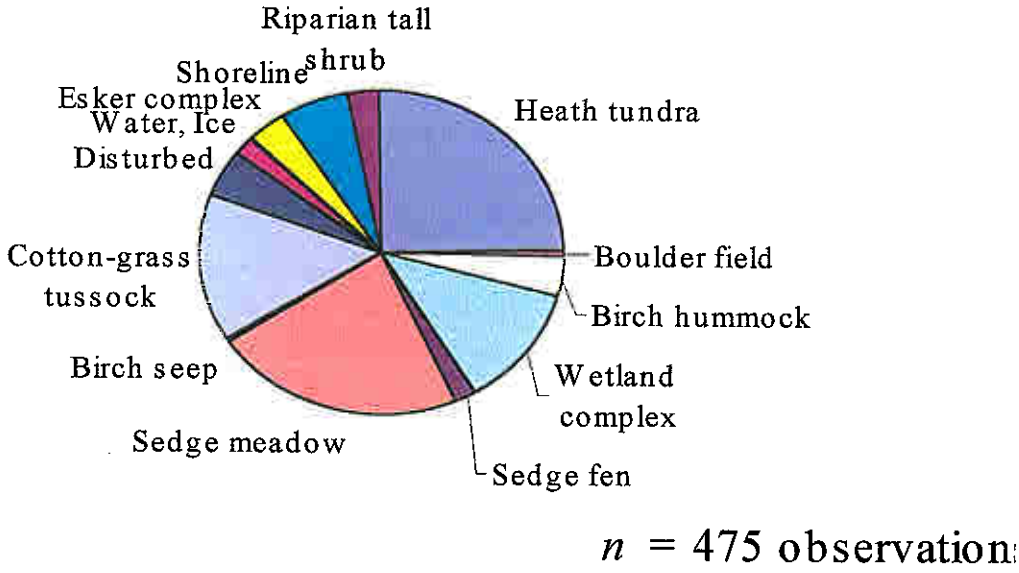


Figure 2. Habitat association for observations of shorebirds during surveys in the Lac de Gras area, 1995 to 1999

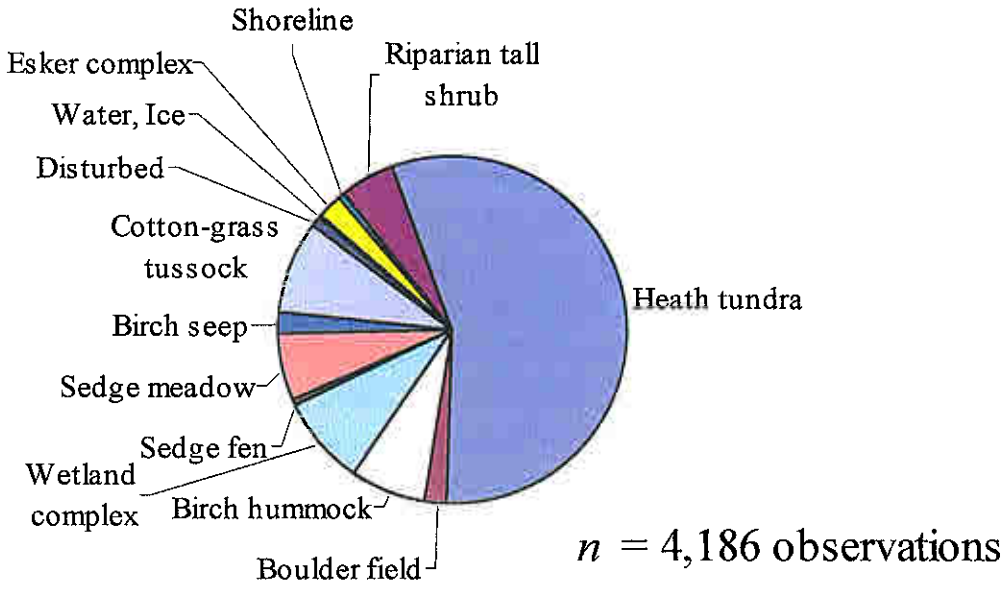


Figure 3. Habitat association for observations of passerines during surveys in the Lac de Gras area, 1995 to 1999.

Construction will directly affect 655.1 ha (6.6 km²) of potential bird habitat, 510.9 ha of which is terrestrial. Based on the highest estimate of terrestrial breeding bird territories within the study area (198.9 per km²; Rescan 1999c), 1,016 territories could be displaced by construction of roads, pits, and associated facilities. This represents 0.49% of the estimated 207,115 territories in the entire area of the BHP habitat map, based on the same density estimate.

The proposed development footprint will eliminate 5,165 m of shoreline. Shoreline habitats are important feeding and nesting areas for several species of waterfowl and shorebirds. This represents 0.16% of the 3,263,776 m of shoreline originally available within the habitat-mapped study area. Existing and permitted developments at EKATI™ have usurped 23,429 m of shoreline.

Construction will create or enhance nesting habitat for some species, particularly, for example, shorebirds, which prefer to nest on gravel. Those habitats, however, may be inaccessible until cessation of operations.

Operation of roads, pits, and associated facilities will cause high-intensity disturbance within a 50-m buffer, for a total area of 428.7 ha. Based on bird surveys and anecdotal observations collected on site during 1995-1999, data suggest that birds typically show no detectable responses to stressors and that effects from mining and associated activities are negligible (Rescan, 1999c). However, birds will encounter noise and

increased mortality risk within this buffer area during migration and nesting. Some reduction in effectiveness of habitat for nesting, feeding, and staging is likely, but the magnitude of this reduction is unknown. Within the 50-m disturbance buffer, approximately 2,863 m of shoreline occurs. A 50-m disturbance buffer around existing and permitted EKATI™ developments affects 625.7 ha of potential bird habitat, and 18,198 m of shoreline.

Despite human disturbance associated with mining, waterfowl and shorebirds continue to utilize lakes adjacent to the Panda Pit, mine infrastructure and roads. One pond, only 225 m from Panda Pit and adjacent to an active road, is commonly used by greater scaup and northern pintails for feeding and staging. Data from BHP's 1999 WEMP suggest that the distribution and number of loon territories adjacent to the mine site are remaining stable (Rescan 1999c). Loons are regularly seen within the mine site area and continue to maintain territories on a number of lakes close to the mine, including Kodiak Lake, located adjacent to the airstrip and the main camp, and Long Lake, which has been altered through the construction of dykes and the addition of processed kimberlite material in the upper cells.

Shorebirds such as red-necked phalaropes and least sandpipers also use ponds within the existing footprint. Several pairs of semi-palmated sandpipers have nested adjacent to developed areas over the last two years (S. Moore, Rescan Environmental Services, pers. comm).

Low-intensity disturbance will occur within a 300-m buffer during operations, affecting a total area of 2,013 ha of potential bird habitat, and 57,077 m of shoreline. This area also represents the primary dustfall zone. Changes to vegetation resulting from dust deposition may affect migratory birds by altering availability of nest sites or food. Of greater consequence, however, is the predicted pattern of snowmelt in the dustfall zone, which is expected to accelerate green-up by 10-14 days in affected areas. This could provide spring foraging opportunities for passerines and waterfowl, and advanced nesting for passerines. However, alterations to plant communities resulting from dust deposition on vegetation may be negative to some birds, in that berry-producing species may be reduced. A 300-m disturbance buffer around existing and permitted EKATI™ developments affects 3,356 ha of potential bird habitat, and 86,058 m of shoreline.

Generally, habitats lost due to the proposed development consist mostly of heath tundra habitat units, which are poor in quality and low in value for most birds. Although individuals with territories adjacent to the pits will be displaced, birds are adaptable. Structures such as buildings and communication and weather towers can provide nesting opportunities for birds (Ritchie, 1991).

In the short term, development of the three proposed pits will eliminate nesting and feeding habitat for some birds such as Lapland longspurs, sparrows, and horned larks. However, based on recent breeding bird surveys, upland bird diversity around Pigeon Pond and Sable Lake is low compared to other breeding bird plots, due to the prevalence of poor quality habitat. Loon territories have not been documented on Sable Lake from 1995 to 1999. Thus, habitat loss in association with the proposed

development is negligible with respect to the surrounding habitat within the wildlife study area (Table 3).

The density of breeding bird territories, species diversity, and species richness were monitored on permanent survey plots from 1995 to 1999. None of those parameters changed significantly over time or relative to distance from the mine (Rescan, 1999c).

Table 3. Criteria Used to Assess the Significance of the Proposed Development of Sable, Pigeon and Beartooth Pits and Roads on Migratory Birds

Criteria	Comments
Geographic Extent	The effects of the proposed developments will be limited to those birds with territories adjacent to development.
Duration	Those effects that do manifest themselves will be seasonal, while birds are present during spring and summer. Duration will be long-term, but will subside after human activity ceases.
Frequency	The frequency of effects will be continuous for individuals residing adjacent to the proposed development, and will reoccur on an annual basis.
Ecological Context	Birds affected by the proposed development represent a very small fraction of the population at the local, regional, or greater-than-regional levels. Integrity of bird populations and habitats will not be affected at the local, regional and greater levels.
Reversibility	Upon termination of mining activities, disturbance impacts will cease. Negligible habitat alteration will persist. Site reclamation and natural revegetation will restore the areas of the pits and roads to useable habitat.
Probability	Impacts will occur to those individuals nesting, foraging, or travelling adjacent to the proposed developments. Impacts are unlikely to occur at the local level, regional and greater levels.
Sustainability	The impacts from the proposed developments are predicted to not have any measurable effect on the sustainability of bird populations at the local level, regional or greater levels.

c) Kimberlite Composition and Toxicity, Line 348-349 ToR

The Panda and Fox kimberlites were tested for toxicity to aquatic life using crushed samples collected from the original bulk samples. These were crushed to the sizes expected from the process plants, including the combined fine and coarse fractions. The Panda kimberlite was not toxic to fish, while the crustacean *Daphnia* and the green algae *Selanastrum* exhibited low level toxicity at the highest suspended solids concentration. Microtox and *Ceriodaphnia* had an IC50 and LC50 of 169 mg/l and 106 mg/l, respectively.

The Fox kimberlite was acutely toxic to all test species with the level of toxicity varying considerably from one species to the other. The most sensitive (toxic) response was produced by trout with an LC50 of 667 mg/l. The endpoints for other species were:

luminescent bacteria IC50 – 737 mg/l, green algae – 6050 mg/l and *Daphnia* - 7305 mg/l. Generally, toxicity is dependent on the proportion of kimberlite that can remain suspended in the water column. Complete results of the toxicity work are detailed in the report, "*Aquatic Toxicity Associated with Diamond Ore (Kimberlite) Mining, (Envirotest 1998)*"..

In the toxicity work done by Harrison et al. (1995 and 1997) on the Fox kimberlite, it should be noted that all work was performed on material taken directly from end-of-pipe, and involved the testing of effluents directed to a mine water settling pond and to the Phase 1 Containment Area. The observed toxicity was almost entirely eliminated when the pH of the effluent was lowered (pH<8.0) or the effluent filtered to remove suspended solids. This, combined with BHP's toxicity testing, suggests that both alkaline pH and suspended solids were major contributors to the observed fish mortality.

The bulk sample plant observations indicate that the Beartooth kimberlite is comparable to that found at Panda, and the Sable and Pigeon kimberlites are more similar to Fox material. The kimberlite properties fall within the diatreme kimberlite types of Panda and Fox that have previously been sampled, tested and found to have low toxicity. Given the low levels of toxicity exhibited by Panda and Fox, and since Sable, Pigeon and Beartooth exhibit characteristics and properties similar to these two kimberlite pipes, further toxicity testing is not warranted.

Additionally, the coarse processed kimberlite (sand) is deposited as a damp pile within the footprint of the Koala waste rock storage area; this will include processed kimberlite from Sable, Pigeon, and Beartooth pipes. Any runoff from this pile is directed to the Long Lake Containment Facility and is tested under the waste rock leachate program and the Surveillance Network Program of Water Licence N7L2-1616. This pile will be perennially frozen and will be encapsulated within waste rock over the mid to long-term. There is no plan to deposit coarse processed kimberlite in Beartooth Pit following mining. This pit will be filled with the slurry stream of fine processed kimberlite that would normally be directed to the Long Lake Containment Facility.

The EAR states in Section 5.6.6.4, that a water quality monitoring program will be initiated once the processed kimberlite has settled in the exhausted pit. Once water meets acceptable standards, the lake will be reconnected to the downstream watershed.

d) Use of the Development for Future Exploration, Line 147-151 ToR

In the Environmental Assessment Report, page 2-45, BHP states:

"At this time, no further exploration activities are planned for the Sable, Pigeon and Beartooth pipes. However, the proposed infrastructure, when established, could be utilized to support future exploration in the area."

In its letter to BHP on June 22, 2000, the Review Board requested additional information regarding use of the development for future exploration activities. However, it has been noted by BHP that the Table of Non-Conformity, attached to the letter, did

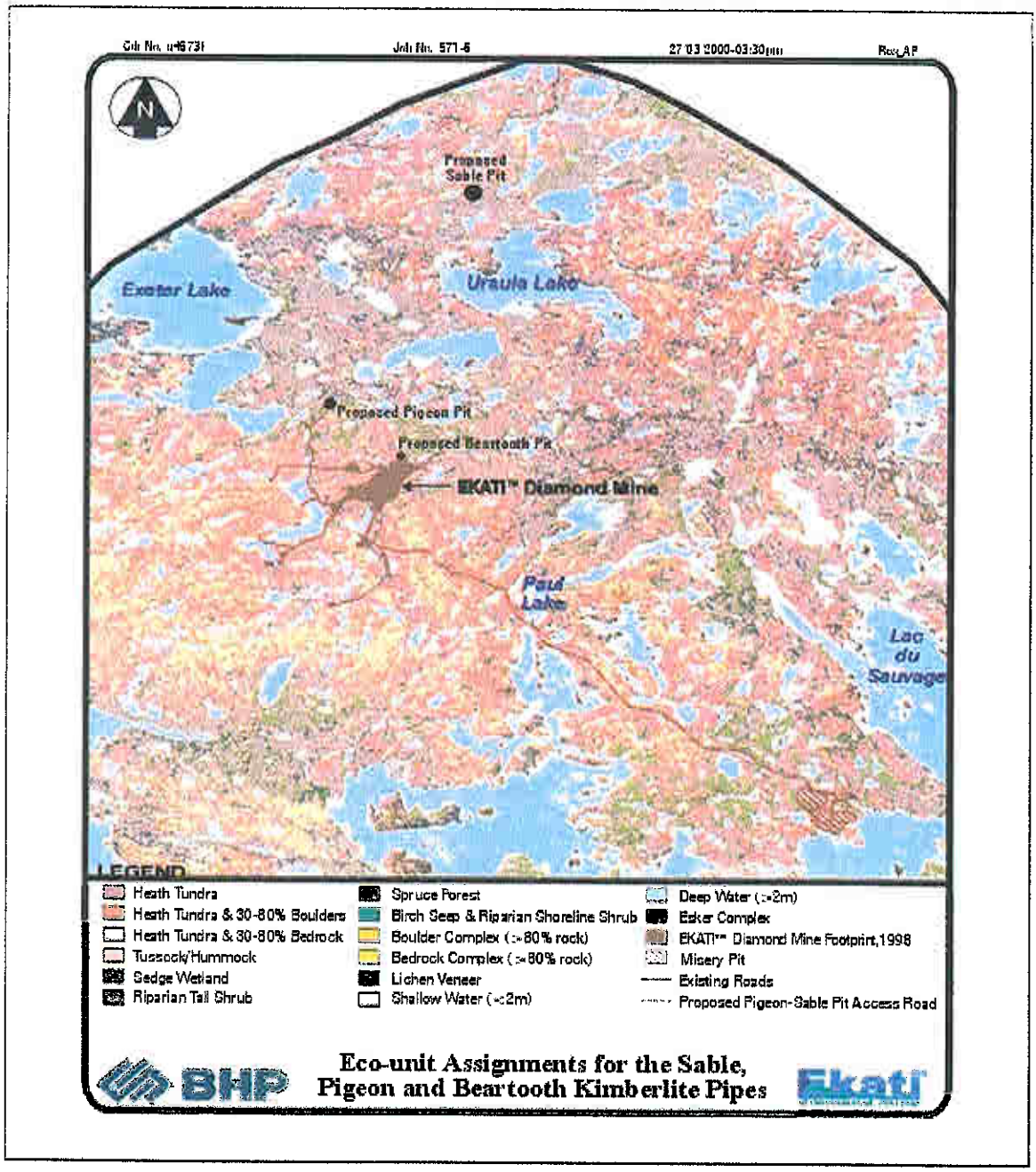
not clearly identify the non-conformity item. Unless otherwise directed by the Review Board, the information contained in the EAR meets the requirements of the ToR.

e) Sable Lake Vegetation Classification, Line 230-232 ToR

The original EIS contained data relating to the vegetation at the Sable Lake development (see Table 4.4-1 from page 4-48 of EAR inserted here) and the regional details were provided in Figure 3.7-10 on page 3-152 (see inserted figure). However, the data were not available for inclusion in the habitat maps. These data have been updated and are presented here in graphic and numeric form.

From EA Report for Sable, Pigeon and Beartooth Kimberlite Pipes, April 2000
Table 4.4-1 Habitat Lost to Point and Linear Features

	All Units are in Hectares										
	BF, RB: Bedrock and Boulder Fields	BLb, BLr, BLe: Open Mat Tundra	SSe, BEe, BLe: Esker Complex	BL: Closed Mat Tundra	BL + BR, EA: Tundra/Wetland Complex	BR: Birch Hummock	EA: Cotton Grass Tussock	BR, EA, CE, CA: Wetland Complex	BC: Birch Seep	SR: Willow Riparian	Total
Point Features											
Sable Pit	0.7	0.7	0.0	253.9	0.0	0.7	0.0	0.0	0.0	0.0	256.0
Pigeon Pit	5.5	15.5	0.0	90.0	0.0	2.1	0.0	16.9	0.0	0.0	130.0
Beartooth Pit	0.0	0.5	0.0	7.6	2.2	0.0	0.0	0.1	0.6	0.0	11.0
Total Losses Due to Point Features	6.2	16.7	0.0	351.5	2.2	2.8	0.0	17.0	0.6	0.0	397.0
Linear Features											
Sable Road	0.0	8.3	0.2	25.1	0.0	0.7	0.2	0.3	0.0	0.0	34.8
Pigeon Road	0.0	4.5	4.9	38.2	8.1	1.4	0.0	0.0	0.2	0.0	57.3
Beartooth Road	0.0	0.0	0.4	3.7	0.5	0.3	0.0	0.0	0.0	0.0	4.9
Total Losses Due to Linear Features	0.0	12.8	5.5	67.0	8.6	2.4	0.2	0.3	0.2	0.0	97.0
Total Direct Habitat Loss Due to All Proposed Development	6.2	29.5	5.5	418.5	10.8	5.2	0.2	17.3	0.8	0.0	494.0
Percent	1.3	6.0	1.1	84.7	2.2	1.1	0.0	3.5	0.2	0.0	100.0



Introduction

The comprehensive baseline ecosystem maps developed for the 1,900 km^2 study area around the current EKATI^{TM} Diamond Mine did not extend to include the northern most section of the proposed development:

- Sable Pit; and
- Northern 500 m of the proposed haul road leading to the Sable Pit.

This area was mapped in 1999 with the objective of providing an inventory of ecosystem units within the area surrounding the proposed Sable Road/Pit to provide baseline

information. Ecosystem mapping was conducted according to the methods employed by Oikis Ecological Services in 1994 and 1995 using 10 ecosystem units:

- Bedrock and Boulder Fields
- Open Mat Tundra
- Esker Complex
- Closed Mat Tundra
- Tundra/Wetland Complexes
- Birch Hummock
- Cotton-grass Tussock
- Wetland Complexes
- Birch Seep
- Willow Riparian

The same ecosystem modifiers were applied as those in the original classification. These modifiers qualified the: extent of boulders; bedrock; terrain slope; extent of esker material; and the extent of shrubs greater than 50 cm high.

Methodology

Ecosystem mapping was conducted on August 3, 1999 and consisted of two field staff visiting the site and identifying, classifying and delineating ecosystem units on 1:50,000 topographic maps. The Sable Pit area and Sable Pit haul road were walked and mapped. A 500 m buffer on either side of the proposed pit and proposed roadway was also included and delineated based on ecosystem units. Selected areas, up to 1 km away, were also examined and mapped. This included areas that may have been concealed by a hill or valley.

Ecosystem units were transcribed from topographic maps to Arcview Software by a GIS technician. Colour themes were applied to each ecosystem unit, which matched those originally used by Oikis Ecological Services. Area calculations for potentially impacted areas were then generated for each ecosystem unit using Arcview. The GIS data base was used to define the areas potentially affected by the development of the Sable Road, Pit.

Results and Discussion

The data available for the Sable pit area have been defined for the section of the map that was not included in the EA for the Sable, Pigeon and Beartooth Kimberlite Pipes. The proportion for the vegetation types for the mapping extension were evaluated for:

- Sable Road extension: last 500 m (closed mat tundra: 6.9 ha)
- Sable mine and waste rock storage areas (closed mat tundra: 214.3 ha); and
- Associated infrastructure (closed mat tundra: 17.1 ha, bedrock and boulder field: 0.2 ha, open mat tundra: 0.6 ha, birch hummock: 0.7 ha). (Includes 5.8 ha in lower previously mapped area)

For the Sable complex in the extension area mapped, 99% of the area affected is closed mat tundra with the remaining areas being boulder fields, open mat tundra and birch hummock.

For the Sable Pigeon and Beartooth proposed development, the proportion of closed mat tundra is greater than in the total study area with 79.7% and 25.5%, respectively (Table 4). Both the proposed development and the EKATI™ mine effect a reduced area of water when compared to the total study area. This is due to the avoidance of dump and road construction on aquatic habitat.

Table 4. A summary of the project related areas (ha) for the study area, EKATI™ mine and the Sable, Pigeon, Beartooth proposed development.

Eco-unit	SPB Development		EKATI™ Mine Total		Total Study Area	
	(ha)	% of total	(ha)	% of total	(ha)	% of total
Water	31.7	6.9	121.9	10.9	49828.3	32.4
No data available					176.8	0.1
Bedrock and Boulder Fields	4.7	1.0	51.3	4.6	3919.3	2.5
Open Mat Tundra	26.5	5.8	365.3	32.6	37376.6	24.3
Esker Complex	4.9	1.1	8.7	0.8	2434.7	1.6
Closed Mat Tundra	366.4	79.7	360.7	32.2	39228.2	25.5
Tundra/Wetland Complexes	3.2	0.7	153.7	13.7	7629.8	5.0
Birch Hummock	3.8	0.8	34.9	3.1	2848.2	1.8
Cotton-grass Tussock	0.2	0.0	3.3	0.3	1056.7	0.7
Wetland Complexes	18.0	3.9	46.1	4.1	7861.0	5.1
Birch Seep	0.2	0.0	35.3	3.1	1129.9	0.7
Willow Riparian		0.0	0.6	0.1	469.3	0.3
Total (excl water)	*427.8*	*93.1*	*1059.9*	*94.5*	*104130.3*	*67.6*
Total (incl water)	*459.5*		*1121.1*		*153958.6*	

For the proposed development, a smaller proportion of important habitats, such as wetland complexes and willow riparian, are affected when compared to the regional distribution (Figure 4). Therefore, the effects on habitat availability are less than a randomly placed development. Careful field work to align the road and dump designs that avoid wetland margins assist in minimizing the vegetation effects of the proposed development. The proportions of wetland complex and esker complex affected by the proposed development are similar to the natural proportions present in the study area.

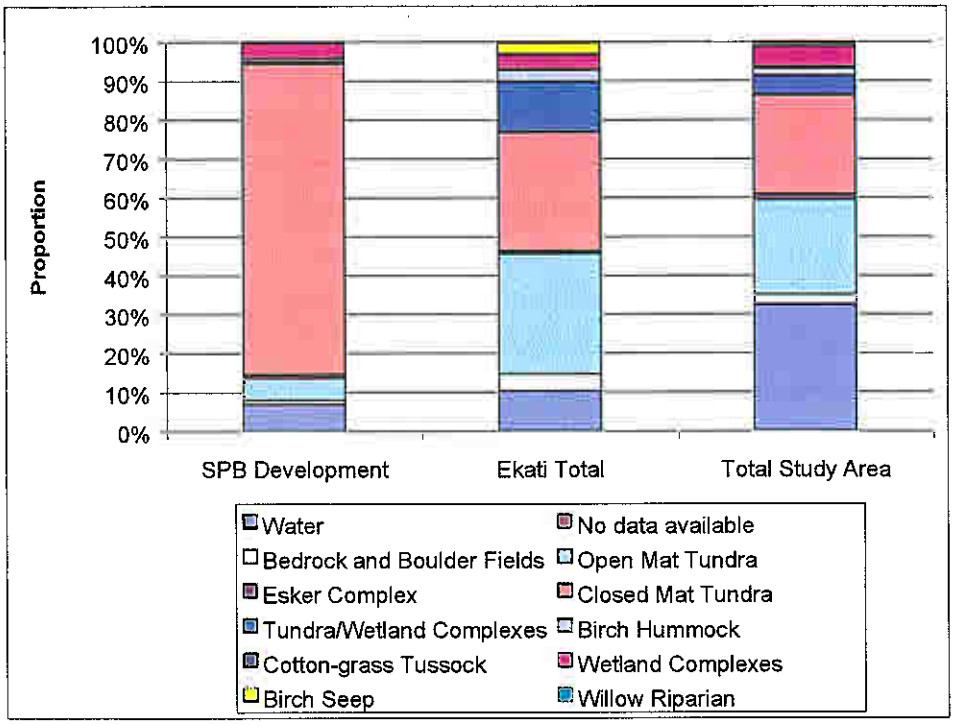


Figure 4. The proportions of eco-units affected by the Sable Pigeon Beartooth Proposed and EKATI™ developments compared to the study area proportions.

Therefore, the effects on the removal of vegetation by the proposed development will be long-term (>15 years), reversible (with natural rehabilitation) and localized within the direct footprint. The habitat effects of the development will be proportionally reduced as a larger area of low habitat value closed mat tundra will be affected.

f) Temporal Boundaries, Line 259-262 ToR

The MVEIRB indicates that EAR Section 4.2.2 does not address the issue of temporal boundaries for the environmental assessment. A summary and review of applicable sections is presented to address temporal boundaries.

Development Timeframe as Described in the EAR

The Project Description (PD) defines the temporal boundaries for the life of mine, including proposed development of Sable, Pigeon and Beartooth pipes. Life of mine plan and as well as the temporal boundaries for mining-related activities are presented in Table 4.7-1 (page 4-40) and Figure 4.7-1 (page 4-41). Figure 4.7-2 (page 4-42) shows the schedule of activities for the Sable, Pigeon and Beartooth developments. These data set the temporal boundaries for the new pipes within the context of the overall EKATI™ Mine plan. The mine plan presented in the Project Description report was also presented in the EAR on pages 2-49 and 2-50. The Project Description Report has been included with the EAR as a CD-ROM.

Assessment Methodology Section of the EAR

The importance and significance of "temporal boundaries" as per the ToR from the MVEIRB is dealt with in this section through the use of "*duration*" as a key attribute in addressing effects for each VEC.

Paragraph 1 of Section 4.2.2 (page 4-7) begins by noting that the significance of residual effects was assessed using various attributes. The attribute "*duration*" (attribute number # 2 on page 4-7) was defined as *"the length of time that a development activity has the potential to affect the VEC"*. In the last paragraph of this section, we state that "*geographic extent and **duration** were often considered to be of greatest importance when assigning the significance rating to a residual effect*".

Sections 4.2.2.1 to 4.2.2.8 address specific methodologies used in the assessment of effects for each VEC, each addressing temporal boundaries as the duration of effects on the VECs (Tables 4.2-3 to 4.2-6). Since the significance of residual effects differ based on the VEC being assessed, "*duration*" and thus temporal boundaries were defined differently for each VEC

Specific Sections Addressing Temporal Boundaries for Each VEC

This section summarizes and highlights the key sections of the EAR where temporal boundaries for each VEC were addressed for the different phases of the project.

Air Quality

Sections 4.3.1.2 (page 4-27) deals with air quality effects during mining operations but also includes *activities undertaken as part of construction* e.g. movement of heavy equipment, traffic emissions, quarrying, *etc.*

- Sections 4.3.1.2 to 4.3.1.5 (page 4-27 to 4-31): air quality effects as a result of various project activities/components during *mine operations* including blasting in the pits, movement of heavy equipment via haul roads, emissions from internal combustion engines, thermal inversions and wind erosion of waste rock storage piles. For instance Tables 4.3-4 and 4.3-5 look at gaseous emissions associated with the development of the three new pipes and estimated traffic volumes during operations.
- Section 4.3.1.7 on page 4-34 (last paragraph): air quality issues during *decommissioning* (fugitive dust) and *post-decommissioning* (wind erosion of reclaimed areas).
- Sections 4.3.2 (sub-sections 4.3.2.1 to 4.3.2.4): Effects of noise on ambient air quality such as blasting activities during *construction and operations*, as well as effects of noise from other activities (haul roads, aircraft; *etc*) *during operations* are also addressed.

Permafrost

Section 4.4.1.1,page 4-41: it is noted that "there is a some potential for permafrost to be affected during *all phases* of the proposed development as a result of activities such as road building, construction of site facilities, dam construction, stream diversion, open pit mining and waste rock deposition ".

Groundwater

Section 4.4.1.2: Paragraph 2 (page 4-44): various project activities including lake dewatering, mining of pipes and re-establishment of lakes ".....will take place during the *construction*, *operation* and *decommissioning* periods, respectively."

Section 4.4.1.2.3: Details potential effects during the *operations* phase of the project

Section 4.4.1.2.4: Project effects during the *decommissioning* phase. The last paragraph in this section notes that [for Sable Pit] the residual effect on the groundwater regime will be continuous for a *moderate to long-term (15 to 25 years),* but that the effect will be reversible after re-establishment of equilibrium conditions.

Vegetation

Section 4.4.1.3, Paragraph 1 (page 4-47): begins with "Vegetation will be affected during *all stages* of the proposed development ....."

Section 4.4.1.3.2 (page 4-47): notes that "vegetation.....will be lost during *construction* and *operations*" [as a result of development of pits, waste rock storage piles, etc.].

Section 4.4.1.3.3 (page 4-49): Potential effects on vegetation as a result of degraded air quality associated with *mining activities during construction, operations and decommissioning*. This sub-section concludes (last paragraph on page 4-51) by noting that the effect on vegetation will be "continuous *during operations"* and is "reversible once dust and gaseous emissions cease". *i.e.* no effects during the *post-decommissioning* period.

Elsewhere in sub-sections dealing with vegetative biodiversity (Section 4.4.1.3.4) and wetland losses (4.4.1.3.5.1), reference is made to effects being of *short to moderate duration* (< 10 to > 10 years; biodiversity) or *moderate to long-term* (several decades; wetlands).

Heritage Sites

Potential effects on heritage sites during the various phases of the project are addressed in Section 4.4.1.4

Section 4.4.1.4.1 (page 4-54; first paragraph): "[with the exception of human activity and roads] ...no other activities associated with the Sable Pit will affect archeological

resources. This includes *all aspects of construction*, except roads, and *all activities required for maintenance and decommissioning*".

Section 4.4.1.4.1 (page 4-54): Pigeon and Beartooth pits, the EAR notes that "[with the exception of roads and human activity] ... none of the other *development activities* associated with *construction, operations or decommissioning* of these pits is expected to affect archaeological resources."

Section 4.4.1.4.1.1.: *Road construction*, the effects on archaeological resources.

Section 4.4.1.4.1.3 (page 4-56): Effects of human undertakings on archaeological resources *during construction, operations and decommissioning*.

The issue of temporal boundaries for water-related VECs is addressed in Section 4.5. Since environmental effects are described in great detail for each of the three new pipes, this summary will concentrate on Sable Pit as an example, and will make reference as appropriate to relevant sections of the EAR where the issue of temporal boundaries for the other pipes is addressed.

Water Quantity

Temporal boundaries for the three new pipes are assessed with respect to the "*duration*" attribute for *construction, operations, decommissioning, and post-decommissioning* phases in sections 4.5.2.1, 4.5.3.1, 4.5.4.1 and 4.5.5.1 for all three pipes. Below are some examples for Sable Pipe development:

Section 4.5.2.1.2 (Page 4-84, last paragraph): Effects on water quantity due to flow diversion, "*the duration of the effect is greater than 10 years and continuous*"
Section 4.5.2.1.3: Waste rock storage will affect the drainage area for "*an extended period of time (greater than 20 years)*".

Section 4.5.2.1.4.1 (last paragraph on page 4-86): Reclamation of Sable Pit and notes that changes to the hydrologic regime "*...will persist for 25 consecutive years (long-term)...*".

Using a similar format and approach sections 4.5.3.1, 4.5.4.1 and 4.5.5.1 address temporal boundaries for effects on water quantity as a result of the development of Sable Road and other roads, Pigeon Pipe and Beartooth Pipe, respectively.

Water Quality

Temporal boundaries are assessed with respect to the *duration* attribute for activities that may affect water quality during *construction, operations, decommissioning and post-decommissioning* phases in sections 4.5.2.2, 4.5.3.2, 4.5.4.2 and 4.5.5.2. Some examples with respect to Sable Pipe development:

Section 4.5.2.2.1: Water quality effects as a result of dewatering and pit water discharges. The duration of effects on water quality resulting from dewatering is "*.....very short-term (<3 years)...*" (page 4-87).

Section 4.5.2.2.2 (page 4-88): Pit water discharge, notes that "*the duration of the effect would be for approximately six years,* and for as long as water is pumped from.....".

Section 4.5.2.2.3 (page 4-88) *Construction* of Two Rock frozen core dam) is predicted to cause a residual effect on water quality in downstream water bodies whose duration "*....would be very short-term, lasting only during freshet of one season*".

Section 4.5.2.2.5 (page 4-89)Reclamation of Sable Pit (*decommissioning and post-decommissioning*) states that water quality in the reclaimed pit (*after 25 years*) will be similar to that of other undisturbed lakes in the area.

Fish/Aquatic Habitat

Temporal boundaries with respect to fish/aquatic habitat are addressed in various sections including 4.5.2.3, 4.5.3.3, 4.5.4.3 and 4.5.5.3. Examples:

Section 4.5.2.3.2 (first paragraph on page 4-92): "the fish communities of Sable Lake and Two Rock lake will be lost, at least *for the duration of mining activities* and until habitat restoration and pit filling are completed"

Section 4.5.4.3.1: Effects on fish/aquatic habitat as a result of *construction and operations* activities associated with the development of Pigeon Pipe are summarized.

Section 4.5.4.3.1.2 (page 4-110): Pigeon Pit, says that "*After three years of mining*, Pigeon Pit will be reclaimed as a viable fish bearing lake....."

Wildlife and Habitats

The environmental assessment for wildlife VECs is addressed in Section 4.6 of the EAR. In the general subsections, it is noted that "Effects on wildlife and wildlife habitat associated with development activities *may take place throughout all phases from development through post-decommissioning"* (Section 4.6.1, first paragraph, page 4-130).

Section 4.6.1.3: Summary (with temporal boundaries) of predicted effects resulting from the development of the three pipes (and associated infrastructure) such as roads) on various wildlife VECs. Relevant sections are highlighted in the following sections.

Caribou

Section 4.6.1.3.2 (Page 4-162): Effects of development on caribou will persist over more than one decade, but will be reversible in less than 10 years post-operation.

Grizzly Bears

Section 4.6.1.3.3 (page 4-164): For grizzly bears, effects will persist over more than one decade, but will be reversible in less than 10 years post-operation.

Furbearers

Section 4.6.1.3.4 (page 4-164): Similar predictions to those for caribou and grizzly bears.

Birds

Section 4.6.1.3.5 (page 4-166): Temporal boundaries similar to those for caribou and grizzly bears.

Item 2 – Conformity Letter

2. The Review Board agrees with BHP that its EA Report does address Recreation Use (Human Use) and is therefore in conformity.

No response required.

Item 3 – Conformity Letter

3. Regarding the Ursula quarry, BHP shall identify their proposed quarry and provide the information requested. Without this information, including alternatives, the Review Board cannot provide the direction BHP seeks in its letter dated June 12, 2000.

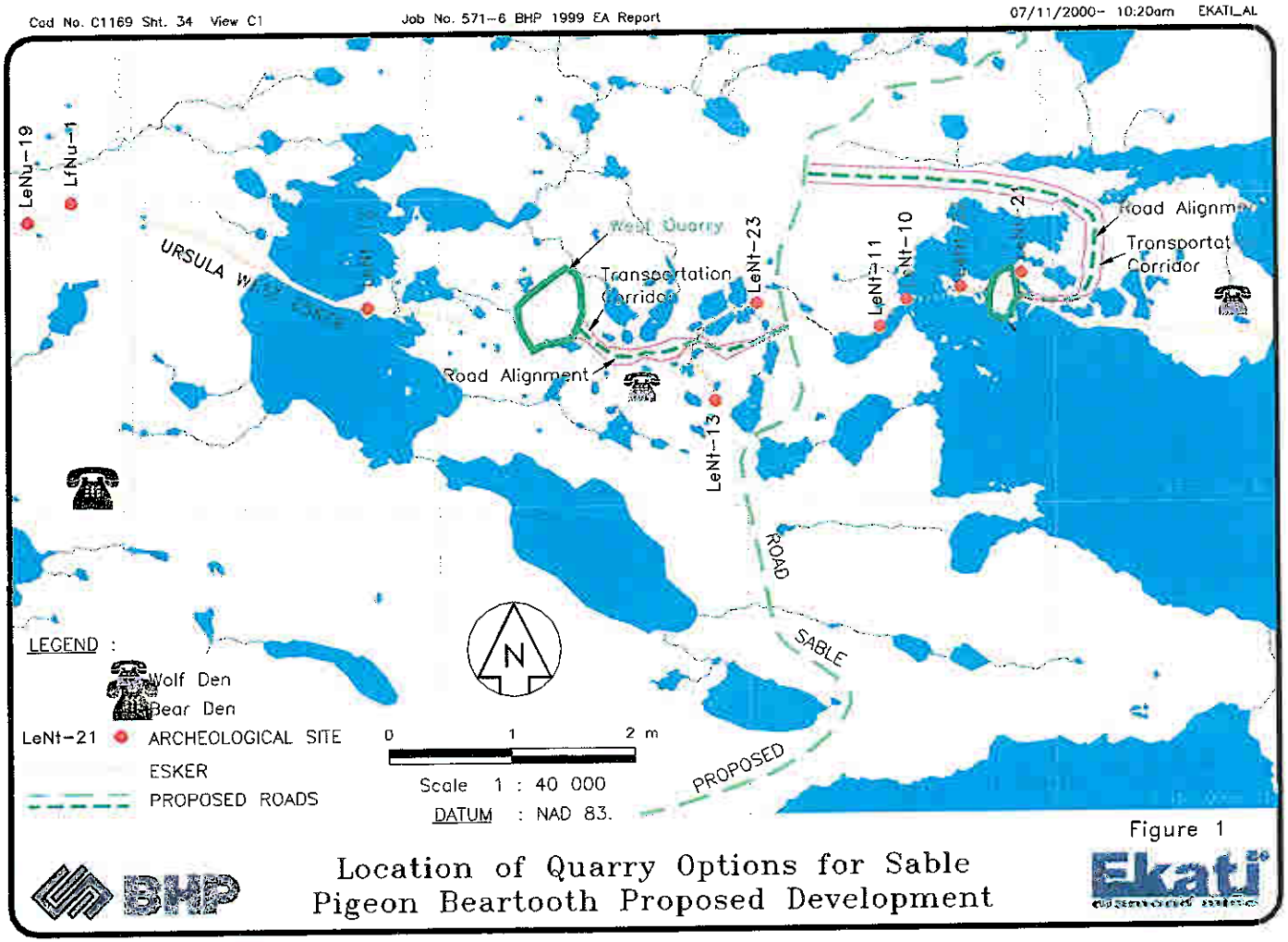
Project Description

The proposed development of the Sable and Pigeon pits and associated infrastructure will require granular material for surfacing roads and laydown pads, and for berm construction. This material is available in the Ursula Esker situated to the south of the proposed Sable pit development. Two potential, alternative locations for the quarry (West and East) as presented in Figure 1 are being evaluated and additional work will be conducted to determine the ultimate location. The quarry will provide approximately 200,000m^3 of construction material.

The vast majority of the general construction fills required to support the proposed developments, including road fills and laydown pads, will consist of waste rock from mining activities. The purpose of the quarry is to provide select granular material needed for surfacing roads and laydown pads, and for berm construction at the Sable development. The volume of granular material required during the proposed development, mining and reclamation phases is estimated to be 200,000 m^3.

Potential impacts of esker development are of public, environmental and cultural concern. While eskers *per se* are not a Valued Ecosystem Component (VEC), they are

often used for carnivore denning, bird nesting and as travel corridors by caribou and other wildlife. As such, eskers are associated with the wildlife VEC. In addition, some eskers have been found to have archaeological significance as Heritage Sites.


Cad No. C1169 Sht. 34 View C1
Job No. 571-6 BHP 1999 EA Report
07/11/2000- 10:20am EKATI_AL
LeNu-19
LfNu-1
URSULA W
Wolf Quarry
Transportation Corridor
LeNt-23
LeNt-11
LeNt-10
Road Alignment
Transportation Corridor
LeNt-13
ROAD
SABLE
PROPOSED
N
LEGEND :
Wolf Den
Bear Den
LeNt-21 ARCHEOLOGICAL SITE
ESKER
PROPOSED ROADS
0 1 2 m
Scale 1 : 40 000
DATUM : NAD 83.
Figure 1
Location of Quarry Options for Sable
Pigeon Beartooth Proposed Development
BHP
Ekati

Introduction

Due to extensive meltwater activity that occurred during deglaciation, glaciofluvial deposits, such as eskers, cover a large portion of the claim block. Eskers and kames contain glaciofluvial material that is ideal for construction. The sand and sandy gravel provides habitat for burrowing animals and as such are often used as denning sites for larger mammals. In the Ursula Lake area, the well-defined esker takes form in the typical sinuous shape with relatively steep slopes and low-lying discontinuities in the esker ridge.

The two potential quarry areas directly affect the esker as the mining plan is to removal of some material for construction purposes. The extent of disturbance will be the direct footprint including buffer zone related to a decrease in use/productivity. The quarry will, potentially, operate 24 hours/day including haul traffic associated with material. On closure rehabilitation work will be carried out.

The proposed West Quarry is situated on an elevated section of the esker located approximately 2.0 km west of the proposed Sale haul road. A 100 m wide corridor has been identified within which an access road to the quarry will be constructed (Figure 1). The proposed access road corridor includes a portion of the Ursula West esker.

The proposed East Quarry located to the east of the proposed Sable Road will require a 3.5 km access road (Figure 1).

The road corridor has been identified but the exact location of the road alignment within the corridor has not been defined. The final road alignment will consider the foundation conditions, ecological and cultural resources and habitat.

Vegetation

The environmental effects associated with the vegetation are:

- Direct: Construction of the quarry and access road; and
- Indirect: Dust fall affecting species composition and productivity.

Data were obtained for the various areas from the GIS database of Eco-units and the superimposition of the quarry footprints. The footprints identified are the:

- Direct footprint of the quarries and access roads (25 m);
- Access corridor (150 m);
- Buffer zone for wildlife (1 km); and
- Dust deposition area around roads and quarries (100 m).

The different footprints identify the areas that may be affected by the construction of the quarry through a direct loss of habitat (footprint), areas affected by dust (100 m) and areas where habitat effectiveness is reduced for large carnivores (1 km) (Table 5,)

Table 5. Areas potentially affected by the East Ursula Esker Quarry Option (water margin in m).

Eco-unit	Quarry and Road Footprint (ha)	Quarry and Road (100 m buffer) (ha)	Quarry and Road (1 km buffer) (ha)	Road Corridor (ha)
Water	<0.1	9.5	300.7	0.1
No data[1]		<0.1	1.6	
Bedrock and Boulder Fields			1.8	
Open Mat Tundra	2.5	17.9	102.2	13.4
Esker Complex	5.8	14.3	54.6	3.0
Closed Mat Tundra	7.4	37.7	412.4	26.3
Tundra/Wetland Complexes	0.6	5.0	18.9	2.9
Birch Hummock		2.8	48.5	0.9
Cotton-grass Tussock			9.0	
Wetland Complexes			34.0	
Birch Seep			8.1	
Willow Riparian			1.9	
Total	**16.3**	**87.2**	**993.7**	**46.6**
Water margin (m)	114.2	4682.1	33391.7	246.4

[1] Small areas not classified.

Table 6. Areas (ha) potentially affected by the West Ursula Esker Quarry Option (water margin in m).

Eco-unit	Quarry and Road Footprint (ha)	Quarry and Road (100 m buffer) (ha)	Quarry and Road (1 km buffer) (ha)	Road Corridor (ha)
Water	0.1	3.6	120.9	<0.1
No data			<0.1	
Open Mat Tundra	1.4	13.5	214.5	3.6
Esker Complex	24.7	28.4	128.7	11.2
Closed Mat Tundra		6.4	183.4	
Tundra/Wetland Complexes	0.5		69.8	
Birch Hummock			2.0	
Cotton-grass Tussock		0.0	8.4	
Wetland Complexes	1.8	9.0	92.1	1.6
Birch Seep			15.4	
Willow Riparian			0.6	
Total	**28.5**	**61.0**	**835.7**	**16.4**
Water margin (m)	268.6	2938.8	32016.4	64.1

Direct

The quarry development will directly remove vegetation (Table 5.) The actual area affected by the East Quarry (16.3 ha) is less than the West Quarry (28.5 ha) due to its ultimate smaller footprint. However the esker complex removed by the East Quarry is less (5.8 ha) as compared to the West Quarry (24.7 ha). Additionally, the wetland complex, which is important habitat for wildlife, is affected by the West Quarry (1.8 ha). The development of the West Quarry would also remove more than double the wetland margins than the East Quarry (268.6 m vs. 114.2 m). The entire habitat within the footprint will be removed for the period of operation. However, on closure of the quarry, rehabilitation will produce a viable ecosystem in most areas.

Indirect

The principal effects on vegetation are related to air quality issues arising from dust and gaseous emissions, primarily NO_x and SO_2. Due to the small size of the equipment, gaseous emissions will not be a factor for vegetation adjacent to the quarry. However, fugitive dust emissions can have both direct and indirect effects on vegetation. The 100 m buffer represents the potentially affected area for dust. The longer access road to the East Quarry means that the area potentially affected by dust is greater than the West Quarry with 87.2 ha and 61.0 ha, respectively.

These effects can be negative or positive, depending on plant species but for the quarry development the effects will be short-lived (< 3 years) localized resulting in a negligible effect on the population distribution in the Eco-units adjacent to the road/quarry.

Rehabilitation

The principal means of restoring vegetation in the quarry footprint will be natural colonization. Following the removal all quarry equipment, the surface topography will be altered to ensure stability and create conditions favourable for natural colonization. Other areas of minor disturbance with physical characteristics suitable for the establishment and support of vegetation will be scarified and seeded.

Archaeology

The proposed West Quarry is on an elevated section of esker that has not been assessed on the ground for archaeological resources. Potential for archaeological sites on this landform is judged to be high, based on the yield from surrounding and similar areas. A section of the Ursula West esker is within the transportation corridor. This corridor is also judged to have high archaeological potential and has not been previously examined on the ground for archaeological resources. If the West Quarry is selected, detailed archaeological ground reconnaissance, consisting of foot traverses and subsurface testing, will be conducted on all portions of the Ursula West esker that are required for the gravel quarry or an access route. The eastern 0.5 km of the West Quarry access corridor situated on terrain that has low archaeological potential and/or

was investigated previously with negative results. No ground reconnaissance of this portion of the corridor is proposed or necessary.

The East Quarry requires about 3.5 km of new access (Figure 1) and is in an area that has been examined for archaeological resources. There is limited potential for additional resources, but it is possible that an isolated find or small lithic scatter could be present in interior portions of this landform (moderate potential). If the East Quarry is selected, additional archaeological reconnaissance will be conducted; reconnaissance will involve foot traverses and subsurface testing in areas typified by vegetation cover. The initial (western) 1 km of the access corridor for the East Quarry is judged to have low archaeological potential and no ground reconnaissance is required. Due its proximity to Ursula Lake and the presence of some elevated landforms, the remaining 2.5 km is judged to have moderate archaeological potential. If the East Quarry is selected, ground reconnaissance will be conducted along this 2.5 km long portion of the access road.

Although a shorter road route is generally preferred, the access corridor to the West Quarry includes a section of the Ursula esker that has a high potential for archaeological sites. The transportation corridor to the East Quarry has a lower potential for conflict with sites. The decision to locate a corridor rather than a direct alignment will allow the road to be "field fitted" to avoid, where practical, archaeological resources. Sites that could not be avoided would be mitigated through a combination of excavation and/or surface collection.

Both gravel quarry sites are located on high, broad sections of esker. Although the East Quarry is closer to a major lake, some archaeological ground reconnaissance has been conducted. The results of the 1999 inventory were limited with only two archaeological sites discovered. LeNt-21 and LeNt-22 are both small lithic scatters that are outside of the boundaries of the East Quarry (Figure 1). Although there is potential for a small, undiscovered archaeological site within the proposed quarry, such a site would either be avoided or mitigated. The West Quarry is on the west end of an elevated section of esker that is highly likely to contain one or more large archaeological site. Again, any site discovered would be avoided when possible or mitigated through excavation and/or surface collection.

In conclusion, potential for archaeological sites is judged to be greater in association with the use of the West Quarry and its access route. Thus, the potential to affect archaeological sites is also judged to be greater. The effects are less likely to occur in association with a road route as it can be relocated within the defined corridor. The direct site elimination within the gravel quarry footprint would be high unless the archaeological resource is near a boundary.

Regardless of which gravel quarry is chosen, detailed archaeological ground reconnaissance will be conducted in all portions judged to have moderate or greater archaeological potential. Whenever possible, sites will be avoided through quarry boundary or road relocation. When relocation is not feasible, sites will be adequately

mitigated through excavation and/or surface collection in conjunction with detailed recording. Archaeological reconnaissance, site assessment, impact determination and mitigation will be conducted in a manner similar to that undertaken elsewhere in the BHP claim block. It will be directed by a qualified archaeologist holding a valid Northwest Territories Archaeologists permit.

Wildlife and Wildlife Habitat

The species most likely to be affected by the quarry development include caribou (*Rangifer tarandus groenlandicus*), grizzly bears (*Ursus arctos*) and carnivores (wolves and wolverines). These effects are due to the use of eskers by these species as:

- Denning areas for mammalian carnivores;
- Wildlife travel corridors; and
- Hunting and feeding habitats.

Eskers are important travel corridors for caribou and grizzly bears and serve as insect relief habitat during the summer (BHP Diamonds 1995b).

Methods

Wildlife use of the Ursula esker system was assessed based on information collected during studies conducted within the project area from 1994 to 1999 (BHP Diamonds 1995a, 1995b, 1995c, Banci and Moore 1996, Golder 1998, 1999, Rescan 1999). This assessment used study areas encompassing a 1 km buffer around the road corridors and the West and East quarries (Figure 1) defined as 835.7 ha and 993.7 ha respectively. As eskers provide important reproductive habitat for carnivores, a more conservative approach was adopted than the 800 m buffer that was used in the EAR. The project area refers to the area used for wildlife studies within the BHP claim block.

The "Ursula West" esker refers to the esker segment that extends from the western half of Ursula Lake to Exeter Lake in the west. "Ursula East" is the continuation of this esker from Ursula Lake east to Caribou Lake.

Wildlife Movement and Travel Corridors

The discontinuous Ursula esker is part of a larger regional esker extending beyond Yamba Lake in the west and to beyond Caribou Lake in the east. Wildlife studies conducted since 1994 have confirmed that this esker system constitutes an important wildlife corridor, as well as providing for other life requisites of wildlife species.

This area is important as a wildlife travel corridor because it lies within a natural north-south corridor between two large lakes, Exeter and Ursula. During the ice-free season these lakes are natural barriers to movement. The proposed quarry locations are located where the east-west Ursula esker and this north – south travel corridor intersect.

Caribou

Systematic surveys conducted since 1994 have delineated three major corridors used by caribou during the spring (mid April to mid June) migration (BHP Diamonds 1995a, b):

- A corridor formed by Yamba, Achilles and Ajax lakes, and their associated eskers (Banci and Moore 1997)
- A corridor formed by Exeter, Ursula and Caribou lakes and the esker system associated with these lakes.
- North shore of Lac de Gras, onto the Lac du Sauvage esker, across the wetlands at Duchess Lake and onto the Coppermine River and Duchess East esker (BHP Diamonds 1995b). This is the preferred route for migrating caribou.

The importance and use of these routes in a given year is a function of where caribou have over-wintered. However, it would not be unusual for a substantial number of caribou to cross the proposed quarry sites and associated roads during spring migration.

Summer occurrence of caribou and their distribution within the project area is dependent on where caribou have calved. In recent years calving locations have been variable and as a result the spatial and temporal distribution of caribou during post-calving has been uneven and unpredictable. It is possible to have almost no, or tens of thousands, of caribou summering in the project area.

Caribou have used the Ursula esker during the summer period: feeding in wetlands adjacent to the esker, and for walking on the esker. Groups of 10,000 caribou and more have moved from north to south through the corridor between Ursula and Exeter lakes, travelling past the site now occupied by EKATI™ (Banci and Moore 1997). The largest groups of caribou seen during summer are typically associated with esker systems and in the summer of 1996, groups of 3000 to 5000 caribou were observed using the Ursula esker system (Banci and Moore 1997).

Although caribou can occur throughout the project area during fall migration (mid September – late October), the Ursula Exeter esker system is not a major movement corridor, at least for the past seven years. During spring, the many large lakes on this route are frozen and passable. During fall, however, these lakes are open and constitute barriers.

Potential effects and Mitigation

The greatest potential for caribou to encounter the proposed quarry sites is during spring migration and during summer post-calving feeding. To avoid disruption of the spring migration route, construction and quarrying activity will be limited should this become the preferred route during the construction of the Sable pit development. It is expected that caribou will not be negatively affected by activities occurring outside of

the spring migratory period and, given proper traffic management, will continue to use the esker and adjacent habitats.

Grizzly Bears

Esker and den surveys within the project area, and results from radio-telemetry, confirm that the majority of bear dens are located off-esker, typically in kames or other glacio-fluvial deposits. The Ursula esker and adjacent areas are not important for denning by grizzly bears as compared to other areas. Since 1995 only one bear den has been found in this area, on the Ursula esker (Figure 2), and it was a trial or aborted den (BHP Diamonds 1995a).

Grizzly bears use the Ursula esker system and the north – south corridor between Ursula and Exeter lakes for travel and to hunt caribou (BHP Diamonds 1995a, 1995c, Banci and Moore 1997). The study area containing the proposed quarry locations does not appear to have important berry or vegetation feeding, security or resting habitats for bears. The use of the areas by grizzly bears varies with spring use of wetter areas and summer use of the willow riparian zones. For the West and East quarries, the areas of reduced habitat effectiveness (within 1 km) are 101.1 ha and 44.9 ha, respectively. The important habitat reduction for grizzly bears would be less with the East Quarry.

In 1996, of 627 telemetry locations, none were within 5 km of where the Ursula esker intersects the potential Sable road route and only 6 locations were within 5 to 10 km of this point. Grizzly bear habitat assessments conducted in 1999 included all wetland complexes and riparian habitats within the defined study area (Rescan 1999).

The shortest distance that a grizzly bear used a wetland for feeding during spring (June 8-18) from the intersection of the proposed road and the esker was 12 km. There were 5 instances of bear use of riparian habitats during summer (July 29 – August 8) at distances of 3.4 to 6.7 km from this point.

Potential Effects and Mitigation

The proposed quarries are unlikely to affect bear denning. Although there are uncertainties as to how close to disturbance bears will continue their normal behaviour. The proposed road and quarry sites are also unlikely to have an effect on the use of spring (wetlands) and summer (riparian) habitats. However, it is possible that those bears intolerant of disturbance, in particular females with cubs, may be displaced and avoid both the east – west esker travel corridor and the north – south corridor between Exeter and Ursula lakes. Such avoidance could potentially displace bears from using available habitat at a distance from the quarry site.

As discussed in the EAR, grizzly bears are individuals and their responses may not be predictable. Habituation may serve to allow bears to continue their normal patterns of behaviour, despite extraction activities on the esker. The best mitigation measure is if quarrying activities on the esker and road construction in this area do not occur during

the active period, particularly when bears are in a negative energy balance, from den emergence to mid-summer. However, the use of the quarry will be only during the construction period and it is anticipated that the period and magnitude of the disturbance will be negligible.

Carnivores And Dens

Eskers, kames and other glacio-fluvial deposits within the project area have been surveyed by air and on the ground yearly since 1994, with intensive inventories in 1995 and 1996 (BHP Diamonds 1995c, Banci and Moore 1997). In later years, known wolf dens have been monitored and searches for new bear and wolf dens have been conducted (Golder 1998, Golder 1999, Rescan 1999).

Of the 89 carnivore dens documented within the project area 26% occur on the 29.5 km Lac du Sauvage esker (Table 7). At 21.7 km, the Ursula esker (west and east sections) is second only to the Lac du Sauvage esker in length but has only 6% of documented wolf, bear and fox dens (Table 7). Ursula West, the section of esker which intersects the proposed Sable road, has 1 bear den and 2 wolf dens.

The substrate on the majority of the Ursula West esker is typically bouldery and may not be suitable for carnivore denning, nor for ground squirrel colonies, which are lacking (BHP Diamonds 1995c). No fox dens occur on the Ursula West esker.

Table 7. Eskers and carnivore dens located within the project area (1994 to 1999).

Esker	Length		Number of Dens				%
	(km)	%	Bear	Fox	Wolf	Total	
Vulture	2.0	2.2%				0	0.0%
Fish1	2.2	2.4%				0	0.0%
Fish2	7.5	8.3%	2			2	2.2%
Exeter area	7.7	8.5%	1		1	2	2.2%
Caribou	8.2	9.1%	6	3	2	11	12.4%
Ursula West	9.0	10.0%	1		2	3	3.4%
Duchess	11.3	12.5%	4	3	3	10	11.2%
Ursula East	12.7	14.1%	1	1	1	3	3.4%
Lac du Sauvage	29.5	32.7%	16	4	3	23	25.8%
Off-esker, kames, small eskers	n/a		21	8	6	35	39.3%
Total	90.1		52	19	18	89	

The proposed road and West Quarry are adjacent to a traditionally active wolf den. This den was occupied yearly from 1994 -1996, 1998 and this year, 2000 (Figure 2). In the fall of 1994, 14 wolves were observed at this den just prior to abandonment (BHP Diamonds 1995a). Yearly accumulations of prey remains and a complex structure suggest this den has persisted for many years (Banci and Moore 1997). A smaller, 2

burrow wolf den is located 2 km east of the easterly potential quarry (Figure 1). Solitary wolves have been seen using this den but there has been no evidence of natal use.

Wolves use the Exeter – Ursula – Caribou esker system as a travel corridor (BHP Diamonds 1995a, 1995c), and will travel tremendous distances, especially if caribou are scarce in the vicinity. Similarly, although wolverine and foxes do not den on the esker, these species use the esker system as a travel corridor, and to facilitate hunting.

Potential Effects and Mitigation

The greatest potential effect of the porposed West Quarry and the road on carnivore dens is abandonment of the traditional wolf den. It is possible wolves will opt to use another den and avoid this area. Their past pattern of use suggests these wolves will reproduce successfully, if discouraged from using this den. To date, the more easterly den has not been used for reproduction. Quarrying adjacent to this den during the active period may discourage wolves from using this area, as it is isolated within two arms of Ursula Lake.

Use of the Ursula esker as a travel corridor by wolves will likely continue, as discussed in the EAR, although direct avoidance of construction sites may occur. Similarly, displacement of foxes and wolverine from normal feeding, hunting and travel behaviour is unlikely, although they may circumvent construction sites.

Wildlife Habitat

A potential reduction in the use of the area by large mammals is probable. This area has been identified as the 1 km buffer (Figure 2). There will be a reduction in the use of the area due to disturbance effects from the operation of equipment and general road traffic. The East and West Quarries have wetland complexes comprising 1.9% and 8.3%, respectively and willow riparian habitats 0.2% and 0.1%, respectively (Table 8). Careful planning of the access route can reduce the effects on these wildlife habitats. The potential impacts on these habitats and their continued use by wildlife, other than that included above, is as discussed within the EAR.

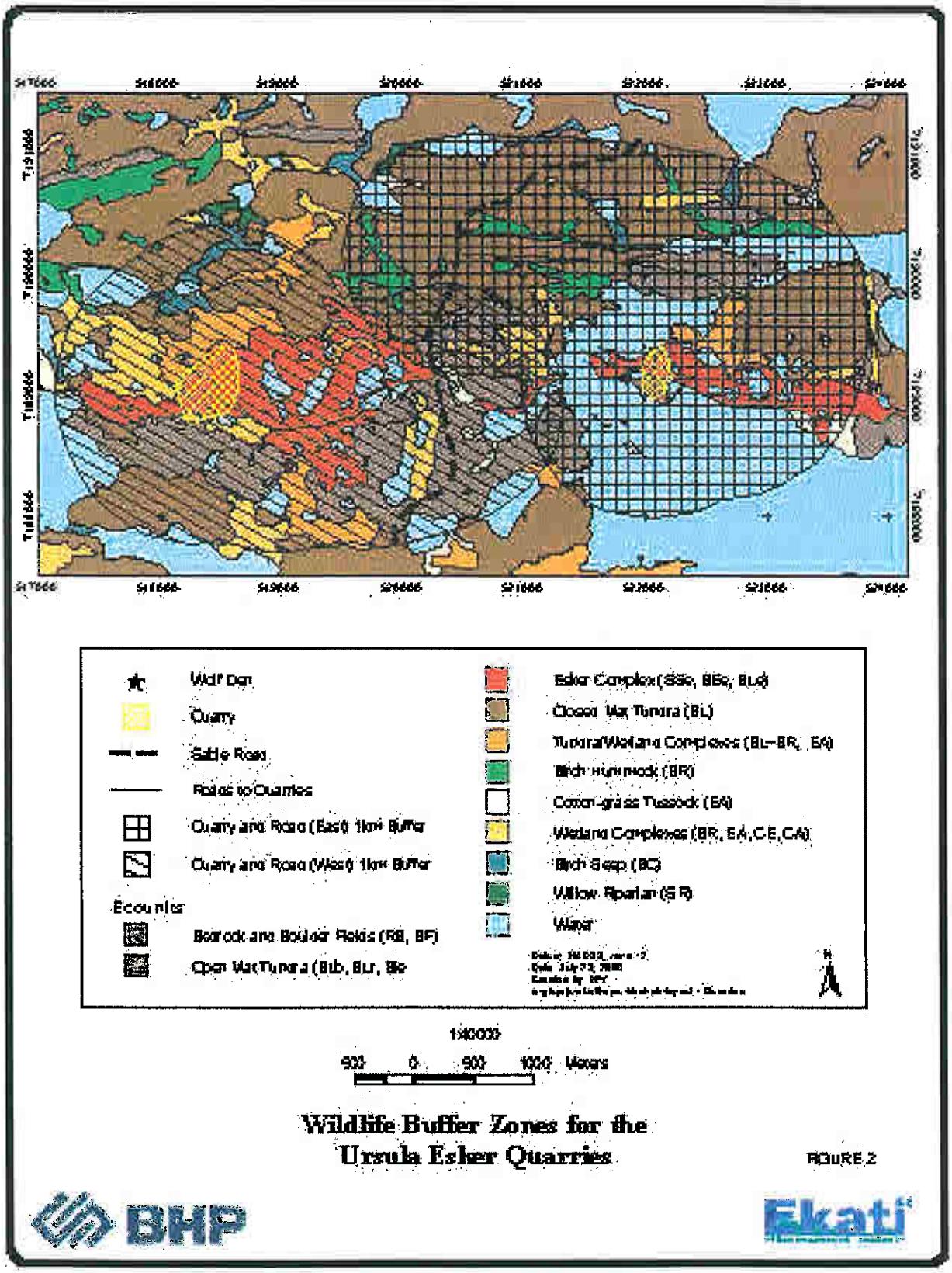

Wolf Den
Quarry
Cable Road
Roads to Quarries
Quarry and Road (East) 1km Buffer
Quarry and Road (West) 1km Buffer
Ecounits
Bedrock and Boulder Fields (RB, BF)
Open Wet Tundra (BLb, BLr, BLs)
Esker Complex (SBs, BBs, BLs)
Closed Wet Tundra (BL)
Tundra/Wetland Complexes (BL-BR, EA)
Birch Hummock (BR)
Cotton-grass Tussock (EA)
Wetland Complexes (BR, EA, CE, CA)
Birch Scrub (BC)
Willow Riparian (SR)
Water
1:40000
900 0 900 1800 Meters
Wildlife Buffer Zones for the
Ursula Esker Quarries
FIGURE 2
BHP
Ekati

Table 8. Ecosystem units affected by a 1 km buffer of the proposed Sable Road, Alternative Quarries and Associated Access Road

	East Quarry and Road		West Quarry and Road	
	(ha)	%	(ha)	%
Water	300.7	30.3	120.9	14.5
No data	1.6	0.2	0.0	0.0
Bedrock and Boulder Fields	1.8	0.2		
Open Mat Tundra	102.2	10.3	214.5	25.7
Esker Complex	54.6	5.5	128.7	15.4
Closed Mat Tundra	412.4	41.5	183.4	21.9
Tundra/Wetland Complexes	18.9	1.9	69.8	8.3
Birch Hummock	48.5	4.9	2.0	0.2
Cotton-grass Tussock	9.0	0.9	8.4	1.0
Wetland Complexes	34.0	3.4	92.1	11.0
Birch Seep	8.1	0.8	15.4	1.8
Willow Riparian	1.9	0.2	0.6	0.1
Total	993.7		835.7	

Except for the portion of the Ursula east esker that maintains the two wolf dens, the majority is not suitable for carnivore denning (Figure 1). The greatest value to wildlife of this particular esker is its importance as a travel corridor, for hunting, foraging, and connecting seasonal habitats. As such, maintenance of its long-term integrity is important.

Evidence from other mining operations suggests that after industrial activity ceases, wildlife species including caribou, carnivores and birds will readily use altered eskers, if the quarrying activity was localized (Vivian Banci, pers. obs.). Because of the aesthetic characteristics of wolf dens (Banci and Moore 1997), whether wolves will return to use a den adjacent to an altered esker is unknown. If a decision is made to quarry on the Ursula esker, the traditional wolf den should be protected, quarrying should occur as far as possible from the den, the period of quarrying should be short and the esker should subsequently be re-contoured to approximate a natural esker.

Summary

The wildlife species most likely to be affected by the development of the Ursula Esker Quarry include caribou, grizzly bears and carnivores. Wildlife studies conducted from 1994 through 1999 provided a baseline of distribution and habitat use information, and a regional perspective on wildlife movements. The Ursula esker system constitutes an important wildlife corridor. The northern section of the proposed road route to the Sable development is in a natural north-south corridor between Exeter and Ursula lakes. The proposed quarry locations fall where a major east-west esker and a north – south travel corridor intersect.

The greatest potential for caribou to encounter the proposed quarry sites is during spring migration and during summer post-calving feeding. The proposed alternative quarries are unlikely to affect bear denning or use of important wetland and riparian habitats. Bears intolerant of disturbance may be displaced from using important habitats located at a distance from the proposed quarry sites. Avoiding construction and quarrying during sensitive periods for caribou and grizzly bears are recommended.

The proposed road and West Quarry are adjacent to a traditionally active wolf den and establishing this quarry could displace wolves from this site. The proposed East Quarry is adjacent to a wolf den that has been used occasionally by solitary wolves but is not a natal den. Wolves use the Exeter – Ursula – Caribou esker system as a travel corridor. Wolverine and foxes do not den on the Ursula esker but also use it as a travel corridor.

Except for the portions of the Ursula East esker that have the two wolf dens, the majority of this esker is not suitable for carnivore denning, nor does it maintain feeding habitat in the form of ground squirrel colonies. Protection of the wolf den, a short period of quarrying, and contouring to approximate a natural esker are recommended if a quarry site on the esker is selected.

The greatest value to wildlife of this particular esker is its importance as a travel corridor, for hunting, foraging and for connecting seasonal habitats. As such, maintenance of its long-term integrity is important. Careful planning of the Sable road route can serve to protect important wildlife habitats within this area.

Water

The quarry will be located on a raised esker so the direct effects on aquatic resources will be minimal. The footprints for the road alignments and the working areas are not in conflict with aquatic resources (Figure 1). There will be some minor changes in the drainage pattern associated with the operation of the quarry but these will be short-lived (<3 years) and limited to the footprint of the quarry. Drainage and sediment control in the active quarry area will be maintained throughout operation.

The access road to the West Quarry crosses a small stream. The current status of the stream as aquatic habitat is unknown. Therefore, if the West Quarry is developed, a field investigation will be carried out. Culverts will be installed should the stream be fish bearing. These culverts will be removed following the closure of the quarry. The road alignment will be modified to avoid the aquatic habitat (West Quarry: 64 m, East Quarry: 246 m) associated with lake margins. Wherever possible, a buffer of 50 m will be maintained between the road and aquatic resources and where not possible, drainage channels will direct run-off to sediment containment areas.

Alternatives

The alternatives to the Ursula esker quarry are:

- Airstrip Esker Quarry
- Crushed Run-of-Mine Waste Rock

The Airstrip quarry has been a borrow source of granular material from 1993 to present. For areas no longer needed, BHP is carrying out progressive reclamation at this quarry in the last few years. Preliminary estimates suggest that the volume of material required (200,000 m^3) for the Sable development is not obtainable from this source. Additionally, the long haul from Airstrip to Sable development area makes this alternative economically prohibitive.

The crushing of non-acid waste rock is another alternative that has had preliminary estimates performed. BHP is currently reviewing the economic and technical merits of this alternative.

Conclusion

The options for developing the granular material quarry for the Sable development are limited. However, an initial field evaluation of the resources has permitted a preliminary environmental evaluation of the development of the quarries (Table 9). The quarry will be in use only during development of the Sable pit development and the areas are limited (West: 28.5 ha, East: 16.3 ha). Therefore the environmental effects will be short-term, localized, of limited temporal and spatial extent and reversible. The program for rehabilitation will focus on reopening the migration and travel corridors and will ensure that the final landforms are stable.

Table 9. Summary of the potential environmental effects due to the development of Alternative West and East Ursula Quarries.

Parameter	West Quarry	East Quarry
Vegetation (loss)	Greater footprint area	Lesser foot print area
Vegetation (dust effects)	Lesser area due to reduced road length	Greater area due to longer road
Habitat loss	Greater direct loss of habitat	Lesser direct loss of habitat
Archaeological resources	High potential for effects	Minimal effects, Site already evaluated
Wildlife habitat	Close to historic wolf den	No historic wolf den
Wildlife habitat	Minimal effects on Grizzly bears	Minimal effects on Grizzly bears
Wildlife movement corridor (esker)	Reduces availability	Reduces availability
Wildlife movement corridor (north south migration)	Reduces availability	Reduces availability
Aquatic resources	Stream crossing	Minimal

Item 4 – Conformity Letter

4. **With respect to the Leslie kimberlite pipe, the Review Board wants to clear up a few matters before making a ruling. To that end, the Review Board has forwarded your June 12 letter to Environment Canada (EC) and the Department of Indian Affairs and Northern Development (DIAND). They shall provide their comments or further input on the matter of the Leslie kimberlite pipe to the Review Board, and by copy, to BHP by 28 June at 5:00 p.m. BHP shall respond to EC's and DIAND's comments, and provide a clear legally binding response regarding its plans for the development of the Leslie kimberlite pipe by 3 July at 5:00 p.m.**

Deadlines and submissions by the three parties were met. These letters are on the MVEIRB's public registry located in Yellowknife, NT.

Item 5 – Conformity Letter

5. **Finally, if the Leslie kimberlite pipe is not included in the Environmental Assessment, BHP would be expected to assess the impact of the reduced mine life on the economy, as requested in the Terms of Reference line numbers 483-486.**

Impact on the NWT Economy of a Reduced Mine Life

Introduction

BHP discussed thoroughly the impact of its original mine plan in the EIS. The concept of mine life is fluid and constantly changing based on a company's economic evaluations. In 1997, BHP had made the determination that the Leslie pipe was uneconomic. Exploration is ongoing and BHP constantly evaluates its claim block in search of further reserves – thus the addition of Beartooth, Pigeon and Sable. Exploration continues today and may or may not result in further development and additional mine life. Such is the very nature of mine life. The possibility of a shortened mine life was addressed in the EIS, Volume I, Section 3.10.1.1.

Impacts based on mine life, likewise, are subject to fluctuation. All that may be predicted will be based on what is known in the present. In the meantime, to assess a reduced mine life requires reducing the economic annual impacts listed in the EIS by ten years and adding three at the 18,000 t/d level. This has the net impact of reducing the mine life as given in the 1995 EIS by seven years. In this presentation the estimated impacts of the Leslie pipe are subtracted from the impacts of the Sable, Beartooth and Pigeon pipes to arrive at a net impact to the economy of the NWT.

The Sable, Beartooth and Pigeon pipes are economic and contribute positively to Gross Domestic Product (GDP) and government revenues, as well as providing employment and business opportunities as discussed in the EAR. The Leslie pipe is uneconomic as

its operating costs exceed estimated revenues by over one-half billion dollars. If Leslie were to be mined it would result in losses to BHP shareholders and the loss of tax revenues to governments.

This analysis is hypothetical because the Leslie pipe has not been included in the mine plan. Like any business BHP cannot operate at a loss if (and remain in business) and in order for any pipe to be included in the mine plan it must create more wealth than it takes to mine it. All of the positive impacts of the Leslie pipe shown below result from the BHP's spending on the labour and the other goods and services required to mine it. These expenditures are what "drive" the direct, indirect and induced benefits. In the real world these expenditures would not be made because BHP cannot cover its costs mining the Leslie pipe.

Below are the predicted net impacts of the reduced mine life on the NWT economy.

Impact on BHP Finances

The mining of Leslie would have a very large negative impact on BHP's finances and lead to significant losses for its shareholders.

As shown on Table 1, because operating costs exceed revenues, mining Leslie would lead BHP to incur a loss of over $500 million ($50 million annually) in resource profits. This loss would be incurred by the shareholders of the company and would also lead to reduced tax revenues for governments.

Table 1: The Impact of Mining Leslie on Resource Income and Profits ($million)

	Total	Annual
Resource Income	2,370	237
Resource Profits	-505	-50

Predicted Impacts on NWT GDP

The mining of Leslie would have a negligible impact on direct NWT GDP[2] because it is an uneconomic pipe. This is not the case with Sable, Beartooth and Pigeon as these pipes are economic and contribute substantially to GDP and tax revenues[3].

[2] Gross Domestic Product measures total production based on the earnings of the factors of production. In the case of BHP its contribution to direct GDP (not including its spin-off impacts that contribute to indirect and induced GDP) is comprised of the labour income paid to BHP's employees (the return to labour – one factor of production) and its resource profit/loss (the return to capital that is used to service debt, taxes and returns to shareholders – another factor of production).

The reduced mine life is estimated to have a significant positive impact on direct NWT Gross Domestic Product (GDP) because BHP is replacing one uneconomic pipe with three economic ones. As shown on Table 2 it is estimated that the net impact of a reduced mine life would lead to a rise in direct GDP of $781 million.

While the direct activity is positive the reduced mine life and the resulting reduction in purchases of goods and services would lead to a fall in indirect GDP of $221 million and in induced GDP of $139 million.

Table 2
Impact of a Reduced Mine life on NWT GDP

	Direct	Indirect	Induced	Total
	($million)			
Impact of Beartooth, Sable & Pigeon	787	117	69	973
Less Impact of Leslie	6	338	208	552
Equals Net Impact	781	-221	-139	421

Source: Ellis Consulting Services

In total it is predicted, that as a result of the reduced mine life, GDP in the NWT would rise by $421 million. Hence the net impact of shortening the mine life actually contributes positively to direct NWT GDP and tax revenues because three economic pipes, even with a much shorter life, are being substituted for one that is uneconomic.

Predicted Impacts on Employment in the NWT

In the case of Sable, Beartooth and Pigeon the resource profits are positive and, combined with the return to labour, these pipes would make a significant positive contribution to direct NWT GDP and government tax revenues.

In the case of the Leslie pipe, the positive impact of the return to labour is offset by an almost equal amount in resource losses to BHP. This results in almost no net impact on direct NWT GDP and the resource losses lead to negative returns to BHP shareholders and to governments in tax revenues (tax write-offs).

Hence the net impact of shortening the mine life would actually contribute positively to direct NWT GDP and tax revenues because three economic pipes, even with a much shorter life, are being substituted for one that is uneconomic.

[3] Please refer to Section 4.7.4 in the Environment Assessment Report for Sable, Pigeon and Beartooth Kimberlite Pipes for a more detailed presentation

The net impact of a reduced mine life of seven years would lead to a drop in employment in the NWT. As shown on Table 3, it is estimated that the net impact of a reduced mine life would be to reduce total employment in the NWT by 8,293 person-years.

The reduced total employment impact of 8,293 is comprised of 3,780 person-years of direct BHP employment, 2,961 indirect jobs and 1,552 induced jobs.

Table 3
Impact of a Reduced Mine Life on NWT Employment

	Direct	Indirect	Induced	Total
	(Person-Years)			
Impact of Beartooth, Sable & Pigeon	1,899	1,442	768	4,108
Less Impact of Leslie	5,679	4,403	2,320	12,402
Equals Net Impact	-3,780	-2,961	-1,552	-8,293

Source: Ellis Consulting Services

Predicted Impacts on Labour Income in the NWT

The net impact of a reduced mine life of seven years would lead to a drop in total labour income in the NWT of $497 million.

Table 4
Impact of a Reduced Mine Life on NWT Labour Income

	Direct	Indirect	Induced	Total
	($million)			
Impact of Beartooth, Sable & Pigeon	131	81	33	246
Less Impact of Leslie	392	250	101	743
Equals Net Impact	-261	-169	-67	-497

Source: Ellis Consulting Services

The fall in net direct labour income is estimated at $261 million and the reduced economic activity associated with indirect and induced production will lead to a further drop of $169 and $67 million respectively.

Impact on Government Finances

The impact of the reduced mine life would be very positive for federal government and GNWT finances.

Table 5 gives the estimated tax activity associated with the reduced mine life. It is estimated that the federal government revenues would rise by $363 million. Of most significance corporate income tax would rise by over $252 million and mining royalties would grow $162 million. On the negative side the employment activity (including direct, indirect and induced) associated with the reduced mining life would lead to a fall in personal income tax revenues of $79 million fuel taxes of $8.4 million.

It is estimated that the territorial government revenues would rise by $61 million. Corporate income tax would rise by over $121 million while on the negative side the reduced mining life would lead to a fall in personal income tax revenues of $34 million fuel taxes of $25 million.

In summary, the net impact of reducing the mine life has an overall positive benefit to the GDP of the NWT when considering EKATI™ Diamond Mine's updated aggregate mine plan. The reduction in mine life does correspond to a shorter length of time that employment is available; however, as stated above, BHP continues its exploration programs. As stated in the EAR, page 1.

"Good exploration targets remain to be tested to be tested, and the discovery of additional economic reserves could well result in a further increase in mine life. The mine plan is expected to change in future years in response to exploration results and overall market conditions."

Any further increase in mine life will lengthen the period of employment, tax revenues, royalty payments, and other socio-economic benefits.

Table 5 - Impact of Reduced Mine Life on Total Tax Revenues ($million)

Tax Category	Impact of S, P & B	Less Impact Of Leslie	Equals Net Impact
Federal Taxes			
Surface Rights Fees	3.0	3.0	0.0
Corporate Income Tax	141.9	-110.2	252.1
Mining Royalties	91.0	-70.7	161.7
Dividend Withholding Tax	9.0	-7.0	16.0
Tax on Canadian Dividends	31.0	-24.1	55.1
Personal Income Tax	39.6	118.1	-78.5
UI Premium	9.4	28.6	-19.2
CPP Premium	7.9	24.0	-16.1
Federal Fuel Tax	4.0	12.4	-8.4
Subtotal Federal Tax Revenues	336.8	-25.7	362.5
Territorial Taxes			
Corporate Income Tax	68.2	-53.0	121.2
Personal Income Tax	17.3	51.6	-34.3
Payroll Tax (Net)	0.2	0.7	-0.5
Fuel Tax	12.0	37.3	-25.3
Property Tax	2.0	2.0	0.0
Subtotal Territorial Tax Revenues	99.7	38.6	61.1
Grand Total	436.6	12.9	423.6

*Sable, Pigeon & Beartooth

Source: Ellis Consulting Services

References

Enviro-Test Laboratories, 1998. *Aquatic Toxicity Associated with Diamond Ore (Kimberlite) Mining*

Harrison, S.E., R.V. Hunt, E. Evans, R.E. McNicol and J.F. Klaverkamp, 1995. A preliminary evaluation of the lethal and sub-lethal toxicities to fish of effluents from diamond exploration in the Lac de Gras Area. Report EC/EB/TS-32. Department of Fisheries and Oceans, Freshwater Institute, Winnipeg, Manitoba

Harrison, S.E., R.V. Hunt and J.F. Klaverkamp, 1997. An evaluation of the lethal toxicities of tailings, effluents, and selected compounds from diamond exploration in the Lac de Gras area. Department of Fisheries and Oceans, Freshwater Institute, Winnipeg, Manitoba

NWT Diamonds Project, Environmental Impact Statement, (BHP 1995)

BHP Diamonds Inc. February 2000. *Interim Abandonment and Restoration Plan*

Banci, V. and S. Moore. 1997. 1996 Wildlife studies, Lac de Gras, Northwest Territories. Prepared for BHP Diamonds Inc. Rescan Environmental Services, Vancouver B.C.

BHP Diamonds Inc. 1995a. EIS (Environmental Impact Statement) for the BHP Diamonds Project. Rescan Environmental Services Ltd. and BHP Minerals Ltd. Yellowknife NT and Vancouver BC.

BHP Diamonds Inc. 1995b. Caribou assessment. Baseline Study Updates. Rescan Environmental Services, Vancouver BC.

BHP Diamonds Inc. 1995c. Eskers, carnivores and dens. Baseline Study Updates. Rescan Environmental Services, Vancouver BC.

Golder 1998. *1997 Wildlife Monitoring Program - construction phase.* NWT Diamonds Project, BHP. Unpubl. report to BHP Diamonds Inc. by Golder Associates Ltd., Yellowknife, NT.

Golder 1999. *1998 Wildlife Monitoring Program - construction phase.* NWT Diamonds Project, BHP. Unpubl. report to BHP Diamonds Inc. by Golder Associates Ltd., Yellowknife, NT.

Rescan. 1999. *1999 Wildlife Effects Monitoring Program.* Rescan™ Environmental Services Ltd. Report prepared for BHP Diamonds Inc.

Appendix A

Conformity Table

ToR Line No.	ToR Text		Comments	Review Board View
138-139	I. Existing equipment, infrastructure, and facilities to be used for processing, disposal, storage and transportation	Chapter 1, 2.2.1, 2.2.2 Project Description	DIAND: Does not include all currently approved operations under the Land Lease, i.e. the Leslie pipe.	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before deciding on the matter.
140	II. Solid waste management and containment areas	2.2.3	DIAND: Leslie pipe not included.	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before deciding on the matter.
147-151	Describe the proposed Ekati™ Diamond Mine extension development sequence, in the context of the entire mining operation including traffic on existing haul roads and transportation corridors, current and anticipated exploration activities that will utilize the proposed development infrastructure, and exploration plans as they relate to the proposed development.	2.2.6	DIAND: Leslie pipe not included.	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before deciding on the matter.
151-152	Also, include a clear rationale for the proposed development sequence in terms of economic risk and	2.2.6	DIAND: as Leslie pipe not included. DIAND: Does not address how the	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before

ToR Line No.	ToR Text		Comments	Review Board View
	uncertainty.		new development can/will be used in the future exploration activities, if undertaken.	deciding on the matter.Non-Conforming
166	V. the tailings (processed kimberlite) containment areas, waste rock (country rock), ore stockpile and overburden storage sites, open pits, sewage facilities and underground workings in the event of a temporary shutdown	2.2.3, 4.10.2	DIAND: need to clarify implications of temporary shutdown for each facility.	Non-Conforming
176	II. re-establishing plant communities and a productive landscape	5.5.2	DIAND: No indication this guideline is provided for the potential quarry location.	Non-Conforming
227-228	Alternative kimberlite pit development sequencing, and mitigation measures considered, shall be reported and reasons provided for their rejection.	2.2.6, 2.3.3	DIAND: Leslie pipe not included; alternative sequences considered should be addressed.	Non-Conforming
230-232	BHP shall provide sufficient information on the existing environment, as it pertains to the proposed development, including the existing mining operation, where appropriate, to give a brief but clear picture of	Chapter 3	EC: Indicates Sable lake vegetation classification missing	Non-Conforming

ToR Line No.	ToR Text		Comments	Review Board View
	the existing environment and its use.			
259-262	In assessing the impact of the proposed development, the developer shall consider, describe and evaluate the environmental impacts of the proposed development for all phases of the proposed development including construction, operation, care and maintenance, closure and post-closure.	4.2.2, 4.9.5	EC: Not addressed in relation to migratory birds. IEMA: The Table in the EAR identifies s.4.2.2 and 4.9.5 as providing the required information but s.4.2.2. Contains no mention of temporal boundaries. S. 4.9.5 pertains only for those VECs for which a cumulative effects assessment was done.	Non-Conforming Non-Conforming
274-276	BHP shall describe planned mitigation measures and consequences (environmental impacts) of potential failure. The residual impacts should be described at least in terms of the following parameters.	4.3, 4.4, 4.5, 4.6, 4.7, 4.10	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
277	I. magnitude	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
278	II. geographic extent	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
279	III. timing	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
280	IV. duration	4.2.2, 4.3, 4.4,	DIAND: No information on the	Non-Conforming

ToR Line No.	ToR Text		Comments	Review Board View
		4.5, 4.6, 4.7	impacts related to the closure of the esker granular quarry.	
281	V. frequency	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
282	VI. irreversibility of impacts	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
283	VII. ecological resilience; and	4.2.2, 4.3, 4.4, 4.5, 4.6, 4.7	DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
284	VIII. probability of occurrence and confidence level.		DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
286	Distinguish between ecological parameters and social / cultural parameters.		DIAND: No information on the impacts related to the closure of the esker granular quarry.	Non-Conforming
287	3.1.6 Environmental Optimization			
303	VI. recreational and tourism land uses	3.8.8, 4.9.6.2	DIAND: Does not include recreational use by the public.	Conforming
304	VII. snowmobile trails	3.8.7	DIAND: Does not include use by other than Aboriginal people (i.e., recreational).	Conforming
348-349	VI. rock types, including the chemistry of pipes and stability of kimberlite by-products	2.2.3.3	EC: No information on kimberlite composition and toxicity for new pipes.	Non-Conforming
477	III. hunting, trapping, and outfitting, recreational, commercial and sport fishing	3.8.8, 4.7.9, 4.9.6.2	DIAND: Lacks impacts to recreational activities to the area by the public.	Conforming
483-	Any changes from the	4.7	Review Board: If the mine, and	Non-Conforming

ToR Line No.	ToR Text		Comments	Review Board View
486	context of the 1995 EIA, or the BHP Socio-Economic Agreement shall be reported including the effects of changes to the pace and scale of the development should be assessed.		duration of mine life change from the 1995 EIA report the change. That is, the socio-economic impact of the change	
549-552	For the purposes of this development, the environmental assessment shall include an evaluation of cumulative effects that are likely to result from the proposed development in combination with other developments; and developments within the regulatory process on the day these Terms of Reference are issued.	4.9	DIAND: Leslie pipe not included.	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before deciding on the matter.
554-555	BHP shall include, as a minimum, the existing BHP Ekati™ Diamond Mine, Diavik Diamond project, and the Echo Bay Mines Ltd. Winter Road and Lupin mine.	4.9.6	DIAND: Leslie pipe not included.	Review Board would like to provide an opportunity for BHP, Environment Canada, and the Department of Indian Affairs and Northern Development (DIAND) to clarify or add anything to the public record before deciding on the matter.

Source: MVEIRB Staff.

Appendix B

EBA Letter On Ursula Esker

July 4, 2000 EBA File: 0101-94-11580.029

Via Fax: (867) 669-9293 (3 Pages)
BHP Diamonds Inc.
1102, 4920 – 52nd Street
Yellowknife, NWT
X1A 3T1

Attention: Tina Markovic

Subject: Ursula Esker Quarry Site Selection and Development Management

The Environmental Assessment (EA) report for the proposed development of the Sable, Pigeon and Beartooth Kimberlite Pipes identifies that a small granular quarry would be developed in the Ursula Esker (Section 2.2.5) near the proposed haul road. The well-defined esker has a typical sinuous shape with low-lying discontinuities in the esker ridge. The proposed haul road alignment crosses the esker's path at one of the discontinuities, following partially exposed bedrock with thin patches of glaciofluvial material.

The vast majority of the general construction fills required to support the proposed developments, including road fills and laydown pads, will consist of waste rock from mining activities. The purpose of the quarry is to provide select natural granular material needed for surfacing roads and laydown pads, and for berm construction at the Sable and Pigeon pits. The volume of granular material required during the proposed development, mining and reclamation phases is estimated to be 200,000 m^3.

The specific site for the quarry has not been identified in the EA report nor has a detailed development and closure plan been provided. This has been identified as non-conforming to the EA terms of reference in the report regarding conformity as issued by the Mackenzie Valley Environmental Impact Review Board (MVEIRB) on June 22, 2000. This letter addresses the current plans for quarry site selection, evaluation and its ultimate management plan.

Site Selection

Three potential sites for the quarry were selected by airphoto interpretation in the late fall, 1999. It was not practical to visit or conduct any site evaluation as there was already some snow cover and therefore final site selection was deferred until the summer, 2000. The quarry site was not well enough defined to be specifically identified during preparation of the EA report. Plans are in-place to visit the alternative sites, identify the relative merits of each and complete site selection during July 2000. An integrated team that includes a wildlife specialist, an archaeologist and a geotechnical engineer will conduct the initial site evaluation.

The factors that have the greatest influence on site selection are:

- prospective material quality and quantity,
- total disturbed area,
- site access,
- wildlife denning sites, and
- heritage sites.

The alternative sites will be screened on the above criteria and a more detailed evaluation initiated on one or perhaps two sites. Those detailed evaluations will include:

- material sampling by hand dug test pits and ground penetrating radar surveys to assess propensity for ground ice and its distribution,
- detailed study of wildlife utilization, and
- archaeological surveys.

These studies will be completed during this summer to provide information required to develop a quarry management plan.

Quarry Management Plan

A quarry management and reclamation plan will be developed and submitted for approval with the permit application. The plan will follow the general principals outlined in the document "*Environmental Guidelines - Pits and Quarries published by DIAND (1989*). Those guidelines are somewhat out of date relative to current environmental norms as they were prepared before the importance of eskers to wildlife was fully recognized. Eskers per se are not a Valued Ecosystem Component (VEC). However, eskers are a component of the VECs: wildlife habitat (carnivore, caribou, and breeding birds), Physical/Terrestrial environment and heritage sites. Changes to eskers have the potential to affect these VECs.

The quarry management plan will fully reflect experience at the mine with development and reclamation of the Airstrip Esker gravel pit as described in: "Quarry Management Plan - Airstrip Esker" (EBA.1997). That document, submitted in 1997, included the following components:

- a description of material requirements,
- site description including surface, subsurface and permafrost conditions,
- site selection considerations, including identification of sensitivities to wildlife and potential for disturbance of heritage sites,
- a description of development methods,
- assessment of physical impacts on the terrain including hydrology and runoff, and
- a complete restoration plan.

The document is supported by separate reports that assess the wildlife use of the affected portion of the esker and the results of archaeological surveys.

At the current time, EBA has been tasked with developing the quarry management plan. This will be done in conjunction with BHP's on site environmental staff for the wildlife component and Points West Heritage Consultants for the archaeological assessment. It is anticipated that all

field activities will be complete during the summer and the quarry management plan will be ready for submission by November 1, 2000.

I trust this brief description of the procedures we have adopted to complete this component of the proposed Sable, Pigeon and Beartooth development plan is appropriate. Please contact either Mark Valeriote or myself if you would like additional information.

Yours truly,
EBA Engineering Consultants Ltd.

D.W. Hayley, P.Eng.
Principal Engineer
(Phone: (250) 767-9033)
(e-mail: dhayley@eba.ca)

DWH/ta

cc: M. Valeriote

X:\0101\Projects\1994\11580\029\Markov-L03.doc

Mackenzie Valley Environmental Impact Review Board

Box 938
200 - Scotia Centre, (5102-50th Avenue)
Yellowknife, NT X1A 2N7
Fax: (867) 920-4761

From: Roland Semjanovs
Communications Officer
MVEIRB

Phone: (867) 873 - 9636
Fax: (867) 920 - 4761

FAXED

Date: July 19, 2000

Pages: 2 including this page

To : **Advertising**
Kim

FAX: 873-8507

Advertising Insertion Order.

Ad	Notice of Public Meeting re: BHP EA	
Ad copy attached.		
Publication	**Date**	**Size**
Yellowknifer	Fri. July 21, 2000	2 col x 5"
News North	Mon. July 24, 2000	

Fax proof to 920 - 4761

Invoice to address above.

If there are any questions you can reach me at the numbers above.

Sincerely,
Roland Semjanovs.

Heidi Klein,	Executive Director	(867) 873-9029
Bridgette Larocque	Finance and Administration Officer	(867) 873-5257
Gordon Stewart	Environmental Assessment Officer	(867) 873-9193
Louie Azzolini	Environmental Assessment Officer	(867) 873-9189
Roland Semjanovs	Communications Officer	(867) 873-9636
Web site	www.mveirb.nt.ca	

FAXED

Mackenzie Valley Environmental Impact Review Board

Notice of Public Meeting

Environmental Assessment of
BHP Diamonds Inc. Ekati™ Mine - Pigeon, Sable and Beartooth Kimberlite Pipes.

The Mackenzie Valley Environmental Impact Review Board has set Wednesday, August 30, 2000 to hold a public meeting to hear views and collect information on the environmental assessment report submitted by BHP Diamonds Inc. on the Pigeon, Sable and Beartooth Kimberlite Pipes.

The meeting will be held in Yellowknife at a place and time to be announced later. If you plan to speak or make a presentation to the Review Board, please let us know by Wednesday, August 23, 2000 so the Review Board can make scheduling arrangements. Depending on the level of interest or other factors, the Review Board reserves the right to cancel or postpone the meeting.

All public documents relating to the BHP environmental assessment are filed in the Review Board's Public Registry, located at its office in Yellowknife, and are accessible to the public for viewing during regular office hours. Some documents can also be viewed and downloaded from the Review Board's web site at http:// **www.mveirb.nt.ca**

For further information, contact:
Louie Azzolini, Environmental Assessment Officer,
Mackenzie Valley Environmental Impact Review Board,
Box 938, (200 Scotia Centre, 5102-50th Avenue)
Yellowknife, NT. X1A 2N7
Phone (867) 873-9189 **Fax** (867) 920-4761

Luciano (Louie) Azzolini

From: "Wilson,Anne [Yel]" <Anne.Wilson@EC.GC.CA>
To: "'Tina Markovic'" <markovic.tina.tm@bhp.com.au>; "'Luciano (Louie) Azzolini'" <EAO1@mveirb.nt.ca>
Cc: "Henry,Anne-Marie [Wpg]" <Anne-Marie.Henry@EC.GC.CA>; "Kochtubajda,Bob [Edm]" <Bob.Kochtubajda@EC.gc.ca>; "Halliwell,Doug [Yel]" <Doug.Halliwell@EC.GC.CA>; "Bates,Laurie [Edm]" <Laurie.Bates@EC.gc.ca>; "Tache,Michel [NCR]" <Michel.Tache@EC.GC.CA>; "Englot,Curtis [Edm]" <Curtis.Englot@EC.gc.ca>; "Henry,Anne-Marie [Wpg]" <Anne-Marie.Henry@EC.GC.CA>
Sent: Friday, June 30, 2000 3:24 PM
Attach: IR - acidic inputs.doc; IR - thermal inversions.doc; IR-PM concentrations.doc; IR - Geology maps.doc; IR - petrography.doc; IR - sediment quality.doc
Subject: IRs on air issues and geology

Hi Tina and Louie,
Attached are IRs on air quality and geology issues. Please have responses directed to the originator of the IR and cc'd to me.
Please note that there may be water-related IRs to follow which are received after close of business today.
Thanks!
Anne

> <<IR - acidic inputs.doc>> <<IR - thermal inversions.doc>> <<IR-PM
> concentrations.doc>> <<IR - Geology maps.doc>> <<IR - petrography.doc>>
> <<IR - sediment quality.doc>>
>
>
> Anne Wilson
> Water Pollution Specialist
> Environmental Protection Branch
> Environment Canada
> Yellowknife, NT
> Ph. 867-669-4735
>

Information Request: Sable, Pigeon & Beartooth Kimberlite Pipes, Ekati Project

Date: June 30, 2000

From: Douglas Halliwell, Aquatic Quality Specialist, Northern Section, Atmospheric & Hydrologic Sciences Division, MSC, Environment Canada, Yellowknife, NWT

Phone: (867) 669-4741
Fax: (867) 873-8185
Email: doug.halliwell@ec.gc.ca

Subject: **Baseline Sediment Quality Data for Sable Lake, Two Rock Lake & Lakes near Pigeon Pond and Beartooth Lake & Comparison to 1999 CCME Canadian Sediment Quality Guidelines**

Objectives: (1) To describe the baseline abiotic conditions for lake sediments in Sable Lake, Two Rock Lake and lakes near Beartooth and using all available data, including BHP and GSC geochemical data.
(2) To compare measured lake sediment values to 1999 CCME Canadian Sediment Quality Guidelines

Time Limits: July 21, 2000

References: (1) Environmental Assessment Report for Sable, Pigeon, and Beartooth Kimberlite Pipes, BHP-Diamet, April 2000.
(2) Re-analysis of Selected Lake Sediment Samples from Bear-Slave Operation, Northwest Territories, NTS 76B (Northwest) and 76D (Northeast), Kjarsgaard, B., Friske, P.W.B. *et al.* Geological Survey of Canada Open File 2578, 1992. Complete with Sample Locations Map & Data Volume. Refer to Sample Sites 2674. 2675, etc.

Preamble: Lake sediment results from Sable, Two Rock, Ulu and Beartooth Lakes are described on pages 3-49 to 3-50 of the April 2000 EAR. There is no mention of baseline GSC lake sediment quality data collected before 1992 (i.e. before 1996 Sable Lake delineation drilling and bulk sampling activities). There is also no comparison of lake sediment data from these four lakes with 1999 CCME Canadian Sediment Quality Guidelines and Probable Effects Levels to discern whether the area is naturally geochemically higher or not than the Canada-wide CCME Guidelines, or whether sediment quality changed between pre-1992 GSC sampling (before 1996 delineation drilling and bulk sampling) and later 1999 BHP sampling (after these activities). It appears that most Sample 2674 GSC

metals values fall mid-range within the BHP 1999 values at Sable Lake, while total copper and iron values are higher in the BHP 1999 analyses. The 1999 lake sediment sample results appear to exceed 1999 CCME Canadian Freshwater Sediment Quality Guidelines for total arsenic, chromium, copper and zinc (total arsenic and zinc levels even exceed Probable Effects Levels).

Requests: Please provide:

(1) Comparison of 1999 BHP results at Sable lake and Two Rock Lake to GSC pre-1992 lake sediment results in Samples 2674 and 2675, respectively, collected at these sites.

(2) Comparison of GSC and BHP lake sediment values from lakes near Beartooth and Ulu Lakes. These comparison will discern whether changes have occurred between pre-1992 (1972 and 1992) and 1999.

(3) Comparison of both pre-1992 GSC and 1999 BHP lake sediment quality results from the four lakes (and, hopefully additional lakes in the future) to 1999 CCME Canadian Freshwater Sediment Quality Guidelines. The comparisons will compare the local geochemical background in the BHP Claim Block area to Canada-wide backgrounds and thresholds.

Information Request: Sable, Pigeon & Beartooth Kimberlite Pipes, Ekati Project

Date: June 30, 2000

From: Douglas Halliwell, Aquatic Quality Specialist, Northern Section, Atmospheric & Hydrologic Sciences Division, MSC, Environment Canada, Yellowknife, NWT

Phone: (867) 669-4741
Fax: (867) 873-8185
Email: doug.halliwell@ec.gc.ca

Subject: **Acid Rock/Mine Drainage: Mineralogy & Lithogeochemistry, Results of Kinetic Geochemical Testing**

Objectives: In order to assess the acid-(or alkaline-) generating potential of various rock types, it is important to know the structure and texture of rock types to assess how rapidly the rocks might be weathered and chemically altered, as well as the sulphide mineralogy (i.e. % content of acid-generating minerals, such as pyrrhotite and pyrite) present. Additionally, as there are higher confidence levels associated with NP/AP ratios from kinetic testing, it would be useful to know what the time frame for kinetic testing will be.

Time Limits: July 21, 2000 or as soon as kinetic geochemical tests are complete and properly reported.

Reference: Environmental Assessment Report for Sable, Pigeon and Beartooth Kimberlite Pipes, BHP-Diamet, April 2000

Preamble: There is some fairly good discussion on pages 2-31 to 2-37 and Figures 2.2-6 to 2.2-8, inclusive, of the April 2000 EAR for Sable, Beartooth and Pigeon Kimberlite Pipes waste rock geochemistry, static and kinetic testing, Neutralization Potential/Acid Potential (NP/AP) Ratios, and reference to various rock types (biotite schist, biotite granite, 2-mica granite, diabase). However, petrographic descriptions are not mentioned.

Requests: Please provide:
(1) Thin section & (especially, opaque mineral) polished thin section petrographic descriptions of rocks subjected to static and kinetic geochemical testing, complete with mineralogy (i.e. % contents of sulphide and other minerals present). Lithogeochemical and mineralogical analyses of these same samples (together) would be useful to determine

what metals contents are in the rock types tested, and where these metals are found in the rocks to assess how readily they could be leached out.

Information Request: Sable, Pigeon & Beartooth Kimberlite Pipes, Ekati Project

Date: June 29, 2000

From: Douglas Halliwell, Aquatic Quality Specialist, Northern Section,
Atmospheric & Hydrologic Sciences Division, MSC,
Environment Canada, Yellowknife, NWT

Phone: (867) 669-4741
Fax: (867) 873-8185
Email: doug.halliwell@ec.gc.ca

Subject: **Bedrock Geology Information & Maps**

Objective: The subject of surficial geology was adequately covered, while the subject of bedrock geology was not. Discussion and maps related to bedrock geology are necessary to know whether the country rocks (e.g. biotite schist, granodiorite), intruded by kimberlite pipes and excavated during open-pit or other mining techniques at each of the three new sites, is potentially acid- (or alkaline-) generating.

Time Limits: July 21, 2000.

Reference: Environmental Assessment Report for Sable, Pigeon and Beartooth Kimberlite Pipes, BHP-Diamet, April 2000

Preamble: The subject of surficial geology was well-covered on pages 3-21 to 3-26 (inclusive), coloured maps and in the vegetation section later on in the April 2000 EAR. The bedrock geology, in contrast, was covered in three-quarters of a page on page 3-26. There was no regional or local (claim block) bedrock geology map, either. Such bedrock geology maps were supplied during the initial EA, under EARP/FEARO Panel, for the NWT Diamonds (Ekati) Project, but are apparently missing this time.

Request: Regional & local (BHP-Diamet claim block) geology maps.

BHP Expansion – Information Requests

Date: 29 June, 2000

From: Laurie Bates
Air Issues Specialist
Atmospheric & Hydrological Sciences Division,
Meteorological Service of Canada, Environment Canada
Phone: (780) 951-8736
Fax: (780) 951-8634
Email: laurie.bates@ec.gc.ca

Subject: **PM Metal Concentrations**

Objective: To attain an elaboration of metal concentrations in airborne particulate.

Time Limits: Prior to completion of the technical review.

Reference: Environmental Assessment Report (EAR), Section 3.1.3, Page 3-17.

Preamble: None

Request: As stated in the EAR, "Several of the TSP filters were analyzed for metals during the 1994 baseline program It was concluded at that time that none of the metal concentrations in the airborne particulate were of concern." Please give more detail as to how this conclusion was reached.

BHP Expansion – Information Requests

Date: 29 June, 2000

From: Laurie Bates
Air Issues Specialist
Atmospheric & Hydrological Sciences Division,
Meteorological Service of Canada, Environment Canada
Phone: (780) 951-8736
Fax: (780) 951-8634
Email: laurie.bates@ec.gc.ca

Subject: **Thermal Inversions**

Objective: Provincial and federal environment ministers have recently approved the Canada-Wide Standards for inhalable particulate matter & ozone. Fugitive dust is the primary parameter of concern at the EKATI™ mine with respect to air quality, but inhalable particulates are not being monitored.

Time Frame: N/A

Reference: Environmental Assessment Report (EAR), Section 4.3.1.1, Page 4-33.

NRDC, 1996. *Breath-taking: Premature Mortality Due to Particulate Air Pollution in 239 American Cities*. National Resources Defense Council.

US EPA, 1995. *Interim Finding on the Status of Visibility Research*, U.S. Environmental Protection Agency EPA/600/R-95/021.

Preamble: As stated in the EAR, "whenever inversion conditions exist at EKATI™ the Mine Operations Team Leader will proceed to the bottom of the pit and obtain air quality measurements. Air quality measurements will include CO, NO_x and oxygen." It is recommended that levels of PM_{10} and $PM_{2.5}$ also be monitored due to the fact that these particulates can impede visibility (US EPA 1995) and contribute to increased mortality and morbidity due to aggravation of existing disease, damage to lung tissue, impaired breathing, cardiac stress and immunity (NRDC 1996).

Request: Please advise whether BHP is prepared to monitor inhalable particulate matter levels in connection with thermal inversions, and if so, provide information on such monitoring.

BHP Expansion – Information Requests

Date: 29 June, 2000

From: Laurie Bates
Air Issues Specialist
Atmospheric & Hydrological Sciences Division,
Meteorological Service of Canada, Environment Canada
Phone: (780) 951-8736
Fax: (780) 951-8634
Email: laurie.bates@ec.gc.ca

Subject: **Potential Acidic Input**

Objective: An expanded discussion of potential acidic inputs and possible impacts to these highly sensitive ecosystems should be included.

Time Limits: Prior to completion of technical review.

Reference: Environmental Assessment Report (EAR), Section 4.3.1.1, Page 4-23.

Request: Regarding the current and expanded operations at BHP, the EAR states "because of relatively low SO_2 and NO_x emission quantities, acid deposition is not predicted to occur" (page 4-23), but does not explain how these predictions were made. Please provide more information regarding the methodology used to formulate these predictions. Due to the high sensitivity of these ecosystems, a discussion of potential acidic inputs and possible impacts to aquatic and terrestrial systems should be included. The proponent should also discuss the potential for long range transport and its impact on more distant areas.

As stated in the EIS from 1995 (Volume IV, page 2.93), typical "unpolluted" background sulphate levels at Snare Rapids were 0.96 kg/ha/a which is below the 7 kg/ha/a protection limit for sensitive ecosystems. It must be noted that this limit has been accepted only for Ontario lake systems and that a "sensitivity" limit has not been defined for arctic ecosystems. Arctic systems are likely more sensitive than this due to the slow growing processes.