JERICHO PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

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EXECUTIVE SUMMARY

Overview

Benachee Resources Inc., a wholly owned subsidiary of Tahera Corporation (Tahera) is proposing to construct and operate a diamond mine ("the Jericho Diamond Project", also referred to as "the Jericho Project", "the Project", and "Jericho") near the north end of Contwoyto Lake in the Territory of Nunavut.

Tahera Corporation has actively explored for diamonds in Nunavut for the past seven years (prior to 1999 as its predecessor company, Lytton Minerals). The company has identified a number of prospective kimberlite pipes and will continue to explore and develop prospective pipes throughout the life of the Jericho Project. The goal is to extract the Jericho kimberlite reserves and find additional economic diamond deposits in the general area of Jericho, thus extending the life of the Jericho Mine.

Project Alternatives

A number of alternatives were examined in developing the Project development plan, including the no project alternative. The no project alternative would result in:

- foregone revenues to governments in the form of taxes and royalties;
- foregone employment and contracting opportunities for Nunavummiut; and
- foregone training opportunities which could provide Nunavummiut and Northerners with transferable skills.

Although some environmental impacts from the Project will occur, with the proposed management plans these impacts will be relatively small and confined to an area around the Project. A total footprint of 221.8 ha will be disturbed by mining; much of it will slowly revegetate subsequent to closure. For comparison, the hamlet of Kugluktuk covers over 1000 ha of land, more than 4 times the area proposed for the Jericho mine's footprint.

Alternatives were also examined for mining, processing, and transportation. Alternatives for mining include a complete underground development of the deposit, rather than the proposed open pit-underground combination. Initial open pit mining provides the necessary economics to make the Project viable; the Project could not proceed as an entirely underground mine. A number of alternate locations are available for plant site construction, but none combine the proximity to the open pit and ease of environmental control the preferred site offers.

Ore processing at Lupin and use of the Lupin tailings containment area was seriously considered, but this alternative required a high level of mutual technical cooperation and the submission of applications to regulatory agencies on the part of the proponent and the owner of the Lupin mine site.. Alternative locations for processed kimberlite fines disposal in the immediate vicinity of the Jericho Kimberlite are not as economically or environmentally favourable as the preferred selection, the details of which are outlined in this document.

The proposed plant complex location is approximately 1 kilometer southwest of the open pit. Alternative locations to the east of the pit were considered, but rejected due to environmental factors and cost of construction.

Three sites in the Project footprint are suitable for waste rock disposal; the two chosen provide a combination of economic and environmental superiority over the third site. All waste could be placed on Waste Rock Dump 1, but would result in a higher dump structure, higher operating costs, and less flexibility in waste handling. There are no practical alternatives to sites chosen for ore stockpiles, as they must be as close as possible to the plant.

Recycling of process water from the processed kimberlite containment area would be possible during summer months, when water in the impoundment was not frozen. However, it would not eliminate the need for discharge of water, nor for the requirement for make up and potable water from Carat Lake.

There are no practical alternatives to winter road transport of supplies to Jericho. Due to the bulk of fuel and ammonium nitrate required, air lifting of supplies would be prohibitively expensive, as is the case with other northern mining operations.

At present, the company plans to globally market diamonds recovered from Jericho as a rough product. The company remains open to discussing the possibility of participating in a secondary diamond industry in Nunavut. However, to date there have been only limited discussions related to this matter.

Project Description

Operations will commence with an open pit mine, and subsequently change to an underground operation in later years. The site layout is shown on Map A (Appendix E). Ore will be mined nine months of the year (April through December) and processed year round. Fine processed kimberlite (roughly 15% of the plant feed) will be pumped to a lake near the plant site (local name Long Lake). Coarse rejects (the remainder of the plant feed, except diamonds) will be stockpiled for use as processed kimberlite impoundment cover material, or other reclamation purposes, where a final cover of overburden will be placed. During winter months an ice road will be used to transport materials and supplies to the Jericho site. With current resources the mine and processing plant will have an 8-year life and employ a total of approximately 110 to 175 people (including employees and contractors) with approximately half that number on site at any rotation. Mine life is 8 years at a rate of approximately 300,000 tonnes per year.

Baseline Conditions

There are 26 years of regional climate data available from Environment Canada (Atmospheric Environment Service—AES) stations at Lupin/Contwoyto Lake. These data are supplemented by site-specific data collected over a five-year period by Tahera. Snow surveys have been conducted since 1996 to supplement stream flow data, in recognition of the importance of the snow melt component to annual discharges of small basins. The mean annual runoff (MAR) for the Project area is 190 mm per year. This corresponds to a long-term average annual flow at the outlet of Carat Lake of about 0.9 m^3/s.

The Jericho Diamond Project lies within the region of continuous permafrost. Permafrost is present everywhere, except beneath large lakes and rivers that do not freeze to the bottom. Permafrost is estimated to extend to depths of approximately 540 m at the Jericho pipe.

A water quality monitoring program was started at the Jericho site in 1995; water has been collected every year since that time. Water in the region has very low metals levels (most below one part per billion), neutral pH, low alkalinity, and is soft.

A mixture of dwarf shrubs, grasses, mosses, and lichens dominates the plant communities at the Jericho site. Wildlife habitats are generally coincident with the ecological zones defined in the vegetation mapping program. Regionally important habitat types in the vicinity of the Jericho kimberlite pipe are the large esker complex to the east and north of the Project site, and the cliffs and rocky hills to the east (Willingham Hills). Aquatic habitats are abundant both regionally and within the Jericho site study area. They provide important breeding habitat for waterfowl and other water birds. In the spring and fall, they are used as staging areas by migratory birds.

Wildlife studies were completed to document the regional occurrence, abundance, and distribution of wildlife species in the area. These studies have concentrated on species that have ecological or economic significance, or are for some other reason important to humans. These species are caribou and muskox, grizzly bears and wolverines, wolves and foxes, and raptors, waterfowl and other birds.

Caribou may move through the Jericho area in May on their spring migration to the calving grounds and from late June to August as they disperse to the south. During the spring migration, the lakes are usually frozen, providing many travel options. As caribou begin to disperse south from the calving grounds, they may be funneled into the Project area by natural topographic features and watercourses, notably Jericho River, Jericho and Carat Lakes, and cliffs at the northern end of the Willingham hills at Jericho. Observations at the Jericho site and radio-collar-generated maps indicate caribou alternately travel down the east side of Contwoyto Lake and avoid the Jericho site completely. A number of carnivore dens and sitings exist for the Jericho site, although no dens are in the immediate footprint of the Project. Rough-legged hawks, golden eagles, peregrine falcons, gyrfalcons, and the common ravens were found to be nesting on cliffs in the Willingham Hills area. The northern harrier, typically nests in marshes, wet meadows or tundra shrubs, and was not found in the cliff areas. The common raven also uses the cliff habitat for breeding.

With the exception of Contwoyto and Carat, lakes near the Jericho site are shallow, single basin lakes, with low shoreline development ratios. A total of seven fish species occur in the Jericho area: Arctic char, Arctic grayling, burbot, lake trout, ninespine stickleback, round whitefish, and slimy sculpin. The same seven species of fish were recorded in sampled streams in the Jericho study area. Most fish recorded in streams (all except ninespine stickleback and slimy sculpin) represented younger age classes that utilized the watercourses for rearing purposes. Fish numbers were generally low in streams.

Environmental Effects

The Project will have negligible to low impacts in a regional context and low to moderate impacts in a site context. No significant impacts on the local or regional climate are expected to result from the proposed mining or processing operations.

The habitat found in the Project area does not appear to be unique and the area of disturbance is small in relation to the habitats available. Up to 221.8 ha of land could be directly disturbed by Project developments at the pipe: over 130 ha (59%) will be upland (dry and rocky tundra). Locally the impacts on habitat will be significant, but within the context of large mammal and bird habitats, impacts will be low to insignificant. Some small mammal and song bird habitat will be lost until areas are reclaimed at the end of mine life. Habitat occupied by the open pit will be permanently altered.

Water quality will not be significantly affected, as all water used at the site will be treated prior to discharge. Discharge water will meet government requirements and be non-toxic to fish.

Cumulative Effects

With respect to regional cumulative impacts, only ecosystem components with large ranges or large areas of influence are likely to be affected by developments at the Jericho Diamond Project. The Jericho site and Lupin Mine are 27 kilometers apart by air. However, any wildlife whose home range is greater than the land (air, in the case of birds) distance between sites could potentially experience a cumulative impact from the proposed development and the existing Lupin Mine. This would include at least the Bathurst caribou herd, grizzly bears, and Arctic wolves. However it is expected that there will be no significant impact on wildlife and their use as an economic resource in the region.

The Jericho Diamond Project is one of several potential developments in the West Kitikmeot. Others include the existing Lupin Mine, proposed mines at Ulu, Izok Lake, George Lake, and Goose Lake, as well as continued mineral exploration throughout the area. The proposed developments are contingent on commodity price increases and/or lowering of infrastructure and transportation costs; unnamed exploration activities are still in their early stages and therefore it is difficult to predict cumulative effects. In addition, the proposed Bathurst Inlet Road and Port project also falls within the region of the Jericho Project.

Environmental Management

Monitoring and mitigation will be the principal methods of impact control for the Jericho Diamond Project. The principal mitigation tools will be a comprehensive environmental management plan to prevent impacts prior to their occurrence. The Jericho management plan will be developed on adaptive principles, that is, the plan will be flexible and modifiable in response to monitoring feedback. This is especially important in the Nunavut context, since much of the impact assessment relied on professional judgement.

Residual Effects

Residual effects are those effects caused by mining that will remain after all mitigation steps have been taken. Residual effects may be thought of as unavoidable impacts. For water quality, residual effects will include increases in water concentration of nitrogen compounds after dilution of runoff water. Sediment will also increase slightly over background, since Carat Lake normally has very low suspended sediment levels (typically below the CCME receiving environment guideline of 5 mg/L for clear waters). With normal mixing in Carat Lake, increases in nitrogen and suspended sediments over background will not be detectable where water enters Carat Lake. Air quality will be affected at the Jericho site even with environmental control, principally from dust deposition. Dust effects will be local to the site and will not impair ecosystem functioning. The residual effects on wildlife habitat will be the 221.8 ha that is disturbed by mining and mine site infrastructure, which will not be reclaimed until the end of mine life. Residual effects on wildlife will accrue from the presence of the mine, but will be negligible to minor with "wildlife has the right of way" principle in place. The principal effect on fish will be loss of habitat: Long Lake and the causeway area in Carat Lake will result in some loss of fish habitat for slimy sculpins and burbot. Tahera will provide compensation for this lost aquatic habitat, through negotiations with the Department of Fisheries and Oceans.

Reclamation and Closure

Progressive reclamation will be practiced at Jericho. On closure all infrastructure will be removed and most disturbed areas will be reclaimed and revegetated. The major exception will be the sides of waste rock dumps, which cannot practically be revegetated, but will be stabilized. Post-closure plans are to allow the Jericho pit to fill with water through runoff, precipitation, and possibly re-direction of a portion of the flow of the diverted C1 stream (subject to discussions with Fisheries and Oceans Canada). In time the water in the pit will return to normal lake levels. However, it is not expected to return to normal lake aquatic productivity levels, given the relatively great depths and lack of littoral habitat in the pit.

Monitoring

Monitoring is a tool to provide feedback on how well impacts have been predicted and to allow appropriate corrective actions, should unexpected impacts occur. A comprehensive monitoring program will be developed for the Jericho Diamond Project, which will be reflected in terms and conditions appended to the Project's Water Licence.

Socio-Economic Setting

The Kitikmeot Region is one of the three regions in Nunavut. The region is located in the Central Arctic 900 km north of Yellowknife, 800 km east of Inuvik, and 400 km west of Gjoa Haven. There are four communities in the western Kitikmeot Region: the hamlets of Cambridge Bay and Kugluktuk, and the unincorporated settlements of Umingmaktok and Bathurst Inlet. The communities were selected on the basis of their proximity to the proposed Project site, their relationship with the region surrounding the proposed Project site, and their potential for supplying the proposed Project with workers, services, and supplies.

In 1998 the West Kitikmeot Region had a population of 2,746. Compared to the 1996 population of 2,618, this is an increase of 128 people (or 5%). Between 1991 and 1996 the regional population increased 25%, between 1986 and 1991 it increased 15%. Of the 1,080 residents employed in Cambridge Bay and Kugluktuk in 1996, 485 (or 45%) were employed in government services, including education and health services. The second largest group, 300 residents (or 28%) was employed in the other services sector. This sector includes communication and other utility industries, finance and insurance, food and beverage service industries, and transportation and storage. One hundred and seventy residents (or 16%) were employed in the goods producing industries that include fishing and trapping, mining and construction. One hundred and twenty-five residents (or 11%) were employed in the retail and wholesale sector.

The Kitikmeot economy is a mixed economy comprised of three key elements: the wage economy, government transfer payments, and traditional activities. Many residents combine cash from wage employment and government transfer payments with traditional activities, such as hunting and fishing for food. The transfer payments from governments come from either subsidies or income support. All three elements play an important role and contribute to the regional economy at different levels and at different times, depending on factors such as seasonal harvesting activities and the availability of wage employment.

The Department of Health and Social Services had the second largest budget in the Government of Nunavut's first budget in 1999. It amounted to $117.4 million (or 22%). On behalf of the Federal Government the department administers non-insured health care services and insured services to the residents of the Kitikmeot. Community Health and Social Service Centres, staffed with nursing and social services personnel, are located in the two larger communities. A Regional Headquarters office is also located in Cambridge Bay.

Socio-Economic Impacts

The Jericho Diamond Project is a small mining Project. It will generate an average of 90 person years of employment for nine years (not including post mining monitoring). The company intends to cooperatively work towards achieving a goal of having 60% of its employees be Nunavummiut within five years of the commencement of construction activities at the Jericho site. Achieving this goal will depend on the collective cooperation of the company with members of the community, regional employment and training agencies, and negotiations with the Kitikmeot Inuit Association on completing an Inuit Impact Benefit Agreement (IIBA). Should such goals be reached, employment of Nunavummiut will range from a high of 68 in Year 3 to a low of 30 in Years 9 and 10. Other mines in Nunavut have generated between 190 to 300 person years of employment. The EKATI™ diamond mine in the NWT generates over 600 person years of employment at its mine site each year. However, even 90 person years of employment can have impacts on a region with a small population, like the Kitikmeot. Major socio-economic impacts will relate to jobs and business opportunities and these will be positive throughout the life of the mine.

According to the socio-economic effects assessment, the economic impacts of the $44.5 million construction costs will flow 35% to Nunavut and the Northwest Territories, 22% to Alberta, and 17% offshore (a diamond processing plant may be procured from South Africa); lesser amounts will go to other provinces. These expenditures will have at most a minor impact on the GDP of the above jurisdictions. Operating expenditures per year will be between $10 million and $34 million; 43% of operating expenditures will be spent in Nunavut and the NWT. Some 533 new jobs will be created in Canada, 161 of which will be in Nunavut and the NWT. Tax revenue to governments from these 533 jobs will total $9 million/year.

There will be negligible impact on traditional land use or on land use patterns as a result of this Project.

Tahera plans to enter into an Inuit Impact and Benefits Agreement with the Inuit of the West Kitikmeot. This Agreement will serve to mitigate any negative socio-economic impacts from the Jericho Diamond Project and will accentuate the positive impacts. As part of the negotiated agreement, a community liaison committee will be established to provide feedback to communities and to the company on progress with job training and hiring, other socio-economic issues, and on environmental management at the Project site.

Although the additional employment in the Kitikmeot communities could result in additional stress for some families, the community leaders believe that, on balance, the jobs will be a good thing for their communities.

Land Use

The Jericho Diamond Project falls within or near the traditional use areas of three native groups: the Kitikmeut (formerly named Copper Inuit by ethnographers), the Dogrib, and the Yellowknife Dene. The Nunavut Planning Commission has prepared maps showing the area of influence for all West Kitikmeot communities. These maps indicate that the Jericho Diamond Project lies within the southern boundary of the area of influence of the communities of Bathurst Inlet, Umingmaktok, and Kugluktuk. Hunters and fishers from these communities occasionally travel by snowmobile or airplane to this region to hunt caribou (winter, early spring) or to fish (summer).

The land is important to people of the communities, because of its essential role in supporting one leg of the economy: hunting, fishing, and trapping. In 1998 68% of the residents of the Kitikmeot hunted and fished and 13% trapped. These numbers are up from the percentages calculated for 1994 in the NWT Labour Force Study.

Although harvesting is a part-time activity for most people, production per hunter is high with the average hunter in the Region taking 1,000 to 1,500 kilograms of meat and fish each year. The replacement value of this food is estimated at between $10,000 and $15,000 per hunter per year. Most local households hunt, fish, trap, gather, and consume the food from this harvest. Country food replaces expensive store-bought food and compared to imported foods, country food provides a better source of nutrients such as iron, magnesium, and calcium. Seal meat, for example, has six to ten times the iron content of beef. Both traditional knowledge and scientific data point to the important connection between individual (and community) health and well-being and access to reliable sources of country food.

Non-resident hunting and tourism are increasingly important contributors to the Nunavut economy, but still represent only a small fraction of the GDP. Mining and mineral exploration are significant contributors to the Nunavut economy and that sector's contribution is growing. Of the $61.3 million spent on 36 different projects in 2001, fifty percent of the projects were located in the Kitikmeot Region. The Nunavut Mining and Exploration Overview 2001 described the Kitikmeot as the hotbed of exploration in 2001. Diamond and gold were the two primary commodities sought by companies in the Kitikmeot Region in 2001.

Occupational Health and Safety

A conceptual occupational health and safety plan has been developed that addresses the requirements of the *Northwest Territories Mine Health and Safety Act and Regulations*. Since the Jericho deposit will be mined by contract mining, the contracting company will play a significant role in development of the operations occupational health and safety plan.

Heritage Resources

Fedirchuk McCullough & Associates Ltd. in 1996 and 1999 completed an inventory and preliminary impact assessment of the archaeological and historical resources in the mine area. Twenty-five archaeological sites were identified in the mine area during the field study. Of the 25, nine are isolated finds, eleven are artifact scatters, two are habitation sites, and three are quarries. Each of the sites is documented in Fedirchuk McCullough & Associates' 1996 report, which is registered in the Prince of Wales Heritage Centre in Yellowknife. From a scientific perspective, none of the identified sites are of sufficient potential of significance to require avoidance by development. At only one site controlled excavation was recommended (and carried out in 1999), in order to determine if additional undisturbed cultural features were present. Additional reconnaissance work was conducted at the potential tailings (coarse and fine) sites for a stand-alone operation.

Traditional Knowledge

Traditional knowledge is considered to be important in evaluation of development proposals in Nunavut for two principal reasons: lack of scientific data on valued ecosystem components; and the importance placed on traditional lifestyles by communities, i.e., maintenance of traditional lifestyles is a key to community wellness. Traditional knowledge sources examined for the Project included visits to the site by Inuit elders, community consultation, and WKSS reports, particularly those dealing with Bathurst caribou. Information from this knowledge base, particularly with respect to caribou behaviour, will be used in the management approach at the mine to prevent harm to caribou herds from mining activities and to prevent harm to Project facilities from large groups of caribou migrating through the Project site.

Community Consultation

Community consultation is a requirement of the assessment process in Nunavut (and most other jurisdictions). Community consultation is required in any event to ensure a project meaningfully addresses legitimate concerns of people that will be affected by the project.

Tahera Corporation (and its predecessor Lytton Minerals) carried out extensive community consultation from 1996 in all communities of the West Kitikmeot region that would be affected by the Project: Kugluktuk, Cambridge Bay, Umingmaktok, and Bathurst Inlet. In addition, several other Nunavut communities were consulted, including Gjoa Haven, Taloyoak, and Pelly Bay. Meetings with responsible government agencies were held in Kugluktuk, Cambridge Bay, Gjoa Haven, Iqaluit, Yellowknife, and Ottawa.

The message from communities to Tahera was that the desire for employment among young people was very strong. The Company also heard that protection of water and wildlife, particularly caribou, was of paramount importance to people.

Mine Waste and Water Management

Stream C1 at the Jericho site presently runs through the area proposed for the open pit. This stream will be diverted around the north end of the pit, and into Carat Lake. The diversion channel in stream C1 will redirect water to Carat Lake to prevent dry-out of the lower reaches of the stream, which contain grayling spawning habitat. Discharge from the waste rock, overburden, and ore stockpiles will be collected and retained in settling ponds to remove suspended solids; additional treatment may be required to remove ammonia. A number of alternatives are being considered including additional storage time in the PKCA, spray irrigation, and a water treatment plant.

It is expected that the impacts to the receiving water quality will be minor, and will be localized to Lake C3 and Carat Lake at Jericho. Water will be discharged from the processed kimberlite containment area annually to maintain the water balance in the facility. Water will meet the Project's water licence criteria prior to discharge and will be non-toxic. Fugitive dust may be problematic close to generation sources during periods (i.e. winter) when effective water control is not possible. Once underground mining begins the potential for fugitive dust emissions should be greatly reduced, because much of the dust generating activity will be underground.

Emergency Plans

Draft versions of a Hazardous Materials Management Plan, a Spill Prevention, Countermeasures and Control Plan, and an Emergency Response Plan have been developed.

Auditing and Continual Improvement

Despite careful planning, certain components of the Environmental Management Plan (EMP) may need to be modified. It will be necessary to audit or review the plan to pinpoint those components that need correction, adjustment, or upgrading. A goal will be to continuously audit all aspects of the plan for effectiveness. In general, the ISO-14001 protocols will be followed.

Throughout the mine life, as policies and regulations change and technology advances, the EMP will be modified to address changes and to benefit from technology advances, where benefits can be clearly demonstrated. The number one objective will be maintaining compliance with regulations governing the Project.

TITIRAQHIMANILLUANGIT HIVUNNIURNIKKUT

Takughauniriit

Benachee Resources Inc., tamaat nanminiriplujjuk ukuat Tahera-kunni Kuaparisat (Tahera) hanajumaplutiklu havaarilugillu qipliqtunik ujarakhiurnikkut ("una Jericho-kunni Ujarakhiuqtit Piliriarutigijaat) haniani tunuata kiklingani uumap Tahirjuap (Contwoyto Lake-mik taijauvaktu) uvani Nunavut Nunanganni (NT). Havaarilirniaqtaat ukunani angmaumajumi ujarakhiurnikkut tunuata kiklingani uumap Tahirjuap (Contwoyto Lake) uvanu Uataani Qitirmiut. Havingnik ungavavangniaqtut maniqqamit havaarilugit tatqiqhiutinin iingujut (8) talvani ukiumi (April-mit November-mut) talvalu havaariinnarlugit ukiuq tamaat. Hiqupluttiaqhimajut qipliqtuniqaqtunik (ahu haniani 15%-ngujuni haffumap havagviup ilanganni) milukaqtaulutik talvunga tahirmut hanianiittumit uumapt havagviup initurlianni (taijauvatumi Takijuq Tahiq); pijuminangittu (hapkuat ilangat uvani havagvingnin pijauvaktut tahapkuangungittut kihimi ujaqqat qipliqtut) katitiqtaulutik atuqtauvangniaqtut matugijauvaklutikluunniit aallanullu atuqtauvaklutik qanurliqaak matugijauvaklutik. Ukiuraangattauq hikumi apqutiqarlutik akjaqattaqpangniaqtut hunanikliqaak ingilrutighaniklu uvunga Jericho-kut initurligijaannut. Tajja havautigijamingnit ukuat ujarakhiuqtit havagviat havauhiqaqpangniaqtut ukiunik-iingujunik makitajjutigilugit havaktiqaqpaklutiklu 110-ngujunikluunniit 175-ngujunikluunniit inungnik (ilagilugit havaktiillu kaantraaliqijillu) hapkuninga avvarijaannik havakpaklutik havautigiiqattarlutik ukunani havavingni pivangniaqtut. Tahera Kuaparisatkut qinirhivaghutik ujaqqanik qipliqtunik uvani Nunavunmi saivanik ukiunik qinirhialirhutk (atuliqtinnagu 1999 himmautigijaat havavik una, Lytton Minerals-kut). Hamna havagvik ilitturihimajut qaffinikliqaak tahapkuninga qipliqtuniqaqtunin ujarakhiurnikkut talvalu tajja huli qinirhiaffaaqpangniaqtut ukunani Jericho-kut Piliriarutainni. Hamna tikittumajaat ilagijaghainni qipliqtuniqaqtunik ujarakhiurnikkut haniani Jericho-kut talva haffuminga havagviujup makitapkautigijaaghaanin. Kiinaujaqtaarutigijaghaat ukunangat tutquqtuivingnut-iliffaaqtauvangniaqtut hapkuat qinirhiajjutighamikkullu havautigijaujjutighakkullu piliriarutighainnik.

Kitulluanik Pijuminarninganik

Kitulluanik pijuminarninganik ihivriughivaktut ujarakhiurnikkut, havauhighaanniklu akjaqattarnighaanniklu. Hamna piliriarutainnik pinngitkumik tammainiaqtut kiinaujaqtaarutighainnik kavamatkut imaatut kiinaujaqtaarnikkut tunihivagutainnin tutquqtuivigijaininlu, havaaghaqarnikkullu kaantraaliqinikkullu Nunavunmiunnut, iliharnighakkullu tahapkuninga ajunngitimingnik havaaqaqtunut. Hilarjualiqinikkut tahamna aallanguutigilimaitaat. Qanurliqaak, aulapkainighakkut parnaijautighaanni, akhuurutigijaat mikiniaqtuq talvalu tahamaniinnaq mihinngarniaqtuq havagvigijamingni. Tahamna ujarakhiurniq nunap ataani pilluaqtauhimajuq ujaqqat talvani pijuminarmata talvalu akikitqijaungmattauq taimaatut.

Kitulluanik pijuminarninganik ujarakhiurnikkut taimaatut nunap ataanin uvangat pijumajaujuugaluamin angmaumajumin ujarakhiurnikkut.

Angmaumajumik ujarakhiurnikkut akikitqijaujuugaluaq taimaatut; tahamna havauhiriniaqtaat tamaitaungittuq nunap iluani taimaatut ujarakhiuqpangniangittut. Qaffiujunikliqaak ujarakhiurnikkut initurlighaqaqtuugaluit hanajaujughanik, talva kihimi angmaumajumik ujarakhiurviqarumik hilarjualiqinikkut taimaatut naammatqijaujuq.

Havingnik havaaqaqtut uvani Lupin-kunni aturniriillu Lupin-kunni uaqtiqtauhimaniit inigijaanni ihumagijaulluaqtuugaluit talva kihimi hamna angijunik aturutiqarniarutigiplugit ingilrutirjuanin talvalu ingiqtuutiniktauq kitunulliqaak tunihivaklutik pijughaungmata. Kitulluanik pijuminarninganik inighainik havaktautaarhimajut qipliqtuniqaqtunik nalvaarhiniit ilijauvaglutik uvunga Jericho-kunnut kiinaujaqtuqpallaarutiginianginmagit talvaluunniit hilarjualiqinikkuttauq ihuarluanginmat taimaatut.

Tahamna ujarakhiurvighaat ilijauhimajuq 1 kilometer-kunnin ungahiktigiqarhuni haangani uataani haffumap angmaumajup ujarakhiurvianni. Kitulluanik pijuminarninganik inighainik kivataani angmaumanip ihumagijaujuugaluit talva kihimi pijumajaungittut hilarjualiqnikkullu akituniqarninganiklu hanauhighaanik akituhukpangnirmut.

Pingahuujut initurliit uvani Piliriarutighani aturumajainni ihuarijaujut ujaqqanik iqqaqturvigijaghainik; ukuak malruk pijaulluarumajaujuk kiinaujaqtuqpallaanginnikkullu hilarjuamullu hivuuranaqpallaanginnikkullu pingahuannin. Tamaita iqqaqtauhimaniit uvungaqtaulaaqtut iqqakuurvingmut 1 talva kihimi amigaitpallaanik iqqakuurviuvangniaqtuq, havauhighaallu akituvallaarluni talvalu ingutaarniriit mikitqijauniaqquuqtut. Talvattauq aallanik kitulluanik pijuminarninganik initurlighanik pillualimaittut havighanut katitirinighainnik tahapkuat qanittughaungmata uvunga ujarakhiurvingnut.

Atuqattarnirighait imaqturnikkut ukunani qipliqtuliqinikkunni ilanganni naammatqijauniaqtuq aujami tahapkuat immat qiqihimaitillugit. Qanurliqaak, tahamna aturutighaa aturaluarumikku talvattauq imailluiffaarutiqaqpangniaqtut, immiqtuqattaqpaklutik uvangat Carat Lake-min. Talvaluttauq imaq kuvijauhimajuq talvangat qipliqtuliqijunin ihuarutigilimaitaat imaqarnighakkut uvani ujarakhiurvingni, kihimi, kingupiklutik pilruurniaqtut tahapkuat imaqarnirini mikitqijauniarmata halumailruvaluit ungavaqtiriniit.

Aallakkuurniqalaittuttauq ukiumi apqutiqarnikkut akjaqattarniq tamajanik uvunga Jericho-kunnut. Amigaitpallaarnikkut uqhurjuaniklu tahapkuningalu tarjuqarniriillu kaasiliivaluit akjarutighait, tingmiakkuurutilugit akituvallaangmat. Qingaunmi-Tahirjuami apqutighaq atuqtauvaktughaq ubluq tamaat hanajaukpat, ungahinngittumik apqutighamin Lupin-kunnin Jericho-kunnun atuqpangniaraat apqutighaq tahamna; ubluq tamaat atuqtaujughaq apqutighaq Lupin-kunnin Jericho-kunnun akituninganin atuqtaullualimaittuq ikajuqtaullualimaitturlu Jericho-kut Piliriarutainnin.

Tajjattauq, qipliqtut ujaqqat niuviqtauvangniaqtut qiplirhaqtauhimaittumik. Ilangannik havaarijaujungnaqtut Nunavunmi-illutik qipliqtunik ujaqqanik kipluinikkut uvani tautuqquuqtaujut angitqijaani Jericho-kut ujarautainni.

Inighaat Qanurliqaak

Tajja ittut qanurliqaak ijjuhiat uqaqtauhimajut uvani Tahera-kut Kuaparisani November 1999 Piliriarutainni Ingiqtuutigijainni. Inighaat qanurliqaak kititiriniit ublumimungaqtaujut unipkaarijauplutiklu ikajuutaunikkut inighaat unipkaanginni.

Ukiunik 26-ngujunik avikturhimajuni katitiriningnik pijungnaqtut ukunangat Hilarjualiqijitkunnin Kanatami (Hilami Hilarjualiqijitkut Ikajuqtii – AES-kunnin taijauvaktut) najuqtaat ukunani Lupin-kunni/Tahirjuami. Hapkuat katitiriniit ilaqaqpaktut initurlinin-kitunikliqaak katitiriniinik katitiqtauvaktunin avatquumajumin tallimat-ukiut katitiqpagaat Tahera-kut. Katitiriningnik katitirivaktut huli tajja.

Mikijunik piqangittut ataani ittumik imarni katitiriniinik ukunani Jericho-kut ilaganni katitiritinnagit Jericho-kut Qipliqtunik Ujarakhiurviannin. Imaqarniqarnikkut katitiriniit katitiqtauvaktut ukunani Jericho-kunni atuliqtillugu 1995. Aputinik ihivriuqhivaktut atuliqtillugu 1996 naunaijarahurrittugit qurluarniriit ilitarinnigahuarhutik tahapkuat aputiqarniriit ijjuhiannik ukiuq tamaat qanurittaaghaita ataani tahaffumap imaqarniriit.

Una akunnganniittuq ukiuq tamaat aullaqpaktuq (MAR-kunnik taijauvaktuq) havagvigijaanni itqurniarhutik aturutighaannik ukuat tallimaujut WSC-kunni igluqpait amigaitqijaunighaqaqtut qulinik ukiunik naunaipkutalgit. Haniani innami hapkuat tallimajut WSC-kut tigumiarnirighait, una Jericho-kut Kuugaq ahu MAR-qarniqaqtut 190 mm-ngunik ukiuq atauhiq. Hamna hivitujumik-piqarniaqquuqtuq ukiuq tamaat qurluangninganik uvani Carat Lake-mi ahu imaatut 0.9 m^3/s-ngujunik.

Una Jericho-kut Qipliqtunik Ujarakhiurviat innamik nunami qiqumainnaqtumi tamaat. Qiqumanniriit amihuniittut talvani kihiani angijuni tahirni atai qiqijuittunin. Qiqumanniriit itiniqarniaqtut ahu 540 m-ngujunik uvani Jericho-kut turhuaqarviini.

Imarighaunmik takuuriqattautighaannik atuliqtut uvani Jericho-kut initurlianni 1995-mi; imarmik katitirivaktut ukiuq tamaat talvuuna. Katitiriniit hapkuat ihumaliurutigiplugit atuqtauvaktut uukturhugit imaqarniriit qanurittaaghaita ujarakhiurviit havaliqtinnagit. Imaqarniriit talvani imakitpiaqtut haviqarniriillu (amigaitqijat mikivallaarhutik per billion-ngujunik), pH-kunnilu, mikijullu tarjuqarniriit talvalu qituttuujut.

Aallatqiingujunik avaalaqiaqarhutik, ivingniklu, urjullu nauttiavaluillu amigaittut ujarakhiurvianni Jericho-kut ihivriurutait iniqtiqtauvaktut talvani.

Uvani Jericho-kut initurlianni, anngutighat initurliit ilagivaktait tahapkuat hilaliqijit ihivriuqhivianni talvani naunaipkutaujumi nauttiarnit nunaujaliurnikkut piliriarutainni. Nunamiuttanik anngutighat aallatqiiktut ukunani Jericho-kut qipliqturhiurvianni turhuangutainni angijut ajaraliaqarniriit kivataani tunuanilu tahaffumap initurliit ujarakhiuqtit, tahapkuallu kingingniriillu ujaraqarniriillu ukunani kivataani (Willingham Hills-mik taijauvaktuni). Imarmiuttat amigaittut talvani haniani initurliannilu Jericho-kut ihivriuqhiviat ilaganni. Niriniarviuvaktut tingmijjanin qujaginnaq tahamna. Upinngakhamilu ukiaghamilu, nutqangagvigiliqpagaallu tingmijjanin aullaaqattaqtunut.

Angunahuarnikkut ihivriurhiniit iniqtiqtauhimajut titirarniriinnik nunamiuttat pitquhiiniklu, amigainniriiniklu aallautqijariiniklu anngutighat tahamani. Ihivriurutait uvani Jericho-kut initurlianni iniqtiqtauhimajuq ukunani ukiuni 1995-min 1997-mun. Uvani Jericho-kut initurlianni, ihivriurhilluaqpaktut tahapkununga anngutighanut inuujjuhirijaghaita kiinaujaqtaarutiginiarumikku ihumagiplugit taimaatut, talvaluunniit aallaniktauq ihumagijarivallaaqtainik hapkuat inuit, ilagiplugit tuktullu, umingmaillu, akhallu, qalviillu, amaqqullu, tiriganniallu, niqainnatuqtunullu, tingmijjanullu aallanullu tingmivaktunut. Tuktut ingilravigivagaat tahamuuna Jericho-kut ilaganni uvani May-mi upinngakhami ingilraaliraangamik irniurvighamingnungauliraangamik uvangallu atparaangat June-min Aagussi-mun utiuffaaliraangamik tatpaunga. Upinngakhami ingilraaliraangamik, tahiit hikuuvaktut, aallakkuurniarutighamingnik pivaghutik. Tuktut tatpaunga aullaqpallialiraangata irniurvingmingnit, aullaarvigivangniaqtaat tahamna ujarakhiurvik ingilraliraikpata nunakkullu imaqarnikkullu, Jericho-kut Kuugaq aturlugu, Jericho-kullu Carat Lake-kullu kingiktukkullu tunuani kiklingani Willingham-kut kingiktuanni uvani Jericho-kut. Takuuqattarnikkut uvani Jericho-kut initurlianni ukuallu naalautiqaqtut-qunguhirmiat-aturhugit nunaujat naunaipkutigiplugit tuktut ingilraviit uvunga kivataanut Tahirjuap talvalu tikijuittugit Jericho-kut initurliat atauttikkuraaluk. Qaffiujulliqaak niqainnaqtuqtut hitirijaat takuvigivagaillu talvani Jericho-kut initurlianni, talvaluttauq hitiqarviqangittut talvani aturvighainni haffumap havaarijaujughap. Hitamaujut niqainnaqtuqpaktut anngutighat aallatqiingujut, hapkuallu tulukkat, nalvaarijaujut ivvaviqaqpaktut kingiktuanni Willingham Hills-kut ilaganni. Hapkuninga ilaqaqtut tingmiaqpait, qupanuaqpaillu, ukiuqtaqtumiuttat kilgaviit, kilgaviit kilgavirjuallu. Una ukiuqtaqtumiittut kilgaviit, ivavaktut iviqarnirni, qinipanirnilu maniqqamilu avaalaqiaqarnini, takunnaittullu kingiktut ilaganni. Tulukkat tahamani kingiktuni ivavaktullu.

Ukuangungittuk Tahirjuarlu Carat Lake-lu, tahiit haniani ittut Jericho-kut initurlianni tahamani itkattut immat, atauhirmi natiqaqtut tahiit, ukuninga ilaqarhutik naqittunik hiniqarhutik tahapkunani. Tamaat iqaluqarniriit aallatqiiktunik saivaujut uvani Jericho-kut ilaganni. Hapkuangujut: Iqalukpiillu, iqaluinnaillu, uugallu, ihuullu, nataarnallu, kapihilivaluillu, kanajullu. Hapkuat aajjikkiiktunik saivaujunik iqaluqarniriinnik titirarhimajunin tahapkunani kuugavalungni nalvaarhivaktut Jericho-kut initurlianni ihivriurhivagvianni tahamani. Amigaitqijat iqaluit titiraqtauhimajut kuugavalungni (tamaita hapkuat kihimi kapihilivaluillu kanajullu) ukiuqaqpallaangittut tahamani imarmiuvaktut iqalugaliurhutik. Iqaluqarniriittauq ikitqijaujut tahamani qurluaqtuni.

Pitquhiminituqqatut ilitturhaiplutik ihivriurhijut, pitquhii uvani Uataani Qitirmiut-Slave-kutigut Ihivriurhijut (WKSS-kunnik taijauvaktuq) unipkaaliurhimajut takuurijautaarhutik nalvaarijauhimaniillu katitirhutigik ukununga Jericho-kut Ujarakhiuqtit Piliriarutainnin hilarjuakkut ihivriurhivaktut naniliqaak ihivriuruminaqtuni. Tahera-kut ilagannik kiinaujanik tunihihimajut WKSS-kutigut ihivriurutigijaghainnin. Uqarnikkut ilitturhaujjauvaktut hilarjuakkut pitquhiannik ukuninga ilihimattiaqtunin inungnin pulaaqattarhutik uqaqatigiingnikkut.

Una Jericho-kut Ujarakhiuqtit Piliriarutigijaat initurlirivaktaanni hanianiluunniit pitquhiminirnikkut aturvigivagainni hapkuat pinghuujut inutuqainnin inuqarvigivagaannin: ukuat Qitirmiut (atiqarhimajuugaluit Ahiarmiuttanin ukuninga atirhivaktunin), ukuat itqilriit Dogrib-kunnin taijauvaktut, ukuallu Yalonaimiuttat Itqiliit. Ukuat Nunavunmi Parnaijarnikkut Katimajiit nunaujaliurhimajut tahamna takughaupkarhugit atuqtaulluaqpaktut ukuninga tamainnin Qitirmiuni nunaqaqtut. Hapkuat nunaujat titirarhimajut ukuat Jericho-kut Ujarakhiuqtit Piliriarutigijaat haangani kiklingniqaqtut tahamani atuqtauvaktuni hapkuat nunalingni Qingaungmi, Umingmaktuumi Kugluktumilu.

Angunahuaqtillu iqalughiuqtillu ukuningaaqtut nunalingni aullaarvigivagait sikituukkullu tingmiakkullu uvunga nunap ilangannut tuktuhiurhutik (ukiumi, upinngakhami) iqalukhiurhutikluunniit (aujami).

Hilarjuakkutigut Mihingnarniqarniriit

Una Piliriarutigijaat hapkuninga mihingnarniqarniarungnarhijut mikijunikluunniit akhuurniriinnik talvani nunami talvalu mikijumikluunniit angijaaqtunikluunniit mihingnarniqarniaqquuqtut tahamani initurlini. Mihingnarniqalimaittulluunniit tahapkunani nunalingni hilangutainni hapkunatigut ujarakhiurnikkullu havagvighakkullu tahamani. Qurluaqtumi C1 uvani Jericho-kut initurlianni tajja qurluaqtuq tahamunga atuqtaujumajunut angmaunanighakkut ujarakhiurvighaannin. Hamna qurluangniq ahinukkuuqtauluni qurluaqtitauvangniaqtuq uvunga Carat Lake-mut. Iqqarnighaittauq hapkunangat ujaqqanin, hapkuningalu amigaiqtunin haviillu katitiriniinin katitiqtaulutiklu tutquqtauvangniaqtut ukununga tahirannuanut ahivaqtirilugit tahapkuat qirhuumaniit; talvattauq ahianin ungavaivaklutiktauq tahapkuninga tuqunaqavalungnirnik. Qaffinikliqaak aturutighamingnik ihumaliuqtut aturlugilluunniit amigaittuliurutikkut uvani Carat Lake-kut tahianni qilamik katitirijjutighainnik tahapkuninga kaasiliivalungnik ilaqaqtunik, ilagannik tutquqtuivighaannik ukunani itkattuni tahirniluunniit kinipanirniluunniit, imaqarnini kuvijuni hapkunanilu imarighautini igluqpaghainni. Quujaqturviillu imarluktullu imarighaqtaulutik pijauvangniaqtut kuvijautinnagit tahapkununga qipliqtuniqaqtunut najugainni. Mihingnarniqarniangittut tahapkunani imaqarniriinni talvani nunani. Immat kuviraqtauvangniaqtut ukunangat qipliqtuniqarniriinin ukiuq tamaat imaqarniriit naammagijainni pinahuaqpaklutik. Immat hapkuat Piliriarutini naammagijauvangniaqtut imakkut naunaipkutaqarniriinnik kuvijautinnagit talvalu tuqunaqalimaittuttauq.

Anngutighat nalvaarijauvaktut Piliriarutigijaghaanni ilaganni aallangulimaittutut ittuq talvalu nunap ilangat tahamani mihingnarutighaat mikiniaqtuq tahamani. Tikinniarungnarhijaat 230 ha-ngujunik nunanik mihigijauniaqtut piliriarutinik hanaliqqata tuhurjjuqinikkut: avatquumajumik 130 ha-ngjunik (57%-ngujut) nunainnarmi inniaqtut (paniumajumi ujaraqarninilu maniqqani). Mihingnarniriit anngutighani naunainniaqtuq, talvalu kihimi angijuni anngutighani tingmijjanilu, mihingnarutighaat mikiniaqtuq. Mikijut anngutighat ilangillu tingmijjat najugaminiit tammarniaqtut tammaumaghaalimaittulluunniit ukuat ujarakhiuqtit talvaniitkumik kihiani talvalu anngutighat najugaminiit angmaumajut ujarakhiurviit tahamani kihimi aallangurniriit aallanguqpiarniaqtut taimuuna.

Uuminga piqarniaqtut "aajjikkuuhiurnighakkut" mihingnarniriinik tahirmiuttani anngutighanut uvani Jericho-kut initurlianni ukuninga ahu havaarijaujunin qipliqtuqarnirhiurnikkut igluqpagijainnin; mikijumin itkannirnik hinainiklu Carat Lake-kut tammainiaqtut hananirmut hapkuninga imaqarvighanin hanalirumik. Ukiumi apqutighamin pijumaniaqtut akjarvighainnin tamajanik uvunga Havaarijamingnut, ikaarviqarlutik uvani Lynne-kunni (hivulliqpaami ukiughami kihiani) ukunanilu Tahirjuat tahianni. Mihingnarniriit apquhiurnikkut ikaarvighait pivallaalimaittut atuqtaililugit tahapkuat tahiit iqalukhiurviqattiaqtut, ukuat atulimaitaat tahamna iqluit iqalugaliurvigivagait ukunani Tahirjuami ilanganni Jericho-kut initurligijainni. Tahamna mihingnarniqaqtuq tahirmiuttanut uvani itkangniqarnini (hinirainni), atuqtauvaktuni imarmiuttanin tahapkuninga imarmiuvaktuninlu iqalungnilu. Niriuktut tahapkuat mihingnarniriit hapkununga imaqarninut mikiniaqtuq, talvalu talvungaqtitauvaklutik Tahirmut C3 uvungalu Carat Lake-kunnut Jericho-kunni. Kuvittailinirlu, upalungnaijautiniklu pittailinikkullu parnaijautiqaqpangniaqtut mihingnaqpallaarnikkut pijumannginmata hapkununga tahirnut. Ahinungauqattaqtighamin ukunani qurluaqtuni C1 immanik uvungaupkaivangniaqtut Carat Lake-kunnut paniqpallaaqunnginmagu naqitqijani talvani qurluaqtuni iqaluqarniqarmata tahamani.

Tahapkuat katihimanikkut mihingnarniriit, tahapkuanginnait hilarjuakkutiguurnikkut ungahiktigijunilu angijualungnilu najugarniriinnik mihingnautiginiarungnarhijaat hanajjuhianni ukunani Jericho-kut Ujarakhiuqtit Piliriarutigijaanni. Una Jericho-kut initurligijaat Lupin-kunnilu Ujarakhiuqtiat 27 kilometers-kunnik ungahiktigijut tingmiakkuurumik. Talva kihimi ungahiktigijaat nunakkut angitqijaujuq Tahirjuaq innami tahamani akunnganni nunami. Qanurliqaak, anngutighat kitulliqaak najuqpagait angitqijaukpata nunamin (tingminikkuttauq, tingmijjanut) ungahingniriit ukuak initurliik akhuraaluk mihingnarniaqtuq ukunangat hanajjuhighaaninlu uumaplu Lupin-kut Ujarakhiurvianinlu najugainnin. Hapkuat ilaginiaqquuqtaat Qingaungmiuttat tuktullu amihuarjuit, akhallu amaqqullu. Qanurliqaak niriulluangittut mihingnarutainnik anngutighallu atuqpagaillu kiinaujaqtaarutigiplugit tahamani nunami.

Una Jericho-kut Ujarakhiuqtit Piliriarutigijaat atauhiujuq amigaittunin havaarijaujuq uvani Uataani Qitirmiut. Ilangit ukuat tajja ittuq una Lupin-kut Ujarakhiurviat, ujarakhiurvighaallu uvani Ulu, Izok, George Lake uvanilu Goose Lake qinirhiavigijauvaktunilu tahamani nunami. Tahamna pijumajaat hananighakkut qanurliqaak akituqarniriinnik akittuqpallaarnikkulluunniit ikiklivallianikkulluunniit igluliurnikkullu aullaarutighakkullu akiinin; inuqangittuniklu ihivriurhinikkut qinirhiajjutighamingnik tajja huli pilihaarutigingmagit talvalu talvuuna hapkuninga nalurhaqtut qanurliqaak mihingnarutiqarniariaghaita.

Umiktiritinnagit parnaijautighaat imaatut Jericho-kut ujarakhiurviat immiqtaunikkut pilraarlutik piniaqtut, nipalliqattarnikkullu talvalu ahu qurluangniriit C1 qurluanganni qurluaqtittilutik (uqautigilraarlutigik kihiani Iqalukhiuqtillu Tarjuliqijillu Kanatami). Qanganguqqat tahamna imaq ujarakhiurvingni tahinngurniarivuq qakugulikiaq.

Qanurliqaak niriugutigijaat tahamna tahiq imarmiuttanik aajjikkutarilimaitaat pitquhiraluangat itiningninganiklu hiniqqukinnirmullu tahaffumap ujarakhiurviugaluap. Hiuraqarniriit ihuilutauniaqtut tahamani (ukiuniluunniit) imaqarniriit ajurnaqqata tahamani. Ujarakhiuliqqata ataani nunap tahapkuat tingilukaaqtut hiuqqat takughauvallaalimaittut ujarakhiuqpangniaramik nunap ataani.

Takuuriqattarnirlu mikitqijaniklu pitquhighainnik taimaatut pivangniaqtut mihingnarniriit munarittiarlugit ukunani Jericho-kut Ujarakhiuqtit Piliriarutainni. Una aturluangniaqtaat hivuuranarnikkut qajangnaqtuni ingilrutainnik hilarjuakkutigut naammagijaujunik parnaijautiqarlutik mihingnarnikkut pitinnagit talvuuna.

Takuuriqattarniq

Takuuriqattaqpaktut qanurliqaak mihingnaqtunik ilitturinahuarhutik talvalu ihuaqtumik pinahuaqpaghutik tahapkuninga mihingnaqtunik pittailiplutik niriunngitamingnit atauttikkuurutainnik. Takuuriqattautighamingnit piliriarutiqarniaqtut atuqtaghait Jericho-kut Ujarakhiuqtut Piliriarutainni tahapkuninga pitquhighamingniklu atuqtaghamingniklu ihuarijaannik Piliriarutikkut Imaqarniriini Laisiqarniriit.

Mihingnarniarutighaat uvani ujarakhiuqtini havauhighaat niriugijaujut inuqarnighakkut kiinaujaqtaarutigijungnaqtaat. Angijut inuqarnighakkut kiinaujaqtaarutigijungnaqtaanni mihingnarniaqtut havaaqarnighakkullu nanminiiqtughanullu havauhighakkut hapkuallu nakuuniaqtut talvani havauhighaanni ujarakhiuqtit. Tahera-kut ilauqatigijumajait hapkuninga Inuinnanut Mihingnarnikkuullu Nunaqaqqaarnikkullu Angirutainnik ukuallu Inuinnait Uataani Qitirmiuttat. Una Angirut ikajuutauniaqtuq tahapkuninga ihuigijaujunut inuqarnighakkut kiinaujaqtaarutit mihingnarniriinut ukunangat Jericho-kut Ujarakhiuqtit Piliriarutainnin talvalu nakuujunik mihingnarniqarumajut. Ilagijaanni uqautauvaktut angirutit, nunalingni akunnganniittughamik katimajiralaaghamik makipkainiaqtut uqaujjiqattaqtughaq nunalingnut ukunungalu havagvingnut hivumuurnikkut qanurittaghaita havaaghaqarnikkut ilihainirlu havaktigharhiurnirlu, aallallu inuqarnighakkut kiinaujaqtaarutighaat uqautigijauvaktullu hilarjuakkullu aulapkainighaannik uvani Piliriarutit initurlighaanni.

Inuqarnighakkut-Kiinaujaqtaarutighat

Una Jericho-kut Ujarakhiuqtit Piliriarutait mikijuq ujarakhiurnikkut havaaqaqtut. Havaktittiniaqtuq 93-nik inungnik ukiuq tamaat aturlugit naingujut (9) ukiut. Aallat ujarakhiuqtit uvani Nunavunmi havaktittivaktut 190-min 300-mun inungnik ukiumi havaaghaqarnikkut. Una Ekati-kut qipliqtuniqarnikkut ujarakhiuqpaktut uvani Nunattiami havaktittivaghutik avatquumajumik 600-nik inungnik ukiumi havaaqaqtittivaghutik talvani ujarakhiurvianni ukiuq tamaat. Qanurliqaak, hapkualluunniit 93-ngugaluarhutik inungnik ukiuni havaaqarnikkut mihingnaqtuqtauq uvani nunalingni mikikunik inuqqukitkaluarhutik uvanitut Qitirmiuni. Una angijumik mihingnaqtuq inuqarnighakkut-kiinaujaqtaarutighat mihingnarniriit havaaqaqtittivangniaqtullu nanminiirutauvangniaqtullu havaaghaqarnikkut.

Una Inuinnanut Mihingnarnikkuullu Nunaqaqqaarnikkullu Angirutainni uqautigiqattaqpangniaqtaat ukuallu Qitirmiuni Inuit Katutjiqatigiingnilu, una pitqujauhimajuq Inuinnanin katimajighaannin uvani Qitirmiuni nunagijaanni uvani Nunavunmi.

Una Uataani Qitirmiuni Nunaat avvarijaat uvani uataani haffumap Qitirmiuni Nunaanni, atauhiujuq hamangat pingahunin aulapkaitittiujut uvani Nunavunmi. Una nuna ittuq uvani Qitqani Ukiuqtaqtumi 900 km-ngujunik ungahiktiqaqtuq Yalonaimi, 800 km-ngujunik uvangat Inuuvingmit talvalu 400 km-ngujunik uatigijaat Uqhuqtuumin. Hitamanik nunaliqaqtut talvani avikturhimanianni nunami: hamalatkut ukunani Iqaluktuuttiarmi Kugluktumilu, talvalu nunaliit mikijuk ukuak Umingmaktuurlu Qingauklu. Ukuat nunaliit pijaujut qanitqijaungmata uvunga havaarijaghap inighaanni; ilihimattiarmatigiklu tahamna nuna havaaqarnighakkut initurligijaghaat talvalu havaktighamingnik, ikajuutighamingnik tamajaghamingniklu pilaaramik tahamani.

Uvani 1998 Uataani Qitirmiut Nunaanni inuqarhimajuq haffuminga 2,746 talvalu uvani 1996 inuqarhimajuq haffuminga 2,618, aklivaalliqtuq haffuminga 128 inungnik 5%-ngujunikluunniit taimaa. Hapkuat 1,080 inuqarniriit havaktut uvani Iqaluituuttiarmilu Kugluktumilu uvani 1996-mi, 485 talvaluunniit 45%-ngujunik havaaqaqtut kavamatkunni, ilagiplugit ilihaqtittinikkullu aanniaqtailinikkullu. Una aippaa angitqijautigijaat, 300 inuqarniriit talvaluunniit 28%-ngujunik, havaaqarhutik aallani ikajurnikkut. Hamna hapkuninga havaaqarhimajut naalautiliqinikkullu aallallu tatqaani havaaqaqtut, kiinaujaliqinikkullu titiqiqinikkullu, niqiliqinikkullu niuqqaqtittinikkullu aullaaqtittinikkullu tutquumajuliqinitkullu. Uan hannangujut avatquutaillu saivatingujut (170) inuqarniriit talvaluunniit 16%-ngujut havaaqaqtut hapkuninga iqalughiurnikkullu naniriaqturnikkullu, ujarakhiurnikkullu igluqpiurnikkullu. Uan hannangujut avatquutaillu tuanti-faingujut (125) inuqarniriit talvaluunniit 11%-ngujut havaaqarhutik niuviqtittinikkut havagvianni.

Una Qitirmiuni kiinaujaqtaarutit aallatqiiktut pingahuujunin pilluaqtauvaktut: akiliuhiaqattarnikkut kiinaujaqtaaqpaktut, kavamatkunnin akiliuhiaqpaktut talvalu pitquhiminirnikkut hulilukaarutainnik. Amigaittut inuit havaaqaqpaghutiklu manikhiuqpaktut talvalu kavamatkunnin akiliuhiaqpaghutiktauq pitquhiminirnikkut hulivaghutik hapkuninga angunahuarnikkullu iqalukhiurnikkullu pivaghutik. Hapkuat akiliuhiarutigivagaat kavamatkunnin imaatulluunniit tunirhaktauvaktut akighinaarnikkut talvaluunniit ulaassirnikkut. Hapkuat tamaita pingahuujut atuqtauvaktut piqpagijaujut tamaita havauhiilu tunirhaujjuhiilu hamani kiinaujaqtaarutait aallatqiighutik pitquhiinin talvalu aallatqiighutik tunirhaktauniriit hapkuninga piliraangat angunahuarnikkullu havaaghaqarnighakkullu najurnairaangata.

Havagviat Aanniaqtailiqijillu Inulirijillu aipparijaanin angitqijaujuq kiinaujaqtaarnikkut ukunani Kavamatkut Nunavunmi hivulliqpaarijaanni uvani 1999. Tamaat kiinaujat $117.4 million taalaujuq talvaluunniit 22 per cent-ngujuq. Una havagvik aulapkaitittivaktut aanniaqtailinikkut ikajuutainnik kivgarhugit Kanataup Kavamait munariplugit inuit Qitirmiuttat. Nunalingni Aanniaqtiliqijillu Inulirijillu Havagviqaqtuk uvani angitqijami malrungni nunalingni talvalu Angajuqqaaqarhutik Havagvianni uvani Iqaluktuuttiarmi. Ukuak malruujuk aanniarviik uvani Kugluktumi Iqaluktuuttiarmilu munarhiqarhutiklu inulirijiqarhutiklu.

xsM5tp4f5 si]vz5

ckwozi z

W]N8y Ehxy{f5, N1uiE/sJ5 bBwsC fxS]En4f8i5 GbBwsCH X3N4ymK5 nNix6Lt4 xsM5tix6Lt[l s/C1ix3=1u4 s/ci4 yt]Mi4 G"psEf s/ci4 yt]Mi4 WoExz5"H ciQ/zi sx1Nzb v8gwb]b4 kNK5 kNzi. xsM5tQx3ix6S5 s4fwzJu4 s/C1ix6t5tlt4 sx1Nzi v8gwb]b4 sxoi6Xyxi et3us5. n=4 s/C1ix6bsc5b3ix6S6 bei4 (_i4 srsu xbsy3u GwSD9u5 tn7SEj5H srsl4]b3li WoExali. nN/siz n=4nw5 s/ci yt]MaJ5 GciQ/zi !%- WoExc3=sJjx6bs?9oxJ5H X2bsc5b3ix6S5 bys2 ciQ/zi WoExc3=sJ2 ciQ/zk5 GkNQ/sJu xtc6gj5]M1o4H; wo3ifq5 xqJ5 GWoExc3=1u wo3ifw5 s/ci yt]MaJ5 wMs8q9lQ5H vtbsix6S5 xg6bsJ4nslt4 nN0Jbslt4 nsy0Jt4nsix3lt4 xyq8k9l k]b8a6tEi3j5 xg6bsix3lt4 ra9o6]Ku4 nsy0Jtc6t9lQ5 xg6bslt4. besJi srsi srs4f5 x2d5 xg6bsix6S6 wq3Cvb4t5t0Jbsli hNgw8N3i4 xg6bsJ4ni[l psEfj5.]n8N WoExaJ5 mo[lQ5 s/C1ix3=1u WoExc3=1ul srsi4 *_i4 WoExaix6S6 x7m wcNw/6t5tli ciQ/zi4 !!)_u5 !&%_k5 GwMslQ5 wcNw/6t5]y8g]C4tsJ9lH N2XE/q5 wisJu WoExc3=1u ir5]bC/6Lt4. bBwsC fxS]En4f5 e]i8Nc5b6ymK5 s/ci4 yt]Mi kNKu srsao6gi &_aJi G!(((trMs6t8NA v7XisMs6g5, ot5 ukD{ eic5b6ymK5H. v7XisJ5 NlNw6yK5 s/ci4 yt]Mcs6gi4 x7m e]i8N3ix6S5 x7m WoExcw8N3lt4 Niy}=Q/q8i5 WoExaizi psEf WoExE/z. g]C3=4nc6S5 NiyJmlt4]tNs0/4nsbs4v8iD8N6gi4 s/ci4 yt]Mi4 Wbcs6gi4 wiQ/zi psEf2 WoExaizk5 szy4yQxDbsN/6g6 WoExc3=sJ2.]tNs/5 ne2X9oxJ5 WoExaJu5 xg6bs4v8i3ix6S5 eiDbslt4 x7m WoExcDbslt4.

wodyE/s]z D8N6g5

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k]8a6tEi6 xg6bsJu4 wm3u4 s/C1ix3=1u n=4nc6gu xs/4f5 WoExaJ8N6S6 wm6 dxa8qt9lA. ryxi, wms2 f=/sQxc3izi4 kczt5tJ8N8qM6, x7ml wms2 xg6bsQxc6g2 rsE5]b4u5 kczt5tq9li. x7m f=/sJ6 wm6 xg6bsJ6 s/C1ix3=c3=1u5]k6r4]K9o6bsN/8qM6 k]8a6bsQxc6X5 WoExc3=1j5, WsJ8]i3i6nsN/6S6 wmr8i6nsJu wo3ifw5 NJ6bcC/6t9lQ5.

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WoExaJi wodyE/sJ5

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srsi2 @^_i4 x=4g6ymisJu gnZ4n5 xgw8NsK5 x?lusboEp4f8i5 vNbu5 Gx?lzb x?lusboEi3j5 WoExc3=1uH WoExc3=sJi]lW7uFv8gwb]b4u.]b4fx gnZ4nw5 wMc6S5 wisJi4 gnZ4ni4 vtbsifi4 bBwsC4f8i5. gnZ4n5 vtbsJ5]h8N vtbsc5b6S5 vJysmw8N6gu4.

wm3i ur5gi gnZ4nw5 xgw8NsMs8qM5 psEfj5 vtbsJ5 psEfu s/ci yt]M vtbsMs8q8iq8i WoExE/q8i. wm3j5 gnZ4nw5 vtbsc5b6g5 psEfu5 bwmzi5 vtbsc5bo6S5 !((%_u5. xSt5 cspn6bsiq5 bwmzi5 WoExac5b6S5 !((^_u5 n3?s?9oxJ5 gnZ4nq8k5 wMs2lt4 wobE/st9lA W7mEsiz xSts2 xs4g5 x3]CAb]h6 wm3kxc5b6g5 ur5]gbsJk5.

x3]CAb]h6 xs1isJ6 WoExaJj5 NlNw6bsMs6S6 xg6Lt4 b9omi4 WSC cspn3=q8i4 sz]bk5 srs5 !) cspn6bsJi4 xg6Lt4. mo[lQ5 wiQ/q5 b9omk5 x4gxic6t9lQ5 WSC cspn3=1k5, pxEf E? whmQ/sK6 x3]CAb]h6 xs1icC/Ex4nzi4 !() uoubi4. bm8N nioc6S6 x3]CAb]h6 n3?sisJu4 rsE5 o4u).(u#Fs.

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LIST OF FIGURES

All figures are located at the end of the report

LIST OF MAPS

LIST OF ATTACHMENTS

All attachments are at the back of the report.

1.0 INTRODUCTION

1.1 CONCORDANCE TABLE

Pursuant to guidelines of the Nunavut Water Board (NWB) Table 1.1 provides a concordance table of where in this report items listed in Guidelines for the Proponent are addressed.

1.2 SUPPORT DOCUMENTS

Table 1.2 lists the support documents appended to this Final EIS.

1.3 TAHERA CORPORATION

Tahera Corporation is a publicly traded mining/exploration company with diamond interests in Nunavut and NWT. Benachee Resources Inc. is a 100% held subsidiary of Tahera Corporation. Tahera Corporation has the full right to act and negotiate on behalf of Benachee Resources Inc. for the purposes of this Project. The Jericho Diamond Mine will be the company's first operating diamond mine.

1.3.1 The Jericho Project

Project Name: Jericho Diamond Project, Nunavut Territory (Figure 1.1)

Owner: **Toronto Office**

Benachee Resources Inc.
803 121 Richmond Street West
Toronto. Ontario
M5H 2K1
Benachee Resources Inc. is a wholly owned subsidiary of Tahera Corporation whose corporate office is located as above.

Mr. Gregory Missal, VP Nunavut Affair
803 121 Richmond Street West
Toronto. Ontario
M5H 2K1
Phone: (416) 777-1998

Mr. Grant Ewing, VP Investor Relations and Corporate Development
803 121 Richmond Street West
Toronto. Ontario
M5H 2K1
Phone: (416) 777-1998

1.3.2 Corporate Environmental Policy

For the Jericho Diamond Project, Tahera's environmental policy will apply to all employees and contractors, where applicable. Information and explanation of Tahera's environmental policy will be part of orientation for all new employees and relevant parts of the environmental policy will be written into contracts for companies providing services to the mine.

It is Tahera's policy to achieve a high standard of environmental care in conducting its business as a resource company contributing to society's material needs. Tahera's approach to environmental management seeks continuous improvement in performance by taking account of evolving knowledge and community expectations.

Specifically, it is Tahera's policy to:

- Comply with all applicable laws, regulations and standards; uphold the spirit of the law; and where laws do not adequately protect the environment, apply standards that minimize any adverse environmental impacts resulting from its operations;
- Communicate openly with government and the community on environmental issues, and contribute to the development of policies, legislation, and regulations that may affect Tahera;
- Ensure that its employees and suppliers of goods and services are informed about this policy and are aware of their environmental responsibilities in relation to Tahera's operations;
- Ensure that it has management systems to identify, control and, monitor environmental risks arising from its operations and to prevent environmental impacts prior to their occurrence;
- Conduct research and establish programs to conserve resources, minimize wastes, improve processes, and protect the environment;
- Take appropriate corrective actions should unexpected environmental impacts occur. Appropriate actions will be taken to prevent reoccurrence of such unexpected impacts.

1.3.3 Exploration History

Following staking in 1993, Lytton Minerals Ltd. and New Indigo Resources Inc. (amalgamated in 1999 to form Tahera Corporation) initiated exploration on the claims with several campaigns of regional to detailed overburden sampling and airborne geophysical surveys. Significant indicator mineral trains were outlined in 1994 on the Burnside and northern most Jericho claims, indicating a potentially diamondiferous kimberlite source in Carat Lake. Since 1994 several dispersion trains have been identified and a number were drill tested in 1997. Delineation and definition drilling, decline development and underground bulk sampling, and a resource estimation were carried out on the Jericho Pipe through 1996 and 1997. The 1998-2001 programs consisted of: airborne geophysical surveys and ground follow up; overburden sampling for indicator minerals; prospecting and geological mapping; and drilling of the Contwoyto-1 pipe (located in 1998) with a large-diameter rig to obtain a mini-bulk sample for estimation of tonnes and grade.

An environmental baseline study was implemented by Lytton-New Indigo in 1995 in order to obtain land use permits, water licences, and to provide information for a Project EIS required for mine approval. Environmental studies have been on-going through 2001.

Tahera's permits are current and in good standing, or have been reapplied for, or Tahera has applied for an extension. The company has a reclamation bond of approximately $864,000 in place, through its water permit with the Nunavut Water Board, to cover the cost of clean up and rehabilitation of the Jericho site. Tahera and its predecessor companies have always strove to conduct their operations in an environmentally responsible manner. There are presently no significant outstanding environmental assessments that have not been addressed by the company.

1.4 SUSTAINABLE DEVELOPMENT AND PRECAUTIONARY PRINICPLE

The Nunavut Planning Commission (1997) defines sustainable development as:

> …the management of natural resources and the environment in such a way that economic, social and cultural needs are met and ecological processes and natural diversity are maintained.

The Commission further states:

> The people of the region have stated clearly and consistently over the years that there must be a balance between industrial development and other human activities in order to guarantee the long-term preservation and conservation of the land, wildlife, and wildlife habitat.

Mining involves the exploitation of non-renewable resources; the challenge is to carry out this exploitation in such a way as not to preclude use of the post mining land for other purposes. The Jericho Diamond Project intends to meet this challenge by minimizing disturbance to the land (consistent with economic development of the Project and safety of operations) and by progressively reclaiming the site (consistent with best restoration practices and constraints imposed by the Arctic climate).

A requirement of the Nunavut Water Board (NWB) for issuance of the Jericho Water Licence will be application of *the precautionary principle*. By this the NWB means environmental stewardship that includes addressing potential environmental impacts that may occur, but for which there may be no scientific certainty. The Jericho environmental impact, socio-economic effects, and heritage resources impact assessments have addressed all known potential effects of the Project on the environment, economy, culture, and heritage of the region, in turn, keeping in mind the requirement to balance mining activity with preservation and conservation of the land, its wildlife and their habitats, and the quality of water and air, as well as add to the economy and quality of life in the West Kitikmeot region. A key to the Jericho operation will be implementation of an adaptive management plan; this plan will be comprehensive in its approach, responsive to the unexpected, and flexible to changes needed to address the unexpected. A comprehensive follow up monitoring program is planned that will provide an audit of predictions and allow early detection of unwanted changes and corrective action on the part of Tahera Corporation.

1.5 REGULATORY REGIME

To operate, the mine will require a Water Licence issued under the authority of the Nunavut Water Board (NWB).

A Mining Lease and Land Leases will also be required to operate the mine. The Kitikmeot Inuit Association or DIAND, depending on land ownership, issues mining leases.

The Jericho site is on both Inuit owned (surface rights) and Crown lands. Land leases will be required: for Inuit owned lands from Kitikmeot Inuit Association (KIA), and for Crown land, from Department of Indian and Northern Affairs (DIAND).

A Section 35 authorization for alteration of fish habitat will be required for construction of the C1 diversion, use of Long Lake and Stream C3, dewatering of Long Lake, and construction of the water intake. The Project will require a quarry permit for esker borrow sites, and permits for explosives transport, manufacture, and storage. As well, permits may be required for camp incinerators and sewage disposal. Depending on the nature and extent of the operational monitoring program, permits may be required to conduct some of the monitoring activities, e.g. a Fisheries Act Section 52 approval for collection of fish.

Exploration activities to date have required certain permits and licenses. These regulatory instruments are listed in Table 1.3

1.6 LAND TENURE

The Jericho kimberlite is located entirely on federal Crown Land; land tenure must be secured through the Indian and Northern Affairs Canada (DIAND) in the form of land leases. Land access, and other components of the site infrastructure, to the Jericho site is through land that has Inuit surface rights; access will require a land lease from the Kitikmeot Inuit Association, the Designated Inuit Organization for the Kitikmeot region of Nunavut. Proposed boundaries for leases are contained in lease applications, which were previously submitted to the appropriate regulatory authorities. Copies are attached here (for information only) in Permit Applications (Appendix A.2).

2.0 THE PROJECT

2.1 PROJECT JUSTIFICATION

2.1.1 Revenues to Government

Nunavut currently depends on several hundred million dollars annually from the Federal Government. A desire of the Nunavut government is to decrease this reliance by recognizing that mining will play a major role in achieving a self-sustaining economy for the Territory. Government jobs, which are paid for out of tax revenues, account for most of the employment in communities of Nunavut. With development of a self-sustaining economy will come the need to diversify the economic base. There is great potential for finding and developing exploitable diamond and precious metal deposits in Nunavut, especially in the West Kitikmeot region. The Jericho Diamond Project has the potential to be the first of these. Existence of a producing diamond mine in the region will act as a magnet for further investment in diamond exploration and diamond mine development in the region. Timely approval of the Project will provide a signal to investors that Nunavut is a good place to do business.

2.1.2 World Diamond Supply

The natural diamond supply in 2000 was 110 million carats, worth US$7.86 billion. Supply of rough diamonds to the market was, however, almost US$9 billion, as De Beers sold an additional US$1.1 billion worth of diamonds from its stockpile. The EKATI™ mine produced 2.6 million carats in 2000. Diavik plans to produce up to 6 million carats per year (Rombouts 2001). The world's largest diamond mine, Argyle in Australia, produced 30 million carats in 2000, down from an average annual production of 40 million carats (Janse 2001). In contrast, the entire life-of-mine production for Jericho is projected to be 2.53 million carats. As can be seen, the Jericho Project will have no significant effect on the world diamond market. However, the economic effect on Nunavut will be significant.

2.1.3 Employment and Business Opportunities for the Kitikmeot

The Jericho Project will provide employment and business contract opportunities for Nunavummiut; it will provide taxes and royalities to government. While the Project is small by comparison to the large diamond mines in NWT, it has the potential to directly employ over 150 people. Spinoff effects of this employment will be much greater. Skills learned by people working for the Project at the mine, or elsewhere in Nunavut, will be transferable to other vocations once the mine closes. This will be the long-lasting legacy of the Jericho Diamond Mine. To the extent that competitive services can be offered, Inuit-owned firms will be given preference for contracts servicing the mine.

Additional economic information is contained in the Socio-Economic Report (Appendix C.1.1).

2.2 PROJECT ALTERNATIVES

2.2.1 Mining

The Jericho kimberlite is the only kimberlite resource, held by the company, which can be economically developed at this time. If more economic kimberlite pipes are found to be worthy of developing in the vicinity of the Jericho kimberlite, their extraction may utilize the infrastructure developed for the Jericho Mine. Economics and geographic proximity would ultimately determine if the Jericho site could be utilized for processing of any future economic kimberlite discoveries by the company. Any mine plan related to future discoveries will likely entail a separate environmental impact assessment and will be determined by permitting and regulatory authorities.

2.2.1.1 Open Pit

Alternatives for open pit mining are discussed below. Alternatives would not appreciably affect environmental impacts of the Project, but are important for economic considerations. Both paced and accelerated production were considered as alternatives for open pit mining. Accelerated production will require the construction of two main ore stockpiles (for central and northern lobe ore) and one low grade stockpile (see Map A, Appendix E). Ore stockpiles will be largest at the end of Year 4 when the central and northern lobe stockpiles will contain about 400,000 and 500,000 tonnes of ore, respectively. The low grade stockpile will then contain 1.7 million tonnes.

The alternative to accelerated mining was to mine at a rate in balance with the process plant (i.e. 330,000 tonnes per year). However, estimates indicated higher unit mining costs (due to a lower production rate) and higher fixed costs (due to the carrying costs for equipment trapped on-site). The result was less than optimum cash flows.

The choice of accelerated production will not result in any increase in the footprint size, nor changes in the final configuration of mining units, such as waste dumps or pads.

An alternative to the combined open pit - underground mining is an entirely underground operation. In remote and high cost areas like the Jericho site, Project development would not be feasible without initial open pit mining. Only open pit mining provides both high extraction and development rates, relative to capital expenditures needed to repay heavy investment costs required for the infrastructure. Furthermore, dilution of ore is less with open pit mining; estimates by Project mining engineers are 20% additional dilution with underground ore extraction. Finally, financing will certainly be more readily obtained with a combination open pit-underground operation than an entirely underground mine.

At approximately 180 m depth, open pit mining will cease and underground mining will commence. Once waste rock removal becomes excessive, underground mining will become more economical. The economics of underground mining are based on the geometry and value of the kimberlite, the cost of ramp and sublevel development, rock mechanics considerations, and the direct mine operating costs.

Mine operation by Tahera as opposed to the use of a mining contractor was considered. The trade-off of higher operating costs, resulting from use of a mining contractor (with equipment provided), was determined to outweigh the additional capital Tahera would need to raise in order to purchase its own mining equipment. Tahera believes that sufficiently experienced and qualified Nunavut contractors exist to carry out these mining operations.

2.2.1.2 Underground

Selection of a mining method nearly always involves a compromise between cost, resource utilization, dilution, and production rate. In this respect it is useful to consider the evolution of most underground kimberlite operations. All of them started with open pits (of one sort or another), which then converted to glory hole methods until control of dilution became critical, at which point caving methods were used.

Current underground kimberlite operations favour block caving, if it is applicable. Considerable sub-level caving has been tried, but there is very little done now. Open benching has also been widely applied. There have been some trials with open stoping and vertical crater retreat, but with variable results. There are no backfill operations. The method chosen for Jericho, based on engineering and cost considerations, was open benching.

2.2.2 Ore Processing

An alternative to mining and processing at Jericho is construction of a processing plant at the Lupin Mine site, stockpiling of ore at Jericho, and campaign hauling of ore to Lupin over a winter road to the Lupin Mine. This alternative was discussed in detail in Tahera's November 26, 1999 Project Proposal (Tahera 1999). Pre-feasibility level studies carried out for Tahera by SRK Consulting showed lower capital costs, but also higher operating costs, because of the requirement to haul ore 29 km to the Lupin site. Environmental impacts could be less with a satellite operation, since PK containment areas would be shared under this scenario. However, this alternative required a high level of mutual technical cooperation and applications to regulatory agencies. With there being no economic advantage to a satellite operation and given the small footprint created by a stand alone option, it was determined that a stand alone option was preferable, as is the case with most mining operations.

There are no economic alternatives to the proposed method of ore processing. The recovery process of diamonds from kimberlite is well tested and proven. No alternate process was considered.

In arriving at the selected site location for the processing plant, a number of alternatives were considered.

i) In the valley next to the winter road access – ground conditions were considered to be too wet.

ii) On the hill above the winter road access – a suitable area for coarse PK disposal could not be found; it also added approximately 1km to the fine PK disposal pipeline.

Alternatives are discussed further in the Project Description (Appendix A.1).

2.2.3 Materials Handling Facilities

An analysis of site alternatives for mine components (waste rock dumps, ore stockpiles, PKCA) has been conducted. The three waste rock dump sites shown in Map B (Appendix E) are viable. However, analysis favours splitting the waste into Dumps 1 and 2. Dump site 1 has the capacity to hold all planned waste rock; use of Dump sites 1 and 2 will reduce the height of a single waste dump, allow more flexible management of waste rock, and lower trucking costs. Dump site 3 was deemed less desirable from both environmental and economic standpoints; drainage control was a concern and haul distance was slightly greater.

Ore stockpiles, for economic reasons, need to be placed close to the processing plant. While alternate locations are possible, the preferred placement will result in the least amount of distance for rehandling. This in turn will reduce fuel consumption, which means less winter haulage of fuel to the site and less emissions from mobile equipment during operations.

2.2.4 Processed Kimberlite Disposal

Several options for the processed kimberlite containment area (PKCA) were examined. All but the Long Lake option were previously discussed by SRK (1998); the use of Long Lake was examined in 1999. Preliminary geotechnical engineering and environmental studies suggested Long Lake would provide an acceptable location for processed kimberlite fines. Map B (Appendix E) shows the location of all basins examined for PK fines disposal and all alternate sites considered for the plant. From both economic and environmental considerations, the preferred site has advantages. Use of Long Lake as the containment area will result in a much shorter line for the fine PK. Further, no water bodies will need to be crossed, eliminating one source of accidental spills to the receiving environment. Long Lake has a very limited fish population, i.e. slimy sculpins and burbot. Both Key and Lynne lakes contain trout and char. Neither Pocket Lake nor the adjacent unnamed lake (south of Key and Lynne lakes) have fish, but ore would have to be hauled a much greater distance from the pit to a processing plant located south of Lynne Lake. This longer route would also require ore trucks to cross several water courses, adding to the small potential for ore spillage into water.

Likewise a plant east of the existing exploration camp would require PK fines to be piped a much greater distance and over the stream connecting Key and Lynne Lakes. There is a well-used caribou trail corridor that traverses the area east of Lake C4, and passes just west of Lynne and Pocket Lakes; any infrastructure in this corridor has the potential to interfere with caribou movement, increasing potential Project impacts to caribou.

2.2.5 Process Water Recycling

Plant make up water requirements will be 27 m^3/hour. This water will be drawn from Carat Lake as previously discussed. During the winter free water in the PKCA is unlikely; all water will be locked up in ice. Fine slurry from the plant will freeze rapidly in winter and would be one of two main source of water flowing into the PKCA, with effluent from the waste water treatment plant (WWTP) being the other. Water could be recycled from June through September and reduce the required draw from Carat Lake by approximately 56,000 m^3. This would represent from 18 to 21% of the required discharge from the PKCA to Lake C3, which flows into Carat Lake.

There are a number of disadvantages to this system:

- Recycling would not result in a totally closed PKC facility, as water would still need to be discharged each year to maintain a balance in the facility.
- Two separate water supply systems would be required: one for winter and one for summer, at added capital and operating expense.
- Water from Carat Lake will be required for potable use year round and for the processing plant in the winter; thus the water supply infrastructure discussed previously would still be required and no reduction in surface disturbance would result from recycling water from Long Lake.
- Approximately 2 km of supply line would be required to run from the west end of Long Lake to the processing plant, and a pump and reclaim barge would be required at Long Lake, adding to capital and operating expense.
- Either a diesel pump, a power transmission line, or a separate generator would be required at the barge site with some increase in the risk of a fuel spill into Long Lake. A fuel spill could require cessation of PKCA discharge until the fuel could be soaked up (if that were possible). Cessation of discharge for any significant period would force an increase in the discharge rate (when discharge recommenced), in order to draw down the PKCA the normal amount by the end of the open water season.
- Discharge water quality from the PKCA would remain unchanged.

In summary, recycling would add significant capital and operating costs, but would provide very little, if any environmental benefit.

2.2.6 Transportation Alternatives

The only economical method of transporting bulk materials and supplies, such as fuel and ammonium nitrate (the two largest items required for mining), is presently via winter road (the Echo Bay Lupin Winter Road) that currently connects Yellowknife with EKATI™, Diavik, and Lupin. A 29 km extension on Contwoyto Lake would be required to connect Jericho Mine to the existing winter road. A short, 3.5 km extension up Lynne Creek, across

Lynne Lake, and through a draw to the Jericho Mine, or an all weather road north of Lynne Lake, would be required to connect the Mine to Contwoyto Lake. The winter road typically operates from January through March each year.

Capital and operating cost refinements favour the latter alternative of an ice road over Contwoyto Lake.

If an all weather road is built, either from Yellowknife to Kugluktuk, or from Bathurst Inlet to Lupin Mine, a shorter winter road from the Jericho site to connect to the all weather road would be required. An all-weather road to complete the connection between Lupin and Jericho mines could not be supported by the current economics of the Jericho Project.

2.2.7 Diamond marketing

Tahera's rough diamond production will, in all probability, be sold by way of a marketing agreement reached with an experienced diamond marketing company. Such a company will have the ability to sell on the open market, in a timely manner, all production (i.e. all sizes of diamonds) recovered from the Jericho kimberlite. The ability to market the entire production from Jericho is crucial for the sustainability of cash flow for the Project. A final decision on marketing will be made prior to the commencement of commercial production.

Tahera Corporation remains open to the possibility of jointly participating in a secondary diamond industry in Nunavut. To date, no agreements have been made on such a concept. Under such a venture, extensive training would be required for any person to fill these positions. Training for diamond industry positions would have to be obtained from abroad, perhaps from Europe.

2.2.8 The No Project Alternative

From a strictly economic view, the no project alternative would result in a significant lost opportunity, since tax and royalty revenues to government, and employment and business contracting opportunities to individuals and companies would be lost. Beyond that, the attraction of Nunavut to other potential diamond mine investors would be lost. An operating diamond mine in Nunavut will act as a 'lightning-rod' to attract other investment in the diamond, as well as precious metals industries. The potential for development of a secondary industry (cutting) exists with a mine in Nunavut. Finally, many of the job skills learned in the mining industry are directly transferable elsewhere, e.g., heavy duty mechanics and heavy equipment operators, environmental and geological technicians.

From an environmental view, the no project alternative would mean no impacts from mining. However, viewed in a regional context, negative impacts from the Jericho Mine will be very limited, both spatially and temporally. Environmental management plans will ensure impacts are reduced to the extent practical and limited to the site. Residual impacts will be few and mostly medium term (life of mine). Management plans have been made adaptive and flexible to expected and unexpected changes that may occur. After final closure, the total area of disturbance will equal 221.8 ha, which is less than one-quarter the land area of the hamlet of Kugluktuk. The following revenues would be foregone:

- 35% of the $44.5 million construction costs to Nunavut and the Northwest Territories;

- 43% of operating expenditures of between $10 million and $34 million per year in Nunavut and the NWT;
- tax revenue to governments from these 533 jobs of $9 million/year.

2.3 PROJECT DESCRIPTION

Benachee Resources Inc., a wholly owned subsidiary of Tahera Corporation (Tahera) plans to construct and operate a diamond mine ("the Jericho Diamond Project") near the north end of Contwoyto Lake in Nunavut Territory (NT). A detailed Project Description is presented in Appendix A.1. Operations will commence with an open pit mine at the north end of Contwoyto Lake in West Kitikmeot. Ore will be mined eight months of the year (April through November) and processed year round. Fine processed kimberlite (roughly 15% of the plant feed) will be pumped to a lake near the plant site (local name Long Lake). Coarse rejects (the remainder of the plant feed, except diamonds) will be stockpiled for use as processed kimberlite impoundment cover material, or for other reclamation purposes where a final cover of overburden is required. During winter months an ice road will be used to transport materials and supplies to the Jericho site. With current resources the mine and processing plant will have an 8-year life and employ a total of approximately 105 to 175 people (including employees and contractors), with approximately half that number on site at any rotation. Tahera Corporation has actively explored for diamonds in Nunavut for the past seven years (prior to 1999 as its predecessor company, Lytton Minerals). The company has identified a number of prospective kimberlite pipes and will continue to explore and develop prospective pipes throughout the life of the Jericho Project. The goal is to find additional economic diamond deposits (in the general area of Jericho), which would extend the life of the processing plant and the use of the infrastructure at the site. A portion of the cash flow from the Project will be re-invested into exploration and development programs.

Location: 350 kilometres SW of Ikaluktutiak (Cambridge Bay) (NT)
420 kilometres NNE of Yellowknife, NWT and 170 km north of the EKATI™ Diamond Mine and Diavik Diamond Project at Lac de Gras, NWT
Jericho Site: 25 kilometres NNW of Lupin Mine
65°59'50" N Latitude, 111°28'30" W Longitude

Proposed Development:

Eight-year operating life on currently proven reserves.
Open pit mine Years 1 to 4 at 330,000 tonnes per year.
Defined resource: 2.52 million tonnes averaging 1.25 carats per tonne with an average value of US $76 per carat (Central Lobe) and US $60 per carat (other lobes).
Processing plant on site.
Implementation of underground mining at Years 5 to 7.
Processing only of North Lobe ore Years 8 to 9.
Ore treatment by Dense Medium Separation (DMS) with cut-off size of 1.15 mm particle size (at present).

Diamond Sorting at on-site facility.

Processed kimberlite disposal on site: stockpile for coarse rejects (-8 to +1 mm) and impoundment for fines (-1mm).

Access and Transportation:

1,200 m long airstrip at Jericho

Float and ski plane access on Carat Lake (occasional)

Ice strip for Hercules aircraft in winter on Carat Lake, if required

Winter Road Access from Yellowknife to Jericho (mid January to mid March)

All weather road from Contwoyto Lake to the mine site.

Employment:

Mine Construction:	25 to 60 including pre-stripping work force
Plant Construction:	20 to 60 people
Operations:	60 to 116 people over 3 years for open pit mining
	48 people over 2 years for underground mining
	40 people over 8 years for processing

Proposed Work Schedule: Mining: 2x12-hour shifts/day, 7 days /week (April through November)

Process Plant: 2x12-hour shifts/day, 7 days per week (year round)

Two week on, two week off roster

Project Schedule:

The proposed schedule has the following key milestones:

• Permit and Authorization Applications	January, 2001
• Draft EIS Submission	January, 2001
• Prehearing Meetings	May & June 2001
• Final EIS Submission	January 2003
• Final Public Hearings	April 2003
• Project Approval (NIRB)	Early June 2003
• Approval from Minister	Late July 2003
• Mobilization and Winter Road Haul	January – March 2004
• Site and Facilities Construction	March – December 2004
• Open Pit Development	March – May 2004
• Full Production	First Quarter 2005

Tahera will appoint a design engineering firm as the engineers for the design, procurement, and construction management of the diamond plant and infrastructure. Dowding Reynard & Associates (Pty) Limited (DRA) of South Africa were responsible for the design and construction of the 10 tonne per hour pilot plant located at the Lupin Mine and the engineering design and estimate for the feasibility study. DRA have provided the information required for this proposal related to the diamond processing plant.

The appointed engineering firm will provide engineering supervision for the Project construction and commissioning. A Mine manager will have overall site responsibility. The engineering firm will also appoint Canadian sub-contractors to erect the buildings, plant, fuel storage facility, power generators, camp, water services, and processed kimberlite disposal system.

Plant commissioning is scheduled for fall 2004. The engineering firm will provide experienced mechanical, instrumentation, and process engineers, and where appropriate, vendors will provide commissioning engineers. Tahera Corporation will recruit plant employees, who will participate in the pre-commissioning period and the start up.

A 51% Inuit-owned firm, Nuna Logistics is currently mining at Diavik, did the development mining work at EKATI™, and has operated the Lupin winter road for several years. As a result of their involvement in the EKATI™ and Diavik Projects, Nuna Logistics has gained significant experience in the areas of mining and site developments in the Northwest Territory and Nunavut. This combined experience and expertise has led Tahera Corporation to consider Nuna Logistics a preferred contractor for the mining and road construction components at the Jericho Mine site. Nuna Logistics has provided extensive information for this application in areas related to mining, transportation, and road construction.

Should regulatory approvals permit, mobilization to the Project site could begin by February 2004. At this time an ice road would be completed from the Lupin Mine to Jericho and a camp, diesel storage facility, workshop, explosive storage facilities, and ice access roads on the site would be established.

Tahera Corporation will appoint a Mine manager to overview the design, procurement, and construction of the Project. An accountant will be designated in 2004 to provide financial control services for the Project development and the ongoing operation. Tahera will recruit employees for the plant operation late in 2003 and 2004, or as the regulatory process will allow, and implement a training program prior to plant commissioning. Tahera's environmental manager will continue to monitor environmental conditions and manage environmental matters during the construction phase.

A pre-strip pit will be excavated to expose sufficient kimberlite ore to permit a speedy start up of the processing plant. During the pre-stripping period the open pit will not generate any revenue. Due to the ultimate depth of the planned pit, successive pushbacks will be necessary following the completion of each pre-stripping pit. The width of the pushback will be based on minimum practical mining widths, equipment selection, the required ore schedule, safety, cost, efficiency, and other technical issues.

Mining will be by conventional open pit methods, followed by underground mining using open benching or sublevel caving methods. High and medium grade ore from the F6 and F4N zones (central and northern lobes) will be stockpiled immediately north and east of the process plant. The remaining low grade kimberlite will be stockpiled close to the pit, separate from the high grade and waste material, in the event future diamond values increase and the material becomes economically viable. Also, a sample from the south lobe will be taken and processed in the plant to evaluate more accurately the recoverable grade and value of the diamonds. Waste rock, consisting largely of granite, will be placed in Waste Rock Dumps 1 or 2 located immediately to the northeast and south of the pit (see Map A).

Underground access will be achieved via a portal in the pit. Ore and waste material from the underground operation will be placed on the high-grade ore stockpiles and the waste dumps. Waste from the underground will come mainly from the decline and level development.

The ore processing plant will be supplied from South Africa, built in modules, and shipped to site in containers. Where possible major equipment has been selected on the basis that it must be supported in Canada. The ore will be processed using conventional diamond processing techniques, with the process flowsheet design based on metallurgical characteristics of the kimberlite ore that was treated in the underground bulk sample program at Tahera’s 10 tonne per hour process plant (located at the Lupin Mine site).

The mining contractor will arrange housing for mine crews. A housing complex constructed of industrial trailers will be erected at the site. Accommodation and kitchen construction and operation will meet or exceed all Workers' Compensation Board, Nunavut Environmental Health, and National Fire Code regulations. The accommodation block will have a built-in fire detection system. The kitchen canopy and exhaust ducts will be fitted with a fusible link activated wet chemical fire suppression system. Dry chemical fire extinguishers will be located at all exits, with additional units positioned strategically within the building. All doors leading outside will be clearly marked with exit signs, swing outward, and be fitted with panic bars (pressure released horizontal latch mechanisms across the centre of the door). Emergency battery operated lighting will be provided in all accommodation and kitchen areas.

Process and potable water will be drawn from Carat Lake from a causeway and pipe constructed out into the lake approximately 90 m to put the intake below the level where ice damage occurs. Water will be pumped to the plant and accommodation block from a pump house at the shoreward end of the causeway. Approximately 31 m^3/hour will be required.

One fuel storage area will be constructed for all fuel requirements and will be located near the processing plant. The fuel farm will contain twenty vertical tanks that will be shipped in pieces and erected on site. As well, the existing nine tanks used for underground exploration will be moved into the fuel farm area. The fuel farm will be bermed to hold a minimum of 110% of the capacity of the largest tank. The berm will be lined with an impermeable, petroleum-resistant geomembrane.

A lean-to extension to the processing plant will house three 1300 kW, 60 Hz 600 V generator sets (2 + 1 standby) and a 300 kW emergency camp generator all under a 5t maintenance crane. Two additional 800 KW generators will be used (1 + 1 standby). Generators will be diesel-powered and burn low-sulphur fuel to minimize emissions. Typical fuel consumption for the units is 217 L/hr/unit at full load for the larger units. Power distribution will be by weatherproof Teck cable buried along the access road sides.

Granular fill material will be required for top dressing pads and roads, especially in Year 1 when pre-construction commences. Four borrow areas have been identified from previous geotechnical investigations. One is distant from existing roads and will not be exploited, unless other nearby sources are exhausted. All borrow areas are north of the exploration camp and two are adjacent to the airstrip.

Three ore stockpiles, two waste dumps, a coarse rejects stockpile, and an overburden stockpile will be constructed to hold materials generated by mining operations. Two ore stockpiles will be located near the processing plant; a low grade ore stockpile will be located between the pit and the plant. Waste rock dumps will be south and northeast of the open pit. The overburden stockpile will be south of the open pit and the coarse kimberlite rejects stockpile will be east of the plant.

Damming a lake basin south of the proposed location for the processing plant will create a processed kimberlite containment area. The basin, with dams added, will be capable of holding all processed kimberlite solids generated by the process plant. Waste process water will be discharged to the containment area. Runoff collected in the catchment and water from the process plant will require discharging annually. Discharge will be to Lake C3 (see Map E, Appendix E), immediately southwest of Carat Lake and in the same drainage basin. Discharge water will meet Project licence requirements, including being non-acutely toxic to fish.

A series of berms, ditches, and sediment containment ponds will be constructed to collect water for treatment prior to discharge from the site. For eight months of the year water will be frozen; a large percentage of the water on the land will be discharged in the freshet period (typically June) and lesser amounts throughout the summer and early fall. Design of the water handling structure will account for this characteristic of small Arctic drainage basins. A small stream crosses the area that will become the open pit. In order to keep water out of the pit and to protect downstream fisheries resources, a diversion will be constructed in Year 1. The diversion will ensure natural flow volumes are maintained and water quality not be affected, as the engineering design requires protection of the diversion bed from erosion.

A rotating biological contactor waste water treatment plant will be installed to treat and disinfect grey and sewage water from the accommodation, kitchen, and plant. The treatment plant will handle only domestic waste water and is capable of producing an effluent that is better than NWT guidelines for municipal waste water plant discharges.

Tahera will practice progressive reclamation to the greatest extent possible. Once the open pit is completed waste rock dumps will be reclaimed; infrastructure no longer required for underground mining will be removed, and the site reclaimed. Reclamation trials undertaken by Tahera in the initial years of mining will guide revegetation efforts. Maximum use will be made of the experience of others, such as the EKATI™ Mine and Diavik operation.

2.4 PROJECT STUDY BOUNDARIES

2.4.1 Spatial Boundaries

The spatial boundaries of the study area varied with the component being studied. The entire Kitikmeot region was included in socio-economic studies. Aquatic studies were limited to a 50 km^2 area centred at Carat Lake. Wildlife studies included a local study area of 100 km^2 and a regional study area, extending from Pellet Lake in the south to Dragon Lake in the north, and from Contwoyto Lake in the east to Rockingham Lake in the west.

2.4.2 Temporal Boundaries

Again, temporal boundaries varied with the component of the biophysical environment being considered. For global warming effects, the period evaluating this effect varied from several millennia to geological epochs. More definitive data are available for the central Arctic for the last 100 years (WKSS 1999). Temporal boundaries for wildlife, vegetation, and aquatic studies were, of necessity, limited to the study period (6 years) (baseline studies were conducted from 1995 through 2000). Where appropriate, historical data over a longer time frame were evaluated, e.g., climate normals were obtained for a 26-year time span.

2.5 REGIONAL CONTEXT

The Jericho Project is located in the West Kitikmeot, which includes the central Arctic islands and the coastal area as far inland as Contwoyto Lake. Kitikmeot is the traditional Inuit name for the area and means “from the centre” in Inuinnaqtun (NPC 2000). The Kitikmeot is one of three regions in Nunavut, the others being Kivalliq, and Qikiqtani. The West Kitikmeot contains three ecological zones. The northern, or high Arctic, includes Victoria Island lowlands and Shaler Mountains, part of the Amundsen Gulf lowlands, and the Kent Peninsula. The southern, or low Arctic, encompasses most of the region excluding parts that are forested. The Taiga Shield covers the southern portions of the region including part of the Coppermine River Upland. The West Kitikmeot lies within the Canadian Shield and encompasses part of three geological provinces: Bear, Slave, and Rae.

Precipitation in the West Kitikmeot is low (12.5 to 25 cm) and much of it falls as snow; summers are short and winters are cold. Temperatures in January are as low as -50°C and summertime highs range from 15 to 25°C. Two zones of the West Kitikmeot contain extremely limited tree growth: high and low Arctic.

3.0 BIOPHYSICAL ENVIRONMENT

3.1 BIOPHYSICAL BASELINE DATA COLLECTION

Data were collected on the biophysical environment at the Jericho site commencing in 1995. Studies have been conducted since that time, providing a comprehensive database of over six years of data. The Baseline Summary Report is presented in Appendix B.1.1

3.2 DESCRIPTION OF THE PHYSICAL ENVIRONMENT

3.2.1 Surficial Geology

The Jericho Project is situated in the southwest portion of Nunavut in a tundra environment. At the Jericho kimberlite pipe site, the low relief of the terrain and relative immaturity of the drainage network has resulted in a drainage pattern that can be described as contorted (Chorley et al 1985). Numerous lakes and many ephemeral streams interspersed among boulder fields, eskers, and bedrock outcrops characterize the pattern.

Glaciers inundated the Jericho area several times during the Pleistocene Epoch with the last deglaciation occurring 9,300 years ago. Associated with this last glaciation is a discontinuous, but locally thick, blanket of gravelly silty sand till with many cobbles and boulders. Glaciolacustrine sediments locally blanket the till, particularly below an elevation of 480 m around Carat Lake. Glaciofluvial land forms deposited during deglaciation include eskers, outwash deltas, kame deltas, and supraglacial deltas. Glaciofluvial sediments range from clean sand and gravel to thick boulder and block accumulations.

Over the past 9,300 years, periglacial processes have caused mechanical breakdown and mass wasting of glacial soils and near-surface rock. Organic soils have developed in some poorly drained areas.

3.2.2 Climate

The proposed Jericho mine site is at 65°47’ north latitude in an area marked by short, relatively cool summers and cold winters. Temperature range between summer and winter means is 40°C. Precipitation is limited and averages about 300 mm per year, falling half as rain and half as snow (rainfall equivalent). Various estimates of evaporation suggest approximately 250 mm per year; evaporation takes place almost entirely during the four snow-free months of the year. The Jericho Diamond Project is located 60 km south of the Arctic Circle; daylight is continuous at the beginning of summer and virtually absent at the beginning of winter.

There are 26 years of regional data available from Environment Canada (Atmospheric Environment Service—AES) stations at Lupin/Contwoyto Lake. These data are supplemented by site-specific data collected over a six-year time period by Tahera. Data collection is currently on going. Long-term averages for major parameters measured are shown in Attachment 3.1.

3.2.3 Air Quality

There are no direct observations of air quality at either Lupin or Jericho. Government of the Northwest Territories data for Daring and Snare Lakes indicate undisturbed areas of the southern Arctic have PM-10 (suspended particulates 10 µm or less in diameter) concentrations of <10 µg/m^3, which is typical for other undisturbed sites measured in North America. This is also consistent with findings from EKATI™ (BHP 1995) and Diavik (1998) mines.

At Diavik, ambient concentrations of particulates, CO_2, SO_2, and NO_2 are normally low (Diavik CSR 1999). The Independent Monitoring Agency (IMA) for the EKATI™ Mine has not recorded air quality as a concern at the mine (IMA 1999).

3.2.4 Hydrology

Small basin hydrological data were not available for the Jericho site prior to collection for the proposed Project; since 1995 hydrological data have been collected from the site. Snow surveys were conducted at the Jericho site between 1996 and 1999 to supplement stream flow data, in recognition of the importance of snow melt to annual discharges of small basins.

The mean annual runoff (MAR) for the Project area was estimated using the closest five Water Survey of Canada (WSC) stations with greater than 10 years of record. Based on its location relative to the five WSC catchments, the Jericho River is estimated to have a MAR of 190 mm per year. This corresponds to a long-term average annual flow at the outlet of Carat Lake of about 0.9 m^3/s.

The principal water bodies of interest include Carat Lake, Lake C3, the connecting stream (Jericho River), Stream C1 (which needs to be diverted around the pit), and Stream C3 (which will carry PKCA discharge to Lake C3). Water balances for the two lakes are shown in Table 3.1. Figures 3.1 and 3.2 show the stage-discharge relationship developed for Carat Lake inflow and outflow and for Streams C1 and C3, respectively. Attachment 3.2 contains a discharge summary for area streams for 1999. Tables 3.2 and 3.3 provide water balance calculations for the site and the PKCA, respectively, using the MAR assumptions discussed above. Table 3.4 provides basin spring snowmelt runoff estimates for Streams C1 and C3, using snow pack data collected from 1996 to 1999 (1998 data are not available).

Snowfall runoff estimates for both drainages fall within the range reported for other small drainages in the low Arctic (+/-75%).

3.2.5 Permafrost

The Jericho Diamond Project lies within the region of continuous permafrost. Permafrost is present everywhere, except beneath large lakes and rivers that do not freeze to the bottom. Permafrost is estimated to extend to depths of approximately 540 m at the Jericho pipe.

3.2.6 Surface Water Quality

A water quality monitoring program was started at the Jericho site in 1995; water was collected every year until 2000. Data from this program was used to establish baseline water quality prior to mine development. Lakes within the Jericho watershed are oligotrophic. The pH is neutral to slightly acidic with very low concentrations of total dissolved solids (7 to 18 mg/L) and little to no suspended solids (<1 to 4 mg/L). Water is very soft (hardness 3.4 to

12 mg/L – one outlier at 24 mg/L) and very low alkalinity (2.5 to 12 mg/L – one outlier at 23 mg/L). Other physical parameters are also very low in concentration. Water is very close to distilled water and has nearly no buffering or metal absorption capacity.

Most total and dissolved metals concentrations are below analytical detection limits. Those metals that are detectable are below the Canadian Council of Ministers of the Environment (CCME) freshwater aquatic life guidelines. Metals and major ions that are detectable included aluminum, calcium, magnesium, silicon, and strontium. Iron was detected in selected samples. Zinc was detected in the total metal values of Jericho Lake and River only. Table 3.5 provides a summary.

3.2.7 Groundwater

Groundwater has not been detected in any of the many boreholes drilled at the Jericho site and is not expected to be an issue. One ground ice sample analyzed had elevated metals. Should ground ice be encountered during Project activities, melt water may require treatment prior to discharge to the receiving environment.

3.2.8 Sediment Quality

Sediment samples have been collected from a number of Project area water bodies summarized in Table 3.6.

In 1995 and 1996 sediment was collected by coring. In 1999 and 2000, sediment samples were collected by means of a stainless steel Ekman grab (lakes) or shovel and coarse screen (20 mesh) (streams); the analysis parameter list was similar to that for water, but Inductively Coupled Plasma (ICP) (ppm) rather than ICP-Mass Spectrometer (ppb) detection limits were used. Triplicate samples (three samples from each site) were taken in late July 1999 and 2000 and analyzed for total extractable metals. A summary of results is provided in Table 3.7.

The sample results were compared with the *Interim Canadian Sediment Quality Guidelines (CSQG)* for freshwater sediments drafted in July 1995. The guidelines consider: the sources of the chemical to the aquatic environment; its distribution, behaviour, and persistence in sediments; its potential to bioaccumulate; and its effects on aquatic organisms that are exposed to sediments. Two limits are given in the criteria. The threshold effect level (TEL) is defined as the lowest concentration of a substance that is likely to induce discernible environmental effects (including subtle behavioural and sublethal physiological effects). The probable effect level (PEL) defines the range of chemical concentrations in which adverse biological effects are frequently anticipated. Based on results for the Jericho site, the criterion for arsenic may be excessively protective, since baseline information on aquatic biota does not suggest any adverse effects from high levels of metals or metalloids, whereas criteria for arsenic are exceeded in most samples. Chromium and copper exceed the threshold level in most samples. Nickel, to a somewhat lesser extent than arsenic, is above the probable effect level in many samples, which again suggests that the criterion for nickel may be excessively protective for the Jericho environment. For nickel only the mean and maximum concentrations observed for samples exceeded the PEL, whereas for arsenic in some samples even the minimum concentration observed exceeded the PEL.

3.3 DESCRIPTION OF THE BIOLOGICAL ENVIRONMENT

3.3.1 Vegetation/Wildlife Habitat

A mixture of dwarf shrubs, grasses, mosses, and lichens dominates the plant communities at the Jericho site. Map C (Appendix E) is a compilation of 1995 and 1999 data in an ecological zones map. Plant communities and wildlife habitat types (ecological zones) in the Project area were studied, mapped, and reported by Canamera (1995, 1996a, 1997). A review of Canamera's work and evaluation of 1999 studies was reported by Outcrop Nunavut (Vegetation Report, Appendix B.1.2).

At the Jericho site, wildlife habitats are generally coincident with the ecological zones defined in the vegetation mapping program. Regionally important habitat types in the vicinity of the Jericho kimberlite pipe are the large esker complex to the east and north of the Project site, and the cliffs and rocky hills to the east (Willingham Hills). Aquatic habitats are abundant both regionally and within the Jericho site study area. They provide important breeding habitat for waterfowl and other water birds. In the spring and fall, they are used as staging areas by migratory birds, although neither of these uses occurs within the Project footprint.

3.3.2 Wildlife

Wildlife studies were completed to document the regional occurrence, abundance, and distribution of wildlife species in the area (1999 and Y2000 Wildlife Report, Appendix B.1.3). Studies at the Jericho site were completed in 1995 through 1997, and 1999 through 2001. At the Jericho site, studies have concentrated on species that have ecological or economic significance, or are important to humans for some other reason. These species are caribou and muskoxen, grizzly bears and wolverines, wolves and foxes, and raptors, waterfowl, and other birds.

Caribou may move through the Jericho area in May on their spring migration to the calving grounds and from late June to August as they disperse to the south. During the spring migration, the lakes are usually frozen, providing many travel options. As caribou begin to disperse south from the calving grounds, they may be funnelled into the Project area by natural topographic features and watercourses, notably Jericho River, Jericho and Carat Lakes, and cliffs at the northern end of the Willingham hills at Jericho. Observations at the Jericho site and radio-collar-generated maps indicate caribou alternately travel down the east side of Contwoyto Lake and avoid the Jericho site completely.

A number of carnivore dens and sitings exist for the Jericho site, although no dens are in the immediate footprint of the Project.

Four raptor species, as well as the common raven, were found to be nesting on cliffs in the Willingham Hills area. These include the rough-legged hawk, golden eagle, peregrine falcon, and gyrfalcon. The northern harrier typically nests in marshes, wet meadows, or tundra shrubs, and was not found in the cliff areas. The common raven also uses the cliff habitat for breeding.

3.3.3 Aquatic Environments

Baseline inventories were undertaken in all water bodies potentially impacted by development. The monitoring program was conducted in specific areas that potentially could be directly impacted. Fish tissues, benthic macroinvertebrates, and periphyton communities were collected at control lakes, located outside the proposed development area. The names and locations of all sampled water bodies are shown in Figure 3.3. The Aquatic Baseline Report is presented in Appendix B.1.4).

Aquatic baseline inventories were conducted over five years, with three sampling sessions in 1995, 1996, and 1999 (spring, summer, fall), one in 1998 (spring), and two in 2000 (summer and fall). Activities carried out during each sampling period are summarized in Table 3.8.

3.3.3.1 Overview

With the exception of Contwoyto and Carat, lakes near the Jericho site are shallow, single basin lakes, with low shoreline development ratios. Many of these water bodies are small (<20 ha) and contain few fish. All of the water bodies within the Jericho site represent oligotrophic systems that have low primary productivity. A total of seven fish species occur in the Jericho area, as listed in Section 3.3.3.6. The same seven species of fish found in the lakes were also recorded in sampled streams in the Jericho study area.

3.3.3.2 Phytoplankton

During 1995 and 1996, lakes in the Jericho area had similar phytoplankton communities that generally exhibited low densities. These results are indicative of oligotrophic or low nutrient conditions. In general, golden-brown algae (Chrysophyta) had the greatest biovolumes. This is consistent with a broad-based regional survey of 153 lakes, rivers, and pools in the Northwest Territories conducted by Moore (1978).

3.3.3.3 Zooplankton

In 1995 and 1996, lakes in the Jericho area had generally similar zooplankton communities that exhibited low densities. Again, these results were indicative of oligotrophic or low nutrient conditions. Species abundance varied between summer and fall, which suggested a successional change in the zooplankton community.

3.3.3.4 Stream Periphyton

In 1995 and 1996, the periphytic algal community in each stream was unique; differences in both species and density were recorded. Differences in micro-habitat (e.g. depth, flow velocity, substrate composition) likely accounted for this variability. Chlorophyll *a* and ash free dry mass (AFDM) values at all sites were consistently low, which is an indication of nutrient poor oligotrophic conditions.

3.3.3.5 Benthic Macroinvertebrates

Lakes

Mean densities and mean number of taxonomic groups of benthic macroinvertebrates were generally greater in the littoral (shallow) zones than in the profundal (deeper) zones. This reflects the higher productivity of shallow water habitats, due to higher water temperatures and greater light penetration. Extremely low oxygen levels (anoxia conditions) were not recorded in the profundal zones. Therefore, it was not a factor in benthic macroinvertebrate production at the time of sampling. The benthic macroinvertebrate community structure was indicative of a short growing season and a homogeneous substrate dominated by fine sediments. The benthic macroinvertebrate communities of lakes were generally similar. Taxa exhibiting the highest densities were chironomids (midges), oligochaetes (aquatic worms), and nematodes (round worms).

Streams

There were differences in the macroinvertebrate community among sampled streams at Jericho. This was true within a given year and among years. These differences were likely related to changes in micro-habitat (e.g., depth, flow velocity, substrate composition). In general, benthic macroinvertebrate communities in streams within the Jericho study area were representative of subArctic systems; species composition and low densities were indicative of oligotrophic systems.

3.3.3.6 Fish

Species Composition and Abundance

A total of seven fish species occur in the Jericho study area: Arctic char, Arctic grayling, burbot, lake trout, ninespine stickleback, round whitefish, and slimy sculpin. A wide variety of age-classes of most species were recorded in lakes. However, most fish recorded in streams (all except ninespine stickleback and slimy sculpin) represented younger age-classes that utilized the watercourses for rearing purposes. Fish numbers were generally low in streams.

The fish community in specific lakes and streams varied, but some general patterns were apparent. The fish community in each lake consisted of only a few species. These simple fish communities tended to be numerically dominated by a single species, usually lake trout or Arctic char. The number of species encountered in a water body was related to lake size; smaller lakes contained fewer species. Some fish species were present in low numbers or were entirely absent from other study area lakes, but were abundant in streams associated with these lakes.

Biological Characteristics

Fish populations in the Jericho study area exhibited biological characteristics that are typical of fish in sub-Arctic lakes. Length-frequency distributions for lake populations typically were bimodal with larger individuals dominating the sample. Sampled fish were slow growing and exhibited large variations in length at a given age. Fish also matured at a late age. These biological characteristics are typical of unexploited fish populations residing in sub-Arctic oligotrophic lakes that have low primary productivity (Johnson 1976).

Feeding habits of fish at the Jericho study area were dependent on food availability. The most prevalent food groups consumed by all fish species were zooplankton and chironomids. The feeding habits of fish were also related to species-specific food preferences. Lake trout and Arctic char from the larger water bodies (Carat, Jericho, and Contwoyto lakes) consumed fish as part of their diet. In contrast, benthic macroinvertebrates accounted for a large proportion of the food consumed by round whitefish.

Habitat and Habitat Use

The characteristics of most lakes in the study provided the necessary habitats to support self-sustaining fish populations. Based on initial work in 1999 and 2000, Lake C2 does not support fish and Long Lake (Lake D10) supports only slimy sculpin and burbot. It is likely that the lack of extensive areas of deep-water in these two lakes reduces the availability of wintering habitat, thereby limiting their potential to support fish.

In most lakes, spawning habitat characterized by clean gravel to boulder-sized substrates was widely distributed in areas of sufficient depth to avoid freezing. These features are required by lake spawning species, such as lake trout (DeRoche 1969), Arctic char (Johnson 1980), and round whitefish (Scott and Crossman 1973). In contrast, rearing habitats in these sub-Arctic lakes were limited in distribution and abundance, but of sufficient amount to maintain fish populations.

Streams in the Jericho area are generally small, ephemeral watercourses dominated by ill-defined channels and large substrates. Those that maintain water flow during the entire summer period freeze to the bottom during winter. As a consequence of these characteristics, fish utilized the habitat provided by these systems on an opportunistic basis and generally restricted their use to the lower sections. Spawning, rearing, and feeding habitats were present in varying amounts and were used by fish originating from lakes. Fish species that were recorded in surveyed streams included Arctic grayling (spawning and rearing), Arctic char (rearing), burbot (rearing), lake trout (rearing), ninespine stickleback (feeding), round whitefish (rearing), and slimy sculpin (feeding).

Few streams surveyed contained good quality habitat. A significant feature of the Jericho River was the presence of a cascade area located near the outlet of Jericho Lake. Although not an absolute barrier, this area creates a significant impediment to fish passage between the Jericho river system and lakes situated farther upstream.

3.4 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

Environmental impact assessment includes the following:

- assessment of potential impacts including accidents and malfunctions;
- assessment of cumulative impacts; and
- assessment of residual impacts.

Major issues are discussed throughout the assessment since they have an affect on all three areas. The environmental assessment follows procedure outlined by the Canadian Environmental Assessment Agency (CEAA 1994, 1997) which provides a clear, well-defined system to classify adverse environmental effects and a criteria rating system to ascertain their significance. The Environmental Impact Assessment is presented in Appendix B.2.1.

3.4.1 Potential Environmental Impacts Examined

Pursuant to the guidelines established by Nunavut Water Board (NWB), September 1999 and as amended April 5, 2000, this environmental impact assessment examines the following areas of potential impact:

- Regional Climate and Site Climate

- Hydrology, Surficial Geology, and Permafrost
- Water Quality and Air Quality
- Vegetation and Wildlife Habitat
- Wildlife, including: raptors, waterfowl, shorebirds/gulls, song birds, small mammals, muskox, caribou, fox, wolf, wolverine, and grizzly bear
- Fish, including: habitat and populations
- Benthic Invertebrates, Periphyton, and Zooplankton
- Cumulative Effects

Previous documents submitted by Tahera dealt with the option involving mining at Jericho and processing ore at Lupin Mine as the preferred method, whereas this Final EIS discusses in detail mining and processing at the Jericho site.

3.4.2 Significance of Effects

The significance of impacts to the biophysical environment have been evaluated using criteria listed in “A Reference Guide for the Canadian Environmental Assessment Act for Determining Whether a Project is Likely to Cause Significant Environmental Effects” (CEAA 1994). Effects have been evaluated based on potential magnitude (especially due to mishap or accident), frequency of occurrence, length of occurrence, degree of reversibility, time frame for reversibility, potential significance of effects on the affected ecosystem(s), and probability of occurrence of the impact and the effect(s).

3.4.3 Valued Ecosystem Components Considered

Valued Ecosystem Components (VECs) considered included all physical and biological components of the environment assessed for potential Project impacts. Valued Socio-economic Components (VSECs) are considered in the Socio-economic Impact Assessment. In developing VECs, reference was made to community consultations where people identified issues of concern. Issues raised by communities were very limited and very consistent: water quality, wildlife habitat, and wildlife (specifically caribou, grizzly, wolf, and wolverine). The VEC list considered for cumulative effects assessment for the Jericho Project includes:

- air quality;
- water quantity and quality;
- permafrost;
- terrestrial and aquatic habitats;
- terrestrial and aquatic plants and animals; and
- heritage resources.

Details of the assessment of each of these components are presented in the Environmental Impact Assessment, Environmental Effects Assessment on Wildlife, and Aquatic Impact Assessment (Appendices B.2.1, B.2.2, and B.2.3, respectively) and in the Heritage Resources Impact Assessment (Appendix C.3.3).

3.4.4 Treatment of Residual Environmental Impacts

Rating criteria developed under the Canadian Environmental Assessment Act (CEAA 1994) were employed to evaluate the significance of the environmental effects. The rating criteria used were:

- Magnitude
- Geographic extent
- Duration
- Frequency
- Reversibility
- Ecological context
- Level of confidence
- Certainty

Magnitude

Magnitude describes the nature and extent of the environmental effect. The magnitude of an effect is quantified in terms of the amount of change in a parameter or variable from an appropriate threshold value; the latter may be represented by a guideline or baseline condition. Three general categories of change to be employed are low, medium, and high. The definitions used to rate the magnitude will be specific to a particular effect and will depend on the type of effect, the methods available to measure the effect, and the accepted practices for a particular discipline.

Geographic Extent

Geographic extents are similar to the spatial boundaries of the assessment outlined in each impact section. Geographic extent criteria differ among different VECs and are discussed under each.

Duration, Timing and Frequency

Duration is defined as a measure of the length of time that the potential effect could last. It is closely related to the Project phase or activity that could cause the effect. Project phases that define the temporal boundaries related to duration are construction, operation, closure, and post-closure. Duration criteria are discussed in each assessment where relevant.

The duration criterion is divided into three classifications:

> Short-term (L) - Effects lasting for less than one year (associated with the construction period, or other short-term activities).

Mid-term (M) - Effects lasting from one to nine years (associated with life of the mine).

Long-term (H) - Effects lasting longer than 10 years (persist beyond closure of the mine).

Frequency

Frequency is associated with duration and defines the number of occurrences that can be expected during each phase of the Project; it differs for each VEC.

Reversibility

Reversibility is the ability of communities to return to conditions that existed prior to the adverse environmental effect. The prediction of reversibility can be difficult because environmental effects may, or may not, be reversible. Despite this, it is important to ascertain reversibility because it has an important influence on the significance of an effect. Two rating criteria were used: reversible (R) and not reversible (NR).

Ecological Context or Effects on Ecosystem Functioning

Ecological context is a measure of the relative importance of the affected ecological component to the ecosystem, or the sensitivity of the ecosystem to disturbance. It indicates the degree to which an effect on the component would affect the ecosystem. Ecological context rating criteria are specific to each effect, but they can be grouped into three general categories: low (L), moderate (M), and high (H).

Level of Confidence

Using the rating criteria described above, the significance of adverse environmental effects is evaluated based on a review of Project specific data, relevant literature, and professional opinion. Based on recommendations by Barnes and Davey (1999), the assessment should also include a rating system that evaluates the level of confidence in the prediction of significance. Three rating criteria will be used to assess the level of confidence: low (L), moderate (M), and high (H).

Certainty

To arrive at a high level of confidence for a significance rating, it is usually desirable to apply rigorous scientific and/or statistical methods (quantitative approach). Where such methods are not feasible, professional judgement is usually employed (qualitative approach). Rating the certainty of the significance rating is an additional step that can be used to justify or substantiate the level of confidence in the evaluation. The three rating criteria that will be applied to each of the two certainty categories (quantitative and qualitative) are low (L), moderate (M), and high (H).

3.5 BIOPHYSICAL IMPACT ASSESSMENT

3.5.1 Climate

3.5.1.1 Potential for Effects from the Project

Given the scale of activities, no changes in the regional or local climate would be possible from exploration-related activities. Changes in microclimate were not measured or evaluated during the exploration phase of the Project.

No significant impacts on the local or regional climate are expected to result from the proposed mining or processing operations. At the microclimate level, some impacts will occur from changes in topography at the open pit, from dust due to operations, and from local small changes in water balances due to operation of sedimentation ponds and the tailings impoundment. These changes will be irreversible over all but geological time scales, because landscape-altered infrastructure (e.g. waste rock dumps) will stay in place after mine closure. Changes will be significant at the site level, but insignificant at the regional or higher level. The probability of occurrence is 100% given that the Project proceeds.

3.5.1.2 Potential Effects on the Project

Climate change has been identified by government agencies as an issue of concern, particularly global warming. The Responsible Authorities for the Diavik Comprehensive Study discounted, as an issue, global warming over the life of mine for Diavik. Given that the Jericho Project is 170 km north of Diavik, it can be reasonably concluded that global warming will not significantly affect the Project during its life.

Further, the Project does not depend on frozen core dams, nor on permafrost presence for any Project facility. It is extremely unlikely that the trend in global warming will accelerate enough over the eight-year life of mine to make a winter road supply scenario unworkable. Other climate changes such as changes in precipitation and temperature will not significantly affect operation of the mine or processing plant.

The limitations and opportunities of Arctic climate have been taken into account in Project planning, as discussed in the Project Description (Appendix A.1).

Reversibility is unlikely, if effects occur, given the life span of the mine and the probable life span of global climate change. The probability of occurrence cannot be predicted, as global climate change is currently the subject of much scientific (and political) debate.

3.5.2 Seismicity

While the Jericho area is in a region of low to very low risk for seismic activity, at the request of Natural Resources Canada, a seismic risk analysis was commissioned by the Pacific Geosciences Centre. Their report is attached in Attachment 3.3. Based on their report, the impacts on the Project are considered negligible.

3.5.3 Permafrost

If an increase in the active layer of any mine unit or facility becomes problematic, the issue will be addressed so as to reduce or eliminate permafrost melting to the extent practical. For instance, if mats are ineffective in preventing building settling on soils, pilings could be driven down to bedrock. Impacts of the Project on permafrost would be temporary, until remediation addressed the issue. The significance is predicted to be minimal, given that the Project does not rely on permafrost for operation. The probability of occurrence is judged to be low, since management practices will be aimed at preventing permafrost melting. Freeze-thaw in the bedrock in the pit and underground areas is estimated to be a maximum of one to three meters and will have no effect on permafrost levels beyond that peripheral zone.

3.5.4 Hydrology

Potential hydrology impacts include:

- diversion of Stream C1;
- redirection of runoff to Carat Lake to the PKCA or loss to groundwater through spray irrigation; and
- alteration of the flow regime in Stream C3.

3.5.4.1 Mining and Mine Rock

Assessment of Potential Effects

Control of water from disturbed areas will change natural flows to a limited extent as listed in Table 3.9.

Stream C1 (Map A, Appendix E) presently flows adjacent to the area proposed for the Jericho open pit. This stream will be diverted north of the pit, and back into its present channel above grayling spawning habitat (lower 100 m). All water presently flowing in the natural channel will flow through the diversion; the impact on hydrology will be negligible.

Waste rock dumps may require clean water ditches to divert upslope water around the dump. As well, runoff water from the dumps will require settling. If treated water is not returned to Carat Lake (e.g. if diverted to the PKCA or spray irrigated) some of the annual runoff from the site will be lost. This will be a very small fraction of the total runoff for the drainage basin containing Carat Lake; impact will be unmeasurable.

A settling facility/pump system will be required to remove runoff from the open pit; the settling facility will operate in a similar manner to the waste rock dump pond(s). Again, in terms of water volumes, failure of a pond berm would have negligible effect on Carat Lake levels.

Accidents and Malfunctions

Sediment control ponds have a relatively small contained volume (the largest is 13,000 m^3). An uncontrolled release from these structures would have an unmeasurable effect on the water balance of Carat Lake basin. Settling embankments will be engineered structures, inspected frequently, and having a geomembrane core; failure is remote. However, should the settling embankments fail, the immediate effect would be the release of contained water, which could enter Carat Lake. Since the volume of the proposed settling facilities will be very small compared to the volume of Carat Lake, water released by such an accident will have negligible effect on lake level.

3.5.4.2 Diamond Processing

Assessment of Potential Effects

Fine kimberlite will be impounded in the PKCA. Flow to the PKCA from the processing plant will be 168,000 m^3/year. With the conservative assumptions that all of this water would separate from the PK solids and that water normally found in the basin would report to the discharge, between 250,000 m^3 and 313,000 m^3 of water would require discharge (dependant on lower and upper bounds of the MAR). Excess storage within the facility will allow the discharge to be distributed over a 3 to 4 month summer period (May to August). If water were released over 3 months, approximately 84,000 m^3 to 104,000 m^3 would require discharge each month; if water were released over 4 months, this range reduces to 63,000 m^3 to 78,000 m^3 per month. Based on timing of melting of summer lake ice and the experience of northern communities with year round discharge of sewage to wetlands (Dillon Consulting 1998), it is probable that ice contained in the east cell (from winter plant discharge) will not melt before the end of the spring freshet. This will cause a decrease in the effective short-term (summer) storage capacity of the PKCA; it will also moderate the effects of spring freshet.

Seepage from waste rock and low grade ore stockpiles may be directed to the PKCA to allow additional residence time for degradation of ammonia. A worst case analysis, assuming all runoff would need to be diverted to the impoundment, indicates the above estimates could be two times higher than indicated for the PKCA alone (SRK Memo, Attachment 2.2, in Appendix B.3.1).

Changes in the hydrologic regime from operation of the processing plant will include: withdrawal of water from Carat Lake and eventual return through discharge from the PKCA and Lake C3; and minor alteration of drainage patterns, resulting from the requirement to treat water from the area disturbed by the plant. Water balance changes to the Carat Lake drainage basin will be insignificant (less than 1% change), as will changes in drainage patterns caused by plant construction and operation.

Potable water will be required at the camp and will be drawn from Carat Lake. Potable water use will be approximately 900 m^3/month (30 m^3/d or 1.25 m^3/hr). Used water will be routed through a sewage treatment plant, resulting in a small amount of evaporation. From the treatment plant water will be piped to the PKCA. PKCA effluent water ultimately will return to Carat Lake and thus the impact on water quantity from potable water use will be negligible.

Accidents and Malfunctions

The largest accidental water release would be failure of the PKCA dams; such an accident is very unlikely. Dam locations were investigated by geotechnical drilling to confirm dams will be founded on bedrock. The dams will be engineered structures with a geomembrane core lining to prevent seepage. They will be inspected annually by geotechnical engineers and resulting reports provided to regulatory authorities. Failure frequency of earth-fill dams has been the subject of much study. Given conservative operation of dams, piping (water creating a channel or pipe in the dam) and slope instability have been, historically, two of the major causes of dam failure. Table 3.10 provides failure estimates, which are very low. Most slope instability becomes apparent before collapse occurs; remedial action can be taken to prevent dam failure.

In the unlikely event of an uncontrolled release of water from the PKCA, there would be a short-term, significant impact on the water balance of Lake C3 and Carat Lake; water level would rise with potential flooding over a short period of one or two days. Failure of the west tailings dam could result in release of a maximum of 225,000 m^3 of water to the settling pond (if the break occurred in June). Water would then flow over the spillway of the settling pond dam and down Stream C3 to Lake C3. This volume of water is approximately 5% of the volume of Lake C3.

Erosion of the Stream C3 channel would be likely, resulting in sediment being carried into Lake C3. Some fine PK would also likely flow into Lake C3, although if the settling pond dam held, much of the PK would be retained in the settling pond. The impact on water volumes in Lake C3 and Carat Lake from a west dam failure would be low, but significant (10% increase in water volume, or less than natural variation), and short-term (a few days at most for water to return to normal levels). The channel between Lake C3 and Carat Lake is rocky and erosion at this point from increased flows is unlikely. The buffering effect of Carat Lake would result in only small (a few percent) increases in outflow from Carat Lake.

Given the small percentage of the Carat Lake basin affected, only a small effect on the water balance would result from the uncontrolled release of 225,000 m^3 of water from the PKCA. The average outflow from Carat Lake is 0.9 m^3/s or 77,760 m^3/day. A release of 225,000 m^3 of water over a short period would result in an increase in outflow from Lake C3 and a subsequent increase in outflow from Carat Lake. Natural outflows at freshet from Carat Lake can reach 10 m^3/s or 864,000 m^3/day, thus a worst case release of water from the PKCA at peak flows would increase outflows over about a five-day period by 4% per day.

The result would likely be some bank flooding at both the inflow and outflow points during the freshet period, when water levels were naturally high. Failure of the east dam of the PKCA would result in the loss of considerably less water, because only Cell 1 would be affected. Total volume would be less than 100,000 m^3. Flows would be to an unnamed Lake and then into Key and Lynne lakes, ultimately flowing out of Lynne Lake, down the outlet stream, and into Contwoyto Lake. Volume of the unnamed Lake is approximately 200,000 m^3 and its banks are quite steep. Sufficient volume is available in the basin to prevent water flowing overtop the basin into adjacent areas.

3.5.5 Surficial Geology/Land Forms

3.5.5.1 Assessment of Potential Effects

The effects on surficial geology will be at the local landscape level. Geomorphological processes will not be affected, but new landscapes will be created by waste dumps (permanent), the open pit (permanent), coarse kimberlite storage (permanent), ore stockpiles (life of mine), and infrastructure (life of mine).

Borrow materials will be required for construction activities, such as roads and embankments for sedimentation ponds. To the greatest extent practical, materials generated by mining will be used for construction. Some esker material will be required as top dressing on roads and for dams, especially during the initial construction when stripped overburden will be frozen and not suitable for immediate use pending melting of contained ice. This will require temporary stockpiling.

3.5.5.2 Accidents and Malfunctions

Accidents and malfunctions do not apply to changes in land forms.

3.5.6 Water Quality

Potential water quality impacts arising from the mining operation are:

- suspended sediment and nutrient discharges from waste rock dumps, ore stockpiles and overburden stockpile, and from the PKCA;
- possibly copper from the waste rock (maximum leachate concentration from laboratory testing 0.016 mg/L); and
- limited greywater and sewage discharge (11,000 m^3 annually) from the mining camp (to the PKCA).

Discharge from the waste rock, overburden, and ore stockpiles will be collected and retained in settling ponds or the PKCA to remove suspended solids; treatment alternatives have been developed as a contingency against water not meeting Licence discharge requirements. Sewage and greywater will be treated prior to discharge to the PKCA. Testing to date (see Characterization of Waste Rock and Characterization of Kimberlite Ore, Appendices D.1.3 and D.1.4, respectively) indicates JD-01 ore and waste rock are non-acid generating. Processed kimberlite will be alkaline.

3.5.6.1 Mining

Assessment of Potential Effects

<u>Nutrients</u>

Nitrogen

A flow diagram for nitrogen generation and leaching for the Jericho Project is provided in Figure 3.4. The nitrogen load produced in the mining operations will be dependent on explosives use. Table 3.11 lists the expected use of explosives by year. Release of nitrogen species (NO_3, NO_2, NH^{4+}) was calculated using the Ferguson and Leask (1988) model. Results of the model are presented in Table 3.12, based on the above and the mining schedule presented in the Project Description. The mining schedule table is reproduced in Attachment 3.4 for reference.

Water from the waste rock dumps and ore stockpile will be treated in sediment collection ponds and then discharged to the environment (if water meets Water Licence criteria), or further treated. Alternate treatments include: extended storage time in the PKCA; spray irrigation; or a water treatment plant. These are discussed in the Project Description (Appendix A.1).

Total nitrogen loading from runoff, using the nitrogen model results and assuming all N will speciate to nitrate, is provided in Table 3.13. Nitrogen loading would occur during the summer when water is flowing. Given that Project area lakes are typical of oligotrophic sub-Arctic lakes and are phosphorus limiting, the nitrogen input is not expected to affect primary productivity. This prediction will be monitored by means of periphyton studies in the lake as discussed in the Environmental Monitoring Plan (Appendix B.3.3). Increases in nitrogen concentration are unlikely to be great enough to be detectable by nitrogen concentration measurements.

Phosphorus

Nitrogen and phosphorus concentrations in Carat Lake are very low (ammonia: <0.005 - 0.28; nitrate: <0.005 - 2.5; total dissolved phosphorus: <0.001 - 0.027 mg/L). Since modelling predicts an increase in nitrogen loadings to Carat Lake, due to runoff from the mine site, any increase in phosphorus might be expected to lead to some increase in primary productivity. This change could be either positive or negative, depending primarily on the effects on primary producers. A significant increase in benthic algal standing crop each year might have a negative impact on overall aquatic community productivity and thus on the availability of food for fish. However, a moderate increase in phytoplankton productivity would likely be mirrored in an increase in zooplankton productivity and possibly benthic meiofauna productivity, resulting in an increase in available fish food. This, in turn, would be expected to increase fish standing crop and/or productivity. This latter effect has been observed at EKATI™ Mine with additions of nitrogen and phosphorus to lakes (EKATI™, pers. comm., 2000).

Leach extraction tests (24-hour de-ionized water leach) were conducted on kimberlite ore and waste rock. Phosphorus concentrations remained below detection, as would be expected, given the very low solubility of phosphorus and the low background concentrations of phosphorus in both the host rock granite and kimberlite. Thus, leaching of phosphorus in runoff from waste handling facilities is not expected to add to the available phosphorus in receiving waters.

Suspended Sediment

Suspended sediment will result from runoff from roads, the open pit, waste rock dumps, and the ore stockpile. Water from these areas will be routed to sediment collection ponds. Sedimentation facilities will operate during open water periods (approximately late May to early October each year). Accumulated bottom sediment will be periodically removed (if required) and trucked to the waste dump, where subsequent rock cover will prevent wind erosion and retard water erosion.

During periods when facilities are discharging, pond water will be periodically monitored for turbidity. A correlation between turbidity (as measured by a turbidity meter) and total suspended solids will be established. Should turbidity meter readings indicate potential for discharge water to exceed total suspended solid concentrations specified in the mine Water Licence, the situation will be remedied (by addition of flocculents or other means, as appropriate, in consultation with the Nunavut Water Board).

Low to extremely low loadings of suspended sediment will also result from wind erosion of disturbed areas and from ore and waste rock handling. Not all, or even most, of the suspended particulate matter from these sources will reach mine area water bodies. Predictions are consistent with Diavik findings of no significant impact to sedimentation from dust generation at their Lac de Gras Project and with the experience of EKATI™ Mine (Diavik 1998).

Metals

The Jericho waste rock is comprised of relatively unaltered granitic host rock. The waste is non-acid generating with negligible levels of sulphides, and low trace metal concentrations. Leach extraction tests (SRK, Appendix D.1.3, and Waste Rock Test Results, Appendix D.1.6) indicate that leachate in contact with the granitic waste rock is likely to have neutral pH's, moderate alkalinity levels, low total dissolved salts, and low metal concentrations. Concentrations of all metals are likely to be well below the concentrations specified in the Metal Mine Liquid

Effluent Regulations, and concentrations of most metals are likely to be below the CCME guidelines for protection of aquatic life.

Possible exceptions are copper, aluminum, and arsenic, which slightly exceeded the CCME guidelines in several of the test samples. Copper and aluminum concentrations (Cu: 0.003 to 0.016 mg/L; Al: 0.015 to 0.118 mg/L) are limited by solubility controls, and are therefore unlikely to exceed the levels measured in the tests. Arsenic concentrations may be an artifact of the testing, as they are not consistent with the extremely low arsenic content of the solids and because a second set of tests had consistently low arsenic concentrations. One sample had slightly elevated chromium. This sample was from the contact between kimberlite and granite and represents only a very small proportion of the waste rock.

Kimberlite ore is strongly acid consuming, with a high portion of carbonate, negligible sulphides, and low trace metal concentrations. Leach extraction tests (Appendix D.1.4) indicate runoff in contact with the kimberlite ore is likely to have slightly alkaline pH's, and elevated alkalinity, hardness, and total dissolved solids (TDS) levels. Metal concentrations are expected to be below the CCME guidelines for the protection of aquatic life. Possible exceptions are copper, selenium, and nickel. However, elevated concentrations of these metals in the tests were all very close to the method detection limits.

Accidents and Malfunctions

Water will be controlled for the mining operation by means of sediment containment ponds and routed to ponds by ditches and berms. In the unlikely event of dike failure, water would be released to the environment. Direct release from the berms and ditches would be to the tundra, where suspended sediment would settle out and plants would absorb N, based on the experience at EKATI™ Mine (EKATI™ 1999). If the sediment control pond for Dump 1 failed, water could reach Carat Lake before a substantial decrease in nitrogen occurred, due to the pond's proximity to Carat Lake (100 m). Assuming no flocculents were in use in Pond 1 and the pond was full at the time of failure, some of the suspended sediments might also reach Carat Lake, although substantial amounts would drop out on the tundra prior to the water reaching Carat Lake.

An increase in sediment would be short term, given that the failure was contained immediately. Silt fences, placed quickly at the shoreline to prevent further sediment release to the lake, could limit sediment dispersion in Carat Lake. Silt fencing would also be placed directly below the dike failure of the sediment pond immediately upon detection of a break. Remaining water could be pumped back onto the waste rock dump, thus providing time to effect temporary dike repairs.

Elevated nitrogen could also result from failure of the pond dikes and could not be controlled as easily as suspended sediment. The impact would be a short-term (a matter of hours, depending on the length of the spill) increase in nitrogen concentrations where the spill entered Carat Lake. Assuming Pond 1 was full, a maximum of 8,300 m^3 could be released, compared to the volume of Carat Lake of 27 million m^3.

Changes in water quality would be detectable in the southeast bay of Carat Lake for a distance from the spill, depending on the actual concentration of nitrogen compounds. The actual spatial extent would depend on the amount of mixing as well as the concentration of nitrogen in the spill.

3.5.6.2 Diamond Processing

Assessment of Potential Effects

Diamond processing will result in fine and coarse fractions of processed kimberlite. Effects on water quality will be related to these waste streams. Discharge will be to Lake C3. Predicted effects on Lake C3 water quality were modelled by URS. Their report, Lake C3 Modeling, is attached in Appendix D.1.2. Waste water treatment plant effluent will be discharged to the PKCA, which will have a small effect on the water quality in the containment area. The only other possible water quality effect will be runoff from the plant site, which will be contained and routed to the PKCA.

The fine and coarse fractions of processed kimberlite will be stored in controlled areas; there will be no direct runoff to the environment outside of areas where containment and treatment are possible. Potential impacts could result from nitrogen and suspended solids loadings. High pH process waste water could also potentially have an impact, if discharged directly to the environment.

<u>Fine PK</u>

Suspended Sediment

Suspended solids in the fines will be controlled with flocculents and coagulants, if required, as discussed in the Project Description (Appendix A.1). Based on tests conducted during bulk sampling and pilot plant operations, suspended solids levels expected will be in the 1 to 8 mg/L range (see Evaluation of JD/01 Tailings Geochemistry, Appendix D.1.5). Full scale operations may vary from these results. EKATI™ uses a combination of flocculents and coagulants (EKATI™ pers. comm. 2000), which may be required at Jericho. However, some of the remaining suspended solids in the main cells of the PKCA should drop out of suspension in the polishing pond. EKATI™'s Water Licence limit of 25 mg/L should easily be met if a similar limit is set in the Jericho Water Licence.

Nitrogen

The nitrogen model predicted concentrations will be below CCME receiving environment guidelines in the PKCA and will be further diluted in the polishing pond and in the discharge stream. Concentrations predicted are consistent with findings at EKATI™ Mine (EKATI™, pers. comm. 2000). Addition of mine water could result in an elevation of nitrogen in the PKCA. Speciation cannot be predicted a priori with any accuracy, since some ammonia will oxidize in the high pH environment of the PKCA. Excess storage capacity in the PKCA will allow treatment of supernatant water, if it does not meet Water Licence criteria.

<u>Coarse PK</u>

Suspended solids in the coarse fraction of the PK will not be problematic due to nature of the material. Concentrations of nitrogen in runoff from coarse kimberlites are predicted to be well below CCME guidelines. Runoff from the coarse PK will be collected and routed to the PKCA.

Accidents and Malfunctions

Although a very low probability, accidents that would result in impacts on water quality of receiving environment water bodies would be limited to spills from the PKCA. Any other spills would be contained within the plant complex area.

Notwithstanding the very low risk/probability of dam failure, the impact from tailings dam failures is potentially high. Therefore, as part of its prudent and proactive environmental management, Tahera will closely and continuously monitor the PKCA dams.

An uncontrolled release of water from the PKCA could result in a short-term significant impact on the water quality of Lake C3 and possibly Carat Lake. The area of Lake C3 immediately adjacent to the mouth of Stream C1 would take on the characteristics of the spill liquid. Erosion of the Stream C3 channel would be likely, resulting in sediment being carried into Lake C3. Some fine PK would also likely flow into Lake C3, although if the settling pond dam held, much of the PK would be retained in the settling pond. It is not possible to provide estimates of the amount of PK that would be released into Lake C3, because that is dependent on the amount and location of PK in the PKCA when the west dam failed, and whether the settling pond held or failed also. The predicted water quality of PK supernatant is provided in Table 3.14, from SRK's assessment of processed kimberlite (Appendix D.1.5).

No dilution will be required to reach receiving environment water quality for parameters other than suspended sediment, assuming ammonia oxidizes in transit, or as is the case with EKATI™, is below receiving environment guidelines entering the mine's PKC. Up to 5 times dilution, or more, would be required to meet clear water suspended sediment guidelines, if suspended sediment concentrations in Lake C3 were at their low range when the spill occurred. Two times dilution will be required to meet drinking water guidelines. As no drinking water will be drawn from Lake C3, this is not an issue for discharge, since dilution will occur in the lake as supernatant diffuses into lake water. If ammonia is elevated as predicted by SRK's tests, but not experienced by EKATI™, ammonia would also be elevated in Lake C3 and could be at toxic concentrations, at least in the part of the lake near Stream C3's mouth.

Failure of the east dam of the PKCA would result in the loss of considerably less water, because only Cell 1 would be affected. Total volume would be less than 100,000 m^3. Flows would be to Ash Lake and then into Key and Lynne lakes, ultimately flowing out of Lynne Lake, down the outlet stream (D1), and into Contwoyto Lake. The volume of the unnamed Lake is approximately 200,000 m^3 and its banks are quite steep. Sufficient volume is available in the basin to prevent water flowing overtop of the basin into adjacent areas. Key Lake has a volume of 225,000 m^3 and Lynne Lake a volume of 1,070,000 m^3. The capacity of the three lakes is such that the lakes would modify flood flows from an uncontrolled release. Water quality impacts are as discussed for a west dam failure.

3.5.6.3 Waste Water Treatment Plant

Assessment of Potential Effects

Operation and water quality from the waste water treatment plant (WWTP) are discussed in the Environmental Management Plan (Appendix B.3.1). Effluent from the WWTP will be directed to the PKCA. Phosphorus will be absorbed by the PK fines and nitrogen loadings will be diluted a minimum of 15:1.

Accidents and Malfunctions

Normal operation of the waste water treatment plant will not impact water quality, as discharge from the plant will be to the PKCA and not to a receiving water body. The water volume from the plant will be a small fraction (<7%) of the process discharge and will therefore not affect the chemistry of the PKCA. Failure of the waste water (sewage) treatment plant would be noticed immediately and rectified.

3.5.7 Air Quality Assessment

3.5.7.1 Introduction

Potential sources of airborne contamination at the Jericho site are:

- dust from blasting;
- fumes and dust from mining operations, principally movement of vehicles in the pits and on roads;
- windblown dust from the ore stockpiles, waste rock piles, and overburden piles;
- exhaust from mobile equipment and the diesel-powered generators at the mining sites, shop, and camp.

Most of the dust generated will be from open pit mining operations. Figure 3.5 is a flow diagram of potential sources of dust at the Jericho site.

For deep kimberlite pits, exhaust fumes from mining equipment may have a significant impact on air quality in the pit. During construction and operation, air quality in the pit will be monitored on a schedule acceptable to the Workers' Compensation Board, Yellowknife, or appropriate regulatory body.

Mobile and stationary internal combustion engines at the Jericho site (principally diesel engines) will produce small quantities of suspended particulates (and NOx, SOx, and CO). Emissions from these sources for the EKATI™ and Diavik projects, both approximately an order of magnitude larger than the Jericho Project, have been judged (and accepted by regulatory agencies) to be insignificant. Thus no significant impacts to air quality at the Jericho site from these sources is expected. Levelton's modelling predicted somewhat elevated exhaust gas concentrations within the footprint of the mine under worst-case (no wind) conditions. Based on meteorological data collected at the site since 1996, calm periods are normally relatively short.

3.5.7.2 Assessment of Potential Effects

A United States Environmental Protection Agency (EPA) air quality model, Industrial Source Complex, vers.3 (ISC3) was used to predict potential air quality effects from mining. The model simulation was conducted by

Levelton (Air Quality Report, Appendix D.1.1) and covers the period of mine life (Years 2 & 3) when the most emissions will be generated.

Emission sources will include both stationary (e.g. ore dryer; diesel generators at plant, camp, and shop) and moving (e.g. ore trucks). Table 3.15 provides a list of sources modelled. Refer to the Project Description (Appendix A.1) for additional information.

3.5.7.3 Model Results and Assessment

Emissions must be judged against background concentrations. Ambient air quality at the site was discussed in Section 3.2.2.

Ambient Air Quality Objectives

The Canadian air quality objectives are shown in Table 3.16.

Exhaust Gases

The exhaust gasses consist of NO_X, SO_2, CO, and CO_2. Table 3.17 provides an emission inventory for all exhaust gases and shows that for NO_X and CO_2 the emissions are divided somewhat equally between mobile and stationary sources.

Greenhouse Gases

The annual emission of CO_2 for stationary sources is 27,480 tonnes, which is similar to the annual emission from mobile sources, 21,102 tonnes. These values are high and represent the results of conservative emission factors, plus the assumption that all sources are operating at steady full power.

Nitrogen Dioxide

Modelled values are generally below the 1-hour Canadian Air Quality Objective of 400 mg/m3, except for a small area next to the processing plant. Values above 400 mg/m3 occur at only 15 receptors and mainly for stable or neutral conditions for a wind speed of 1 m/s. These values assume that all NOx is converted to NO_2. Wind speeds of 1 m/s or less occur less than 11% of the time at the Jericho site.

The addition of the mobile sources increases the modelled ground level concentrations and extends the size of the area for which concentrations exceed 400$\mu g/m^3$. Model results are very conservative, due to the assumption that vehicles are constantly emitting NO_X at the maximum rate throughout the day.

Although NO_2 may be emitted directly to the atmosphere, most is formed through reactions between NO and other gases. The reaction of NO with ozone is an effective means of conversion to NO_2.

If the ozone concentration is greater than the maximum predicted NO_X concentration, then total conversion is assumed. A conservatively high ozone level used in Alberta is 100 $\mu g/m^3$. In this case the 400 $\mu g/m^3$ contour is located primarily within the mine's fence line.

The ozone limited NO_2 concentrations are reasonable and the impact of NO_X emissions should be minimal (given the conservative nature of the model, the meteorology, and the emission estimates).

Sulphur Dioxide

The 450 $\mu g/m^3$ contour lies mainly within the Jericho site: the 900 $\mu g/m^3$ contour lies near the immediate vicinity of the pit. Maximum concentrations primarily occur during stable or neutral conditions with 1 m/s wind speeds. As in the case of NO_X, the conservative nature of the modelling exercise suggests that SO_2 emissions should not present a major impact on the environment.

Particulate Matter

From model results without mitigation, the PM_{10} concentrations appear to be abnormally high. With water spraying of roads, values are lower than for the unmitigated case, but extensive areas are still above 50 $\mu g/m^3$.

The size of areas used for the stockpiles (in calculating emission factor) were conservatively large. In reality, only a portion of a stockpile will be disturbed; the rest will be left undisturbed and will likely crust over. Hence, fugitive dust emissions would be suppressed for the undisturbed areas of any stockpiles. In addition, calculation assumptions that roads will be constantly emitting dust is clearly not the case.

Blasting

Not only does blasting create dust emissions, but the explosives will generate nitrates that may be deposited on nearby lakes. The U.S. Environmental Protection Agency air emission guidelines (AP-42, Section 13.3) indicates that 8 kg of nitrogen oxides can be created for each tonne of explosive used. An estimated 0.96 kg of ANFO is used per cubic meter of rock blasted. The rock volume per blast is approximately 14,400 m^3, which requires 13.8 tonnes of ANFO, and in turn yields about 110 kg of nitrogen oxides created with each blast. AP-42 also notes that oxygen-deficient explosives produce little or no nitrogen oxides and hence the estimate of 8 kg of nitrogen oxides per tonne of explosive is very uncertain.

Another rule of thumb is that 1% of the explosive is converted into nitrogen oxides. Thus, if 13.8 tonnes of explosives are used, 138 kg of nitrogen oxides would be created. This is similar to the AP-42 estimate. Not all of the NO_X will be transported away from the blast area. Since the blast will be a short-term event and dispersion models assume somewhat continuous emission sources, it is difficult to model how the explosive generated NO_X will be distributed. Since the explosives will be used deeper in the pit as time passes, more of the material will be trapped in the pit and not escape.

Total explosives use in Year 2 is estimated at 2,000 tonnes, which would yield 20 tonnes of nitrogen oxides.

Concentrations in the Mine Pit

There will be times when the atmosphere is very stable and a low-level inversion occurs. During such conditions emissions could be trapped in the pit and ambient concentrations of exhaust gases and particulate matter could increase to high levels. The operator will monitor these conditions; should pollutants accumulate in the pit, mining operations will shut down until safe to continue.

Conclusion

Model Application and Emission Estimates

The AP-42 factors used in this study and the use of continuous emission sources for the roadway and drop sources are overly conservative.

Assessment

The proposed mining activities will introduce air pollutants into the air shed. Potential ambient concentrations of NO_2 and SO_2 will be generally within government guidelines. Highest concentrations tend to be isolated within the Project area. It is doubtful that all sources of NO_2 or SO_2 will be active at the same time. Hence the aggregate plume from the site will have a variable, but not maximum, concentration over time.

It appears that fugitive dust may result in high ambient concentrations. However, this would be most probable during the summer: the time when mitigation through watering will be most affective. Maximum concentrations tend to occur when the atmosphere is stable and the wind speed is low. But when wind speed is low, fugitive dust emissions will tend to be at their lowest and hence actual ambient concentrations will also be low.

Once underground mining begins, the potential for fugitive dust emissions should be greatly reduced, because much of the dust generating activity will be underground. Thus, impacts on air quality will diminish with time.

The impact of mining activities on air quality will be negative, sub-regional in scope, medium term in duration (life of mine), and medium in magnitude.

3.5.7.4 Accidents and Malfunctions

Accidents and malfunctions considerations do not apply to air quality effects in general. If roads are not watered in summer, dust could increase. Failure of exhaust emission controls on power generators will result in increases in emissions of NOx, SOx, and possibly total suspended particulate (TSP) and CO. Alternate means of dust control will be employed, if the regular water truck is not functioning. All mobile and stationary engines at the site will be regularly maintained to ensure proper efficiency and operation, thus any malfunctions would be short-term. It is in the interest of Tahera to maintain engines, since the cost of fuel is high and a significant part of mine operating costs.

3.5.8 Noise

Noise is important in the context of its potential impacts on human and wildlife receptors. Noise will be generated from mobile and stationary mining equipment, blasting, and aircraft at the Jericho site. Noise during the construction phase will be less than during operation and occur over a much shorter period (9 months vs. 8 years). During closure and post closure phases, noise levels will again be reduced to at or near background.

The Jericho Project proposed mine site is in an undeveloped area. Ambient background noise levels in such areas have been found to be between 25 and 40 dBA (Diavik 1998) with wind, precipitation, and thunder being the principal sources of increases above ambient.

Studies in the Alaska oil fields, where development exceeds that planned over the next decade plus in Contwoyto Lake area, suggest that animals (particularly large mammals) are not disturbed by human-caused noise, unless it is sudden (e.g. blasting), or unless the area has a history of trapping or significant hunting activities. Where exploitation of wildlife has occurred, animals tend to avoid any human activity.

3.5.8.1 Sources

Blasting

Blasting will be carried out to develop the open pit. Blasts will occur, on average, daily but will be at approximately the same time of day. Noise from blasting will be intense near the source and very short duration (typically one second). All personnel and visible wildlife will be cleared to a safe distance prior to blasting (typically 600 m). As the pit develops, pit walls will increasingly dampen blasting noise. At 600 m blast noise will be over 100 dB (peak level; blast noise effects are not measured as for more constant sources). Unweighted peak sound levels are not judged by humans (and by inference other animals with similar hearing mechanisms) to be as loud as A-weighted continuous sound levels (measured in dBA).

Other Mining Sources

The principal noise source from mining operations will be mobile equipment outside the limits of the open pit. This will include ore trucks, utility vehicles, pickup trucks, and earth moving equipment (scrapers and crawler tractors). Within the pit a shovel and drills will also operate. Studies at EKATI™ Mine done for Diavik Mines indicate noise from equipment within open pits drops off to near-background levels (40 dbA) close to the lip of the pit. Thus, this equipment noise is unlikely to be problematic outside the mine’s immediate area of influence.

3.5.8.2 Potential Impacts of Noise from Diamond Processing

Based on experience with the 10 tonne per hour (TPH) pilot plant, noise from the plant will not be noticeable above ambient background noise beyond the walls of the building. The production plant will have a 40 to 50 TPH capacity and will therefore be expected to produce somewhat higher noise levels. Other processing noise will be related to mobile equipment, which will include a dozer (D6), front end loader (966), a dump truck (Cat D300 or Kenworth), and a pick up truck. Vehicles will be used intermittently as required to move materials and people. The crusher will operate 24 hours per day.

Power generators will also be in the general vicinity of the plant and will add to the background noise in the area. Power generators will be in a lean-to building adjacent to the plant, will have muffled exhausts, and will generate a constant noise that people and animals will habituate to readily (becoming similar to white noise when habituation occurs).

3.5.8.3 Aircraft Noise

Aircraft will be used for movement of personnel and some supplies to the Jericho site year round. Aircraft noise will be limited to a few minutes during landings and takeoffs. The service schedule is to be determined, but will be less than one flight per day during both construction and operation, with an average of 2 to 3 flights per week during open pit operations and 1 to 2 during underground mining and in the final two years of processing. Aircraft will be Hawker-Siddley 748 or Twin Otter class with the occasional larger or smaller aircraft.

3.5.8.4 Accidents and Malfunctions

Accidents are unlikely to significantly increase the ambient noise at the site, except momentarily. Malfunctions could include muffling of mobile equipment or the power station; any malfunction would be repaired immediately upon occurrence.

3.5.9 Hazardous Materials

3.5.9.1 Hazardous Materials List

A list of hazardous materials to be used at Jericho is contained in Table 3.18.

Proper management will ensure impacts from hazardous materials are minimized. A hazardous materials management plan has been developed and will be updated prior to construction (Appendix D.2.3). A spill contingency plan has also been developed (Appendix D.2.4). Therefore, any impacts that occur would be expected only from accidents and malfunctions.

3.5.9.2 Accidents and Malfunctions

Routine spills can be expected from drips and small spills from containers of petroleum products. Spills will be cleaned up immediately and, in the case of soils, remediated by land farming on site. Spills will be reported to the spill line where required, as detailed in the spill contingency plan previously cited.

Rupture of a Storage Tank in the Tank Farm

Rupture of a tank in the tank farm will result in spillage of the contents inside the containment berm; no impact on the surrounding environment or water bodies will accrue from such an accident. Response and clean up procedures are detailed in the spill contingency plan. Considering the track record of constructed tanks at the Lupin and EKATI™ mine sites, where no tank failures have occurred (over 20 years in the case of Lupin), the probability of such a failure is rated very low.

Failure of the Tank Farm Berm

Failure of the tank farm berm could occur, if water pressure behind the berm is sufficient to pipe through a weak area in the liner and berm. This type of failure will be prevented by routine inspections and keeping ponded water to a minimum behind the berm. The probability of such a failure is rated as nil with proper inspection and maintenance.

Spills of Bulk Petroleum Products

A number of petroleum products will be kept in bulk at the maintenance shop. These include solvent (e.g. Varsol™), hydraulic oil, transmission oil, and others. Such products will typically by kept on hand in 205 L barrels, which will be stored in silled areas capable of containing the contents. Spill kits will be kept in appropriate locations to help limit spill impacts. The probability of a spill to soil is rated as low; any such spill would be cleaned up immediately and the soil remediated on site. Because of the storage location of such products a spill to a water body is rated as nil, as the spilled product could not reach a water body.

Other Hazardous Materials

Table 3.18 provides a listing of spill potential for other hazardous materials that will be used at the Jericho Mine.

Transportation-Related Accidents

Some potential exists for spills of hazardous materials during transportation. Materials will be transported in winter, when the opportunity for thorough clean up is greatest. Although very small, there is some potential for hazardous materials to be lost to water bodies through transport trucks breaking through the ice on a lake. This hazard is discussed under Aquatic Impact Assessment (Appendix B.2.3), as aquatic populations would be at risk. Other than irretrievable loss through the ice, spills would be cleaned up promptly through a coordinated effort of the transport carrier and Jericho Mine personnel, as discussed in the spill contingency plan.

3.5.10 Vegetation and Wildlife Habitat

Potential impacts to vegetation and wildlife habitat will include removal of vegetation and alteration or elimination of wildlife habitat.

3.5.10.1 Assessment of Potential Impacts

The extent of disturbance to the vegetation and wildlife habitat at the mine site is summarized in Table 3.19. The Project superimposed on vegetation mapping is shown on Map C (Appendix E). Definitions of ecological zones are based on those developed for 1995 studies and are listed in Attachment 3.5.

Vegetation is a VEC in that it provides food and habitat for wildlife species. Plants are the vehicles that deliver energy from the sun to terrestrial ecosystems by producing plant tissue consumed by herbivores, soil building invertebrates, and micro-organisms. Habitat diversity ensures overall biodiversity and so contributes to overall ecological stability.

The plant communities in the Project area are representative of the surrounding tundra biome. No rare or endangered plant species or plant communities were identified during vegetation studies in 1995 or 1999 (Vegetation Report, Appendix B.1.2). Terrain disturbance caused by the Project will not diminish the overall biodiversity of the local tundra biome.

Project Interactions With Terrain And Wildlife Habitat

1. The combined area of plant community and habitat destruction required for mine, camp, airstrip, and related facilities will be up to 221.8 ha.

2. Dust from seasonal mining operations may reduce plant productivity in nearby undisturbed plant communities.

3. The overall amount and quality of forage and habitat sustaining herbivore populations at the Jericho Project site may be reduced.

4. Reduced forage will reduce herbivore productivity and abundance.

5. Reduced herbivore habitat may reduce prey abundance and availability.
6. Reduced prey availability and abundance may reduce predator populations locally and in the region.

All working and road surfaces will be snow covered and so very little dust will be generated from winter loading and hauling. Dust accumulation in the snow layer will therefore have little if any effect on the onset of the spring melt and run off. Summer blasting, waste rock disposal, and stockpiling ore will be associated with the standard dust suppression activities on the roads and in the pit. Also, summer precipitation will wash dust from foliage and inhibit dust accumulation on plants. Studies at Lupin into the effects of dust on plant density and biodiversity near gravel roads showed "the effects of road dust on tundra vegetation, in terms of total cover seems to be only minor" (Svoboda, 1997). Dust generation has been examined for the Project and reported in the Air Quality Report (Appendix D.1.1).

Environmental Effects Of Terrain Disturbance On Wildlife Populations

The distribution of wildlife in the area of the Project is, in part, a function of the natural habitats there. The minimum site criteria for a species' "key habitat" is "to support at least 1% of a national population" (Alexander et al., 1991). This definition has been used for assessing significance of migratory bird habitat in the NWT and is being extended to all other wildlife habitat in this discussion. None of the wildlife species found in the study area are found in concentrations that would represent 1% of their population. The Project area therefore does not meet the criteria for "key habitat" for any species. None of the lands required for the Project were found to be "key migratory bird terrestrial habitat" (Alexander et al., 1991) or "wildlife areas of special interest" (Ferguson, 1987). Also, none of the populations of wildlife species in the Project area are declared as being threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2002).

3.5.10.2 Accidents and Malfunctions

Conceivable accidents and malfunctions that could increase disturbance areas include failure of waste rock dumps, stockpiles, or dams on the PKCA. Construction of the waste rock dumps and stockpiles will be in lifts with set backs. Factors of safety will be conservative and all stockpiles and dumps will be founded on bedrock over most of their footprints, as detailed in the Project Description (Appendix A.1). Failure of a dump slope could result in minor runout of waste rock. Any failure other than the base 10 m lift would result in most rock runout onto the step-back bench at the foot of the failed slope, rather than beyond the base footprint of the dump. Failure of any part of the base lift would result in additional area being covered with rock, the extent of which would depend on the amount of rock that slid down the failed slope. Assuming an entire slope of Dump 1 failed, an area 10 m by 1000 m (1 ha) could be affected. This assumes the slope of the dump face would drop from 2:1 to 3:1 and that one of the longest slopes of the largest dump completely failed.

The overburden stockpile, which has the greatest potential to fail, will be constructed with a toe berm of run-of-mine waste rock to prevent runout should slumping occur.

3.5.11 Wildlife

3.5.11.1 Introduction

The terrestrial wildlife VECs considered in this environmental effects assessment were developed from two sources. The first was from the concerns and values expressed to Tahera during community consultation sessions. The second was from similar studies completed over the past 10 years for other mining ventures in the central mainland tundra:

- the Izok Project proposed by Metall Mining Corporation in 1993;
- the NWT Diamonds Project (now EKATI™ Mine) in 1996;
- the Ulu Project by Echo Bay Mines Ltd. in 1997; and
- the Diavik Diamonds Project in 1998.

The terrestrial VECs that emerge from these sources collectively are fairly consistent and include: terrestrial vegetation (as the key component of wildlife habitat); eskers; caribou; muskoxen; carnivores (grizzly bears, foxes, wolves, and wolverines); raptors; and water birds. The environmental effects assessment on wildlife is presented in Appendix B.2.2.

3.5.11.2 Significance Of Environmental Effects

The degree of significance (levels) of environmental effects are specified in terms of spatial (local/regional) and temporal (long-term/short-term) extent. Also specified is that the levels of environmental effect be explicitly defined. They are intended to provide criteria for classifying the environmental effects of the Jericho Diamond Project on VECs.

While these definitions may seem relatively precise, the predictions of environmental effects are necessarily approximate. Seldom are environmental data sufficient to allow precise quantitative measurements and/or predictions on the effects of interactions between the dynamic natural environment and human activities. Accordingly, the effects have been classified, based on the informed judgement of experienced scientists, the results of previous studies, and environmental reviews of mining projects in the region. In many cases these classifications are considered accurate and sound, based on the available information, the nature of the linkage, and our current understanding of the VECs in this environment. Where data gaps prevent reliable assessment, a monitoring effort will be conducted to expand on available data and improve understanding.

3.5.11.3 Physical Presence of Facilities

Background

Wildlife abundance in the area of the Jericho Diamond Project is seasonal. Birds are migratory and use the tundra for the summer breeding and fledging period. A raptor nest site that has been active in three of four years surveyed is located in a cliff above the winter road route crossing Lynne Lake. Caribou are migratory and are present continuously during spring migration for most of May and then seem to appear in large numbers for very brief periods any time from late June through mid-August (post-calving period - late summer). Year round residents of the Project area include small mammals, living under the snow in winter and in burrows or under rocks in summer. Ground squirrels hibernate for the winter and seem to be everywhere during the summer. Arctic hare can be seen in all seasons at locations that offer good escape terrain.

Discussion

Raptors

Jericho Diamond Project mining operations will be seasonal, beginning in April and continuing into December. These activities will occur for the entire raptor breeding, nesting, and fledging period during Project development and the eight-year mine life. The two largest raptors of the region, golden eagle and gyrfalcon, are not regular occupants of known nest sites in the Project area; peregrine falcons are quite tolerant of human activities, and rough-legged hawk nesting activities are dependent on small mammal population cycles.

Migratory Birds

Migratory bird species are represented in the local fauna by individual breeding pairs for species that are generally distributed throughout the continental tundra and, for some species, beyond. None of the species known to breed in the Project area have been observed in large concentrations. Large concentrations of waterfowl have not been observed at either Carat Lake or that portion of nearby Contwoyto Lake (5 km). A pair of loons and a pair of oldsquaw nest in the outflow to Carat Lake and a pair of Arctic terns nested nearby in 1999. Interactions with migratory birds during mining activities will be of a passive nature. Direct interactions, which could cause displacement of individual pairs of loons or oldsquaw known to nest in the Project area, are not required for the normal seasonal mining operations. Operating plans and the Project environmental management and spill prevention plans will include contingency measures that ensure contaminants from accidental spills do not enter Carat Lake, its outflow parallel to the airstrip, or local ponds between the airstrip and the camp.

The environmental effects of Jericho Project seasonal mining activities on migratory birds will be local, and will be present for eight years with minor effect on the migratory bird populations of the mainland tundra.

Small Mammals - Herbivores

The species of microtine rodent, hare, and ground squirrel present in the Project area are found throughout the tundra of Nunavut and beyond. They are resident throughout the year. The Jericho Project will have a direct effect on small mammal habitat as discussed above. Beyond that, the effects from mining activities on cyclic microtine populations will be undetectable. Direct effects on ground squirrels will be those associated with ground squirrels' habituation to camp facilities as shelter and a source of scraps (nesting material and food). Arctic hare will use the camp in winter as shelter from the elements, and in summer and winter as shelter from predators.

Despite low vehicle speed and animal right-of-way policy, it is possible that vehicle accidents with small mammals may occur. Where feasible, extra culverts could be laid down during road building in the Jericho area, to allow a number of "safe passage" routes for small mammals under the road. To prevent attracting carnivores, any small mammal road kills will be disposed of by incineration immediately.

Muskox

Muskox in low numbers were observed in the Project area during aerial surveys in 1999 and other overflights of the Project area since 1995. While muskox are resident in the region, their use of the grounds in the immediate vicinity of the Jericho pipe, Carat Camp, and airstrip appears infrequent. Furthermore, muskox show great tolerance to benign and passive interactions with human activity, as has been demonstrated by years of observations at Lupin Mine. No road accident involving muskox at Lupin has been reported (Hohnstein, 1996).

Caribou

The Jericho Diamond Project is located on the summer range of the Bathurst caribou herd. Large concentrations of caribou with and without calves have been observed passing through the Project area, travelling north and south. The Project is located near the apex of a very large lake and the movement of caribou through the Project area may be due, in part, to large concentrations of caribou passing around the lake rather than selecting the Willingham Hills for a specific summer destination.

On only one occasion during the past decade of human activity at the Jericho site was a large concentration of caribou observed to interrupt a summer migration to feed and rest in the Project area. This occurred June 26/27 1996 when a post-calving herd estimated at 50,000 spent 12 to 18 hours in the area. The observation and Project response was recorded by Tobias Vlasblom, the engineer supervising the airstrip construction: “Into the night shift, around 9 pm, a large herd of caribou appeared at the north end of the old Jericho camp, and all equipment was shut down.” (The location mentioned is just north of the north end of the Jericho airstrip.) His observation for June 27 was also recorded: “The caribou that shut down operations yesterday moved southeast around 11 am and we were able to continue (airstrip construction) in the afternoon” (Canamera, 1996b Jericho daily engineering report, unpublished).

Similar observations have been made at Lupin. In June 1999 herds of 1,000+ caribou passed between Lupin and Contwoyto Lake more or less continuously on June 27, 28, 29, and 30. All were non-breeding animals moving northwesterly, with a high proportion of bulls and yearlings (Ben Hubert’s observations and 1999 Jericho Project wildlife log – see Appendix B.1.3).

These observations show that physical infrastructure (Lupin mine) and the activity of heavy construction equipment (Jericho airstrip construction) are not barriers to large aggregations of migrating caribou. These observations also show that large herds of caribou must be expected in the Project area during mining operations. The site plan, mining operations plan, and Project environmental management systems (EMS) have been developed accordingly.

Movement of caribou through the area during spring migration is significant. However, observations to date suggest that spring migration through the Project area is characterized by a steady stream of smaller herds (100's), as opposed to summer observations of either small numbers (<10) moving very little, or very large herds (>1,000) moving through quickly (1999 & Y2000 Wildlife Report, Appendix B.1.3).

The distribution of caribou trails in the Project area (Map B, Appendix E) and the reports of observers show the distribution and direction of movements of caribou during migration events through the Jericho Project area. This information shows that it is possible (and necessary) to develop a cost effective site facilities configuration plan for the mining site, which will not unduly hinder the movement of large numbers of caribou during the post-calving through late summer period. At a regional scale it is noteworthy that during the period of construction, mining, and ore processing activities at Lupin from 1980 to 1998, the Bathurst Herd increased from 140,000 in 1980 (Case et al., 1995) to 349,000 in 1996 (Gunn et al., 1997).

Carnivores

Project personnel have observed fox, wolf, wolverine, and grizzly in the area since the Project began in 1992. Several dens have been located nearby, but none within the active footprint of the mine and related facilities and infrastructure.

Fox

Arctic fox and red fox have been observed in the Project area, but only red fox have been found to occupy dens. Interactions between seasonal mining operations and foxes should be minimal. Mining activities have no need to disturb the area of the den, nor is there a need for mining personnel to visit it.

Wolf

As with foxes, interactions of wolves with the Project should be passive, with no Project activity requiring direct exposure to wolf den areas. The environmental effects of seasonal mining activities on the wolf population over the eight-year period of the Jericho Project will be local, moderate, and minor.

Wolverine

The same mitigation measures to be practised by the Project for foxes and wolves apply equally to wolverines. It is also essential that any road kills be disposed of by incineration immediately. Hunting at the minesite by mineworkers will be prohibited. The environmental effects of seasonal mining activities on the tundra wolverine population over the eight-year period of the Jericho Project will be local, moderate, and minor.

Grizzly Bear

The large esker complex running northwest from the airstrip shows the remains of four grizzly dens. Grizzlies den for the winter in October. In the area of the Project it is expected that well drained soils including eskers will be the preferred denning habitat. Males remain active later in the fall and emerge a month earlier than females with their cubs (Craighead and Mitchell in Chapman and Feldhamer, 1982). Emergence from winter dens may coincide with both mining and winter hauling resupply activities in the Project area.

Bears and the sign of bears have been observed at the Carat Lake camp, but there have been no direct interactions with grizzly there since the camp was established in 1996. The camp management has always been diligent in incinerating kitchen garbage and an electric perimeter fence was erected in the summer of 1996. The experience with grizzly at Lupin Mine shows that mining within the range of grizzly has had negligible direct impact on grizzly bears in the region (Metall, 1993).

In the matter of denning habitat, there is no need or intention of taking granular material from the northwest esker complex where evidence of past grizzly denning has been observed. The record of grizzly interactions at the Carat Lake camp is evidence of the effectiveness of the current practice of incineration and electric fencing. These practices will continue for the duration of seasonal mining operations at the Jericho Project.

The impact of the Jericho Project activities over their eight-year schedule will be local, moderate, and minor on grizzly bear abundance and distribution.

3.5.11.4 Transportation Effects

Background

Transportation support for the Project will have two main components:

- annual winter resupply from Yellowknife over the Echo Bay Mines winter road;
- up to three flights per week to Jericho for crew change and camp provisioning during seasonal mining and hauling operations.

Raptors

The resupply route does not pass near any of the known gyrfalcon or golden eagle nest sites in the Willingham Hills/Contwoyto Point area. Surface transport activities between Jericho and Lupin will be suspended for the season by the time rough-legged hawks and peregrine falcons undertake nesting (late May/early June). All birds will have departed by the time the winter ore haul/Jericho resupply resumes in January. There are no raptor nest sites near the airstrip. Interactions between raptors and Jericho Project transportation activities will be infrequent and the resulting environmental effects on raptor populations will be minor.

Migratory birds

Winter road transport activities on the Jericho winter road will be suspended for the season by the time that migratory birds return to their summer breeding territories in the Jericho/Lupin area (early June). All birds will have departed by the time the winter Jericho resupply resumes in January. Waterfowl nesting occurrences on ponds near the airstrip have not been observed, but a brood of oldsquaw ducks was seen there in August 1999. Interactions between migratory birds and Jericho Project transportation activities will be infrequent and the resulting environmental effects on migratory bird populations will be minor.

Caribou

Data from aerial surveys and the observations of personnel at Carat Camp and Lupin describe the caribou spring migration through the Lupin/Jericho area beginning in mid-April 1999 (caribou first recorded at Lupin 17 April; caribou tracks first noted at Jericho 21 April; wildlife log in Appendix B.1.3). The annual resupply on the Lupin winter road will be completed by mid-April. In 1999 the peak of the spring migration in the Jericho area seemed to occur 15 - 23 May (Appendix B.1.3).

Contwoyto Lake lies across a broad expanse (110 km) of the Bathurst herd's spring migration route (see Kelsall, 1968; Mueller and Gunn, 1996). In any given year thousands of caribou cows can cross the spring ice of Contwoyto

Lake en route to the calving ground. An ice road running the length of the lake from its southern apex to Lupin has operated yearly since 1983 (see Table 6.3.2-2 in Diavik CSR for 1983-1997 winter operating statistics, CEAA 1999). The mean "last truck" date for the 1983-1997 period was April 4. This is earlier than the observed spring migration period at Lupin and Jericho (1999 wildlife log in Appendix B.1.3), but the snow berm along the road way from clearing the right of way persists on the ice surface until break-up.

Studies of interactions between caribou and transportation corridors have not shown that caribou change their migration route or distribution in response to transportation corridors alone (Bergerud et al. 1982). In the case of the Bathurst herd spring migration to the calving grounds, the interaction will be most frequent on the Lupin - Jericho haul road between late April and late May, after the resupply road south of Lupin to Yellowknife has shut down. The concentrations of bulls, yearlings, and barren cows observed moving through the Lupin area in late June 1999 seemed to follow the shoreline, even though the lake remained covered with ice. Haul road operations for Jericho are expected to shut down mid to late March and so interactions with such a wave of migrating caribou will not occur. However, such concentrations of caribou should be expected at seasonal mining operations at Jericho as discussed above.

Caribou have been a constant feature of spring and summer operations at Lupin for its entire operating history. The numbers of caribou present from year to year and from month to month are variable (Mueller and Gunn, 1996). Only three accidental caribou deaths in over 20 years of operations have been reported by Echo Bay Mines at Lupin (Hohnstein, 1996); a far greater risk to both caribou and humans is the matter of caribou on the airstrip. That risk will be similar at the Jericho airstrip for the periods of spring migration through late summer, when caribou should be expected in numbers ranging from individuals to thousands. Their presence will be similar to that observed at Carat Camp and Lupin; individual animals and small groups can take up temporary residence, and large numbers will pass through without any sign of forewarning.

Extensive studies into caribou reaction to aircraft have been made on different herds in the past 20 years. Perhaps the most detailed was the study of low-level fighter jet training flights over the George River herd's range in northern Quebec. Training flights over the range were initiated in 1981 with 1,500 flights increasing to over 6,000 in 1988, and were expected to increase further to 18,000 in 1996. The study compared caribou movements in areas of flights to caribou movements not influenced by training flights; although overt responses by caribou to overflights were common, no significant (statistical) effects on daily activity levels or distance travelled were detected (Harrington and Vietch, 1991). The study found the "disturbance footprint" of a low-level jet flight to be less than 500 m. The number of flights into the Project area will be considerably less than those reported above and will be low level only during approaches for landing and climb-out after take-off.

The environmental effects of Jericho Project transportation activities on the Bathurst caribou herd will be regional (spatial extent), moderate (for the life of the Project), and minor on the overall population.

Carnivores

The risk of interactions between carnivores and Jericho Project transportation activities is very low for all species. Foxes, wolves, and wolverines will not linger or be attracted to the seasonal hauling activities. Grizzly bears, emerging from their winter quarters, might investigate. The environmental effect of Jericho Project transportation activities on carnivores will be local, moderate (for the life of the Project), and minor on the overall population.

3.5.11.5 Environmental Effects On Wildlife From Processing Kimberlite

All Jericho process-related activities will take place within the disturbance footprint. A number of well-used trails cross the plant complex area and caribou will have to be deflected around the plant to the south, if they travel that way heading north or south (Map B). Buildings and other infrastructure will not pose a hazard to caribou; rather the caribou could cause damage to pond and ditch berms, if sizeable numbers trampled these areas.

The supernatant water of diamond processing plants (fine PK) is relatively contaminant-free compared with tailings of metal and precious metals mines. Use of the PKCA by waterfowl should not result in any impacts to the birds.

3.5.11.6 Summary - Environmental Effects Of The Jericho Project

The interactions of seasonal mining and hauling, and year round kimberlite processing activities with wildlife over an eight year span were examined and environmental effects on wildlife populations assessed (Table 3.20). In all cases (raptor populations, migratory bird populations, small mammal populations, ungulate populations, and carnivore populations) the environmental effects would be contained to the area of the Project or the limit of the range (for caribou). The effects do not extend beyond the life of the Project, and are not detectable in the population.

In the case of terrain disturbance, it will take many years to naturally revegetate the 221.8 ha that will be disturbed. No cumulative environmental effects are foreseen. The sustainability of harvests on populations that are presently being harvested should not change as a consequence of the overall negligible effects from the Project. These findings are consistent with those of the environmental effects assessment of the Diavik Project, which is approximately 170 km south of Lupin and is proposed to operate for 23 years and disturb an active footprint more than five times greater than that of the Jericho Project (CEAA 1999).

3.5.11.7 Accidents and Malfunctions

Accidents that could significantly affect terrestrial wildlife are limited to road accidents and large spills of hazardous substances or process liquids (fine PK). Road accidents have been successfully limited in over two decades of operation at the Lupin Mine by employing a “wildlife right of way” policy and educating the workforce. A similar strategy is planned for Jericho. This policy and limiting road speed should serve to reduce road kills to near zero for medium and large mammals, thus reducing impacts from movement of materials and personnel to negligible levels.

Spills of petroleum will be contained at the Jericho site by the fuel farm berm. To reduce routine and other spills to the largest extent possible, Tahera will train and orient employees by means of the Spill Prevention, Countermeasures and Control Plan. Small spills will not significantly affect terrestrial animals and large spills should not occur, or be so infrequent as to have negligible impact on a local level. Spills during the winter resupply will be cleaned up immediately and will not affect terrestrial animals; animals will be kept away from spills, if any venture close to the site.

3.5.12 Aquatic Resources

3.5.12.1 Assessment Of Potential Effects

Introduction

Project activities at the Jericho site have the potential to affect fish in several ways. These may include direct effects on fish, such as mortality, or indirect effects on fish through changes in habitat and water quality. Fish habitat could be physically lost to the footprint of the development. The value of habitat to fish could be reduced through changes in water quality. Water quality may also influence fish by affecting the health of a population, or by changing the reproductive capacity of primary producers (phytoplankton and periphyton) or food sources (zooplankton and benthic invertebrates). An Aquatic Impact Assessment was conducted by RL&L in 2000 (Appendix B.2.3) and updated by PE Environmental in 2002 (Attachment 4.1 in Appendix B.2.3).

Project activities have been grouped into three pathways of potential effects on fish: direct mortality, loss or degradation of habitat, and reduced water quality. Each of these pathways represents one primary effect, but it is acknowledged that a Project activity could have multiple effects. Potential environmental effects, in relation to the environmental management and mitigation plans for the Project, are examined below.

Potential Effects Causing Fish Mortality

Water Withdrawal

Project Activity

One main water intake would be constructed in Carat Lake to supply potable water to the camp and plant. Approximately 31 m^3/hour (anticipated 30 m^3/hr for plant and 1.25 m^3/hr for camp) will be withdrawn. On an annual basis, this represents 0.8% of the volume of Carat Lake. A small, temporary water intake (screened pump hose) will be used for the exploration camp when in operation.

Potential Effects

The footprint of the intake structure may destroy fish habitat and entrainment into the intake structure could cause direct mortality of fish. Fish utilize the Carat Lake margins in the vicinity of the camp and mine, primarily for rearing by young-of-the-year and juvenile fish. Although lake margins near the proposed intake structures provide habitat, high concentrations of fish were not recorded in these areas, and the areas were not categorized as high quality habitats. As such, there is the potential for fish mortality, but it is unlikely that large numbers of fish will be entrained.

Assessment of Potential Effects

The DFO guidelines (1995a) for screening of water intakes will be met and intake structures will not be placed in important fish habitat. As such, no adverse environmental effects associated with the water intake structure are anticipated.

Use of Explosives

Project Activity

Explosives would be the primary method of excavating waste rock and kimberlite ore during construction and operation of the open pit and underground. Use of explosives would cause shock waves that radiate outwards from the point of detonation.

Potential Effects

Free-swimming fish are present in Stream C1, Lake C1, and along the southeast shoreline of Carat Lake, which are in the vicinity of the pit (Map A). Incubating fish eggs (resident populations of lake trout and slimy sculpin) will be present in Lake C1 during part of the year. Incubating eggs (lake trout, Arctic char, round whitefish, and slimy sculpin) may also be located along the southeast shore of Carat Lake. The assumption for the presence of incubating eggs is based on indirect evidence (i.e., presence of suitable spawning habitat and the presence of young-of-the-year Arctic char), rather than a physical collection of fish eggs. Although spawning by larger fish species was not documented in Stream C1, it is likely that slimy sculpin use this system for spawning and egg incubation. Based on the timing of spawning (McCart and Den Beste 1979), incubating eggs of lake trout, Arctic char, and round whitefish could be present on shoals along the lake margins between September and March; eggs of slimy sculpin could be present during June and July (Scott and Crossman 1973).

Since the pit is adjacent to fish bearing waters, there is potential for shock waves produced by explosives to affect fish.

Assessment of Potential Effects

Guidelines have been developed by Wright and Hopky (1998) for the protection of fish from exposure to shock waves induced by the use of explosives. Two factors may cause harm to fish and fish eggs: an instantaneous pressure change or "over pressure", and "peak particle velocity", which is a measure of ground vibration. The threshold for an instantaneous pressure change is 100 kPa, measured in the swim bladder of a free-swimming fish. For spawning beds where eggs are incubating, peak particle velocities below 13 mm/s are recommended to ensure the protection and viability of eggs. Both thresholds are based on a 50% mortality rate (Dennis Wright, Coordinator, Environmental Science Division, Federal Department of Fisheries and Oceans, pers. comm.).

Based on guidelines presented in Wright and Hopky (1998), the intensity of the shock wave produced would vary depending on the weight of the charge, distance from the point of the explosion, characteristics of the substances through which the shock wave is travelling, and the time delay between explosions.

To assess the effect that explosives may have on fish, the magnitude of the shock waves that are expected to enter the water body can be determined based on formulas provided in Wright and Hopky (1998). Based on the maximum weight of explosives that can be expected, only the *Peak Particle Velocity* guidelines for use of explosives will be exceeded in the lower section of Stream C1 and in Carat Lake.

Based on this information, use of explosives in the mine pit could result in some level of adverse environmental effects, but only on a very localized scale.

Harvest by Angling

Project Activity

Angling is a common recreational activity in northern mining camps. Lake trout and Arctic char are anticipated to be the target species for the majority of anglers. Angling targeted at other sportfish is unlikely, because they occur infrequently in the Project area (Arctic grayling), or are not normally considered a target species (round whitefish).

Potential Effect

Angling of fish in water bodies within the Jericho site under the existing sportfishing regulations would likely result in the harvest of a portion of the sportfish population within the water bodies. Even if anglers practice catch-and-release for lake trout and Arctic char during their fishing excursions, a percentage of the fish captured and then released may die from hooking injuries (Falk et al. 1974; Loftus et al. 1988).

In sub-Arctic lakes, even with relatively low levels of angling pressure, the resulting harvest of resident fish can cause a shift in fish community structure and may lead to an eventual collapse of the target fish population. Fish in the small (<20 ha), oligotrophic water bodies within the Jericho site are slow-growing, exhibit a low reproductive potential, and occur in small populations. Given these characteristics, fish populations in the Jericho site are unlikely to sustain even low levels of harvest over an extended period of time.

Assessment of Potential Effects

A ban on angling by mine employees in the vicinity of Carat Lake will essentially eliminate fish mortality associated with harvest and hooking injuries. Although the ban does not include Contwoyto Lake, potential harvest of fish in this water body is considered low, as all angling will occur from shore (i.e., no boats). Poor access to the resource will severely restrict the number of anglers using Contwoyto Lake, resulting in very low harvest rates. Therefore, adverse environmental effects associated with harvest by angling will be limited. Tahera will coordinate the company's initiatives with DFO and the territorial government.

Potential Effects Causing Loss of Fish Habitat

Many water bodies in the Jericho site currently support or have the potential to support fish populations. Assessment of Project activities associated with the development "footprint") that may cause physical loss of fish habitat is important. Current design of the proposed Project will ensure that the development footprint infringe minimally on most water bodies that are currently supporting, or having the potential to support, fish. The mine infrastructure will infringe on some ponds and ephemeral streams, but these water bodies are too small and too shallow to support resident fish populations, and/or are isolated from fish bearing waters.

A small amount of shallow water habitat (750 m^2) will be removed where the water intake structure is located. Partial compensation will involve replacement of subsurface parts of the causeway footing, thus providing new habitat. Long Lake will also be removed as fish habitat. The lake currently supports only limited populations of slimy sculpin and burbot.

That fish habitat can be adversely affected by changes in the productive capacity of upstream areas (i.e., nutrients and food resources) is acknowledged, but these effects are considered negligible. As such, small ponds and ephemeral streams are not deemed potential fish habitat and, therefore, are not dealt with in this assessment.

Permanent and Winter Roads

Project Activities

The mine infrastructure will require a network of permanent roads within the Jericho site and a winter road that connects the mine to the Lupin winter road. The permanent road section will cross one water body (Stream C2), requiring installation of a culvert. An all weather road (Years 2 to 8) will traverse approximately 3 km of tundra before connecting to Contwoyto Lake, but does not cross any permanent streams. The winter road to Contwoyto Lake (Year 1 only) will traverse 2.5 km of tundra and two watercourses (Streams D1 and D2) and Lynne Lake, but no permanent structures, such as culverts, will be required.

Upon closure of the mine, all permanent roads and associated structures (culverts) will be removed, and the sites will be rehabilitated.

Potential Effects

All streams traversed by permanent and winter roads freeze to the channel bottom during winter; therefore potential adverse effects would occur only during the open water period. Construction, operation, and closure of the permanent roads in the Jericho site have the potential to alter drainage patterns by preventing down slope movements of surface water, resulting in reduced runoff to streams. Ditching along permanent roads may also accelerate erosion processes and funnel sediment laden water into the stream, possibly reducing water quality. Both have the potential to adversely affect fish habitat. Culverts may also create barriers to fish passage by preventing access to habitat that may be suitable to fish. However, the proposed crossing site of the permanent road across Stream C2 does not traverse a fish bearing section. Inventories undertaken on this system documented that fish distribution was limited to the first 100 m upstream of the lake confluence. The permanent road crossing is situated well upstream of this point (approximately 400 m). Due to its small size and ill-defined channel, the stream section at the proposed crossing is not easily accessible to fish; its value as fish habitat is negligible. As such, the potential for permanent roads to cause a loss of fish habitat is very low.

Assessment of Potential Effects

The DFO (1995b) guidelines will be met regarding permanent and winter road construction, operation, and closure. Therefore, potential effects will be fully mitigated. Since the proposed crossing sites do not traverse stream sections utilized by fish and are of limited value as fish habitat, potential for loss of fish habitat is very low. Based on this information, there will be no adverse environmental effect associated with the loss of fish habitat caused by permanent and winter roads.

Diversion of Stream C1

Project Activities

Stream C1 is part of a small drainage basin (1.13 km^2) situated at the southeast corner of Carat Lake. Footprint of the proposed mine pit will include a section of this stream (Map A). To maintain the drainage capacity of the basin, and to prevent flooding of the active pit, a diversion channel, 425 m long, will be constructed along the western perimeter of the mine. Construction of the diversion system will consist of a dike across Stream C1 at the upstream end, a man-made channel to divert the flow around the mine pit, and a dissipating pond at the downstream end, where the flow re-enters the original stream bed. This will require instream activities at the upper and lower ends of the artificial channel, but will occur in winter, when no freshwater is present in the stream.

Once operational, the system will divert all flow from Stream C1 (at approximately 815 m upstream of Carat Lake) into the artificial channel around the pit. Water will then be diverted back into Stream C1 at approximately 275 m upstream of Carat Lake. Total length of stream removed from production will be approximately 541 m. The diversion channel will be made capable of fish passage.

Upon mine closure and with the approval of DFO, the diversion system will be modified. A weir will be placed in the diversion dike to allow excess flood water (not required to maintain flow in the diversion system and lower section of Stream C1) to flow into the original natural channel and into the pit.

Potential Effects

Potential fish habitat is available up to the natural barrier (815 m of stream); however, inventories completed in 1995, 1996, spring 1998, and 1999 provided strong evidence that fish distribution was restricted to the lower section of stream. Despite extensive sampling through the system, no fish were ever recorded more than 100 m upstream from the confluence with Carat Lake.

Species recorded in the lower section of Stream C1 included Arctic char, Arctic grayling, burbot, lake trout, round whitefish, and slimy sculpin. Young-of-the-year and small juveniles that used the system opportunistically for rearing purposes consistently dominated the fish community. With the exception of slimy sculpin, no adults or fish eggs were ever recorded in Stream C1; therefore, the system was not used for spawning or feeding, and it did not provide a movement corridor. Estimated density of fish recorded in Stream C1 was approximately 15 fish/100 m.

Fish also used the outlet zone of Stream C1 and Carat Lake for rearing and feeding and the area may be used for spawning and egg incubation. The assumption of the existence of incubating eggs is made based on indirect evidence (i.e. presence of suitable spawning habitat; presence of spawning fish and young-of-the-year, which still had yolk sacs), rather than a physical record of fish eggs. Thus, incubating eggs of lake trout, Arctic char, and round whitefish could be present between September and March (McCart and Den Beste 1979). Although no spawning by larger fish species was documented in Stream C1 (e.g. Arctic grayling), slimy sculpin likely use this system for spawning and egg incubation; eggs of slimy sculpin would be present during June and July (Scott and Crossman 1973).

Project activities affecting Stream C1 have the potential for alteration, disruption, or destruction of fish habitat in Stream C1 and its outlet zone with Carat Lake. The effects may include: physical removal of fish habitat (unused) in Stream C1 due to dewatering (541 m of stream) during operation; and a reduction of water quality and habitat quality in Stream C1 and Carat Lake, due to increased suspended sediment concentrations during operation and closure. One additional effect may be fish stranding in the diversion channel, which could result if base water flows were not sufficient to maintain free-standing water in the diversion system following spring freshet.

Assessment of Potential Effects

Stream C1 provides rearing habitat for young-of-the-year and small juveniles of several fish species, apparently restricted to the lower 100 m section immediately upstream of Carat Lake, according to extensive fisheries inventories. Therefore, removal of potential fish habitat in the upper portion of Stream C1 will not adversely affect fish. Because flows will be maintained by the diversion system, loss of nutrients or invertebrate production from upstream areas will be minimal.

The environmental management and mitigation plans are designed to reduce the introduction of sediments into Stream C1 and prevent sedimentation of downstream sections of the stream during maintenance (see Section 2.3.2.3, Appendix B.3.1). As such, very limited potential exists for adverse environmental effects caused by elevated suspended sediment concentrations in the lower section of Stream C1 and in Carat Lake.

The potential for fish stranding is extremely low, since fish distribution is restricted to the lower 100 m of stream (well below the entry point to the diversion at 275 m).

Based on this information, diversion of Stream C1 and the resulting loss of a portion of the channel will not result in loss of fish habitat.

<u>Processed Kimberlite Containment Area (PKCA)</u>

Project Activities

The PKCA, required to store fine PK, discharge from the water treatment system, runoff from the plant site, and possibly runoff from the mine site, will require the use of several water bodies in the collectively termed "Long Lake System". These include Long Lake, an unnamed pond at its west end, an ill-defined channel connecting the two, and an unnamed pond perched above Long Lake along its northern shore (Map A). Upon closure of the mine, dry portions of the PKCA will be rehabilitated, leaving a much smaller lake basin at its western end. Due to its small size and shallow depth, this water body will not support a viable fish population.

Potential Effects

Several potential effects are associated with the PKCA. The primary effect would be permanent loss of fish habitat that presently exists in Long Lake System. During construction and operation of the PKCA, direct mortality of fish will occur due to stranding or increased toxicity of the water within the storage cells.

Long Lake is a small (9 ha), elongated water body, with a maximum depth of 8 m, supporting limited numbers of two fish species, burbot and slimy sculpin, identified during intensive fish sampling in 1999 and 2000. Stream C3, which connects this basin to Lake C3, is impassable to fish over much of its length (>600 m); the fish community is resident to the Long Lake system.

In addition to habitat loss and direct mortality of fish due to the PKCA, the altered discharge regime of Stream C3 during construction and operation of the facility could have detrimental effects on fish.

Assessment of Potential Effects

Nine hectares of fish habitat for slimy sculpins and burbot represents less than 10% of the available shallow lake habitat in the Jericho area. Therefore the effects are high for Long Lake and moderate for the Jericho area. Effects are entirely residual, i.e. there is no mitigation possible other than compensation. Fish will be salvaged, if possible. Timing will be critical for this operation, as it must be undertaken in the summer. To be successful, however, Long Lake will need to be drained to the extent possible prior to salvage. To minimize suspended sediment, water must be withdrawn under ice cover, or the winter prior to the salvage attempt.

Water Intake Causeway

Project Activity

A causeway, constructed of waste material generated during development of the mine, will protect the Carat Lake water intake and pipeline from ice damage. The surface area of the causeway footprint will be approximately 1,400 m^2. Rehabilitation during the closure phase will entail sealing the water intake pipe and grading the causeway down to ice level during winter. In spring, dislodged material will sink to the lake bottom.

Potential Effects

Carat Lake in the vicinity of the causeway is used by several fish species including lake trout, Arctic char, burbot, round whitefish, and slimy sculpin. The lake margin is used for rearing and feeding purposes and spawning does occur in the vicinity of the causeway.

Potential effects associated with the causeway include loss of fish habitat, reduced water quality, and destruction of fish eggs. The causeway footprint will physically cover fish habitat, thus causing its loss. Loss of habitat could also result indirectly from the causeway, due to alteration of water movement patterns in the southeast corner of Carat Lake. In lake environments, char species often require water movement to maintain the viability of incubating eggs deposited on rock substrates (lake trout) or in reeds (Arctic char). The causeway design calls for a 90 m length, which should not significantly affect water circulation.

Construction of the causeway also has the potential to destroy fish eggs deposited in the substrate. Because construction will occur at a time when fish eggs of the majority of species are not present (open water period), this potential effect is negligible.

Reduced water quality will be associated with construction of the causeway. Use of waste rock from the mine will introduce fine materials into the water, resulting in increased suspended sediments and sedimentation.

Rehabilitation of the causeway will result in:

- additional loss of fish habitat by increasing the size of the footprint;
- destruction of fish habitat provided by the causeway itself; and
- introduction of sediments from the top dressing of the roadway.

Assessment of Potential Effects

Both construction and rehabilitation of the causeway will cause physical loss of fish habitat. The causeway may also affect spawning habitat by altering water circulation patterns in the southeast corner of Carat Lake. It is assumed that the sediment control measures implemented during construction and rehabilitation (see Appendix A.1 for details) will prevent large amounts of sediment from entering the aquatic environment. As such, loss of habitat is deemed to be the only potential adverse effect on fish caused by the water withdrawal causeway.

Potential Effects Causing a Reduction in Water Quality

Several Project activities could potentially affect fish indirectly by reducing water quality, such as: releases of effluent from the mine and waste rock areas; effluent discharge from the PKCA; and releases of air-borne contaminants (emissions and dust). These activities have the potential to introduce contaminants (metals, nutrients, and suspended sediments) into the aquatic environment. In sufficient quantity, these contaminants may reduce water quality to the level where aquatic biota are adversely affected. Potential effects to fish include increased contaminant loads, lowered reproductive capacity, and loss of habitat. A change in water quality can affect fish indirectly by altering productive capacity of the aquatic ecosystem. Nutrient loading may increase the production of invertebrates, thereby providing more food for fish. Conversely, elevated suspended sediment loads could reduce primary production of phytoplankton by reducing light penetration.

<u>Mine Effluent</u>

Project Activity

Several Project components in the mine area are sources of effluent, including the PKCA, waste rock dumps, ore stockpiles, and mine pit. The mine pit effluent is considered a combination of waste rock and ore effluent, and therefore, will not be discussed separately. Surface runoff from permanent roads associated with the mine may also contain elevated levels of suspended sediments. This source is considered minor, because it will be contained by ditches or the existing tundra and therefore, will not be assessed.

Potential Effects

Given the topography of the site, mine effluent could affect water quality in two fish-bearing lakes (Carat Lake and Lake C1) through the introduction of nutrients and contaminants. The potential effects of a change in water quality on fish and other aquatic biota are briefly discussed below.

In nutrient poor water bodies, biological productivity is generally limited by the nutrient (nitrogen or phosphorus) in shortest supply (Wetzel 1983). In water bodies at the Jericho site, phosphorus is the nutrient in shortest supply. Adding more phosphorus could stimulate biomass production of algae, which in turn, may affect the food-chain by increasing the biomass of zooplankton, benthic invertebrates, and ultimately fish. This potential shift in trophic status and community structure could alter the natural state of the affected water bodies.

Acidic effluent (i.e., extremely low pH) has the potential to be toxic to aquatic organisms, but can also facilitate release of metals into the environment. Elevated metal concentrations can have both lethal and sublethal affects on fish (Alabaster and Lloyd 1982).

The effects of increased suspended sediment concentrations on fish and fish habitat may involve the following (Anderson et al. 1995):

- reduced fish survival by direct mortality or by reducing growth, overall health, and resistance to disease;
- modifying the abundance and type of pelagic food organisms available to fish; and/or
- interfering with the natural movements of fish.

Sedimentation could affect the egg and larval stages of fish for species requiring clean rock substrates for incubation. Smothering of eggs and altering the porosity of the substrate could reduce survival. Sedimentation could also affect fish habitat by reducing the productivity of benthic communities.

Assessment of Potential Effects

The predicted physical parameters and concentrations of metals and nutrients from each of the effluent sources are discussed in Section 3.5.6. Mine water will be pumped to the PKCA and/or spray irrigated if it does not meet Project Water Licence criteria. As such, the predicted impact on fish will be negligible.

Air-borne Contaminants

Project Activity

Development of the open pit, use of haul roads, infrastructure development, and use of a sand/gravel airstrip are all potential sources of air-borne contaminants (primarily dust). Other potential sources of air emissions include the diesel generator and camp incinerator. The majority of emissions would most likely be dust generated from mining activities, such as blasting and transportation of waste rock and ore.

Potential Effects

A portion of the dust generated from the proposed development would eventually be deposited onto the surface of Carat Lake and other water bodies within the Jericho site, disperse into the water column, and ultimately settle on the bottom. The potential effects of dust on water quality would be increased levels of suspended sediment in the water column and sediment deposition on lake bottom habitat. This could result in decreased survival and biomass production of invertebrates. Extreme levels of sedimentation could result in mortality of fish eggs.

Assessment of Potential Effects

Quantitative data are not currently available for the proposed Project to assess potential effects of dust and air emissions on water quality, however, data are available for the Diavik Diamonds Project (Diavik 1998), another sub-Arctic project, but much larger.

The effects of dust deposition on water quality were evaluated for several fish bearing lakes in the vicinity of the proposed Diavik mine by calculating annual total suspended sediment (TSS) concentrations and sedimentation rates. The maximum annual potential increase was 5 mg/L for TSS and 0.05 mm/year for sedimentation; neither value exceeded the threshold for the protection of aquatic biota (5 mg/L and 1 mm/year for TSS and sedimentation, respectively). The Diavik EIA concluded that the effect of dust on water quality had a negligible effect on aquatic biota.

Based on the Diavik data, air-borne contaminants generated from the proposed Jericho development will not cause adverse environmental effects on aquatic biota.

Discharge from the PKCA

Project Activity

During operation, effluent from the PKCA will be released from the polishing pond into Stream C3, which connects the Long Lake System to Lake C3. The amount of discharge from the PKCA would vary depending on several factors, including snowpack depth, precipitation, and mining activities, but would not exceed 313,000 m^3 annually. A controlled release during the 3 to 4 month open water period of approximately 0.034 m^3/s would accommodate this requirement (Project Description, Appendix A.1).

Potential Effects

Potential fish habitat is limited due to the small size of Stream C3. Due to dispersed and subsurface water flow farther upstream, fish use is restricted to the lower 300 m, which is dominated by multiple channels and shallow riffle habitats. In 1999, 3 juvenile Arctic char were recorded in Stream C3, while in 2000, 10 Arctic char, 1 burbot, and 37 slimy sculpin were encountered.

Fish also use the Stream C3 outlet zone in Lake C3 for rearing and feeding. It is unlikely that the area is important for spawning due to the absence of suitable spawning habitat and the fact that no spawning fish or young-of-the-year fish were recorded.

During construction and startup of the PKCA, water inputs from the Long Lake basin into Stream C3 will be interrupted. This will result in loss of fish habitat in the lower section of the stream.

Release of PKCA supernatant (overlying water in the containment area) during operation could potentially affect water quality in Stream C3 and Lake C3 through the introduction of nutrients and contaminants, and suspended sediments. Based on leach tests conducted by SRK Consulting (Appendix D.1.5), the only constituents of the mine runoff that may exceed water quality guidelines are ammonia (predicted value = 17.3 mg/L) and total suspended sediments (predicted value = 8 mg/L). However, ammonia is not expected to be above concentrations of 2 mg/L in the fine PK supernatant, based on results at EKATI™ Mine (EKATI™, pers. comm. 2000). PKCA supernatant will not be released until water quality meets Project Water Licence limits (Section 3.8 discusses management options).

During post-closure, the smaller catchment basin will result in much lower water flows in Stream C3. This could result in dewatering and loss of fish habitat in the lower 300 m of the stream.

Assessment of Potential Effects

Development will permanently remove from production the fish habitat provided by Stream C3, because of dewatering during post-construction and post-closure phases of the Project. During the operations phase, discharge from the PKCA will maintain fish habitat in Stream C3, but this is a temporary mitigative measure. Contaminant concentrations are assumed to be at acceptable levels due to implementation of mitigative measures. Therefore, issues associated with reduced water quality caused by discharge from the PKCA are considered negligible.

3.5.12.2 Accidents And Malfunctions

Road Activities

A network of permanent and winter roads in the Jericho site will be used to transport a variety of items. The transported tonnage and frequency of traffic will be much higher on the winter road, therefore potential for an accident or malfunction to occur is greatest, though still remote, during winter road activities. As such, the assessment focuses on winter road use.

Access to the Jericho site during winter will include use of a winter road that extends from the Lupin site. This route goes in a northerly direction across Contwoyto Lake, before turning east to traverse a 3 km section to the Jericho site. This 3 km section will be used in Year 1 only, and will be replaced with an all weather road to the north of Lynne Lake (Map A). The winter road in this section will cross three water bodies (Lynne Lake and Streams D1 and D2) and the small bay where the winter road intercepts Contwoyto Lake. The all weather road will not cross any streams. Stream D1 is the drainage channel between Lynne Lake and Contwoyto Lake. It has extremely limited value as fish habitat, due to the absence of a defined channel (RL&L 1997), but is included in this assessment, because a spill in this system could drain directly into Contwoyto Lake.

The Tahera winter road will be an extension of an existing route, in use since 1983, and providing transportation from Yellowknife to Echo Bay Mines Ltd. Lupin facility. Based on statistics for the existing route from Yellowknife (Diavik 1998), the Tahera route will operate from 50 to 76 days per year, depending on climatic conditions. Between 160 (underground phase) and 320 (open pit phase) truck loads will be required for resupply (Appendix A.1). Demobilization will require 180 truck loads, if all buildings are removed. If buildings are scrapped and landfilled, the number of truck loads required will be 81 (Appendix A.1).

<u>Assessment of Potential Effects</u>

A number of hazardous materials would be transported along the winter road. The spill prevention plan covers response procedures for accidental spills (Appendix D.2.4). It is possible that some material would remain after clean up and could potentially affect fish, depending on the location and timing of the spill.

Data for the period 1994 to 1998, presented in Diavik (1998), indicate a spill rate of 9.0×10^{-7} per loaded truck kilometre of travel on the existing route from Yellowknife. Using this information, the estimated number of return trips, and the distance travelled within the Jericho site (3.5 km), the number of potential spill incidents would be less than 0.01. Even if the total number of predicted trips were used, the number of incidents during the entire life of the Project would not exceed 0.003.

Thus, the likelihood of a spill occurring within the Jericho site during the life of the Project is extremely low. It should also be noted that not all truck loads will contain materials that are hazardous to the aquatic environment.

Tahera may transport a number of potentially hazardous materials on the winter road, but the primary concern, in terms of volume, is fuel (diesel and gasoline). At sufficient concentrations, hydrocarbons are known to be toxic to aquatic biota (CCME 1999).

For the purposes of this assessment, it is assumed that a 'worst case spill' may occur in the Jericho site; mitigative measures will not remove the entire spill and the spill will enter the aquatic system.

Evaluation of Significance

The effect of a spill on aquatic biota would depend on the volume remaining after cleanup and the volume of the water body affected. For this evaluation, magnitude of the effect is based on the size of water body affected by a spill. Presumably, the larger the water body, the greater the ability to reduce the concentration of the contaminant. A spill occurring in Lynne Lake (16 ha) or its tributary (Stream D2) would have a high rating, while a spill on Contwoyto Lake or its tributary (Stream D1) would receive a rating of moderate. Spills are short duration events, however the effects of a spill on aquatic life could be much longer. As such, the duration of a spill event has a single rating of moderate (several years). It is assumed that no more than one spill of supplies (fuel) will occur during life of the Project.

The magnitude of a spill in the Jericho site was rated as high for small water bodies (traversed by the winter road) and moderate for larger systems. The ecological context of a spill is high in a small water body, such as Lynne Lake, because it is likely the fish population would be extirpated. This effect is not reversible during life of the Project. Stream access to the lake is severely restricted, which would inhibit recolonization by fish. In contrast, fish originating from populations not affected by the spill could recolonize the impacted area in Contwoyto Lake. In both situations the geographic extent of the spill will be low (restricted to the sub-local level).

In summary, adverse effects associated with an accidental spill on the winter road in the Jericho site may be high, but they would be restricted to the sub-local level. Therefore, the overall projected rating for a 'worst case spill' was not significant. The level of confidence in this rating is low as is the certainty (qualitative and quantitative) in the evaluation. At the present time, there is insufficient information to accurately predict the magnitude of the effect on fish.

Fuel Farm Spill

Fuel farm spills were discussed under hazardous substances above.

Structural Failure of Waste Rock Dump

Failure of waste rock dumps will not lead to impacts on water bodies as failed dump faces will not reach natural water bodies at the site (i.e. Carat Lake or Lake C4).

Structural Failure of the Processed Kimberlite Containment Area (PKCA)

Baseline inventories in the Jericho site have identified several fish-bearing water bodies downstream of the PKCA. In the Carat Lake drainage these include Stream C3, Lake C3, Carat Lake, and Jericho Lake. In the Contwoyto Lake drainage, they include Key Lake, Stream D2, Lynne Lake, and Contwoyto Lake.

Given the location of the PKCA, structural failure of the containment area resulting in an uncontrolled release of effluent (although a remote possibility) has the potential to adversely affect the aquatic environment in one of these drainages. The effluent (sediment and water) would contain elevated concentrations of suspended sediments and ammonia above background (Appendix A.1). If this material reached the aquatic environment, the resulting effects would be loss of habitat, possible direct mortality of fish, and reduced water quality.

There are a limited number of emergency mitigation measures that can be implemented in the event of structural failure. They would involve construction of temporary coffer dams used to contain the spill.

Evaluation of Approach

For the purposes of this evaluation, it is assumed that mitigative measures will not prevent entry of an uncontrolled spill into the aquatic system and the spill will occur in June when the volume of effluent in the PKCA would be at its highest. The magnitude is considered to be high for each adverse effect (loss of habitat, direct mortality of fish, and reduced water quality), because the result could be extirpation of the fish community. It is assumed that the effects of an uncontrolled spill would extend downstream to several water bodies. A spill to the east would influence all lakes and streams in the Contwoyto Lake drainage and the small bay of Contwoyto Lake. A spill to the west would extend downstream to Lake C3 and Carat Lake. This is a conservative, worst-case scenario, since in the Contwoyto Lake drainage, three lakes are located between the proposed PKCA and Contwoyto Lake, whereas on the Lake C3 (west) side, the polishing pond is located between the PKCA and Stream C3.

Evaluation of Significance

The adverse effects of an uncontrolled spill from the PKCA will be significant, because the fish community in each affected lake may be extirpated. Immediate consequences could include direct mortality, due to acute toxicity of contaminants in the effluent. Long-term consequences could involve degradation or complete loss of habitat due to sedimentation and possibly reduced water quality. The ecological context of an uncontrolled spill is high in all cases and, in a worst-case scenario of significant transport of fine PK into receiving water bodies, it is unlikely that the effect would be reversible during life of the Project. The geographic extent of the spill would be moderate, because only water bodies within the Jericho site would be affected. The level of confidence in this rating is low, as is the certainty (qualitative and quantitative) in the evaluation. At the present time, there is insufficient information to accurately predict the extent of the effect (i.e., the downstream extent of the adverse effects) and the duration of those effects.

3.5.13 Biodiversity

The environmental impact assessment does not deal separately with biodiversity, as its key components – terrestrial plants, terrestrial animals, aquatic plants, and aquatic animals – are assessed. By inference, an assessment of impacts on these components will provide an overall assessment of effects on biodiversity.

Locally, the Project may affect biodiversity in that some landforms will be rendered uninhabitable by plants and animals. On a regional scale, biodiversity will not be measurably affected, principally because the Project site constitutes only a very small part of the range of any populations found in the region. The Project site contains no rare or endangered species. Species of concern that are found in the Project area are barrenland grizzly bears and peregrine falcons; neither will be significantly affected by the Project with proper management of activities. There are no special community assemblages in the Project area, such as waterfowl staging areas, and thus, no areas that require special protection or avoidance because of their unique characteristics.

Reclamation on-going through the Project life and on closure will return much of the habitat of the site to near its original state. Reclamation is detailed in the Project's Reclamation Plan (Appendix B.3.2).

3.5.14 Mine Closure

Impacts from temporary and final closure of the Jericho Diamond Mine are discussed in Appendix B.3.2. The principal aim of temporary closure procedures will be to ensure the site is secure and stable and that no accidents or malfunctions of infrastructure and equipment left on site will adversely affect environmental integrity of the site. This will require that certain management activities, such as water management, continue at the same or nearly the same level as during mine operation. Final closure will result in all infrastructure being disassembled and the site being returned to its natural, or near natural, state through reclamation activities. Overall, both temporary and final closure will result in a lessening or elimination of impacts from mining activities.

Monitoring, both during temporary closure and after final closure, will ensure predictions concerning impacts are verified or corrective action is taken.

3.6 ENVIRONMENTAL CUMULATIVE EFFECTS ASSESSMENT

3.6.1 Introduction

Cumulative environmental effects are defined as:

- "Impacts on the natural and social environments which: occur so frequently in time or so densely in space that they cannot be 'assimilated' or, combine with effects of other activities in a synergistic manner" (Canadian Assessment Research Council *in* Nunavut Planning Commission 1997) or
- "The effect on the environment that results from the incremental impact of proposed actions when added to other past, present and reasonably foreseeable future actions." (Environment Canada *in* Nunavut Planning Commission 1997).

- "…changes to the environment that are caused by an action in combination with other past, present and future human actions." (Cumulative Effects Assessment Practitioners Guide. Hegmann et al. 1999).

With respect to other projects to consider, the Canadian Environmental Assessment Act requires that the environmental effects of projects that will be carried out must be examined in combination with the environmental effects of the Project being proposed. By implication, only projects or activities that have already been approved must be taken into account. The environmental effects of uncertain or hypothetical projects or activities need not be considered.

Cumulative effects from the Project can be local (i.e. restricted to the site) or regional (the size of which depends on the biological or physical component of the environment under consideration). Local effects are the result of different Project activities having a combined effect on a particular component. The effects may act additively, synergistically, or subtractively (one effect may mitigate another effect). Regional effects are those which have the potential to combine with other human activities (within the spatial boundaries considered for a particular environmental component) to have an impact (negative or positive).

Figure 3.6 is a summary of cumulative effects and linkages. The linkage diagram is simplified and ancillary facilities, such as the airstrip, are not included because they are much less significant. The Environmental Cumulative Effects Assessment is presented in Appendix B.2.4.

3.6.2 Projects Considered

Guidelines established by other agencies subsequent to the Canadian Environmental Assessment Office policy have broadened the scope of projects to be considered. The guidelines prepared for Tahera by the Nunavut Impact Review Board require consideration of the following:

- EKATI™;
- Diavik;
- potential future developments at the Jericho site;
- gold and other precious and base metal mines and deposits;
- the Echo Bay Mines winter road;
- the possible construction of an all-weather road from Yellowknife to Coppermine and a port and southern road network on the Arctic coast;
- hunting and guiding (no indication of what should be included or excluded);
- exploration by other companies;
- the likelihood of the NWT Power Corporation's developing some or all of the potential power sites that it has identified in the Region.

Not included in the NIRB guidelines, but an important consideration at this time, is the proposal to construct a port at Bathurst Inlet and an all-weather road to the east shore of Contwoyto Lake opposite Lupin Mine.

This list opens the assessment to considerable speculation; many activities are unknown, very transitory, variable from year to year, of low to negligible local impact, and of no regional impact. This assessment is therefore limited to activities for which there is a project description in the public record, typically in support of development activities. The only active all weather road proposal for the West Kitikmeot at present is the Bathurst Inlet to Contwoyto road and this is the only all-weather road proposal that has therefore been considered. Other access road proposals have been proposed over the past 40 years with no concrete results (Diavik CSR 1999) and will not be considered for this Project.

NT Power currently has no plans to develop hydro sites in the West Kitikmeot (NT Power, pers. comm. Jan. 2001). Figure 3.7 (courtesy of NT Power) shows sites that have had at least a topographic evaluation. No cumulative effects can be assessed, as there are no projects planned. Further, there are no sites on the map that are close enough to the proposed Jericho Diamond Mine to interact cumulatively with it. The two potential sites on the Burnside River are close to its mouth on Bathurst Inlet over 300 km distant. The Jericho Project is not considered to have impacts up to that distance from the site.

On a very speculative plane, if several mines developed in the West Kitikmeot that could justify a transmission line from the upper Snare River, hydro power facilities might be constructed there (NT Power, pers. comm. Jan. 2001). At present, all known mine proposals would rely on diesel powered generators.

Hunting and guiding activities are low impact in a regional sense. The cumulative effect of all hunting activities on the Bathurst caribou herd is an estimated 14,500 to 18,500 animals harvested annually; of these approximately 1,000 caribou are taken annually by non-resident hunters (WKSS 1999). The Jericho Project will involve neither the harvesting of caribou, nor result in the death of caribou, except by accident. Mitigation of any such accidents is described in the Environmental Management Plan (Appendix B.3.1). There are, therefore, no measurable cumulative effects from mining the Jericho Project in combination with hunting and guiding activities. Cumulative effects of guiding and hunting activities are further considered in the Environmental Effects Assessment on Wildlife, prepared by Hubert and Associates (Appendix B.2.2).

The Bathurst Inlet Port and Road Project would involve construction of a port on Bathurst Inlet, a 211km road to Contwoyto Lake, and an all weather road to the Izok mineral deposit. Crossing of Contwoyto Lake would be via ice road in winter and barge in summer (Bathurst Inlet Port and Road Joint Venture 2002). The following brief summary is based on a draft project description submitted by the Joint Venture. Road construction is scheduled from October 2004 from Bathurst Inlet and from February 2005 from Contwoyto Lake. The Lupin – Izok Lake leg will begin February 2006. Completion of road construction is scheduled for October 2006. There will also be two barge terminals on Contwoyto Lake; the east terminal will include a 20-person camp, a small maintenance shop, and a truck parking area. During operation, an estimated 45,000 tonnes of fuel and supplies will be hauled west over the road to operating mines. From 300,000 to 470,000 tonnes per year of concentrate will be hauled east from Izok Lake Mine. Summer barge operation will be from mid July to mid October.

No heavy hauling will occur in May and June, when the Bathurst caribou herd may be migrating across the road route north. To the extent that traffic switches from the Yellowknife-Lupin winter road to the Bathurst road, no incremental effects on caribou will occur, although the effects of road traffic are not likely to be less. Caribou will have the right-of-way on the road and traffic will be halted for large groups of migrating caribou on the road.

Most mineral exploration is transitory, very localized, and very low impact. It is also so widely spread that only the Bathurst caribou herd is likely to be affected by more than one project. Advanced projects that are considered in this assessment include the following:

- Izok Lake (being re-evaluated for development by Inmet);
- Ulu (being evaluated by Echo Bay);
- Hope Bay;
- Snap Lake;
- George Lake.

DIAND records were relied upon for descriptions of current activities at the sites.

Existing (or approved) mines included in the evaluation are:

- Lupin;
- EKATI™; and
- Diavik.

3.6.3 Choice of VECs to Consider

Valued Ecosystem Components (VECs) considered in the assessment included all physical and biological environment components that were assessed for potential Project impacts and that have some potential to be affected by the Project. Valued Socio-economic Components (VSECs) are considered in the Socio-economic Effects Assessment (Appendix C.1.2) and heritage resources are considered in the Heritage Resources Impact Assessment (Appendix C.3.3). In developing VECs, reference was made to community consultations, where people identified issues of concern. Issues raised by communities were very limited and very consistent: water quality, wildlife habitat, and wildlife (specifically caribou, grizzly, wolf, and wolverine). Specifically, the VEC list considered for cumulative effects assessment for the Jericho Project includes:

- air quality;
- water quantity and quality;
- permafrost;
- terrestrial and aquatic habitats; and

- terrestrial and aquatic plants and animals.

Table 3.21 lists the projects and potential projects considered for cumulative effects assessment and the VECs that might be affected by cumulative effects from a combination of the Jericho Project and other projects. Discussion is provided in the appropriate section. The rationale for the list in Table 3.21 is based on the known project description of the activity in question, the potential area where a measurable effect could occur, and the nature of the VEC (particularly over what area it is found). Where all three have an area of overlap, an effect could occur.

3.6.4 Spatial Boundaries

Spatial boundaries for cumulative effects assessment vary with the component of the environment being considered. In Nunavut and Northwest Territories data are lacking on which to make a quantitative decision on spatial boundaries for many VECs. Hegmann, et al. (1999) suggest an adaptive approach be used in setting spatial boundaries and this is especially appropriate for the Jericho Project, given the above. Boundaries should be flexible to allow movement, should the introduction of relevant new information suggest current boundaries are inappropriate for the VEC in question.

Because of the general lack of information, professional judgement is required to use most of these guidelines in Nunavut. Assessing the potential for cumulative impacts required the collection of appropriate baseline data, and will require a commitment to monitoring programs in the future. Tahera Corporation provided funding for regional studies carried out by WKSS. Monitoring programs associated with the Jericho Diamond Project are discussed in the Environmental Monitoring Plan (Appendix B.3.3) and will be negotiated in detail during the permitting process.

For the Jericho Project, in most cases the local study area is the footprint of the Project, plus a 100 to 2,000 m buffer (VEC specific). Exceptions are water and air quality, where the nature of the VECs requires somewhat larger local study areas.

Spatial boundaries chosen and the rationale are discussed in each VEC section below.

3.6.5 Temporal Boundaries

Temporal boundaries will be life of mine for effects that cease when the mine is closed. For some effects, such as changes in landform, the temporal boundary will be indefinite. For effects that last beyond life of mine, the temporal boundary will be the length of time the effect lasts. For instance, some habitat loss will continue until rehabilitation processes have returned the site to its former state.

3.6.6 Air Quality

3.6.6.1 Site Specific

Cumulative effects of Project components were considered in air quality modelling; results were discussed in Section 3.5.7.

3.6.6.2 Regional

If the potential for long-distance transport of air contaminants such as metals, which arrive in the Canadian Arctic predominantly from industrial areas in Russia (Diavik 1998), and for green house gas effects are considered, there are no boundaries that can be set for Project effects. However, measurable Project effects on a regional scale cover a much smaller area. As discussed in Section 3.5.7, the Project will make a comparatively insignificant contribution to green house gas emissions; the contribution to greenhouse gases by inactive projects is zero.

Other projects listed in Table 3.21 taken cumulatively will not significantly affect air quality.

3.6.7 Noise

3.6.7.1 Site Specific

The average ambient noise level at the Jericho site will be 35 to 40 dBA. Blasting noise at 600 m from source will be about 115 dB (peak). Blasting will only add cumulatively to the ambient noise at the site once per day and for less than one second. Therefore, it can be discounted as a contributor to cumulative ambient noise at the site.

Other than blast noise, the average ambient noise at the Jericho site will drop to near background close to the site (sound drops off as the square root of the distance from the source). Cumulative noise sources from the Project site are unlikely to cause any significant effects to wildlife off the site proper.

3.6.7.2 Regional

The only existing industrial operation in the region is the Lupin Mine, which is 25 air km distant. It is improbable that either operation will be audible from the other, even under the most favourable sound propagation conditions. Thus, cumulative impacts from multiple noise sources are unlikely to occur.

3.6.8 Water Quantity/Hydrology

3.6.8.1 Site Specific

The water balance information provided in Section 3.2.4 lists all sources of water "use" for the Project, including runoff (the largest collective source of "use"). Actual water use, meaning draw of water from Carat Lake, will be just less than 180,000 m^3 per year.

3.6.8.2 Regional

The regional boundary for cumulative impacts can be taken to be the Carat Lake watershed, which was calculated by SRK (1998) to be 227 km^2. Total runoff for the basin, assuming a MAR of 190 mm, would be over 43 million m^3. The total estimated Project actual use of water is the amount the Project would remove from the basin, and which would not be replaced by runoff and effluent discharge. This is calculated to be 37,668 m^3 plus an additional amount due to evaporation from ponds (the PKCA, or Long Lake excepted, since evaporation currently occurs from the surface) and a small amount due to miscellaneous absorption. This amounts to less than 0.1% of the total basin annual drainage, which is negligible. Lupin Mine, the closest industrial operation to Jericho, draws water from Contwoyto Lake. Contwoyto Lake discharges to the Burnside River, which joins the Jericho area drainage basin downstream of Kathawachaga Lake. The mean annual volume of water draining the Burnside has not been calculated, but is well in excess of the mean annual volume from the drainage basin at the Jericho site. Therefore, no measurable cumulative effects will accrue to the water balance of the Burnside system from operation of both Lupin and Jericho mines.

3.6.9 Water Quality

3.6.9.1 Site Specific

The spatial boundary for the local study area for water quality was set as the outlet to Jericho Lake, rather than a fixed distance from Project activities. This boundary is taken to be well beyond the point where water quality effects of the Project will be unmeasurable and is, of course, downstream of the Project. The Ash, Key, and Lynne Lakes drainage system, which empties into Contwoyto Lake, should not be affected measurably by the Project. No water quality effects are possible above the main inlet to Lake C3, since this is upstream of any Project-related discharge and too distance for fallout from airborne contaminants (i.e. nitrogen from explosives) to be measurable in the water column.

Without mitigation, a number of sources of water discharge from the Project could act cumulatively to add both suspended sediment and nitrogen compounds to Carat Lake, Lake C1, and Lake C3, all of which are fish-bearing. The parameters of concern, as discussed in Section 3.5.6 are suspended sediments, nitrogen (especially ammonia), and copper. All other parameters regulated, or of concern, for the protection of aquatic life will be within receiving environment guidelines.

The areas where nitrogen will be discharged in water will depend on the levels of ammonia found in runoff and the PKCA supernatant water. If runoff and supernatant water meet receiving environment guidelines no negative impacts are expected, although aquatic monitoring will be employed to verify this prediction. Most site runoff will be to Carat Lake, unless diverted. Runoff from the south side of the plant and stockpile area and the PKCA discharge will be to Lake C3, which is immediately upstream of Carat Lake.

The nitrogen loading can be put in perspective by comparing the loading with the amount of water available in the receiving water bodies and the annual flow through of those water bodies. This information was derived from water balances calculated using mean annual runoff (MAR). A conservatively low MAR (130 mm) was used. Water balance is discussed in more detail in the Environmental Management Plan (Appendix B.3.1). Predicted flow through in Lake C3 is several times per year and thus no build up of nitrogen will occur in this lake. Predicted flow through in Carat Lake is from less than once per year to 1.4 times per year (depending on the mean annual runoff estimation). Thus no build up of nitrogen will occur in the Lake C3-Carat Lake system as a result of the combined inflows of water from the Project site.

From the above analysis and the fact that algal growth will be limited by phosphorus, it can be concluded that no significant cumulative effects will result from the combined discharges of nitrogen bearing water from the Project site.

The level of confidence in this estimate is moderate, because it is based on model results and, to a lesser extent, on the experience of EKATI™ Mine (which was used to check on model results).

Nitrogen loading to Carat Lake will last life of mine. Once the open pit and underground phases of mining have ceased, water that flows north will be directed to the open pit, which will then slowly fill over a period of a century or more. By the time the pit fills with water, no more nitrogen will be available to leach. Some loading from the PKCA discharge and from water directed to the PKCA will continue beyond the life of mine for a few years. The extent of this post mining time period cannot be predicted with any confidence prior to mining, but will be predictable with a moderately high level of accuracy prior to closure, because mine monitoring will have provided eight years of data on which to draw conclusions about leaching rates.

3.6.9.2 Regional

Regional boundaries for water quality could be taken to be the entire watershed on which the Project is located (i.e. the Burnside River system). However, this becomes meaningless in terms of measuring effects.

The closest mine to the Jericho Project is Lupin, which discharges effluent to Contwoyto Lake from both the tailings containment area and (in a separate stream) secondary treatment of domestic sewage. Lupin Mine has demonstrated from their monitoring that discharges are not affecting water quality in Contwoyto Lake, 25 km from the nearest point where any runoff from the Jericho Project could physically affect Contwoyto Lake (assuming the Ash-Key-Lynne Lakes drainage basin were affected). Since no persistent xenobiotic organic chemicals are used at either Lupin or Jericho, no measurable cumulative effects on the water quality of Contwoyto Lake are possible from the two operations. Further, as the Jericho Project will not have any significant, measurable effects on water quantity beyond the local study area, no regional cumulative effects are possible.

3.6.10 Permafrost

3.6.10.1 Site Specific

No Project component will have a significant, unmitigatable effect on permafrost. The Project does not require permafrost for either operation or environmental control. Therefore cumulative effects will either be negligible, or not significant, for Project operation and environmental control.

3.6.10.2 Regional

No regional effects on permafrost are possible from any phase of the Jericho Project.

3.6.11 Vegetation and Wildlife Habitat

3.6.11.1 Site Specific

Local terrain disturbance on the plant communities and associated wildlife habitats will all be the direct result of activities and facilities required for the Jericho Diamond Project, and so there will be no contribution to local terrain disturbance with effects on wildlife populations from non-Project sources. The cumulative effect on vegetation will therefore derive from the Project components, previously discussed, and will be minor.

3.6.11.2 Regional

As discussed in Section 3.5.10, the environmental effect of reducing wildlife habitat in the region by 221.8 ha on the sustainable harvests of wildlife populations will be unmeasurable. There will be no cumulative environmental effect on terrain and wildlife habitat from the Jericho Diamond Project site.

3.6.12 Aquatic Habitats

3.6.12.1 Site Specific

The cumulative alteration and loss of aquatic habitat at the Jericho site is listed in Table 3.22. As can be seen, no water body habitat will be affected by more than one Project activity.

3.6.12.2 Regional

The spatial boundary for aquatic habitats has been set as the watershed on which the Project is located. This forms the boundary of the shared resource (water) for aquatic organisms in the aquatic system affected by the Jericho Project. As there are no other industrial operations in the watershed, it is very unlikely that cumulative effects could accrue from operation of the Jericho mine.

3.6.13 Aquatic Plants and Animals

3.6.13.1 Site Specific

There are two drainage basins that could be affected by the Project: Jericho River, which will be affected; and Lynne Lake (Ash, Key, Lynne Lakes, and Stream D2 flowing to Contwoyto Lake), which will not likely be affected. The Project will act cumulatively on the water bodies in the Jericho River drainage as shown in Table 3.23.

Plants would benefit from nitrogen addition, but only in the presence of phosphorus, since phosphorus is limiting in Arctic aquatic systems. However, the principal source of phosphorus at Jericho will be from sewage, which will be treated in a waste water treatment plant and discharged to the PKCA, where phosphorus will be absorbed/adsorbed.

3.6.13.2 Regional

The same argument for habitat applies to populations. No cumulative effects on aquatic organisms on a regional scale are likely.

3.6.14 Wildlife

3.6.14.1 Site Specific

Site-specific cumulative effects, i.e., from the sum of effects from individual Project components were discussed in Section 3.5.10.

3.6.14.2 Transportation

Caribou

The interactions between Jericho Project surface transportation activities and caribou will occur during spring migration. Historically, a maximum of 10% of the Bathurst herd has passed through Jericho. For a cumulative effect to occur part of that 10% would have to suffer a persistent negative effect and that part of the population would also have to suffer effects from another human activity in their range before the effect dissipated. This effect is not possible to predict, let alone measure.

A regional management approach to caribou must be used to address this issue. “During spring migration caribou cows are strongly motivated to reach the calving ground and apparently as they pass Lupin, they do not linger there” (Mueller and Gunn, 1996). Also, presumably they take the most energy efficient route to get to the calving ground. It is therefore unlikely that caribou cows passing Lupin/Jericho on spring migration would also have passed through the EKATI™ and/or Diavik diamond projects. Cumulative effects of successive and sequential interactions are therefore not expected during spring migration. Similarly, it is unlikely that individual caribou cows will pass both Lupin and Jericho sites in a single spring migration period.

Overall cumulative effects of interactions between caribou and mining activities on the Bathurst herd’s range will be negligible. However, the value of the Bathurst caribou herd to the lifestyle of Nunavut and NWT residents is such that the Jericho Project will participate in a caribou monitoring program with the Government of Nunavut and other governments and industry interests. This approach will ensure that the health of the herd is under ongoing surveillance in relation to all human activities on the herd’s annual range. Tahera Corporation endorses the value of such collaboration to the WKSS and to the overall understanding of caribou.

Carnivores

The minor environmental effects of seasonal transportation activities on the grizzly and other carnivore populations over the eight season schedule will be direct and no other environmental effects from local human sources on grizzly in the Project area can be foreseen.

3.6.14.3 Regional

The spatial boundaries for consideration of wildlife effects range from the Project footprint (for small mammals) to the entire winter road from Yellowknife to Lupin and Jericho for caribou.

Cumulative effects from the Jericho Diamond Project are discussed in the context of other human activities in the Project area that are known to influence these VECs and that are within the natural range of VECs populations. No other mining projects (other than Lupin Mine reopening and possible satellite operations at Ulu) are expected to be undertaken in the Project area within the eight to ten year span of the construction and operations phases of the Jericho Project operating seasonally.

The Ulu site is approximately 60 km northeast of Jericho. If developed, the mine would operate as an underground satellite mine (with ore trucked to Lupin in the winter and processed in the Lupin gold mill).

The two Diamond mines in the NWT, EKATI™ and Diavik, are expected to be operating year round well beyond the expected life of the Jericho Project. A third project, Winspear/DeBeers Snap Lake, will likely open within the next few years. The Snap Lake diamond mine is expected to operate at a rate of approximately 3,000 tpd (De Beers 2002). The Snap Lake mine will likely operate beyond the end of Jericho mine life. Two additional mining sites may be developed during the life of the Jericho Project:

- the Hope Bay Joint Venture Gold Project, east of Bathurst Inlet on the northeastern margins of the Bathurst herd's range; and
- the George/Goose Lake Gold Project, east of Lupin on the eastern margins of the herd's summer range.

The other significant commercial pursuit that occurs within the region is caribou hunting from outfitter camps. Guided hunters harvest a small proportion of the 14,500 to 18,500 caribou taken annually from the Bathurst herd. Outfitter's camps are all small (compared to a mine site) and little extra energy is required by caribou to divert around the camps. Hunting activities will likely spook caribou, but no studies have been completed to quantify non-harvesting effects of guiding and hunting camps. To caribou, hunting camps are just one more predator.

The Jericho Diamond Project and Lupin are separated by 25 air km. The separation on land is much greater, because Contwoyto Lake sits between the aforementioned locations. Any wildlife with home range greater than the land distance between sites could potentially experience a cumulative impact from the proposed development. This would include at least the Bathurst caribou herd, grizzly bears, and Arctic wolves. There is little information on foraging ranges of raptors in tundra environments. Some information from the Rankin Inlet area suggests ranges may be approximately 25 km^2 (Hubert, pers. comm. 1999), in which case, raptors could also be subject to cumulative effects from mine development (Lupin and Jericho).

The Comprehensive Study Review of the Diavik Project considered the combined effects of the EKATI™ and Diavik projects and found that there would be "…no effects from changes to vegetation/terrain from winter projects and activities. Non-winter projects and activities (may contribute to) insignificant residual effects" (Table 5.3; CSR, 1999). Adding Snap Lake would not significantly change this assessment. Non-winter activities effects from Snap Lake, as for EKATI™ and Diavik, are likely to be limited to the immediate area of the mine site.

Because of the distance between the NWT diamond mines (EKATI™, Diavik, and Snap Lake) and the Jericho Project (the closest mine, EKATI™, is 135 km south), the only cumulative effect that requires consideration is the winter road. Mines will, or are predicted to, have negligible effect on caribou mortality. The caribou will compensate for any local effects on the animals' energy utilization at the NWT diamond mines long before they reach Jericho. Some cumulative effects on energy utilization might occur between Lupin and Jericho and this is discussed below. Cumulative effects on energy utilization between Jericho and Ulu would be unmeasurable, based on Diavik (1998) modelling results.

Three diamond mines on the southern part of the winter road will lead to increases in traffic with the potential for collisions causing mortalities. However, the probability is very low, based on the previous track record for the winter road to Lupin Mine (three road kills since 1982). The bulk of traffic on the winter road occurs from mid January or early February through mid to late March, whereas caribou migration through the Lac de Gras area is typically in April and through Jericho in late April or early to mid-May. Thus, the potential for negative interaction from the winter road with the migrating caribou herd is negligible. The level of confidence for this prediction is high, since it is based on a broad base of empirical evidence.

Ore transport from Ulu to Lupin may occur over a longer period, if trucks transport over summer at Lupin or Ulu. Ice is typically driveable through at least the first half of May. However, the argument in the previous paragraph with respect to winter resupply to Jericho still applies, and thus ore transport from Ulu to Lupin will not act cumulatively with the Jericho Project.

With respect to energy utilization, one modelling study on the Bathurst caribou herd has been completed (Diavik 1998). The Diavik study predicted some increase in energy required by caribou to divert around the mine, but negligible increase of energy requirements in a regional sense. The same effect can be expected for Jericho. There are certain areas of the mine that caribou will avoid (either by choice or by management), which will result in the necessity for animals to divert around these facilities. Included are the airstrip, waste rock dumps, and open pit. However, at Lupin caribou move freely through the mine area; diversion is not an issue for that mine. Thus no regional-level cumulative effects on energy utilization are likely to result from operation of the Jericho Mine. The level of confidence for this prediction is high, since it is based on nearly two decades of observations at Lupin Mine and results of the Diavik study.

3.7 SUMMARY OF EFFECTS

A summary of potential Project impacts and linkages was provided in Figure 3.6.

3.8 ENVIRONMENTAL MANAGEMENT AND MITIGATION

The Environmental Management Plan is presented in Appendix B.3.1.

3.8.1 Domestic and Industrial Wastes

Domestic sewage will be treated in a plant and water pumped to the processed kimberlite containment area after purification. Domestic garbage, including kitchen wastes, will be incinerated. Large industrial wastes will be burned, stored on site, or removed through backhauls on the winter road. Hazardous wastes (e.g. waste petroleum products) will be incinerated on site or handled through a hazardous waste contractor. Removal from site will be by backhaul on the winter road.

Fuel, ammonium nitrate, and other supplies will be hauled to the Jericho site over the Lupin winter road with extension to Jericho (the overland portion north of Contwoyto Lake by all-weather road). Spill plans will be required by all hauling contractors and existence of an acceptable plan will be verified prior to engaging a new contractor. Tahera's winter haul coordinator will ensure all parties involved understand procedures to be followed in the event of a spill or other emergency associated with the haul. No interference with wildlife movement is anticipated, however trucks will be radio-equipped and drivers will keep each other informed as to wildlife movements across the winter road corridor should they occur.

3.8.2 Aquatic Management

Both population and habitat impacts could result from mine operation. Explosives can negatively affect fish. Ensuring no multiplicative effects from large blasts will minimize impacts from explosives use at the site. Detonations between successive charges will be delayed. Angling also has the potential to negatively affect fish populations in relatively small lakes. Angling by mine personnel will be prohibited in Carat Lake and all smaller lakes within the Jericho area.

The Project has limited potential to negatively affect fish habitat. Long Lake will be eliminated as habitat; the lake currently supports small populations of slimy sculpin and burbot. A small stream will be diverted around the open pit. Ensuring that water flows are maintained in the original channel (above the reaches used by fish) will minimize the effects on downstream habitat. Stream C3 will likely be dewatered for the first year following construction. The stream is used opportunistically by young fish from Lake C3.

Since habitat loss cannot be mitigated, a fish habitat compensation plan will be negotiated with DFO. A conceptual plan is presented in Section 4.0 and Attachment 4.1 of the Environmental Management Plan (Appendix B.3.1). Options examined include habitat enhancement in the Stream C1 diversion, at the water intake causeway, and on a stream system east of the airstrip (O system). The compensation plan adheres to the no net loss principle and the need to maintain habitat productive capacity as recommended by DFO. The plan's fundamental goal is to ensure the long-term viability of the fish community in the Project area.

3.8.3 Noise

Barren-ground caribou have been found to avoid intense noise, but become habituated to routine noise at mine sites, including explosives discharges. Noise generated by the mining operations may contribute to avoidance of the site by other large mammals, such as grizzly bears, wolverines, foxes, and wolves. In general, this effect on carnivores is desirable to help mitigate potential conflicts with mine personnel. However, avoidance will result in some loss of foraging habitat.

3.8.4 Air Emissions

The principal sources of emissions at the Jericho site will be dust from mobile equipment, limited dust generated by explosives discharges, and exhaust emissions from stationary and mobile internal combustion engines. Exhaust gas emissions will be insignificant except on the Project site, due to the small number of sources involved. Dust could have a significant local impact, particularly on vegetation and early snow melt. Problematic sources will be watered during the summer. Snow cover should limit winter dust generation at most times.

3.8.5 Wildlife Management

The most effective mitigation of environmental effects is an operating ethic that reduces and avoids interactions to the maximum practical extent. This will be achieved at Jericho through the environmental management plan (EMP), which addresses all potential interactions between the Project and the environment. The implementation of the EMP will follow, in a general sense, ISO 14000 objectives, which measure effectiveness of an EMP by measurable standards and continuous improvement in EMP execution. General guidelines for minimizing effects on wildlife and wildlife habitat are discussed in the report (Appendix B.3.1).

3.8.5.1 Raptors

Environmental effects of the Project on raptor populations are expected to be minor. However, disturbance of nesting areas will be kept to a minimum through implementation of guidelines developed by GNWT (Shank, unpub.) and nesting areas will be monitored for Project impacts.

3.8.5.2 Small Mammals

All animals will be accorded the right of way. Accidental road kills will be cleaned up immediately and carcasses incinerated. Record of road kills will be logged and evaluated.

3.8.5.3 Ungulates

Muskox and caribou will be guided around hazards at the Jericho site. As a general practice, ungulates will be deflected around the Jericho site by waste dumps. Other measures, such as fencing and berms, will be employed when required (e.g. the open pit lip will be bermed on closure to prevent animals falling into the pit). Very large groups (tens of thousands) of migrating caribou through the Jericho site will trigger mining shutdown, where appropriate, until the animals have passed.

3.8.5.4 Carnivores

There are no carnivore dens in areas that will be disturbed by the Project. Interactions with personnel will be minimized by scrupulous attention to removal of road kills and incineration of kitchen wastes, thus preventing carnivores from developing an association between Jericho activities and food. Feeding of any wild animals will be prohibited. A bear response plan will be developed and all staff made aware of it. Notices will be posted at key points in camp, airstrip, and mine site. This system has been effective at Lupin for many years.

3.9 RESIDUAL EFFECTS

Residual effects are those effects caused by mining that will remain after all mitigation steps have been taken. Residual effects may be thought of as unavoidable impacts. Some effects of the Project will not have residuals and these are not discussed in this section.

3.9.1 Hydrology

3.9.1.1 Assessment of Impact

Two main residual effects on drainage basins will result from the Jericho Project:

- Stream C1 will remain in its diversion channel through mine life and at closure; and
- Long Lake will be filled in with processed kimberlite during mine life and will be reclaimed to land on closure.

Natural runoff flow patterns around dumps and the Low Grade Ore Stockpile will be permanently altered, but without any substantial change in volume of runoff water. The ultimate water bodies will revert to those before mining on closure. Mitigation and management will prevent any additional residual impacts. Water management is discussed in the Project Description (Appendix A.1).

The area of drainage affected by mining will be 1.52 km^2 or 0.6% of the total Carat drainage basin about the lake outlet. On a regional scale, temporary and residual effects on the drainage basin hydrology will be insignificant.

Withdrawal of water and some redirection of natural drainage patterns are required for plant and mine operation. As such, the changes, while insignificant, will remain throughout the eight year mine life. Upon closure, drainage patterns will be returned to as near pre-development as practical.

3.9.1.2 Frequency and Length of Occurrence

Life-of-mine changes in hydrology will be from construction through closure, or eight years. Frequency, with respect to accidents, cannot be predicted. Management of water control structures is designed to prevent accidents to the extent possible, but accidents, although of low probability, may still occur.

Changes in flow patterns in Stream C3 would occur once and be permanent.

3.9.1.3 Degree and Timeframe for Reversibility

Changes to site hydrology, resulting from mine construction, will be reversed at the end of mine life, except the PKCA system. Accidental changes will be remediated as soon as possible after the accident occurs. The principal change due to diamond processing infrastructure (the PKCA and modification of flows in Stream C3) will be permanent.

3.9.2 Landforms

3.9.2.1 Assessment of Effects

Most changes in land forms will be permanent; no mitigation is possible. With DFO approval, the open pit will be flooded upon closure and will become a small deep lake connected by Stream C1 to Carat Lake. The total area affected by the two waste dumps, the low grade ore stockpile, coarse kimberlites, and the open pit will be about 73 ha as indicated in Table 3.24.

3.9.3 Water Quality

3.9.3.1 Mining

Assessment of Effects

The main effects on water quality from mining, as previously discussed, will be:

- increase in suspended sediments;
- increase in nitrogen; and
- possible small increase in dissolved metals.

These effects will be managed through settling ponds, in the case of sediments, and through management of explosives use and directing runoff water appropriately, in the case of nitrogen (as discussed in the Environmental Management Plan, Appendix B.3.1).

Residual effects will include increases in water concentration of nitrogen compounds after dilution of runoff water. Sediment will also increase slightly over background, since Carat Lake normally has very low suspended sediment levels (typically below the CCME receiving environment guideline of 5 mg/L for clear waters). With normal mixing in Carat Lake, increases in nitrogen and suspended sediments over background will not be detectable where water enters Carat Lake.

Frequency and Length of Occurrence

Impacts from mining to water quality will be limited to the open water season each year (June through September). Other than accidents, impacts on water quality from mining activities will be limited to those that result from discharges that meet water licence discharge criteria, i.e., acceptable to regulatory agencies. Impacts will occur throughout mine life and for a short time after closure (post closure monitoring period).

Degree and Timeframe for Reversibility

All effects from normal mine operation will be completely reversible upon mine closure. Effects from accidental release of mine water to Carat Lake would be reversible as well, but would last only until the Lake flushed (one year).

3.9.3.2 Diamond Processing

Assessment of Effects

Potential residual effects on water quality from diamond processing will be some increase in nitrogen concentrations, increased total dissolved solids, and increased alkalinity above background throughout mine life. Nitrogen loading to Lake C3 will be via discharge from the PKCA through Stream C3. The addition of nitrogen will not be ecologically significant (i.e. affect aquatic plant and animal populations), if phosphorus remains limiting. Water quality monitoring suggests this is the case. The dilution modelling conducted by URS (Lake C3 Modeling, Appendix D.1.2) indicates dilutions of Stream C3 between 20 and 100 times in Lake C3 with mixing. The bay at the mouth of Stream C3 will have the lowest dilution consistently; this is where most residual effects on water quality will occur.

Frequency and Length of Occurrence

Impacts on water quality from diamond processing will occur annually during the open water period. Impacts will last for the life of mine and for a short period after closure (post closure monitoring period). Impacts from normal operation will be within those allowed by the water licence. The frequency and length of occurrence of accidents is difficult to predict, as previously discussed.

The impacts of a fine PK spill would be largely irreversible and would last beyond life of mine, except in areas where complete cleanup could be effected.

Degree and Timeframe for Reversibility

All impacts from normal operation will be completely reversible and will occur within the timeframe required to flush Lake C3 and Carat Lake (approximately one year or less for water quality). Long Lake will be permanently altered. The effects of accidents, especially PKCA dam failure may not be completely reversible, depending on the amount of fine PK that cannot be recovered after a spill. Deposits of PK will continue to leach for a number of years, and may generate suspended sediment until completely dispersed below storm wave action depths.

3.9.3.3 Waste Water Treatment Plant

No residual effects are expected from normal operation of the waste water treatment plant, as there will be no direct discharge to the environment.

3.9.4 Air Quality

3.9.4.1 Mine

Assessment of Effects

Emissions will be kept to the minimum practical by efficient use of internal combustion engines (to reduce fuel costs as much as possible) and by watering of road surfaces to minimize dust generation. The Industrial Source Complex ver 3 (ISC3) model results provide an evaluation of the possible levels of emissions at the Jericho site with management controls in place, or residual effects, and thus the effects predicted will all be residual (i.e. those that occur after controls are in place). Since the model used very conservative assumptions, concentrations of air contaminants are expected to be well below those predicted.

Frequency and Length of Occurrence

Effects from dust will occur mostly in the winter months, when sprinkling is not possible. Effects from exhaust gases will be continuous from power generation sources and frequent, but not continuous, from mobile sources. Effects will last throughout the mine life of eight years and will cease when mining and machinery-assisted reclamation ceases.

Degree and Timeframe for Reversibility

All effects from air contaminants will be reversible once contaminant sources cease, or, in the case of dust from disturbed surfaces, once these surfaces are stabilized by reclamation procedures. Reclamation will be on going, but much will occur at the end of the open pit phase (Year 4) and the remainder on mine closure (Year 8 or 9).

3.9.4.2 Diamond Processing Plant

Operation of the processing plant will add emissions from the ore drier and from mobile equipment used to handle ore and coarse PK. Effects will be local to the Project site. The ISC3 model results predicted cumulative effects of all Project sources (See Section 3.6.6).

3.9.4.3 Borrow Pits

Borrow pits will be operated almost exclusively during winter and spring. Dust will be limited to handling esker materials and cannot be effectively controlled. Dust is expected to cover snow adjacent to operating areas. The extent of dust generation will be dependent on the percentage of fines in the esker materials. Dust will wash away with snow melt and will be most prevalent in the first two years of mine operation when esker borrow materials will be most heavily used. Based on EKATI™'s observations, dust will be expected to travel 100 to 200 m from sources.

3.9.5 Noise

3.9.5.1 Assessment of Effect

Every practical effort will be made to eliminate unnecessary noise sources. Mining operations are by their nature noisy, similar to many other heavy industrial activities. It is not practical, nor possible, to mitigate many major noise sources beyond built-in engineering controls, such as engine exhaust noise from mobile heavy equipment. However, most noise sources are relatively constant when viewed from the perspective of the perimeter of the Project site and thus, the impact should be mitigated naturally once wildlife become habituated to the noise. People working at the site will be provided hearing protection as appropriate. The residual effects from noise will be significant for animals that avoid the noise, limited spatially to the mine site, and of medium term, i.e. life of mine. Noise levels will be reduced at the end of open pit mining with the move to mining underground and further reduced in the last two years of the projected mine life, when only ore processing will occur.

3.9.5.2 Frequency and Length of Occurrence

Frequency of noise will be source dependent as discussed previously. Length of occurrence, although intermittent in most cases, will be life-of-mine. There will be three quantitative reductions in noise emanating from the mine:

- when the open pit phase is completed (after Year 4);
- when the underground phase is completed (after Year 6); and
- after mine closure (Year 8).

3.9.5.3 Degree and Timeframe for Reversibility

All noise effects will be completely reversible and will cease upon cessation of the noise source. However, it may take one or two seasons for animals that avoided the site (due to noise) to return.

3.9.6 Vegetation and Wildlife Habitat

3.9.6.1 Assessment of Effects

The disturbance areas shown in Table 3.24 will all be residual (i.e. will occur with Project development). Consistent with good management practices in Arctic regions, including energy conservation and minimizing land disturbance, the footprint of the Project has been kept as small as practical. Ultimately, there needs to be a balance between minimizing disturbance that takes decades to naturally restore, and giving due regard to efficiency of operation and safety. Any significant further reduction in the proposed Jericho footprint would compromise the mine's ability to operate and the safety of personnel.

Residual effects will last for the life of mine. These effects are significant in a local Jericho area context (see Ecological Zones, Map C), but are insignificant in a regional context, because of the relatively small areas affected, compared to the available habitat types in the region.

With reclamation, most of the disturbed area will slowly return to habitat approximately equivalent to that prior to disturbance. Meadows, located where waste rock dumps will be placed, will be lost. In time rock dumps will resemble rocky tundra on their sides and dry barren tundra on top surfaces, where soil will be placed as part of reclamation.

The open pit will become a lake once runoff and snow melt fill the cavity formed from ore removal. The PKCA, which is currently a mixture of lake, meadow, and tundra habitats, will become dry barren tundra and meadow habitat. A total of 11.6 ha of lake will be permanently lost. By comparison, the area of Carat Lake is 271 ha and Carat Lake is a very small lake on a regional scale. Approximately 10 ha of artificially-created lake will be added to the Jericho landscape, once the pit fills with water.

3.9.6.2 Frequency and Length of Occurrence

Essentially all disturbance, except for borrow pit areas, will occur during mine construction in Years 1 and 2. Disturbance in borrow areas will occur mostly during construction, but small amounts of fill material will be required periodically (e.g. to repair roads).

3.6.9.3 Degree and Timeframe for Reversibility

Disturbed areas will be reclaimed when no longer active (see previous discussion). It will, however, require decades for disturbed areas to return to their pre-mining level of vegetative cover, because of slow growth of plants in the Arctic. Some areas, such as dump slopes, will remain bare for many decades, until lichens establish. These areas will then be equivalent to rocky tundra, the most prevalent habitat type at Jericho.

3.9.7 Wildlife

Significant residual impacts to wildlife and wildlife habitat, after mitigation, are all local, most are life of mine, and all are minor or moderate in magnitude at a local scale. On a regional scale, all residual impacts are minor.

The interactions of construction, operations, transportation, and related support activities for the Jericho Project with wildlife over the life of the Project were examined and their environmental effects on wildlife populations assessed. In all populations – raptor, migratory bird, small mammal, ungulate, and carnivore – the environmental effects were found to be contained to the area of the Project, or in the case of caribou, to the limit of the Bathurst herd's range. The environmental effects from the Project on wildlife do not extend beyond the life of the Project, and will not be detectable in any wildlife population. No residual effects are predicted. No measurable cumulative environmental effects are foreseen for wildlife populations in the Project area or region.

In the case of terrain disturbance and habitat alteration, it will take many years to revegetate by natural processes the 221.8 ha that will be disturbed at the Project site. No cumulative environmental effects are foreseen, if progressive terrain disturbance from permafrost degradation and erosion post-closure are prevented.

The sustainability of harvests on populations presently being harvested should not change as a consequence of the overall environmental effects from the Jericho Diamond Project. These findings are consistent with those of the environmental effects assessment of the Diavik Project, which is approximately 170 km southeast of Jericho and proposed to operate for 23 years and disturb an active footprint more than five times that of the Jericho Project (CEAA, 1999).

The level of certainly of predictions is high, because they are based on the proposed operation of the mine.

3.9.8 Aquatic Habitats and organisms

3.9.8.1 Introduction

Environmental effects are complex and interrelated, and may influence many different components of the aquatic biological community. To simplify and focus the environmental impact assessment, fish have been selected as the valued environmental component (VEC) of the aquatic biological community and will be the basis of all evaluations. Fish are deemed to be suitable candidates for this purpose, because they are sensitive to changes in the aquatic environment and they are highly valued by society. They are also a good indicator of biodiversity, which should be an integral component of the EIA process (CEAA 1994).

A significant environmental effect on fish can be direct (e.g., mortality of fish) or indirect (e.g., loss of habitat, poor water quality, or reduced productive capacity). Both types of effects could ultimately have the same consequences.

Rating criteria, developed under the Canadian Environmental Assessment Act (CEAA 1994), were employed to evaluate the significance of the environmental effects.

Impact methodology follows that set out in Section 3.4. Aquatic-specific items are listed below.

Criteria for geographic extent used in this assessment include the following:

Low - Includes specific areas in water bodies within the immediate influence of the Project (foot print and immediately adjoining areas).

Moderate - Includes entire water bodies within the immediate influence of the Project (foot print and immediately adjoining areas).

High - Includes the Carat Lake and Contwoyto Lake drainage basins, excluding the local study area.

The duration criterion is divided into three classifications:

Short-term (L) - Effects lasting for less than one year (associated with the construction period, or other short-term activities).

Mid-term (M) - Effects lasting from one to nine years (associated with life of the mine).

Long-term (H) - Effects lasting longer than 10 years (persist beyond closure of the mine).

Frequency is associated with duration and defines the number of occurrences that can be expected during each phase of the Project. The frequency criterion is divided into three classifications:

Low (L) - Effects occur infrequently (< 1 per month during each Project phase).

Moderate (M) - Effects occur frequently (from 2 to 15 per month during each Project phase).

High (H) - Effects occur continuously.

Five Project activities that caused residual environmental effects, after implementation of the environmental management and mitigative measures, are:

1) Destruction of fish and fish eggs in Stream C1 and Carat Lake, due to use of explosives in the mine pit.

2) Reduced water quality (elevated suspended sediment concentrations) and direct mortality of fish eggs in Stream C1 and at its outlet zone on Carat Lake, downstream of instream activities during construction and operation of the diversion system.

3) Loss of fish habitat and direct mortality of fish in Long Lake, an unnamed pond, and a connecting channel due to construction of the PKCA.

4) Loss of fish habitat in Stream C3, caused by the altered discharge regime.

5) Loss of fish habitat in Carat Lake, due to construction and reclamation of the water withdrawal causeway.

3.9.8.2 Use of Explosives

Introduction

An assessment of the use of explosives in the mine pit identified the potential for adverse effects on fish following mitigation. Based on DFO guidelines (Wright and Hopky 1998), the impacted zone included the lower 100 m of Stream C1 (limit of fish distribution) and the shoreline area of Carat Lake. Detonation of the explosives in the mine pit would create a *Peak Particle Velocity* greater than the specified threshold (13 mm/s), designed to protect incubating fish eggs. The predicted shock wave was not sufficient to produce an *Instantaneous Pressure Change* greater than the specified criterion (100 kPa), designed to protect free-swimming fish. As such, the evaluation of significance will be restricted to the effects of *Peak Particle Velocity* on fish eggs.

The predicted *Peak Particle Velocity* impact zone is estimated to be 225 m from point of detonation. Based on this critical radius, the lower section of Stream C1 will be affected; however, only a small part of the Carat Lake shoreline is within the critical radius.

Based on their habitat requirements, slimy sculpin is the only species that uses Stream C1 for spawning and egg incubation (Scott and Crossman 1973). Arctic grayling is the only other species residing in Carat Lake that could potentially deposit eggs in Stream C1; however, extensive inventories never recorded spawning Arctic grayling or incubating eggs of this species in this system.

Evaluation of Significance

The magnitude of the use of explosives was rated as high during the construction and operation phases of the mine pit. A high magnitude rating was applied because the threshold was exceeded, and therefore, fish eggs could be damaged. Duration received ratings of low and moderate for the construction and operation phases, respectively. As expected, the frequency ratings were high.

Ratings of significance were low for geographic extent and ecological context. The effects of explosive use are restricted to the sublocal area (Stream C1 and its outlet zone) and slimy sculpin is the only species affected in the fish community. Slimy sculpin are widely distributed and there is an abundance of suitable habitat in Carat Lake. The effect on population is also reversible.

3.9.8.3 Diversion System

Fish distribution in Stream C1 is restricted to the first 100 m immediately upstream of Carat Lake. As such, the fish community residing in Carat Lake utilizes the lower section of Stream C1 on an opportunistic basis for rearing purposes.

Fish use the outlet zone in Carat Lake for rearing and adult fish of all species frequent it for feeding purposes. The presence of Arctic char fry (young-of-the-year fish that have just emerged) and lake trout in spawning condition also suggests the area near the outlet zone may be used for spawning purposes by these two species.

The diversion system is designed to divert water at the upper end of Stream C1, transport it around the mine pit, and deposit this water back into Stream C1. A 541 m section of Stream C1 will be de-watered, but because this section is not used by fish, there are no residual effects (loss of fish habitat) associated with de-watering the channel.

There are three potential residual effects associated with the introduction of suspended sediments: the direct mortality of fish eggs; the loss of fish habitat through sedimentation; and lowered production of invertebrates, due to reduced water quality. These effects may occur in Stream C1 downstream of the diversion and in its outlet zone within Carat Lake.

Adverse effects of the diversion system on fish will be largely restricted to the construction phase of the Project and the effects will be at the sub-local level (Section 3.5.12). A small area will be affected during a short time period and only a small component of the Carat Lake fish community will be affected. As such, the diversion system received a rating of not significant. The likelihood that predicted effects would occur during construction is moderate. The qualitative and quantitative certainty of this analysis is low for two reasons: information on the effects of suspended sediments on Arctic fish populations is limited; and quantitative data of suspended sediment concentrations, generated during construction and maintenance, are not available. Therefore, the overall rating for the Project is not significant (NS), but there is also a low level of certainty.

3.9.8.4 Long Lake PKCA

Adverse effects of the PKCA will be high, but they will be restricted to the local level (Section 3.5.12). Because the water bodies affected by the footprint of the PKCA presently support a viable fish community, this Project activity received a rating of significant. The likelihood that the predicted significant adverse effect is high, is based on a high qualitative certainty of the analysis.

It should be acknowledged that the affected fish community consists of small, resident populations of slimy sculpin and burbot that are ubiquitous in the Jericho area. Loss of this particular fish community will have no serious consequences on the ecological integrity of the aquatic system outside of the Long Lake System.

3.9.8.5 Stream C3

The evaluation indicated that operation of the PKCA will cause permanent loss of fish habitat in Stream C3. All effects would be at the sub-local level. Stream C3 provides only a limited amount of habitat for fish and it is available only on an opportunistic basis. Therefore, this habitat is not essential for the long-term viability of the fish community that resides in Lake C3. The level of confidence in the rating is high, based on the degree of qualitative certainty that the relative importance of the affected areas to the fish is limited. Therefore, the overall rating for the Project activity is also not significant.

3.9.8.6 Water Intake Causeway

Adverse effects of the causeway will be continuous, but the effects will be at the sub-local level (Section 3.5.12). The adverse effects will be greater on spawning habitat than on rearing habitat. Using a conservative approach, the causeway received a rating of significant for its effect on spawning habitat and not significant for its effect on rearing habitat. The overall Project effect is also deemed to be significant, because disruption of critical spawning sites could detrimentally affect the viability of Carat Lake fish populations. Due to the low qualitative and quantitative certainty of this analysis, the likelihood of the predicted significant adverse effect occurring is also low.

3.9.8.7 Summary of Residual Effects

The residual effects that remained following mitigation of five project activities were evaluated to ascertain whether these effects were significant (Table 3.25). For the purposes of the evaluation, a significant adverse effect is one that affects a fish community, in sufficient magnitude, duration, or frequency, as to cause a change in the community structure not allowing that community to return to its former structure.

3.10 RECLAMATION AND CLOSURE

Mitigation of disturbance at closure and during mine operation for sites no longer active will be managed through the reclamation plan. A conceptual plan has been developed and liabilities assigned to various mining phases in the Jericho Project Reclamation Plan (Appendix B.3.2). Prior to mine start up, a final operating reclamation plan will be developed. This plan will be modified throughout the mine life, as required, to reflect actual operating conditions.

Terrain disturbance at the Jericho site will include constructing level building and storage pads, establishing waste rock disposal sites, building roads, and possibly expanding existing esker borrow sites for granular materials. On dry sites plant regeneration will be slow and take many years; mesic sites are expected to regenerate more quickly, based on Arctic tundra experience of others. The most direct mitigation practice will be to reduce the disturbed surfaces to as small an area as possible. Most surface materials on sites that are disturbed will be mineral and granular. Revegetation will not show any significant effect, until the disturbed surfaces contain the organics and fine windblown debris necessary for the moisture retention and true soil development necessary to promote seed germination and sustained growth. All soil that is stripped to develop the pit and other sites will be salvaged, where practical, for reclamation and revegetation purposes.

Approximately 20 percent of the local habitat will be disturbed in the immediate area of the Jericho Diamond Project. Regardless of the effectiveness of mitigation measures, the disturbance will persist well beyond the operations phase of the Project.

3.10.1 Reclamation Plan

The reclamation plan for the mine has the objective of minimizing the environmental impact of mining operations to the extent practical, and of maintaining the overall present productivity of the site. The end-land use will be to leave disturbed areas in a state allowing them to return as quickly as possible to productive wildlife habitat.

The general reclamation program components will be as follows:

- salvage and stockpile soil from the areas of disturbance according to the soil salvage plan;
- immediately revegetate areas disturbed by the pre-production phase to the extent practical; in general mesic soils will not have agronomics seeded, unless site-specific experience indicates this is necessary);
- reslope rock dumps to an average angle of 19° (maximum overall 2:1 slope angle of 26°); this will be accomplished by grading off the benches, which will be 10 m high and set back from the one below 15 m;
- prepare surfaces for the replacement of soil materials;
- recover stockpiled soil and spread it over reclaimed areas that would benefit from soil addition;
- revegetate the prepared areas, where appropriate and indicated from reclamation trials;
- establish test plots to optimize growth mediums; and
- monitor growth and develop performance objectives.
- Overburden will be used to top dress most disturbed horizontal surfaces. Given uniform coverage of overburden in the pit area and a 400 m diameter pit, approximately 880,000 m^3 of sand and gravel may be available. This is adequate to place a minimum of 0.3 m of soil on these surfaces. The amount of organic soil salvageable from the open pit area remains to be determined.

Reclamation will be progressive throughout the mine life up to closure and abandonment. Limited reclamation will be possible following construction. Major reclamation will occur in Year 4, following completion of open pit mining, with reclamation of the waste dumps and infrastructure no longer required for the underground mining phase. Ore stockpile pads and portions of the processed kimberlite containment area no longer required will be reclaimed as the mine units become inactive. Final reclamation will occur after mine closure in Year 9. All infrastructure will be removed, or buried on site. Hazardous wastes will be removed; any remaining contaminated soils will be remediated.

A post closure monitoring program will be undertaken to ensure the mine site is left in a stable condition and no contaminants are being exported off the site.

3.10.2 Bonding

Tahera Corporation currently has a $864,000 reclamation bond to cover the cost of clean up of exploration-related disturbance at the Jericho site. The estimated total reclamation cost for the Jericho Diamond Mine is $7.35 million. This will be reduced at the end of 2005 with reclamation of waste rock dumps and removal of unneeded open pit mining equipment. Total reclamation costs at closure will be further reduced when PKCA cell 1 and the Central Ore Stockpile pad are reclaimed and underground mining equipment and required infrastructure are removed in Year 8. Much of the disturbance associated with mining (e.g. waste rock dumps, low-grade ore stockpile, pads) can be reclaimed at that time as well, while accommodation and other necessary infrastructure is still fully operational.

3.11 MONITORING

Requirements for monitoring the biophysical resources (and socio-economic/cultural and heritage resources) throughout the mine life will be part of the terms and conditions appended to the Project's water licence and land leases. The Environmental Monitoring Plan is presented in Appendix B.3.3.

3.11.1 Aquatic Monitoring

The Nunavut Water Board requires a program to verify compliance with regulatory standards and to evaluate effectiveness of the mitigation measures as a condition of Project approval. The aquatic effects monitoring program (AEM) for the proposed Project is designed to monitor effects on water quality and aquatic biota.

A water quality monitoring network will be established at Jericho during mine operations (Figure 3.8). Monthly monitoring is proposed: for streams, July through September; and for deeper lakes, sample as for streams plus April and December. Parameters to be monitored will be a 24-element ICP/MS scan plus pH, alkalinity, suspended solids, and nutrients. Hardness will also be measured, as it relates to metals availability.

In addition to the sites shown, water in sediment control ponds will be monitored during summer months (when free water is present) for the above parameters. For sediment ponds, turbidity will be measured in the field and a correlation developed between turbidity and total suspended solids, to provide an immediate method of determining acceptability of discharge of sediment pond water. Ammonia will also be determined by field methods to provide early warning of increasing concentrations.

Sediment samples will be collected annually from Carat Lake and Lake C3 (receiving water bodies). If metals are elevated above those found from baseline studies, appropriate toxicity testing will be conducted in addition to chemical analyses.

Effluent from the processed kimberlite containment area will be monitored for acute toxicity prior to spring discharge and then monthly when discharges occur (likely July through September); acute toxicity will also be measured at the end of the discharge period. Parameters will be as above.

Components of the aquatic biological community that are potential receptors suitable for monitoring purposes include periphyton, benthic invertebrates, and fish. The first two organisms were chosen as receptors, because they are stationary and are likely to reflect changes in the environment more rapidly than other organisms, such as fish.

Lake trout and round whitefish were chosen as receptors because they have the potential to bioaccumulate some metals and they have a higher social value than invertebrates. Other organisms, such as phytoplankton and zooplankton, were deemed unsuitable as receptors for monitoring for two reasons. Both groups exhibit high levels of natural variability that will make it difficult to identify change. Also, neither receptor is stationary within the context of this Project (eastern portion of Carat Lake), which makes it difficult to ascertain site-specific effects.

One abiotic component will be included in the AEM program. The rate of sedimentation was chosen for monitoring, because it provides a link between elevated suspended sediments and changes in the aquatic biological community.

3.11.2 Terrestrial Monitoring

The migratory nature of most wildlife populations represented in the Project area, the seasonal nature of the major Project components, and the relatively short Project history combined, present a set of variables that make definitive monitoring of Project/wildlife interactions very difficult. Two wildlife monitoring components, however, stand out as worthy of a monitoring effort to both test the predictive relevance of the assessment, and add to the overall knowledge of tundra ecosystems interacting with mining activities.

Monitoring annual raptor nesting patterns and numbers in relation to the proximity of mining activities, microtine cycles, and seasonal weather patterns will provide important information for long-term land use management in areas of raptor breeding habitat. It will, however, probably not show definitive relationships in time to benefit the Jericho Project environmental management program.

The Bathurst caribou herd is of high value to the lifestyle of Nunavut and NWT residents. The Jericho Project will participate in a caribou monitoring program with the Government of Nunavut and other government and industry interests to ensure that the health of the herd is under ongoing surveillance in relation to all human activities on the herd's overall range. Tahera Corporation will participate in any joint industry-government body set up to monitor the Bathurst caribou herd and/or barrenland grizzly.

The Project EIS predicts negligible effects on a regional scale on caribou and muskox from mine construction and operation. The primary purpose of monitoring will be to determine whether any significant local effects occur (e.g. road kills or other mortalities) that might be caused by Project activities, and to adjust activities to reduce or eliminate those effects, should they occur.

Where practical, revegetation of inactive disturbed sites will be undertaken. Success of these prescriptions on test plots and/or areas that are no longer used early in the mine operation will be monitored and modified as appropriate, based on Project experience and the published and unpublished results of others attempting revegetation in the Arctic tundra. Specifically any reclamation trials results available from EKATI™, Diavik, and Lupin will be reviewed and results discussed with environmental personnel from these mines.

3.11.3 Air Quality Monitoring

3.11.3.1 Direct Monitoring

A high-volume sampler will be set up on the roof of the accommodation building for monitoring PM-10 (respirable suspended particulates). Samplers work for a 24-hour period on a six-day rotation. Once operation commences, PM-10 will be monitored during snow-free periods (summer). Sampling will be conducted over the summer for the first year. If PM-10 guidelines are not exceeded, sampling will be reduced to one month during the summer for the rest of the mine operating period. The worst month from the first year's data will be monitored.

Dust fall monitors will be located northwest and northeast of the open pit, as recommended by Levelton (Air Quality Report, Appendix D.1.1) to determine whether dust fall predictions are correct. Dust fall monitors will be operated year round for the first year of mining and results evaluated at the end of that time to ascertain whether the program should continue.

3.11.3.2 Indirect Monitoring

Metals Levels in Lichen

Lichens are known to be sensitive indicators of air borne metal contaminants. Lichens were collected in 2000 and analysed for metals. A sample was taken from west of the airstrip, well away from any exploration project influence. Lichens will be sampled again after two year's operation from sites proximate and distant from operations (based on prevailing wind patterns) to determine whether the Project is affecting metals levels in lichens. If no effects are noted (i.e. proximate sample significantly higher in metals than the distant sample), sampling will be repeated after five year's operation, and then at end of mine operations. If significant differences are detected, sampling will be conducted annually. This trigger will apply to any sampling period, except end of mine life.

Project Dust Effects on Plant Communities

Two transects were sampled in 2000 for plant community composition (Figure 3.9). Transects were located west of the airstrip and southeast of the portal. One-meter quadrats were inventoried at 10 m intervals up to 100 m. Transect zero points were adjacent to the airstrip and portal access road. Transects were marked with stakes so that locations could be recovered. Quadrats were divided into 10 cm square subdivisions and the percent cover of plant species noted for each subdivision. Total cover for the 1m square quadrats were then calculated from subtotals. These transects will be resampled each two years of operation of the mine to determine whether dust is affecting plant communities. A period of two years was chosen because of the nature in which plants grow in the Arctic; many plants only flower and produce seed every two years.

4.0 HUMAN ENVIRONMENT

4.1 SOCIO-ECONOMIC BASELINE DATA COLLECTION

Socio-economic baseline data were collected from 1996 through 2001. Data were obtained from published and unpublished sources and from communities consulted through discussions with municipal governments, territorial agency personnel, and the public at meetings.

The descriptions of the communities are based on information that is within the public domain and is known for several years in order that trends can be seen. The consultants and their local advisors sought data for the Kitikmeot communities on the indicators of community wellness identified in the socio-economic agreement between the Government of the Northwest Territories and BHP Diamonds Inc. (GNWT and BHP Diamonds Inc, 1996), but were unsuccessful for many of the indicators. Such data is not available at this time. Instead the consultants have included a general discussion about these matters using newspaper reports and comments made by community members. The Socio-Economic Baseline is presented in Appendix C.1.1.

4.2 SOCIO-ECONOMIC SETTING

4.2.1 Corporate Policy

Tahera Corporation has adopted the following management policies for their Jericho Diamond Project:

- **Recruitment and Training**: Tahera will seek to hire employees from the West Kitikmeot first, Nunavut second, and people residing elsewhere third, consistent with the Company's commitments made in the draft IIBA submitted May 1999 to KIA, Cambridge Bay. Tahera is committed to increasing the percentage of Inuit employees to 60% over a five-year period. To achieve this objective it will be necessary to work closely with the employment and training officers in Nunavut. It will also be a prerequisite to establish a culture at the operation that supports a multi-cultural group. Tahera Corporation is a member of the Kitikmeot Employment Training Partners Association and will work co-operatively with the Association for training through the Association.

- **Transportation**: Tahera will transport employees living in any West Kitikmeot community or elsewhere between the site and their point of hire.

- **Employee Orientation**: Tahera Corporation will develop and deliver a comprehensive employee orientation program that will be mandatory for all employees. The program will include information on the following: Company organization and mandate; safety and first aid; emergency response; Company policies and procedures; cross cultural awareness and sensitivity; job specific orientation and job exceptions; training programs; site orientation; employee and family assistance program; and benefits, pension, and savings plans.

- **Procurement**: Tahera Corporation will use local suppliers when these suppliers can provide products and services at a competitive price. Tahera recognizes that such purchases can lead to more jobs in the communities; these community-based jobs are often more desirable than fly in/fly out jobs. Tahera Corporation will work cooperatively toward maximizing the use of Inuit owned firms to provide such services as the mining of the open pit or to provide catering services for the Project.

- **Hunting, Fishing, and Firearms**: Tahera Corporation will not permit its employees or contractors to carry unauthorized firearms while at work for the company, and hunting and sports fishing will not be permitted on the property.
- **Alcohol and Drugs**: Tahera Corporation will ban the possession or use of alcohol or illegal drugs by its employees and contractors, while on the Jericho mine site. The possession or use of these products will be grounds for dismissal.
- **Communications and Dialog**: Tahera Corporation will instruct management to be available to assist its employees both on site and in their home community in understanding its personnel policies and health and safety requirements. Management and staff from Tahera Corporation will visit the communities of the West Kitikmeot on a regular basis to discuss employment opportunities and training programs. Community employment officers will be welcome to visit the mine site to discuss employment-related issues with employees and company representatives.
- **Use of Contractors**: Tahera Corporation will insist that its contractors comply with these policies to the extent practicable.

4.2.2 West Kitikmeot Region

The West Kitikmeot Region is one of the three administrative regions in Nunavut. The region is located in the Central Arctic, 900 km north of Yellowknife, 800 km east of Inuvik, and 400 km west of Gjoa Haven. There are four communities in the region: the hamlets of Cambridge Bay and Kugluktuk, and the unincorporated settlements of Umingmaktok and Bathurst Inlet.

The communities were selected on the basis of: their proximity to the proposed Project site; their relationship with the region surrounding the proposed Project site; and their potential for supplying the proposed Project with workers, services, and supplies.

4.2.2.1 Population and Demographics

In 1998 the West Kitikmeot Region had a population of 2,746. Compared to a 1996 population of 2,618, this is an increase of 128 people (or 5%). Between 1991 and 1996 the regional population increased 25%; between 1986 and 1991 it increased 15%. The region has a young population; in 1996, 955 residents (or 36%) of the population were under the age of 15, while 1,565 residents or (60%) were between the ages of 15 and 64.

In 1996, 83% of the population of the West Kitikmeot Region was of aboriginal origin.

4.2.2.2 Employment, Income and Work Force

Of the 1,080 residents employed in Cambridge Bay and Kugluktuk in 1996, 485 (or 45%) were employed in government services, including education and health services. The second largest group, 300 residents (or 28%), was employed in the other services sector.

The average income in the West Kitikmeot Region in 1996 was $27,441. This was $762 (or 3%) more than the 1996 average income in Nunavut. Income data is not available for either Umingmaktok or Bathurst Inlet. The number of people in the labour force in 1999 in the West Kitikmeot Region was 1,224. Of these, 987 were employed and 232 were unemployed. The participation rate was 69% and the unemployment rate was 19%, using the traditional definition of "unemployed" (persons available for work who were without work and had actively looked for work in the previous four weeks, who were on temporary lay-off, or who had definite arrangements to start a new job within the next four weeks).

4.2.2.3 Economy

The Kitikmeot economy is a mixed economy comprised of three key elements: the wage economy, government transfer payments, and traditional activities (WKSS 1999). Many residents combine cash from wage employment and government transfer payments with traditional activities such as hunting and fishing for food. The transfer payments from governments come from either subsidies or income support. All three elements play an important role and contribute to the regional economy at different levels and at different times, depending on factors, such as seasonal harvesting activities and the availability of wage employment.

Although harvesting is a part-time activity for most people, production per hunter is high with the average hunter in the Region taking 1,000 to 1,500 kilograms of meat and fish each year. The replacement value of this food is estimated at between $10,000 and $15,000 per hunter per year. Most local households hunt, fish, trap, gather, and consume the food from this harvest. Country food replaces expensive store-bought food and compared to imported foods, country food provides a better source of nutrients such as iron, magnesium, and calcium. Seal meat, for example, has six to ten times the iron content of beef. Both traditional knowledge and scientific data point to the important connection between individual (and community) health and well-being and access to reliable sources of country food.

4.2.2.4 Level of Education in the West Kitikmeot Region

The 1996 Census data provides the education level of the working age population (15 years of age and older) in Cambridge Bay, Kugluktuk, and Umingmaktok. In 1996, 59% of the working age population of Cambridge Bay, had at least a high school diploma or more education; 43% of the working age population of Kugluktuk had at least a high school diploma or more education; and 29% of the working age population in Umingmaktok had at least a high school diploma or more education.

4.2.2.5 Community Health and Wellness

The Department of Health and Social Services had the second largest budget ($117.4 million, or 22%) in the Government of Nunavut's first budget in 1999 (Ashbury, 1999). On behalf of the Federal Government, the department administers non-insured health care services and insured services to the residents of the Kitikmeot (Tologanak, Pers. Comm., 2000). Community Health and Social Service Centres, staffed with nursing and social services personnel, are located in the two larger communities (Kugluktuk and Cambridge Bay) and a Regional Headquarters office is also located in Cambridge Bay. There are no medical services in Bathurst Inlet, but there is a lay dispense person in Umingmaktok (Tologanak, Pers. Comm., 2000).

4.2.2.6 Health Issues and Concerns

Below is a summary of issues and concerns, as determined by the Kitikmeot Health and Social Services Board before the Department of Health and Social Services, Government of Nunavut, took responsibility for the services on April 1, 2000 (GNT 1999).

Shortage of Health and Social Care Professionals

Much like the rest of Canada, the Kitikmeot is faced with a shortage of nurses and social workers. A high turnover of staff results in moving health and social services professionals to and from the Region. This increased cost impacts on the overall budget, requiring budget cuts in program areas (Tologanak, Pers. Comm., 2000).

Tobacco Use

Tobacco use is a very serious problem in Nunavut and the Kitikmeot Region. Recent figures from Statistics Canada and the GNWT Bureau of Statistics show that Northerners, on an annual basis spend $2,761 per person for tobacco products and alcoholic beverages (Gardiner, 1999). This high rate of tobacco use results in a high number of respiratory diseases and ailments in both adults and children. These types of illnesses continue to increase and are one of the major contributors to many medivacs flown out of the Region during the year (Tologanak, Pers. Comm., 2000).

Social Issues

Unemployment, a shortage of housing, and teenage pregnancy causes a great deal of stress in various family situations and has a large impact on the mental health of the families and thus a community's well being. The communities have a large percentage of residents who are unemployed and as a result are forced to live in conditions that result in this type of stress.

There is a high rate of teenage pregnancy in the Kitikmeot communities and this presents many public health problems and stresses on the health system. Official statistics are not available, but a recent newspaper article that focussed on the community of Arviat, with a population similar to Cambridge Bay (approximately 200 more residents), noted that their teen pregnancy rate for girls' aged 15 – 19 is 230 per 1,000. The national Canadian rate for teen pregnancy is 27 per 1,000 (George 2000). Nunavut's health and social services minister noted that some communities of 1,400 or 1,500 people have 40-to-60 babies being born in a year. Problems associated with these young mothers include a greater risk of complications for both the mother and the child during childbirth, greater risk of anemia, high blood pressure and premature labour, poor nutrition, fewer prenatal check-ups, and fewer stop smoking (George 2000). A teen mother is less likely to complete high school and is more likely to receive social assistance (George 2000).

Mental Health

The mental health of Kitikmeot residents impacts on the number of illnesses, accidents, and attempted and completed suicides. Suicide is one of the most pressing issues that Kitikmeot residents face regularly. One of the contributing factors to the high suicide rate in Nunavut is the impact the social issues have on the mental health of the residents.

Community Mental Health Worker positions have been developed for Cambridge Bay and Kugluktuk to assist individuals, families, and groups in developing community-based action plans to help promote a community awareness of mental health issues. Better communication between the health and social services department and some hamlet administrations are being encouraged to enable more effective services to be provided to each Kitikmeot community.

The State of Knowledge West Kitikmeot Slave Study reported that alcohol and/or drugs account for as much as 88% of unlawful offences in some WKSS communities (WKSS 1999).

Dental Health

Expenditures on dental health in the Kitikmeot Region are large, with the most recent estimates at approximately $1.2 to $1.4 million per year (Tologanak, Pers. Comm., 2000). Recent surveys of children indicate that the dental health of children in the NWT (before Nunavut became a territory) is the worst in Canada. The most recent decayed, extracted, filled teeth / decayed, missing, filled teeth (deft/DMFT) index for six (6) year old aboriginal children in the Kitikmeot Region is 9.28 whereas the deft/DMFT for non-aboriginal children is 1.6 (Tologanak, Pers. Comm., 2000).

In Summary

In January 1999, the Kitikmeot Health and Social Services Board commissioned a review of the delivery of its core public health, primary prevention, and health promotion programs and services. The review listed the following factors as negatively affecting the health and social services in the Kitikmeot Region. They include: a high population growth; high teenage pregnancy rate (three times the national average); unemployment; housing problems; a high crime rate; high infant morbidity, due to high rate of alcohol and tobacco addiction of mothers; high rate of childhood injuries due to accidents; high rates of alcohol and tobacco addiction among adolescents; high rates of sexually transmitted diseases; and high incidence of family violence (Tologanak, Pers. Comm., 2000).

4.3 SOCIO-ECONOMIC IMPACT ASSESSMENT METHODOLOGY

The following sections summarize findings presented in the Socio-Economic Effects Assessment (Appendix C.1.2).

Communities were selected on the basis of their proximity to the proposed Project site, their relationship with the region surrounding the proposed site, and their potential for supplying the Project with workers, services and supplies, and (in the case of Yellowknife and Cambridge Bay) acting as a transportation hub.

The views of the residents of the Kitikmeot (traditional knowledge) are reflected in the assessment of community impacts and the policies of the company have been adjusted to reflect these views.

Economic impacts were assessed by comparing the value of the economic activity from the Jericho Project with the value of the same economic activity described in the Diavik Diamonds Project, Environmental Assessment Subsection (Diavik Diamond Mines Inc. 1998). Significance of impacts was evaluated against the empirical data on the socio-economic baseline (see Appendix C.1.1). If the Project results in a change in the status quo of less than 0.5%, the impact is negligible; between 0.5% and 1.5%, the impact is minor; between 1.5% and 2%, the impact is moderate; and over 2%, the impact is major.

These percentages were based on the recent rates of population growth experienced by the Kitikmeot Communities (4% in five years) and by Yellowknife (5% in five years). If the communities are expanding at an average rate of 1% per year, an impact that is about the rate of expansion should be minor. An impact equivalent to more than double the rate of expansion of the community would be major. The choice of community growth (as the indicator of impact on the communities) is based on the observation that changes in community or regional populations stresses the educational, health, social, and infrastructure facilities of a community. This indicator of change is closely monitored by governments and is used to determine where new resources are best utilized.

4.4 SOCIO-ECONOMIC IMPACT ASSESSMENT

The Jericho Diamond Project is a small mining project. It will generate an average of 90 person years of employment for nine years. For comparison, the EKATI™ diamond mine in the NWT generates over 600 person years of employment at its mine site each year. However, even 90 person years of employment can have impacts on a region with a small population, like the Kitikmeot. The major socio-economic impacts will relate to jobs and business opportunities (see Socio-Economic Effects Assessment, Appendix C.1.2).

4.4.1 Job Opportunities

Tahera's goal is to fill 60% of the positions in its processing plant with Inuit within five years. Tahera will inform its potential contractors of this policy and will indicate that its choice of contractors will be influenced by the extent to which the contractors are committed to hiring and training Inuit from Nunavut and particularly from the Kitikmeot. For the entire Jericho Project, potentially, up to 50% of managers, 60% of skilled positions, and 90% of semi-skilled positions can be filled by residents of the Kitikmeot.

The use of Inuit-owned companies to perform the open pit mining and the catering should assist Tahera in reaching its goal. Table 4.1 summarizes Jericho Project employment requirements throughout the construction and operation phases. In order to get a skilled job, a minimum of Grade 10 education will be required; it is probable that education levels for a number of prospective employees will need upgrading. Since 1996, a number of organizations have worked to upgrade the educational level of Kitikmeot residents.

4.4.2 Temporary Closure

Should the mine be forced to close temporarily in Years 3 or 4 (the years with maximum Nunavummiut employment) 62 to 68 Nunavummiut would be laid off. For the Kitikmeot Region, 68 jobs represent 3.4% of the 1999 labour force of 2,006. Therefore the impact on the Kitikmeot would be major should the layoff continue for months or years. For a few months after the closure, employment insurance would mitigate the impacts of the layoffs. As well, transferable skills learned by Jericho employees would give them the option of seeking alternate employment opportunities.

4.4.3 Final Closure

Should additional economic reserves be found, the mine life could be extended. If the mine closes as presently planned in Year 10, 30 Nunavummiut will be laid off. For the Kitikmeot Region, 30 jobs represent 1.5% of the 1999 labour force of 2,006. Therefore the impact on the Kitikmeot would be moderate. Effects on the labour force from the NWT and other regions would be negligible. Mine employees of contractors may be placed elsewhere and all employees will have gained experience and transferable skills that will assist in re-employment.

4.4.4 Impact on Current Employers

The relatively well paying jobs available at the Jericho Diamond Project and its contractors will attract some of those already employed in the Kitikmeot communities. However, those with a full-time job will be reluctant to leave it for a part-time or short-term job (open pit and underground mining) that requires the employee to be away from home two weeks out of four. The permanent positions in the plant and on the catering team will be the most attractive to those individuals with full-time jobs in the communities. Of the positions available, 14 will be skilled and could attract Kitikmeot residents now holding jobs in the communities. These positions represent 0.6% of the people employed in 1999; the impact will be minor.

4.4.5 Impact on Traditional Land Use

The Project will have little impact on the hunting, fishing, and trapping activities of the local people. The mine will occupy a very small portion of their hunting territory and the trucking activities will be confined to winter ice roads. The impact of the mine and its infrastructure represents such a minute portion of the hunting territory that the impact is judged to be negligible.

4.4.6 Community Impacts

Community consultation underlined the importance of hiring locally and using local suppliers. Community leaders recognized that the rotational lifestyle stressed some families and could result in an increased number of family breakups and cases of physical abuse. Leaders argued, however, that the income produced by working was important to families, as was the pride in having a job. On balance, it was thought better to have the choice of working or living a more traditional lifestyle than having only the one choice of living off the land. Employment opportunities were also considered to be important to the overall well being of the community. Communities are familiar with fly in/fly out employment. Kugluktuk supplied workers for the Beaufort Sea oil and gas development in the 1970s: Kugluktuk and Cambridge Bay supplied workers for Echo Bay Mines Lupin Mine from 1981 to the present: Bathurst Inlet and Umingmaktok supplied catering and exploration assistance to the BHP Hope Bay Project from 1994 to 1998.

As Tahera plans to fly its employees back and forth to their home communities, the Project should have no impact on the demographics of the communities (people will not be moving to or from a community to get a job). As a result, there will be no increased pressure on existing community infrastructure and services as a result of this Project. There will be no increase in costs to governments or community organizations as a result of the Project. Tahera will work with government agencies and community groups to make certain that counselling is available for those employees who might choose this option.

4.4.7 Economic Impacts on the North and Canada

The Jericho Diamond Project will require $44.5 million to build the processing plant and pre-strip the open pit. Of this sum, $6.3 million may be used to procure the diamond plant from an international company in South Africa and $1.3 million may be spent on engineering services in South Africa. Of the remaining $36.9 million, approximately $7.4 million (or 20%) will be spent on labour and $29.5 million (or 80%) will be spent on materials and supplies.

Once in operation the Project's operating expenses will vary year to year depending on the nature of the mining operation. They range from $9.2 million to $34 million in constant 1999 Canadian dollars and will peak in Year 3 (2006). Approximately 30% will be spent on labour and 70% will be spent on materials and supplies throughout the mine life.

While the effects of this economic activity are significant in the context of the Kitikmeot region, the effects on the gross domestic product (GDP) of Canada and NWT will be negligible. The Kitikmeot Corporation, the business arm of the Kitikmeot Inuit Association, has been aggressively seeking opportunities for its subsidiaries and joint ventures with other mine developers in the region and will strive to obtain business opportunities from this Project. Other firms, based in Nunavut or NWT, who are serving the existing gold and diamond mines will also wish to adapt their businesses to provide services to the Jericho Project.

The Project would lead to the creation of 533 direct and indirect new jobs in Canada in Year 3 of operations, including 161 new jobs in Nunavut and the NWT. This would accrue estimated taxes to the federal government of over $7 million and to the governments of Nunavut and NWT, of over $3 million combined.

4.5 SOCIO-ECONOMIC CUMULATIVE EFFECTS ASSESSMENT

The socio-economic cumulative effects assessment addresses the effects of the Jericho Diamond Project in combination with other existing projects and projects that have been approved or are in the regulatory review stage. These projects are largely within the Slave Geologic Province and included:

- other currently ongoing mining projects (i.e. EKATI™ Diamond Mine, Diavik Diamond Project, and Lupin Gold Mine); and
- other proposed mining projects in and near the region, specifically the De Beers' Snap Lake diamond mine.

Neither the Lupin winter road nor the proposed Bathurst Inlet port and road directly affect any communities in the Kitikmeot and therefore were not directly considered in the cumulative effects assessment. While hunting and guiding activities could possibly act cumulatively with the mine development in the Slave Geologic Province on the Bathurst caribou herd (significance judged to be negligible), this activity shares nothing in common with mining projects with respect to impacts on the people living in the Kitikmeot region. Mineral exploration might be expected to draw on some of the same skills required for mining, however, in this case activities vary greatly from year to year and there is no reliable basis on which to compare exploration and operating mine requirements for employment. Thus, mineral exploration is also not considered.

Assessing socio-economic cumulative effects is considerably more imprecise than biophysical cumulative effects assessments given:

- the difficulty of separating direct and indirect effects and the extent to which these overlap;
- environmental uncertainty and the extent to which environment and socio-economics interact;
- changing government policy and regulations;
- changing values of the people and communities involved;
- the imprecision of measurement of socio-economic impacts, other than strictly economic drivers; and
- the dependence of mitigation effectiveness on all of the above.

Given the qualitative nature of the assessment, monitoring becomes more important in assessing effects predictions.

The socio-economic effects from the Jericho Project that may act cumulatively include:

- requirement for skilled and semi-skilled labour;
- requirement for contract services and supplies;
- attraction of other mining projects to the Kitikmeot;
- changes in the traditional economy and lifestyles from a cash economy and rotational work; and
- revenues to various levels of government (positive and minor incremental effect—not discussed).

4.5.1 Labour Requirements

4.5.1.1 Kitikmeot Region

During the period the Jericho Diamond Project will be operating (2004 to 2012) Kitikmeot residents will have the opportunity to work at the existing mines Echo Bay, EKATI™, and Diavik. Job opportunities may also exist at the gold deposits in the Hope Bay area of the Kitikmeot Region and at the Snap Lake diamond mine in the Northwest Territories. In addition, jobs will be available at gold and diamond exploration sites throughout the Kitikmeot (including exploration around the Jericho deposit). The construction of a road from Bathurst Inlet to Contwoyto Lake and beyond also offers the possibility of jobs for people living in the Region.

Most of the residents of the Kitikmeot, who already have the training to work at a mine site, are already employed. Therefore, the commencement of the Jericho Diamond Project will have a major cumulative impact on the

Kitikmeot Region as the operator searches for people to fill the available jobs. Training courses such as those now being offered by Kitikmeot agencies will reduce this impact, but not eliminate it.

The labour demands for Jericho may be lessened somewhat, as the southern diamond mines largely draw on communities in NWT, including Yellowknife, while still relying on the Kitikmeot for some employees. The closure of Polaris and Nanisivik mines will also result in an increase in the available mining labour force.

4.5.1.2 Yellowknife Area

The cumulative impact of the Jericho Diamond Project on the Yellowknife job market and on the Yellowknife business community will be negligible to minor, because the opening of Jericho will coincide with the expected closure of the Con and Giant Mines in the city (Puglia, 2002).

4.5.2 Contract Opportunities

The cumulative impact on Kitikmeot businesses will be less severe than the labour market impact. Those businesses working for, or with, the mining industry will be capable of gearing up to handle the extra business a small mining project, such as Jericho, will bring them.

4.5.3 Attraction of Other Mining Projects

The start up and operation of additional mines in the Territory will certainly enhance the attractiveness of Nunavut to mining activities, because this activity will signal to investors that Nunavut welcomes mining. However, the extent of the effect is largely dependent on other factors, most important of which are:

- existence of economic deposits;
- commodity prices;
- infrastructure improvements, e.g., the Bathurst port and road; and
- the existence of a skilled labour force.

The Kitikmeot region is very prospective for mineral deposits and there is a high likelihood that additional economic deposits will be found. However, the uncertainty for this outcome is very high. Commodity price fluctuations are an entirely external variable. The lack of a skilled labour force will likely be a less significant disincentive to companies wanting to develop mines, since it can be viewed as temporary and more controllable (through the institution of training programs).

There are a number of economic or sub-economic deposits in the West Kitikmeot area that were discussed under environmental cumulative effects, including Izok Lake, George Lake, Ulu, and Doris-Hinge. Ulu is approved and operation dependent on commodity prices. The Doris-Hinge project is in the approvals stage. Others may become economic, if infrastructure or commodity prices improve.

Additional operating mines may result in incremental increases in the impacts previously listed, but the extent of the impacts cannot be predicted.

4.5.4 Traditional Economy

There should be a negligible cumulative impact on traditional hunting and harvesting activities as the sites being developed are small and are already occupied by exploration camps. As well, the rotational nature of the work will allow traditional activities, such as hunting, to continue outside of work periods for Nunavummiut employed at Jericho or other projects. The extent to which wage employment affects traditional lifestyles will be dependent on the individuals involved. A source of cash from mine employment may, in fact, enhance opportunities for traditional activities by providing money to purchase supplies for such activities (e.g. snowmobiles, 4-tracks, and other hunting equipment).

4.5.5 Summary

Cumulative socio-economic effects are most likely to occur from multiple mine developments in the Slave Geologic Province and are largely unpredictable with any degree of accuracy. Effects will be both positive and negative and the division between positive and negative will be almost entirely dependent on the affected communities and individuals. The most significant socio-economic cumulative effects from the Jericho Project will be in Kitikmeot communities and will be driven by the requirement for skilled and semi-skilled labour.

4.6 SUMMARY OF EFFECTS

Most socio-economic effects will be related to employment and business opportunities, both direct and indirect. A second major effect will be tax revenues to governments and a third will be an increase in training opportunities for Nunavummiut. An increase in skill levels will lead directly to a widened opportunity for employment choices for those who chose to take advantage of the opportunity. Table 4.2 summarizes socio-economic effects, most of which will be residual.

4.7 SOCIO-ECONOMIC MANAGEMENT AND MITIGATION

An Inuit Impact Benefit Agreement (IIBA) will be negotiated with KIA. It will set out the terms and conditions for the Project-supplied benefits to Kitikmeot beneficiaries, as defined by the *Nunavut Land Claims Agreement (1993)*. The IIBA will be a key factor in the mitigation of potential negative socio-economic effects of the Project. The terms of the IIBA have not been finalized. Terms of the agreement will be negotiated and remain confidential.

4.7.1 Temporary Nature of Employment

The mine has a limited life span, even if additional reserves can be found to extend mine life. Eventually, the deposit(s) will be exhausted and the mine will close. Set against that is the fact that all Jericho Project employees will gain training (formal and/or on-the-job). Employees will develop or enhance transferable skills and many, especially younger, employees will gain important life skills. By Tahera's providing an incentive for Project contractors to hire Inuit, some of the contractors' employees may be able to transfer to other jobs with the contractors once the Jericho Mine closes.

4.7.2 Community Infrastructure Pressures

The Jericho Project will be a fly-in/fly-out operation. Employees will be hired from communities in which they live. The Project will therefore result in little or no pressure on services such as health, education, policing, or fire protection. The size of communities will not likely increase significantly, although if the Project provides the catalyst for the development of a new business (such as diamond polishing), then some influx of new people would be expected.

4.7.3 On The Job Conflicts

Tahera will develop and deliver a comprehensive employee orientation program that will be mandatory for all employees. The program will include, among other topics:

- company policies and procedures including zero tolerance for racial intolerance, use of drugs or alcohol on the job, and the possession or use of fire arms on the mine site;
- cross cultural awareness and sensitivity; and
- site orientation, including company expectations of employees and company commitments to the health, safety, and well being of employees.

Fighting or intimidation of other employees will be cause for immediate dismissal and removal from the mine site. Tahera will instruct its management to be available to assist its employees both on site and in their home community in understanding its personnel policies and health and safety requirements.

4.7.4 Family Stress

While absence of family members is necessitated by the rotational aspect of the work and remote location of the Jericho Mine, Tahera will work with community and territorial governments to ensure integration of the company program with existing services. The nature and delivery of the counselling program will be subject to IIBA negotiations.

Employee and family assistance programs (aside from counselling), health benefits, and Canada Pension Plan premiums will also be provided. The former will be subject to IIBA negotiations; the latter will be consistent with mining industry norms.

4.8 SOCIO-ECONOMIC RESIDUAL EFFECTS

All effects discussed in Section 4.4 will be residual, although negative effects will be reduced by the mitigation measures discussed in Section 4.7.

4.9 SOCIO-ECONOMIC MONITORING

In order to minimize the negative effects and maximize the positive effects of the Jericho Diamond Project, a socio-economic monitoring committee will be established. The nature of the committee will be subject to IIBA negotiations, but conceptually, the community liaison committee could logically perform the function. This committee will include representatives from the company, its prime contractors, the communities of the Region, and the territorial government(s).

The Nunavut Planning Commission has proposed a series of indicators that any monitoring committee could follow to help it assess impacts on the Region (NPC 2002). These indicators include: unemployment rates, education levels for the Kitikmeot, number of private dwellings in the Kitikmeot, housing characteristics for the Kitikmeot, population changes in the Kitikmeot, age distribution, highest level of schooling, births and deaths, number of persons per private dwelling, and smoking in the Kitikmeot. Baseline figures for most of these indicators can be found in the Socio-Economic Baseline Report (Appendix C.1.1).

4.10 LAND USE

4.10.1 Introduction

The Land Use Report is presented in Appendix C.1.3. This section is based on information in the latest draft of the West Kitikmeot Regional Land Use Plan (NPC 2000). The Regional Land Use Plan is not a prescriptive document similar to normal land use plans. There are no regional designations for each region of the Kitikmeot; there are no guidelines presented for what types of development should occur where. Once in place the West Kitikmeot Regional Land Use Plan will serve as the first level of review for development proposals; at present this review does not take place.

Some general guidelines are also discussed by the draft. These include parks and sanctuaries (none in the region of Jericho), caribou, and eskers. The issue for caribou is that development, particularly mineral exploration, should not negatively impact caribou, especially the Bathurst caribou herd. Communities want development, but not at the expense of the caribou, which provide a necessary food source. The Nunavut Land Claims Agreement makes provision for protected areas. Also, government and other stakeholders are reviewing a management plan for the Bathurst herd. The Nunavut Wildlife Management Board may also develop regulations for caribou protection, such as no exploration activities on the calving grounds, when cows are giving birth, etc.

Eskers provide preferred habitat for a number of animals; they provide dens and sources of prey for carnivores, burrows for rodents, travel routes for caribou and muskox, and sources of prey for raptors. Eskers were preferred sites for pre-contact human hunting camps and therefore may contain archaeological resources. Eskers also provide essential fill materials for surfacing roads and pads, required for construction of infrastructure to support mineral and oil extraction. The draft Regional Land Use Plan recognizes the need for additional research on the dynamics of esker ecosystems and their archaeological importance. Once government studies have been completed, a management plan for eskers may be developed. In the interim, there are no region-wide guidelines for esker exploitation or protection; development proponents must conduct their own impact assessments for eskers proximate to their sites.

4.10.2 Affected Communities

The Nunavut Planning Commission has prepared maps showing the area of influence for all West Kitikmeot communities (Nunavut Planning Commission 1996). These maps indicate that the Jericho kimberlite and proposed mine lies just within the southern boundary of the area of influence of the communities of Bathurst Inlet, Umingmaktok, and Kugluktuk. Hunters and fishers from these communities occasionally travel by snowmobile or airplane to this region for caribou (winter, early spring) or fish (summer).

Bathurst Inlet residents make extensive use of Kathawachaga Lake some 25 km northeast for fishing and hunting as an outpost camp. The communities harvest caribou and muskox throughout the year and trap wolverine and hunt wolves in season. Some fish are caught through the ice of Contwoyto Lake in the winter (Nunavut Planning Commission Transition Team 1996). As the Jericho site is remote from the three communities, it is probably visited most often during the winter period when travel across the land is easier. Bathurst Inlet Lodge has an outpost camp across Contwoyto Lake from the Lupin Mine and uses this camp as a base for outfitting in the fall of the year. The camp consists of structures originally erected by Hecla Mining for mineral exploration purposes.

Dene from the North Slave Region have traditionally used Contwoyto Lake and the Burnside River as a travel route, both in winter and summer, to hunt for caribou and fox (BHP Diamet, 1995).

4.10.3 The Traditional Economy

The land is important to people of communities, because of its essential role in supporting one leg of the economy: hunting, fishing, and trapping. Pursuant to permission to use the 1983 - 1989 Kitikmeot harvest studies granted by KHTA, Kugluktuk, this section summaries information contained in the database relevant to traditional economic activities in the West Kitikmeot region. An update harvest study has been completed but, based on information received from NWMB, is not available at this time. As updated information on harvesting becomes available, Tahera will review it, with respect to its potential to affect the IIBA for the Project.

The principal objective of the harvest study was to obtain wildlife harvest information to assist in an assessment of community wildlife harvest requirements (subsistence hunting). Information was gathered through interviews and adjusted for the total number of known hunters in communities. Generalized information is provided by the study database only on where caribou harvesting took place in the years 1983 through 1989. Not surprisingly, harvesting was reported largely in relative close proximity to communities (usually within 50 km; exceptionally, greater than 150 km). No harvesting was recorded for the Contwoyto Lake area, where the Jericho Diamond Mine will be located.

The study provides no information on country food consumption patterns of West Kitikmeot communities. Table 4.3 provides a brief summary; more information is provided in the Land Use Report (Appendix C.1.3). The reader desiring additional information should contact KHTA in Kugluktuk. From the study it is evident that a number of animals play a vital role in food provision and fur sales. These are summarized in Table 4.3.

4.10.4 Non-Resident Hunting

Non-resident hunters take an estimated 1,000 caribou annually (WKSS 1999). Guide camps are located throughout the Northwest Territories, but only two are known to be located in the West Kitikmeot and both are on Contwoyto Lake, as shown on Figure 4.1.

4.10.5 Tourism

Tourism, while growing, has played a minor role to date in the economy of the West Kitikmeot and Nunavut as a whole. High airfares and poorly developed infrastructure combine to slow growth (Harper 1999). A 1999 estimate for Nunavut's tourism industry suggested $30 million and 18,000 pleasure *and business* travellers (emphasis added) annually added to the economy of Nunavut as a whole (Depuis 1999). No breakdown by area or between pleasure and business traveller was given. Obviously, high transportation costs are much less of a barrier to the business traveller than the tourist. A Government of the Northwest Territories survey (quoted in NPC 2000) indicated the number of visitors to the eastern Arctic, i.e. Nunavut, increased from 4,700 in 1989 to 5,052 in 1994. An estimated two-thirds of the additional visitors went to Baffin Island. If this proportion remained constant, approximately 6,000 pleasure and business travellers came to the West Kitikmeot in 1999.

Using 1989 as a base, tourism increased by 7% in five years. An additional 10% in the following five years (to 1999) would put the total number of pleasure travellers to all of the eastern Arctic in 1999 at only 5,600. This is one third of the 18,000 estimate, of which, a third (6,000) would have been expected to visit the West Kitikmeot (if the pattern of the first five years of the decade held). This is a relatively small number of people. The corresponding impact on the West Kitikmeot economy would also be small, especially given that most of the cost of a short visit to Nunavut is getting there (i.e. most of the economic benefit is to airlines based elsewhere).

While tourism, especially ecotourism, requires unspoiled wilderness, if there is no economical way for tourists to get to the unspoiled wilderness, the resource will remain largely untapped. Infrastructure improvements that positively affect tourism and lower airfares are unlikely to become realities in the near future; cost of implementation may not be justified by the increased revenues that may accrue. The most promising road proposal currently being considered, the Bathurst Inlet to Izok Lake all weather road, would provide only industrial access and does not connect any existing communities in the West Kitikmeot. By design this road would avoid any areas of high scenic value. Therefore, it's contribution to increased tourism is unlikely to be significant.

4.10.6 Other Industrial Activities in the Region

One major mine is located in the area (Echo Bay's Lupin Mine) and there are several mineral deposits that have undergone extensive exploration work. Several mineral deposits have been developed to the advanced exploration stage; two are currently active: Miramar / Cambiex Hope Bay and Kinross / Kit Resources George Lake, both gold properties. Active diamond exploration is also in progress. No other mining project in the West Kitikmeot is in the permitting and approval stage.

Future use of the land in the West Kitikmeot will be dictated by: community desires to maintain traditional subsistence use patterns: the wealth-producing potential tied to resource development; and the need for sustainable economic development in Nunavut. Mining is likely to play a significant role in this land use. The key to sustainable use will be to minimize the impacts from mining on natural resources to the extent possible. Mining has a small footprint and with modern methods of management can be made sustainable within a regional context. Further, diamond mining and processing produces no persistent poisonous contaminants (i.e. xenobiotics). Primarily, it is sediment from diamond mining and processing that requires control and containment.

4.10.7 Parks, Ecological Reserves

There are no parks, ecological reserves, International Biological Program, or other conservation sites in the region occupied by the Jericho Project. Figure 4.2 (courtesy Nunavut Parks web site) shows parks and conservation areas in Nunavut. As can be seen from Figure 4.2, the closest park is Bloody Falls at Kugluktuk.

4.11 OCCUPATIONAL HEALTH AND SAFETY

Tahera's Occupational Health and Safety Plan (OHSP) for the Jericho Mine is presented in Appendix C.2. It addresses the requirement under *Northwest Territories Mine Health and Safety Act and Regulations* (the Act) for an OHSP for the mine. The plan covers diamond processing operations and activities of other Tahera Corporation employees at the Jericho site. Mining of the deposit will be by contract miner, who will be responsible for their own OHSP under Canadian and NWT legislation. Tahera Corporation will ensure the mining contractor has an OHSP that meets legislative requirements prior to work start up at the Jericho site.

Because mine planning has not been finalized, the plan is conceptual in nature. It covers the basic requirements under Canadian legislation. The OHSP will be finalized once the mine plan is finalized and prior to construction of the mine.

Both Tahera Corporation and its employees are jointly responsible for health and safety. Tahera Corporation is accountable for compliance with health and safety legislation and for providing a safe and healthy work environment. Individual responsibilities apply to every employee in the workplace, including the Chief Executive Officer. Individual employees must: know what their responsibilities are; have sufficient authority to carry them out; have the required ability and competence; and clearly recognize that health and safety are not just an extra part of the job but an integral, full-time component of each individual's responsibilities.

4.12 HERITAGE RESOURCES

4.12.1 Heritage Resources Baseline

Fedirchuk McCullough & Associates Ltd. in 1996 and 1999 (Appendices C.3.1 and C.3.2, respectively) completed an inventory and preliminary impact assessment of the archaeological and historical resources in the mine area. Also completed during 1999 was a follow-up study of one site that had been recommended for further study. The following sections provide a brief overview of results. Reports were produced for the Prince of Wales Museum (1996, 1999) and the Inuit Heritage Trust, Iqaluit (1999), as required by permits[1].

Twenty-five archaeological sites were identified in the mine area during the field study. Of the 25, nine are isolated finds, eleven are artifact scatters, two are habitation sites, and three are quarries. Each of the sites is documented in Fedirchuk McCullough & Associates' 1996 report, which is registered in the Prince of Wales Heritage Centre in Yellowknife.

From a scientific perspective, none of the identified sites are of sufficient potential significance to require avoidance by development. At only one site, MaNw 7, controlled excavation was recommended (and carried out in 1999) in order to determine if additional undisturbed cultural features were present. Additional reconnaissance work was conducted at the potential tailings (coarse and fine) sites for a stand-alone operation.

4.12.2 Heritage Resources Impact Assessment

A detailed Heritage Resources Impact Assessment is presented in Appendix C.3.3. Four sites were identified in the area of Long Lake (fine kimberlite disposal) – three as quarries and one an isolated find. These sites would be buried by development of the PKCA. Both scientific and public heritage values are low. Site documentation, collection of artifacts, and photography have mitigated any potential impact to the sites.

Site MaNw 7 is located adjacent to the northwest end of the Carat Lake airstrip. Surface collection and controlled excavation were completed in August 1999, as recommended by Fedirchuk, McCullough and Associates, Project archaeologists. At the termination of the field studies, nine Inuit Elders from Kugluktuk, Umingmaktuk, and Cambridge Bay, and a representative of the Inuit Heritage Trust, visited the site. Controlled surface collection of the exposed artifacts and a detailed site assessment have mitigated any potential future disturbances in the site area. FMA (Appendix C.3.2) concluded no further study is required.

In Year 1 a winter road will be used to transport supplies to the Jericho site. There are three artifact sites relatively close to the proposed route. The road will not touch these sites, however care will be required to ensure accidental disturbance does not occur; the three sites will be staked and avoided.

Three artifacts are located adjacent to currently disturbed areas on the access road to the airstrip. These artifacts are sufficiently removed from the road that disturbance is unlikely to occur, except due to accident.

4.12.3 Management and Mitigation

The principal management procedure to be followed will be to cease ground disturbance, should any artifacts be discovered in the course of mine activities. Any new areas to be disturbed (outside of those presently surveyed) will be surveyed by a qualified archaeologist prior to commencement of any disturbance.

4.12.4 Residual Effects

No residual effects will occur because historical resources will not be damaged.

[1] A letter and copy of the 1996 heritage report were sent to the Yellowknifes Dene by FMA; no reply was ever received identifying any

4.13 TRADITIONAL KNOWLEDGE

Traditional knowledge is considered to be important in evaluation of development proposals in Nunavut for two principal reasons: lack of scientific data on valued ecosystem components; and the importance placed on traditional lifestyles by communities, i.e., maintenance of traditional lifestyles is a key to community wellness. Sources of traditional knowledge evaluated for the Jericho Project are discussed in this section. Further detail is contained in the Traditional Knowledge Report (Appendix C.4)

Traditional knowledge, or *Inuit Qaujimajatuqangit*, is usually defined as that which has always been known by Inuit, that is, knowledge gained through experience. Thorpe et al. (2001) provide a discussion of what is currently taken to include traditional knowledge and the reader is referred to that document, Section 4.1, for further information.

Traditional knowledge was obtained from a number of sources including:

- Inuit elder visits to the Jericho site;
- comments from elders at community meetings; and
- WKSS reports.

4.13.1 Inuit Elders Visits to Jericho

Tahera provided two opportunities for Inuit elders from Cambridge Bay, Kugluktuk, Umingmaktok, and Bathurst Inlet to visit the site: in 1996 and 1999. Both visits coincided with archaeological studies being conducted at the site. Elders were solicited for any relevant information on valued ecosystem components that they might wish to discuss. No new information was obtained from the nine elders who visited the site, all of whom were chosen because their families traditionally travelled in the region.

4.13.2 Input at Community Meetings

Tahera (and its predecessor company Lytton Minerals Ltd.) conducted extensive community consultation from 1996 through the present. As well, a number of government-mandated pre-hearings have been conducted in communities in the West Kitikmeot. Formal gathering of traditional knowledge, such as undertaken by the Naonayaotit Study (see below), was not undertaken. Rather communities were provided information on the Project and invited to provide the company with issues and concerns. Community consultation is discussed further in Section 4.14. Tahera heard that caribou and water quality are very important to the people in communities; the concern to protect these components of the tundra ecosystem is reflected in the proposed design and environmental management for the Jericho Project. Specifically with respect to these two components, Tahera is committed to incorporate Traditional Knowledge, which is made available to the Company, and which is relevant to the diamond mining operation, into the Jericho Project management plan.

concerns about the ethnic significance of the finds.

4.13.3 WKSS Studies

Table 4.4 provides a list of all known reports together with comments on their applicability to the Jericho Project with respect to providing relevant traditional knowledge. Where final reports have been produced, the progress reports are not listed.

WKSS Report Information Use for the Jericho Project

Limited traditional knowledge is presented in most reports with the exception of those noted below. The West Kitikmeot/Slave Studies (WKSS) have been the focus of caribou study efforts in 1996, 1997, and 1998 by RWED. A traditional knowledge study on caribou migration and the state of their habitat was carried out under the direction of Allice Legat of the Dogrib Renewable Resources Committee, Dogrib Treaty 11 Council (Dogrib Treaty 11 Council 2001). A second traditional knowledge study focused on the Bathurst calving grounds (Gunn et al. 1998). A traditional knowledge study focusing on the Bathurst caribou herd calving grounds was published in 2001 (Thorpe, et al. 2001). The principal reason for the five-year study was to document traditional knowledge about caribou from Inuit of the Kitikmeot region. With respect to caribou management, the two Dogrib studies and the Tuktu study may provide useful insights.

Some traditional knowledge provided at meetings is not relevant to the Jericho Project directly, for instance, the use of Contwoyto Lake for hunting and fishing by Inuit was and is important. However, the Project will not directly affect Contwoyto Lake and there is very little risk of indirect impacts (e.g. from winter transportation accidents that are not completely cleaned up).

4.14 COMMUNITY CONSULTATION

Community consultation is a requirement of the assessment process in Nunavut (and most other jurisdictions). Community consultation is required in any event to ensure a project meaningfully addresses legitimate concerns of people that will be affected by the project.

Tahera Corporation (and its predecessor Lytton Minerals) carried out extensive community consultation from 1996 in all communities of the West Kitikmeot region that would be affected by the Project: Kugluktuk, Cambridge Bay, Umingmaktok, and Bathurst Inlet. In addition, several other Nunavut communities were consulted, including Gjoa Haven, Taloyoak, and Pelly Bay. Meetings with responsible government agencies were held in Kugluktuk, Cambridge Bay, Gjoa Haven, Iqaluit, Yellowknife, and Ottawa. The Community Consultation Report is presented in Appendix C.5.

Consultation was predominantly by townhall meetings for communities, and committee or one-on-one meetings with government agencies. Project information dissemination to communities was principally by means of the townhall meetings, supplemented by periodically conducted site tours (1996 to 2001) and newsletters commencing in 2000. Formal presentation of information to government agencies was through reports required for project review, e.g. a Project Proposal, Project Description, external consultants' reports, etc. Consultation will continue throughout mine life, likely through a community liaison committee and required reports to government agencies.

Tahera will conduct periodic site visits as appropriate. Government resource agencies have the right (and legal obligation) to periodically inspect the operation.

On going consultation with the designated Inuit organization and communities will be subject to negotiation through the Inuit Impact and Benefit Agreement process, but is not expected to be substantially different than outlined in this report. Finally, Tahera Corporation has a web site at www.tahera.com where current information on the Company and the Jericho Project can be conveniently obtained for those with an Internet connection. Community consultations undertaken are summarized in Table 4.5.

5.0 MINE ENVIRONMENT

5.1 OPERATIONS ENVIRONMENT MANAGEMENT

The Environmental Management Plan for the Project (Appendix B.3.1) will guide all operations environmental management. The goals of the plan are:

- to keep the Jericho Mine in compliance with all governing regulatory instruments;
- to direct mine activities so as to minimize environmental impacts; and
- to continually strive to reduce residual impacts and improve pollution prevention (i.e. reduce generation of contaminants at source).

5.2 MINE WASTE MANAGEMENT PLAN

5.2.1 Waste Rock

Two waste rock dumps will be created to prevent one dump becoming excessively high and to maximize materials handling efficiency. Geotechnical drilling at the site of Waste Rock Dump 1 and visual inspection by geotechnical engineers (SRK) at both locations confirmed that bedrock is at, or very near, the surface, making the sites suitable for dump construction.

Waste rock will be built in lifts to a maximum total height of 35 to 40 m by end dumping. Each successive lift will be set back from the one below approximately 15 m. On reclamation, dump slopes will be graded back to form a continual slope of approximately 19°. This will provide for a stable structure during construction and, at the same time, minimize costs. A dozer (D9 or D10 class) will be used to move the rock, if required, after dumping from the ore trucks. Lifts will be 10 m thick.

5.2.2 Processed Kimberlite

The diamond processing plant will generate both coarse and fine processed kimberlite (PK). Approximately 10-15% of plant production will result in fine PK and 85-90% in coarse PK. Coarse PK will be stockpiled southeast and proximate to the processing plant. This sand-like material will be left at the angle of repose. Fine PK will be pumped as a slurry to the processed kimberlite containment area, southwest of the plant. The proposed basin has a very small drainage area and can be easily controlled making the site ideal for fine PK disposal. Supernatant water will be discharged in the spring and summer through a polishing pond and small drainage to a lake upstream of Carat Lake.

5.3 MINE WATER MANAGEMENT PLAN

Details are presented in Mine Waste and Water Management (Appendix D.2.1). Tahera is committed to ensuring that mine-generated effluent at the site will not be acutely toxic to aquatic biota. To accomplish this, a surface runoff collection system, consisting of containment berms and ditches, will contain and direct the effluent into one of three separate settling ponds and a processed kimberlite containment facility. This system will operate during all phases of the Project, including post-closure; treatment will continue until concentrations have reached background levels. Final reclamation of the processed kimberlite containment area (PKCA) will include covering with coarse kimberlite rejects, capping with esker material, and revegetating, if practical.

Several alternatives for water management have been developed, including: spray irrigation: increased holding time in an expanded processed kimberlite containment area (to reduce ammonia levels); and a water treatment plant. In addition to this collection and treatment system, mine water releases would be tested routinely to ensure they are non-acutely toxic, as defined by appropriate bioassays.

The diamond processing plant will be completely contained within the Mine footprint. Surface runoff will report to the Waste Rock Dump 2 sedimentation pond, where treatment options (discussed above) will be available.

5.4 HAZARDOUS MATERIALS MANAGEMENT PLAN

Materials handling practices at Jericho Diamond Mine will comply with existing regulations to prevent, to the greatest extent possible, both accidental release of these substances to the environment and accidents resulting from mis-handling or mishap. Further, materials handling practices focus on prevention, as does the spill plan, through inspection of facilities by Tahera Corporation and contractors, periodic drills to test systems, and a program of review and continual improvement combined with training and refresher courses for all employees.

All staff will be required to report materials management concerns to their supervisors, who may notify the Health and Safety Committee and senior site management. All staff will be encouraged to participate in procedures improvements and to bring ideas and suggestions to the Health and Safety Committee, so that they may be reviewed and incorporated into procedure revisions as appropriate.

Ultimately, the plant manager will be responsible for hazardous materials storage and inspection at the Jericho Diamond Mine. The plant manager will co-ordinate with the mine superintendent and the catering manager with respect to any hazardous materials used in their areas of responsibility.

Formal evaluations of the Hazardous Materials Management Plan will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set. The Jericho Mine plant manager will assume overall responsibility for the process.

Further information on the management of hazardous materials is presented in Appendix D.2.3.

5.5 SPILL PREVENTION, COUNTERMEASURES AND CONTROL PLAN

The section summarizes planned spill response at the Jericho Mine. Further details are provided in the Spill Prevention, Counter-Measures and Control Plan (Appendix D.2.4). The purpose of the plan is to provide a practical source of information required to assess spill risks, develop an effective countermeasures program, and respond in a safe and effective manner to spill incidents. The plan includes a discussion of general preventive measures that can be taken to ensure spills do not happen. The appropriate procedures in the plan will be followed in the case of any product spills, whether reportable to external authorities or not. The responsible supervisor will decide what further action is appropriate in each case. The plan covers all major products at the mine that may be subject to spills, including petroleum products and ammonium nitrate. The spill response organization for the Jericho mine is shown in Figure 5.1.

Contaminated materials from spills will be placed in suitable containers and removed from the site or, if a petroleum product, remediated on site. The ammonium nitrate cold storage warehouse and the explosives magazines will be fireproof construction. Spills above legislated thresholds will be reported on the NWT Spill Line.

This plan will be reviewed for accuracy and completeness annually. Changes to procedures, or in chemicals/raw materials used, and the locations used, will be incorporated as amendments to the plan. The spill response plan is an interim document produced in response to government comments on the Jericho Draft EIS.

5.6 EMERGENCY RESPONSE PLAN

An Emergency Response Plan (see Appendix D.2.5) is required prior to mining by the *Northwest Territories Mine Health and Safety Act and Regulations.* The purpose of the Jericho Mine site emergency response plan (ERP) is to set out procedures and processes to be followed in the event of an emergency at the mine. Since the mine detailed engineering has not been completed at the time of writing of this report, it presents conceptual approaches to emergency response and lays the framework for a comprehensive emergency response plan, to be completed prior to mine construction. Completion of the plan will require consultation with Tahera Corporation's major contractors, who will provide mining, catering, and transportation/supply services. This consultation will take place when contracts are signed and prior to construction.

The ERP covers the mining, processing, and ancillary operations (airstrip, sewage treatment plant, explosives manufacture, and catering). It encompasses the activities of all Tahera and contractor employees as well as visitors to the mine site.

5.6.1 Fire

All precautions possible will be taken to prevent fires at the site, because of the difficulty in effectively fighting fires at this remote location, especially during winter. Fire drills will be held on a periodic basic to check personnel preparedness. All buildings housing personnel, or where personnel work, will be equipped with automatic fire suppression systems (wet or dry). The mine camp will meet current fire protection regulations including required sensors, sprinklers, and separation halls and doors. Locations of fire alarms and evacuation routes (if not obvious, e.g. only one door) will be posted in all work areas; fire alarms, fire extinguishers, and fire hoses will be clearly marked in an approved manner.

5.6.2 Uncontrolled Explosions

Controlled explosions (blasting) are part of the mining process and will be undertaken by qualified personnel only. Uncontrolled explosions from misuse of explosives, although extremely unlikely, are possible. As well, any flammable liquids or gases (diesel, gasoline, propane) at concentrations between the lower and upper explosives limits could potentially explode. With proper handling of explosives by licenced contractors, the risk of an uncontrolled explosion, outside of that caused by a fire, is very small.

5.6.3 Medical Emergencies

Medical evacuations will be accomplished by means of fixed wing medivac to Yellowknife. Paramedics/nurses will be on staff full time at the mine; they will be able to provide first aid and to fully treat more minor injuries. A satellite phone system is installed at Jericho and will provide reliable telephone communications in the event of a medical emergency requiring consultation with outside medical help and/or requesting a plane for medivac.

5.6.4 Extreme Weather

Weather extremes include snow storm blizzards in winter and rain storm flooding in summer. Extreme cold is a normal part of Arctic winter and the Jericho operation is designed to operate in this environment; thus cold extremes are considered to have a very low risk of resulting in an emergency situation and will not be considered further.

5.6.5 Emergency Response Organization

The Jericho Mine response organization is shown in Figure 5.1. The figure will be completed prior to mine construction. The figure provides the chain of command in the upper five boxes and agencies that may require contacting in case of an emergency in the lower boxes.

5.6.6 Emergency Prevention

Most emergencies at industrial sites are due to worker injury caused by accidents. An effective safety and accident prevention program therefore is a key component of emergency prevention and will be established at the Jericho Mine through the Occupational Health and Safety Plan (Appendix C.2).

5.6.7 Emergency Response

When an emergency is recognized the first step is to alert all potentially affected personnel by use of the fire alarm system, telephone and/or two-way radios, as appropriate. The second step is to notify the shift supervisor or contact the emergency and spill co-ordinator, who will assume charge of the emergency. It is the responsibility of all personnel to follow the instructions of the emergency and spill co-ordinator.

5.6.8 Emergency Preparedness

A key part of preparedness for emergencies is to ensure that all preparations and emergency equipment are in place and functioning as intended. There are three aspects to this: routine site inspections; training updates, and emergency drills.

6.0 AUDITING AND CONTINUAL IMPROVEMENT

Despite careful planning, it is highly probable that certain components of the environmental management plan will need to be modified. It will therefore be necessary to audit or review the plan to pinpoint those components that need correction, adjustment, or upgrading. Not only the operational aspects of the plan, but any paperwork that deals with the plan, will be reviewed. A goal will be to continuously audit all aspects of the plan for effectiveness. In general, the ISO-14001 protocols will be followed.

Throughout the mine life, as policies and regulations change and technology advances, the EMP will be modified to address changes and to benefit from technology advances, where benefits can be clearly demonstrated. The number one objective will be maintaining compliance with regulations governing the Project.

Formal evaluations of the EMP will be documented, deficiencies noted in the report, and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set. The Jericho Mine site supervisor (Tahera plant manager) will assume overall responsibility for the process; authorization for expenditures may be required from other management personnel.

Mining is a capital intensive industry and major facilities will not be changed during the life of the mine, considering its eight-year life span. Technological change will, however, be monitored through regular information exchanges with operating mines, especially diamond mines in the Arctic. Mine personnel will also monitor relevant technical literature for process changes that may be practically implemented.

7.0 OTHER ECONOMIC ACTIVITIES

7.1 DIAMOND VALUATION

Diamonds produced from the underground bulk have been appraised by a number of diamond valuators:

- Central Selling Organization (CSO), 1997.
- HDM Laboratories, 1998.
- WWW International Diamond Consultants Ltd (WWW)., 1999.

A summary of the valuations is provided in Table 7.1.

In April 1998, the diamonds were re-valued by HDM Laboratories (including greater than 10.8 carat stones), using the Terrac and Adtec simulated methods of diamond valuation (Table 7.2).

In November 1999 Tahera retained WWW International Diamond Consultants Ltd (WWW) to provide a comprehensive analysis and valuation of the diamonds. A total of 10,530 carats of diamonds were valued. A total of 6 independent valuators representing the Antwerp, Israeli, and Indian diamond markets, were requested to carry out the valuations for WWW.

The combined average price of the valuations was US$61 per carat. For the Central, North, and JDF2S lobes, the combined average prices were US$63, US$51, and US$51 per carat, respectively.

Analysis of the size frequency distributions by WWW shows the Central and JDF2S lobes to be similar, where both lobes show a high incidence of large stones. Two size frequency distribution models were produced, a combined model for the Central and JDF2S lobes, and a second model for the North lobe.

Although there are differences in the valuations between the geological zones, there was no conclusive evidence to suggest that the quality of diamonds varies within the deposit. Therefore, a value model consisting of one value per size class was generated. The model assumes that the better quality large stones "that were absent in the samples" (WWW valuation, 1999), will be recovered in production. Applying the model values per size class to the size frequency distribution model, gives an average dollar per carat value of US$90 for the Central and JDF2S lobes, and US$71 for the North lobe.

On the request of SRK, M.H. Oosterveld reviewed the WWW valuation in March, 2000, and an SRK model was proposed. Mr. Oosterveld believes this SRK model is more realistic and is statistically more justifiable (Table 7.3). The more conservative SRK model was used for final revenue estimates in the feasibility study.

Valuation of diamonds produced at Jericho will be conducted by the Canadian federal government, as required by Canadian law.

7.2 VALUE-ADDED OPPORTUNITIES

Tahera's rough diamond production will, in all probability, be sold to the global market, through a marketing agreement with an experienced diamond marketer. A final decision on marketing will be made prior to the commencement of commercial production.

Tahera Corporation remains open to the concept of participating cooperatively in creation of a secondary diamond industry in Nunavut. Opportunities that might exist in a secondary diamond industry include sorting, cutting, and polishing of diamonds from the Jericho Project. Such work is highly skilled and will require a high level of commitment from anyone who may participate in these positions. Training would more than likely need to be acquired from abroad. While Tahera Corporation would cooperatively participate in a secondary diamond industry in Nunavut, such a business will also require a high degree of Nunavut based entrepreneurial vision and participation. Neither Tahera Corporation nor the Jericho Project are large enough to solely support these types of potential opportunities.

EKATI™ currently cuts and polishes up to 10% of its production in Yellowknife. The Diavik mine will also be supplying a portion of their diamonds for the local diamond industry in Yellowknife.

In addition to opportunities related to diamonds, other project related services will be required that may provide opportunities for local businesses. A full list of required services will be provided by the company as the regulatory review of the Project progresses.

8.0 OUTSTANDING ISSUES

There are no major outstanding environmental issues associated with the Project construction, operation, or closure that are not dealt with in this Environmental Impact Statement. A small number of minor issues are dealt with in the Community Consultation Record (Appendix C.5).

Unresolved issues include:

1. A concern that the open pit be backfilled. This would render the Project uneconomic (further discussion is provided in the Project Description, Appendix A.1), and would not result in the replacement of all waste rock, since void spaces would occur during backfilling.
2. A concern that all water bodies remain undisturbed at the site. This would not allow Project development, since Stream C1 must be diverted, Long Lake will be converted to a processed kimberlite containment area, and a causeway for water intake is required in Carat Lake.
3. A concern that esker material not be used for construction. Esker borrow sites have been active for a number of years already. Some esker material will be required, especially in Year 1 when sufficient waste rock will not be available for construction purposes.
4. The desire for a value-added industry with respect to diamond production. Tahera is willing to cooperatively participate in exploring the feasibility of such a matter. At the time of writing of this report, the feasibility of such a proposal had not been fully explored.

There is no practical resolution of items 1 through 3 other than to forego the Jericho Diamond Project. While every effort will be made to minimize disturbance, it cannot be entirely eliminated. The open pit can be made productive habitat once again upon mine closure, by filling with water to form a lake. This will provide fish habitat and thus food for birds and other animals that feed on fish.

9.0 LIST OF CONSULTANTS

Firms that provided consulting services in respect of this environmental impact statement are listed in Table 9.1 in alphabetical order.

10.0 EIS DISTRIBUTION LIST

NIRB - Cambridge Bay
NWB – Gjoa Haven
DIAND – Iqaluit, Ottawa
DFO-Iqaluit, Winnipeg
Environment Canada – Iqaluit, Winnipeg, Edmonton, Ottawa
Health Canada – Ottawa
Transport Canada – Ottawa
Canadian Coast Guard - Sarnia
NRCan – Environmental Affairs - Ottawa
NTI – Cambridge Bay
KIA-Lands &CLARC (Kugluktuk)
NWMB - Iqaluit
NPC - Iqaluit
CG&T - Iqaluit
DSD - Iqaluit
Dpmt. Of Culture & Heritage - Iqaluit
Kitikmeot Health – Cambridge Bay
Kitikmeot Hunters and Trappers' Association - Kugluktuk
Cambridge Bay HTA
Cambridge CLARC & KIA
Kugluktuk HTA
Hamlet of Cambridge Bay
Hamlet of Kugluktuk
CLARC & HTO – Bathurst Inlet
CLARC & HTO-Umingmaktok (Bay Chimo)
NWT Chamber of Mines
Cndn Artic Resources Cmttee
West Kiktmeot Slave Study
Inuit Heritage Trust
Yellowknife Dene
Mackenzie Valley Environmental Impact Review Board

11.0 GLOSSARY

m**m:** abbreviation for micron; 1 micron is 1/1,000,000 of a meter.

absorption: passive entry of matter or energy into a system.

acid generation: With respect to mining, oxidation of sulphides leading to formation of sulphuric acid.

acidic: having a pH of less than 7, on a scale of 1 to 14; the lower the pH, the greater the hydrogen ion concentration in the aqueous solution.

active layer: the layer of soil, or rock, that thaws in summer and refreezes in winter.

albedo changes: changes in the refection ability of a surface.

algal growth: growth of simple forms of plant life with unicellular reproductive structures.

algorithm: process or rules for a calculation

alkalinity: degree of pH over 7; the greater the pH, the lower the concentration of hydrogen ions and the greater the alkalinity.

ambient: surrounding or prevailing.

auditing program: a follow up program to check on performance of the environmental and socio-economic plans for the mine.

baseline studies: starting point or initial studies of characteristics, physical and biological components, and processes of a site, prior to any disturbance or other changes to that site.

bedrock: solid rock beneath unconsolidated material such as soil, glacial, and other deposits.

benthic algal standing crop: biomass at any point in time of algae living on bottom substrate (usually rock) of lakes and streams.

benthic macroinvertebrates: small animals without backbones that live is stream and lake bottom sediments.

biophysical environment: the natural environment outside of man.

blanks: sample which is known not to contain component being analyzed for.

buffering: stabilizing the pH.

carnivore: large mammals that prey on other animals; they include grizzlies, foxes, wolves, and wolverines in the Project Area.

closure and final abandonment: the phase of mining when the deposit is mined out; includes removal of equipment and infrastructure, and stabilizing waste containment structures.

coffer dam: temporary dam to divert water away from an area to allow work in a stream channel or lake.

condemnation drilling: drilling around an ore body to confirm its extent prior to siting surface facilities at a mine.

crushers: heavy equipment used to break up large fragments of rock into much smaller ones.

decanting: pouring off of liquid, leaving sediment behind.

demineralized-deionized water: water that is both distilled (to remove minerals) and passed through an ion-exchange column to remove residual minerals left from distillation.

dense medium separation: method of separating diamond-bearing materials from non-diamond-bearing materials in the processing plant; ferrosilicon is used to increase the density of the liquid in the separation cyclone.

detection limit: quantity of a substance, below which its presence cannot be determined by the analytical instrument.

diamond plant: processing plant where diamonds are extracted from kimberlite ore.

dispersion modelling: method of mathematically predicting how a substance of interest, e.g. dust, will disperse from a source into the surrounding area.

dissolved anions: negatively charged ions in solution.

dissolved metals: measure of metals in a water sample filtered through a 0.45 µm (4.5 x 10^{-7} m) filter to remove all solids.

dissolved solids: any substances that are dissolved in water.

distillation: extraction of the essence of s substance by first vaporizing it with heat and then condensing it with cold and collection of the resultant liquid.

diversion energy dissipation pool: pond with a coarse rock bottom designed to reduce the energy of water exiting the diversion prior to re-entry into Stream C1 and with the purpose of eliminating sediment scouring in the stream.

dust fall monitors: devices to measure the fallout of coarse particulate matter (dust) from the air.

dust loadings: weight of dust that deposits in an area from fallout.

dust suppression: minimization of the generation of dust.

dust-induced: something caused by dust, such as early snow melt.

ecological zones: areas of the landscape that have a common vegetation type and topography, such as upland tundra.

effluents: substances flowing out from a source.

emission factors: emission loadings that can be ascribed without actual measurement to certain classes of emission sources, such as automotive exhaust, based on data collected for that class of sources.

environmental baseline data: data collected on the biophysical environment prior to a development that may affect that environment.

environmental impact assessment: assessment of potential effects on the biophysical environment from a proposed project under study.

environmental impact statement: report of environmental impact assessment of a project.

epilimnion: above the thermocline in a stratified body of water.

esker: linear concentration of granular materials accumulated by glacial and fluvial action.

evapotranspiration: the combination of evaporation from water bodies and transpiration from vegetation.

exposure: with respect to topography, the direction faced by the landscape; also called aspect.

feasibility: engineering study to determine whether a mine project is economic.

fines waste disposal facilities: (also processed kimberlite storage facilities); storage location (usually a pond or ponds) for process plant fine rock flour.

flocculents: chemical substances which cause fine particles to lose their electrical repulsion and accumulate together.

foraging habitats: wildlife habitat used for feeding.

fugitive dust emissions: non-point source dust emissions.

geochemical modelling: method of using chemical theory to predict the behaviour of chemical elements of a substance under specific conditions, e.g. precipitation or re-solution of metals in water.

geochemical testing: tests to determine the chemical nature of ore or waste, or the chemical interaction of different ores or wastes with other materials or their environment.

geomembrane: synthetic fabric, which is essentially impermeable (typical permeabilities are 10^{-23} m/s.

geophysics: a method of prospecting whereby the electrical and magnetic properties of different rock types are exploited to find rock types of interest.

geotechnical engineering: studies of the engineering/structural conditions of the ground, where a facility is proposed or located.

GPS: global positioning system; a system of using geo-positioned satellites to determine location.

granite: granular, crystalline igneous rock, rich in silica and alumina; generally the result of large magmatic intrusions.

granular borrow areas: eskers used for fill.

greywater: water that has previously been used for domestic purposes other than sewage purposes, e.g., dish water.

hydrology: science of the properties of water, especially of its movement in relation to land.

hypolimnion: water below the thermocline in a water body.

ice auger: tool with screw point for boring through ice.

ice road: a road built on the ice; see also winter road.

impoundment: with respect to mining, a facility to contain water or fine plant wastes.

Industrial Source Complex ver 3 (ISC3): air dispersion model used to predict concentrations of pollutants at receptors distant from multiple sources.

indicated resources: mineral resources that have been proven.

inferred resources: mineral resources for which there are drill results to substantiate.

infrastructure: the physical facilities at a site.

ion: an atom that carries a charge due to loss or gain of electrons.

kimberlite: the ore from which diamonds are extracted.

leach extraction tests: methods to determine the amount of a particular substance that desorbs from a solid into a solution, e.g., the amount of metal that goes into solution from sediment when shaken with mildly acidic water.

leaching: process by which components of an aggregate are removed, such as nutrients removed from the soil by water percolating through it.

limnology: the study of lakes.

mean annual runoff: the average runoff from a drainage basin.

median: the middle number in a series of numbers.

mesh: open space in a sieve or net.

metallurgical characteristics: the chemical nature of ore with respect to processing.

microclimatic: climate in a small area, such as immediately adjacent to the ground in a specific location.

micrograms: one millionth of a gram.

microtine: rodents with small teeth, e.g. field mice, voles, etc.

Millipore filter: filter with very fine holes that essentially traps all suspended materials and only passes dissolved materials and water.

mitigation: actions taken to eliminate or lessen an effect or impact.

non-acidic: having a pH of greater than 7, on a scale of 1 to 14.

nutrient discharges: discharges of nitrogen and phosphorus compounds.

nutrients: any materials that organisms take in and assimilate for growth and maintenance.

oligotrophic: with respect to water bodies, low nutrient status.

open pit: area of ground that has been excavated to expanding widths and increasing depths in order to remove ore-bearing material.

open pit mine: mining by means of removing overburden and rock in a surface exposure, typically roughly conical in shape.

organism: any living animal or plant.

overburden: material overlying an economic mineral deposit, which must be removed prior to mining the ore.

periphyton: aquatic attached algae, i.e. algae growing on rocks in lakes and streams.

permafrost: permanently frozen soil or rock.

pH: measure of hydrogen ion concentration in an aqueous solution.

phenology: the study of the development of individual plants throughout the growing season, from dormancy through leaf, flower, and seed development, maturation, and release through leaf fall and return to the winter-dormant state.

phytoplankton: microscopic floating aquatic plants.

PM-10: suspended particulate matter 10 µm or less in diameter; respirable dust.

polishing pond: the last pond in a water treatment system that completes the desired removal of unwanted substances prior to discharge of the treated water.

pore water: water contained in the pores or interstices of the fragments or grains of an organic and/or inorganic aggregate.

primary productivity: the production of living organisms of organic material from inorganic sources.

processing plant: see diamond plant.

prospective: with respect to kimberlite pipes, worthy of close study; potentially economic.

quarry: area from which rock or granular material is removed for construction purposes.

quartile: one quarter of a data set.

raptor: bird of prey, including hawks, falcons, eagles, and owls.

reclamation: process of returning an area to as near as possible its former state, or level of **productivity:** amount of material or in terms of biomass or energy generated in a given time (e.g. a growing season) in an ecosystem.

rip rap liner: channel or bank liner composed of coarse rock to retard water erosion.

rodents: any mammal belonging to the order Rodentia, including gnawing mammals with strong incisors and no canine teeth.

screening model: usually a relatively simple model to identify whether further testing is required to determine whether a condition exists or not.

Secchi disc transparency: transparency of water as measured by the disappearance of a white disk as it is lowered in the water column.

sedimentation ponds: pond to allow sediment in water to settle out.

shake flask experiments: a particular type of leach test that makes use of flasks that are shaken for a given amount of time.

silt: very fine-particled sediment.

speciate: change chemical form, e.g. ammonia changing to nitrate, a more oxidized form of nitrogen

splits: equally-divided parts of one original sample.

staging areas: with respect to birds, areas where they congregate prior to nesting or migrating.

suspended particulate matter: distinct particles of organic and/or inorganic material held in suspension in a medium such as water.

sustainable development: the management of natural resources and the environment in such a way that economic, social, and cultural needs are met and ecological processes and natural diversity are maintained.

swale: a sloping depression that retains vegetation where water tends to runoff.

tailings: non-economic, finely ground rock that represents the discarded component of the end product of mineral processing.

tailings impoundment: an engineered, contained site for disposal of mine tailings.

taxa: groupings, such as species, etc. within the classification of living organisms.

taxonomic groups: a group of organisms with a number of similar attributes set up by scientists studying animal and plant identification, or taxonomy.

temporal: to do with time.

thermal stratification: a stratification or layering of a medium, due to the presence of a temperature gradient.

thermocline: a layer in a lake where the water rapidly changes temperature.

total metals: measure of metals in a whole water sample; included analysis of particulates in the water.

traditional economy: hunting, fishing, the making of crafts.

turbidity: a measure of the amount of suspended solids in water.

Van Dorn sampler: one type of sampler that can be lowered in a water column to a desired depth and then closed to trap the water at that depth inside the sampler prior to retrieval.

vegetation biomass: total mass of vegetation in a given environment; can be measured as live or dry weight.

waste rock: rock containing no economically-recoverable mineralization.

watershed: line between waters flowing to different river basins.

winter road: see ice road.

zooplankton: microscopic aquatic floating animals.

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TABLES

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
4.1	The Proponent	
	Identity	Final EIS, Section 1.3; Project Description Appendix A.1, Section 1.1
	Environmental Policy	Final EIS, Section 1.3.2; Project Description Appendix A.1, Section 1.2
	Past Experience	Final EIS, Section 1.3.3
	Security Requirements	Final EIS, Section 3.10.2; Reclamation Plan, Appendix B.3.2, Section 8.0
4.2	Sustainable Development and the Precautionary Principle	Final EIS, Section 1.4
	Preservation of Ecosystem Integrity	Final EIS, Section 1.4
	Maintenance of Biological Diversity	Final EIS, Sections 1.4, 3.5.13; Environmental Impact Assessment, Appendix B.2.1, Section 1.17
	Attainment of durable social and economic benefits in the Kitikmeot Region	Final EIS, Section 4.4; Socio-Economic Effects Assessment, Appendix C.1.2, Sections 2.4, 4.0
4.3	Baseline Data Collection	Final EIS, Sections 3.2, 3.3; Environmental Baseline, Appendix B.1.1
	Methods	Environmental Baseline, Appendix B.1.1, Section 1.0
	Confidence levels of data	Environmental Baseline, Appendix B.1.1, Section 1.0
	Significant knowledge gaps	Environmental Baseline, Appendix B.1.1, Section 1.0
	Uncertainties	Environmental Baseline, Appendix B.1.1, Section 1.0
	Likely future conditions of baseline data in absence of Project (Environment without residual impacts)	Final EIS, Section 2.2.8; Project Description, Appendix A.1, Section 22.1;Environmental Baseline, Appendix B.1.1
4.4	Traditional Knowledge	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4
	Definition	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 1.0
	Collection methodology	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 1.0
	Location of meetings	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 2.0
	Background information provided	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 2.0
	Treatment in baseline data collection, impact prediction and significance assessment, development of mitigation and monitoring programs	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 5.0
	Support for traditional knowledge studies	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 1.0
	Integration of traditional knowledge in on going baseline data collection, mitigation and monitoring programs	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4, Section 5.0
	Procedures for community-based monitoring of social, cultural and ecological conditions	Final EIS, Section 4.9; Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.8
4.5	Public Consultation	Final EIS, Section 4.14; Community Consultation, Appendix C.5
	Unresolved Issues	Final EIS, Section 8.0; Community Consultation, Appendix C.5, Section 9.0

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	Subject	EIS Section
4.6	Regional Context	Final EIS, Section 2.5
	Biophysical Environment	Final EIS, Sections 3.2, 3.3; Environmental Baseline, Appendix B.11
	Socio-Economic Environment	Final EIS, Section 4.1; Socio-economic Baseline, Appendix C.1.1
	Other Mining Projects	Final EIS, Section 3.6.2; Environmental Cumulative Effects, Appendix B.2.4, Section 2.0; Socio-economic Effects Assessment, Appendix C.1.2, Section 4.7
	NPC Goals for Mineral Development	Various; all goals are listed separated as guideline items
4.7	Regulatory Regime	Final EIS, Section 1.5, Project Description, Appendix A.1, Section 1.3
4.8	Land Tenure	Final EIS, Section 1.6; Permit Applications, Appendix A.2
4.9	Project Justification	Final EIS, Section 2.1
	Purpose and Rationale	Final EIS, Section 2.1
	Project Need	Final EIS, Section 2.1
4.1	Project Description	Final EIS, Section 2.0; Project Description, Appendix A.1
4.10.1	Project Components	Project Description, Appendix A.1, Section 3.0
4.10.1.1	Geology	Final EIS, Section 3.2.1; Project Description, Appendix A.1, Sections 2.2, 2.4
4.10.1.2	Diamond Recovery Plant	Project Description, Appendix A.1, Section 6.0
	Physical Plant	Project Description, Appendix A.1, Section 6.0
	Effluents and Emissions	Final EIS, Sections 3.5.6, 3.5.7; Project Description, Appendix A.1, Sections 15.1, 19.2; Mine Waste and Water Management, Appendix D.2.1, Section 3.2; Air Quality Report, Appendix D.1.1, Sections 3 and 4
	Storage Pads	Project Description, Appendix A.1, Section 14.1
	Water Management	Final EIS, Sections 3.8.2, 3.9.3.2; Project Description, Appendix A.1, Sections 16.0, 17.0; Mine Waste and Water Management, Appendix D.2.1, Section 5.0
4.10.1.3	Process Kimberlite Containment	Final EIS, Sections 3.5.6.2, 3.9.3.2, 5.2.2, 5.3; Project Description, Appendix A.1, Section 15.0; Mine Waste and Water Management, Appendix D.2.1, Section 3.5
	Characteristics of Fine Kimberlite Solid and Liquid	Final EIS, Section 5.2.2; Mine Waste and Water Management, Appendix D.2.1, Section 3.2; Evaluation of JD/01 Tailings Geochemistry, Appendix D.1.5
	Design of the PKCA	Project Description, Appendix A.1, Section 15.0; Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Role of Permafrost in Dams	Final EIS, Sections 3.5.1, 3.5.3; Project Description, Appendix A.1, Section 15.0; Environmental Impact Assessment, Appendix 2.1, Section 1.8; Mine Waste and Water Management, Appendix D.2.1, Sections 2.2, 2.5
	Groundwater Monitoring and Control	Final EIS, Section 3.2.7; Mine Waste and Water Management, Appendix D.2.1, Section 2.2

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
4.10.1.4	Overburden and Waste Rock Disposal	Final EIS, Sections 2.3, 3.8; Project Description, Appendix A.1, Sections 14.2, 14.3; Mine Waste and Water Management, Appendix D.2.1, Section 4.0
	Characteristics of Waste Rock	Final EIS, Section 5.2.1; Mine Waste and Water Management, Appendix D.1.3.
	Acid Generation Potential	Final EIS, Section 5.2.1; Mine Waste and Water Management, Appendix D.1.3
	Water Management Plan	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 16.0; Mine Waste and Water Management, Appendix D.2.1, Section 5.0
	Seepage and Runoff Characteristics	Environmental Impact Assessment, Appendix B.2.1, Section 1.11; Waste Rock Test Results, Appendix D.1.6; Mine Waste and Water Management, Appendix D.2.1, Attachment B
	Characteristics of Frozen Groundwater from Joints and Fractures in Waste Rock Dumps	Environmental Impact Assessment, Appendix B.2.1, Section 1.11; Waste Rock Test Results, Appendix D.1.6; Mine Waste and Water Management, Appendix D.2.1, Attachment B
4.10.1.5	Water Supply and Management	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 10.0
	Water Balance	Project Description, Appendix A.1, Section 16.1; Mine Waste and Water Management, Appendix D.2.1, Section 5.1; Environmental Management Plan, Appendix B.3.1, Section 2.3.1, Attachment 2.2
	Water Management Plan	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 16.0; Mine Waste and Water Management, Appendix D.2.1, Section 5.0
	Water Supply	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 10.0
	Wastewater Discharge	Final EIS, Section 5.3; Project Description, Appendix A.1, Sections 16.2, 17.1; Environmental Management Plan, Appendix B.3.1, Sections 2.3.2, 2.4
	Mine Water Volume Estimates	Project Description, Appendix A.1, Section 16.1; Mine Waste and Water Management, Appendix D.2.1, Section 5.1; Environmental Management Plan, Appendix B.3.1, Section 2.3.1, Attachment 2.2
	Discharge of Underground Mine Water	Environmental Management Plan, Appendix B.3.1, Section 2.6
	Truck Wash	Environmental Management Plan, Appendix B.3.1, Section 2.3.2
	Management of Ice Melt Water	Environmental Management Plan, Appendix B.3.1, Sections 2.3.2, 2.6.2
4.10.1.6	Mine Pit Dewatering	Environmental Management Plan, Appendix B.3.1, Section 2.3.2
	Volumes to be Pumped	Project Description, Appendix A.1, Section 16.1; Mine Waste and Water Management, Appendix D.2.1, Section 5.1; Environmental Management Plan, Appendix B.3.1, Section 2.3.1, Attachment 2.2
	Areas to be Affected	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 16.0; Mine Waste and Water Management, Appendix D.2.1, Section 5.0

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Quantities of Bottom Seds Requiring Disposal and Disposal Methods	Environmental Management Plan, Appendix B.3.1, Section 2.3.2; Mine Waste and Water Management Plan, Section 5.2
	Pit Inflow Volumes and Quality	Project Description, Appendix A.1, Section 16.1; Mine Waste and Water Management, Appendix D.2.1, Section 5.1; Environmental Management Plan, Appendix B.3.1, Section 2.3.1, Attachment 2.2
4.10.1.7	Winter and All-Weather Roads	Final EIS, Section 2.3; Project Description, Appendix A.1, Sections 3.4, 8.0
	Route Selection Criteria	Project Description, Appendix A.1, Section 8.1
	Road Construction for Winter and All Weather Roads	Project Description, Appendix A.1, Section 8.1
	Quantities and Types of Materials Required for Construction and Maintenance	Project Description, Appendix A.1, Section 8.1
	Construction and Maintenance Methods or Site Roads, Frequency of Use, Road Widths, Dust Suppression Methods	Project Description, Appendix A.1, Section 8.1; Environmental Management Plan, Appendix B.3.1, Section 2.7.2
	Future Climate Change Design Measures	Final EIS, Section 3.5.1; Project Description, Appendix A.1, Section 3.4
	Ore, Waste, Material and Supplies Transport Information	Project Description, Appendix A.1, Section 8.2
	Accident Reporting	Final EIS, Sections 5.5, 5.6; Spill Prevention, Countermeasures & Control Plan, Appendix D.2.4, Section 4.0
4.10.1.8	Airport Facilities	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 8.1.3
	Physical Facility	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 8.1.3
	Duration, frequency and extent of use of facilities	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 8
	Volume of Goods and Passengers	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 8
4.10.1.9	Fuel Storage Sites	Final EIS, Section 2.3;Project Description, Section 11.0
	Fuel Storage and Quantities	Final EIS, Section 2.3;Project Description, Section 11.0
	Explosives Storage and Quantities	Final EIS, Section 2.3; Project Description, Appendix A.1, Sections 3.2, 5.4; Environmental Impact Assessment, Appendix B.2.1, Section 11.1.1
	Accident Response Reporting	Final EIS, Sections 5.5, 5.6; Spill Prevention, Countermeasures & Control Plan, Appendix D.2.4, Section 4.0
	Spill Response Training	Final EIS, Sections 5.5, 5.6; Environmental Management Plan, Appendix B.3.1, Section 5.0; Emergency Response Plan, Appendix D.2.5, Section 9.0
	Location of Spill Kits	Spill Prevention, Countermeasures & Control Plan, Appendix D.2.4, Sections 2.2, 5.1
4.10.1.10	Borrow Pits	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 13.0
	Map Borrow Pit Sites Including Those Rejected	Final EIS, Maps, Appendix E

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Selection Criteria and Justify Site Selection	Project Description, Appendix A.1, Section 13.0
	Estimate Quantities Required	Project Description, Appendix A.1, Section 13.0
	Access	Project Description, Appendix A.1, Section 13.0
	Quarry Management Plans	Project Description, Appendix A.1, Section 13.0
	Rehabilitation Plan	Reclamation Plan, Appendix 3.2, Section 5.3.8
4.10.1.11	Waste (Domestic & Hazardous) Management	Final EIS, Sections 3.5.9, 3.8.1; Project Description, Appendix A.1, Sections 17.2, 18.0; Environmental Management Plan, Sections 2.2, 2.5
	Sewage Treatment	Final EIS, Section 3.5.4; Project Description, Appendix A.1, Section 17.1; Environmental Management Plan, Appendix B.3.1, Section 2.4
	Solid Waste Disposal Plans	Final EIS, Sections 3.5.9, 3.8.1; Project Description, Appendix A.1, Sections 17.2, 18.0; Environmental Management Plan, Sections 2.2.7, 2.5
	Hazardous Waste Management Plan	Final EIS, Section 5.4; Environmental Management Plan, Appendix B.3.1, Section 2.5.2
	Accident Reporting	Final EIS, Sections 5.5, 5.6; Spill Prevention, Countermeasures & Control Plan, Appendix D.2.4, Section 4.0; Emergency Response Plan, Appendix D.2.5, Section 4.3
	Spill Response Training	Final EIS, Sections 5.5, 5.6; Environmental Management Plan, Appendix B.3.1, Section 5.0; Emergency Response Plan, Appendix D.2.5, Section 9.0
	Location of Spill Kits	Spill Prevention, Countermeasures & Control Plan, Appendix D.2.4, Sections 2.2, 5.1
4.10.1.12	Power House	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 12.0
	Power Alternatives	
	Location of Power House	Project Description, Appendix A.1, Section 12.0
	Transmission Lines	Project Description, Appendix A.1, Section 12.0
	Fuel Use	Project Description, Appendix A.1, Section 12.0
	Emergency Clean Up	Final EIS, Sections 5.5, 5.6.7; Spill Prevention, Countermeasures and Control Plan, Appendix D.2.4, Section 6.0
	Energy Balance and Strategies for Optimization and Conservation	Project Description, Appendix A.1, Section 12.3
	Emissions	Project Description, Appendix A.1, Section 19.4
4.10.2	Project Design	Final EIS, Section 2.3; Project Description, Appendix A.1
	How Physical Environment Influenced Design	Final EIS, Section 2.2, 2.3; Project Description, Appendix A.1, Sections 3.0, 5.0, 6.0, 14.0, 15.0, 22.0

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Consistency With Ecosystem Function	Final EIS, Section 1.4; Environmental Management Plan, Appendix A.1, Section 1.0
4.10.3	Pace, Scale and Timing of Project	Final EIS, Section 2.2; Project Description, Appendix A.1, Section 22
	Rationale for Pace, Scale and Timing	Final EIS, Section 2.2; Project Description, Appendix A.1, Section 22
	Rate of Production	Project Description, Appendix A.1, Section 5.0
	Potential for Exploration and Development of Additional Kimberlite Pipes at Jericho	Project Description, Appendix A.1, Section 23.0
4.10.4	Future Development	Project Description, Appendix A.1, Section 23.0
	Additional Quantities of Kimberlite That Might be Mined	Project Description, Appendix A.1, Section 23.0
	Potential to Stimulate Other Developments	Final EIS, Section 2.2; Project Description, Appendix A.1, Section 22.1
4.10.5	Technology State of the Art	Final EIS, Section 6.0; Environmental Management Plan, Appendix B.3.1, Section 6.0
4.11	Alternatives	Final EIS, Section 2.2; Project Description, Appendix A.1, Section 22.0
	Other Areas In Nunavut Where Tahera Could Mine Diamonds	not applicable
	Alternative Methods and Facilities Locations	Project Description, Appendix A.1, Section 22.0
4.12	Description of Physical Environment	Final EIS, Section 3.2; Baseline Summary Report, Appendix B.1.1, Sections 2 - 8
	Geology	Final EIS, Section 3.2.1; Baseline Summary Report, Appendix B.1.1, Section 4.0
	Geomorphology	Final EIS, Section 3.2.1; Baseline Summary Report, Appendix B.1.1, Section 4.0
	Permafrost	Final EIS, Section 3.2.5; Baseline Summary Report, Appendix B.1.1, Section 5.0
	Ground Instability Evidence	Baseline Summary Report, Appendix B.1.1, Section 4.0; Mine Waste and Water Management, Appendix D.2.1, Sections 2.0, 3.0, 4.0
	Hydrology/Limnology	Final EIS, Sections 3.2.4, 3.3.3; Baseline Summary Report, Appendix B.1.1, Sections 3.0, 13.2
	Water Quality	Final EIS, Section 3.2.6; Baseline Summary Report, Appendix B.1.1, Section 6.0
	Air Quality and Noise Levels	Final EIS, Sections 3.2.3, 3.9.5; Baseline Summary Report, Appendix B.1.1, Section 14.0; Environmental Impact Assessment, Appendix B.2.1, Section 1.13.
	Palaeontologically Significant Sites	not applicable
	Current Climate and Future Trends	Final EIS, Sections 3.2.2, 3.5.1.2; Baseline Summary Report, Appendix B.1.1, Section 2.0; Environmental Impact Assessment, Appendix B.2.1, Section 1.6.2
	Other Issues Identified Through Consultation	Final EIS, Section 4.14
4.13	Biological Environment	
4.13.1	Vegetation	Final EIS, Section 3.3.1; Baseline Summary Report, Appendix B.1.1, Section 9.0; Vegetation Report, Appendix B.1.2

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Ecological Zones	Final EIS, Section 3.3.1; Baseline Summary Report, Appendix B.1.1, Section 9.0; Vegetation Report, Appendix B.1.2
	Local and Regional Occurrence of Species/Communities	Final EIS, Section 3.3.1; Baseline Summary Report, Appendix B.1.1, Section 9.0
	Health of Species and Contaminant Loadings	Baseline Summary Report, Appendix B.1.1, Section 9.7.2; Vegetation Report, Appendix B.1.2, Section 8.2; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.1; Environmental Monitoring Plan, Appendix B.3.3, Section 5.2.1
	Rare, Threatened or Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0; Vegetation Report, Appendix B.1.2, Section 10.0; Environmental Impact Assessment, Appendix B.2.1, Section 1.15.4; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.1
	Species that Perform Particularly Significant Ecological Functions	Vegetation Report, Appendix B.1.2, Section 8
	Issues Identified Through Consultation	Final EIS, Section 4.14
4.13.2	Wildlife	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Sections 10.0, 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
	Local and Regional Occurrence of Species/Populations	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Sections 10.0, 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
	Relative Seasonal Abundance and Distribution	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Section 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
	Health of Species/Populations and Contaminant Loadings	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.2
	Seasonal Range or Habitat Use, Movements	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Section 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
	Migratory Patterns and Routes	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Section 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
	Significant Habitats	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Section 10.0; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.1
	Wildlife Management Areas	Final EIS, Section 4.10; Baseline Summary Report, Appendix B.1.1, Section 11.2; 1999 and Y2000 Wildlife Report, Appendix B.1.3, Section 1.1
	Rare, Threatened or Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.2
	Species that Perform Particularly Significant Ecological Functions	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.0

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Issues Identified Through Consultation	Final EIS, Section 4.14
4.13.3	Birds (see wildlife, which birds are a subset of)	Final EIS, Section 3.2.2; Baseline Summary Report, Appendix B.1.1, Sections 10.0, 11.0; 1999 and Y2000 Wildlife Report, Appendix B.1.3
4.13.4	Fish and Other Aquatic Organisms	Final EIS, Section 3.3.3; Baseline Summary Report, Appendix B.1.1, Section 13.0; Aquatic Baseline Report, Appendix B.1.4
	Local and Regional Occurrence	Final EIS, Section 3.3.3; Baseline Summary Report, Appendix B.1.1, Section 13.0; Aquatic Baseline Report, Appendix B.1.4, 1999 Report Sections 3.0, 4.0; 2000 Report Section 3.0
	Relative Seasonal Abundance and Distribution	Final EIS, Section 3.3.3; Baseline Summary Report, Appendix B.1.1, Section 13.0; Aquatic Baseline Report, Appendix B.1.4, 1999 Report Sections 3.0, 4.0; 2000 Report Section 3.0
	Health of Species/Populations and Contaminant Loadings	Aquatic Impact Assessment, Appendix B.2.3, Section 3.3.7
	Migratory Patterns and Routes	Aquatic Baseline Report, Appendix B.1.4, 1999 Report Section 3.3.4; 2000 Report, Section 3.3.5
	Habitat	Final EIS, Section 3.3.3; Aquatic Baseline Report, Appendix B.1.4, 1999 Report Section 3.4; 2000 Report Section 3.4
	Management Areas	Not applicable
	Rare, Threatened or Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0; Aquatic Baseline Report, Appendix B.1.4, 1999 and 2000 Reports Section 3.3
	Issues Identified Through Consultation	Final EIS, Section 4.14
4.14	Description of Socio-economic Environment	Final EIS, Section 4.2; Socio-Economic Baseline, Appendix C.1.1
	Human Health	Final EIS, Sections 4.2.2.5, 4.2.2.6; Socio-Economic Baseline, Appendix C.1.1, Sections 1.4, 2.4, 3.4, 4.4, 5.4, 6.4, 7.4, 8.4, 9.4
	Demographics	Final EIS, Section 4.2.2.1; Socio-Economic Baseline, Appendix C.1.1, Sections 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, 9.1
	Archaeology	Final EIS, Section 4.12; 1996 Heritage Study, Appendix C.3.1; 1999 Heritage Study, Appendix C.3.2
	Land and Resource Use	Final EIS, Section 4.10; Land Use, Appendix C.1.3; Socio-Economic Effects Assessment, Appendix C.1.2, Section 3.0
	Local and Regional Economy	Final EIS, Section 4.2.2.3; Socio-Economic Baseline, Appendix C.1.1, Sections 1.2, 2.2, 3.2, 4.2, 5.2, 6.2, 7.2, 8.2, 9.2
	Employment, Education and Training	Final EIS, Section 4.2.2.2; Socio-Economic Baseline, Appendix C.1.1, Sections 1.3, 2.3, 3.3, 4.3, 5.3, 6.3, 7.3, 8.3, 9.3

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Services and Infrastructure	Socio-Economic Baseline, Appendix C.1.1, Sections 1.6, 2.6, 3.6, 4.6, 5.6, 6.6, 7.6, 8.6, 9.6
	Government	Socio-Economic Baseline, Appendix C.1.1, Sections 1.7, 2.7, 3.7, 4.7, 5.7, 6.7, 7.7, 8.7, 9.7
	Issues Identified Through Consultation	Final EIS, Section 4.14; Community Consultation, Appendix C.5
	Interactions Between Socio-Ec and Biophysical Environments; Nature of the Mixed Economy	Socio-Economic Baseline, Appendix C.1.1, Sections 1.2, 2.2, 3.2, 6.2
4.15	Boundaries	Final EIS, Section 2.4; Baseline Summary Report, Appendix B.1.1, Section 1.2
4.15.1	Spatial Boundaries	Final EIS, Section 2.4.1; Baseline Summary Report, Appendix B.1.1, Section 1.2.1
4.16	Temporal Boundaries	Final EIS, Section 2.4.2; Baseline Summary Report, Appendix B.1.1, Section 1.2.2
4.17	Data Acquisition Methodology and Documentation	Final EIS, Section 3.1; Baseline Summary Report, Appendix B.1.1, Sections 2.2, 3.2, 6.1, 6.2, 9.4, 10.1, 13.2.1, 13.3.1, 13.4.1, 13.5.1, 13.6.1
4.18	Data Analysis and Reporting	Final EIS, Section 3.1; Baseline Summary Report, Appendix B.1.1, Sections 2.2, 3.2, 6.1, 6.2, 9.4, 10.1, 13.2.1, 13.3.1, 13.4.1, 13.5.1, 13.6.1
4.19	Impact Assessment Methodology	Final EIS, Section 3.4; Environmental Impact Assessment, Appendix B.2.1; Air Quality Report, Appendix D.1.1, Section 2; Aquatic Impact Assessment, Section 1.3; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 2
4.2	Indicators and Criteria	Final EIS, Section 3.4; Environmental Impact Assessment, Appendix B.2.1; Air Quality Report, Appendix D.1.1, Section 2; Aquatic Impact Assessment, Section 1.3; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 2
4.21	Impact Assessment	
4.21.1	Project Components and Activities	Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1, Section 1.0
4.21.1.1	Open Pit Mining	Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1, Section 1.0
	Permeability of the Open Pit	Project Description, Appendix A.1, Section 5.2
	Effects of De-watering Areas	Environmental Impact Assessment, Appendix B.2.1, Section 1.11; Mine Waste and Water Management, Appendix D.2.1, Section 5.2
	Pit Water Management	Environmental Impact Assessment, Appendix B.2.1, Section 1.11; Mine Waste and Water Management, Appendix D.2.1, Section 4.0
	Salinity and Groundwater Characteristics	not applicable
	Permafrost Intrusion	Project Description, Appendix A.1, Section 5.2; Environmental Management Plan, Appendix B.3.1, Section 2.6
	Environmental Effects of Pit Water	Final EIS, Sections 3.5.6.1, 3.6.9; Environmental Impact Assessment, Appendix B.2.1, Section 1.11.1

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Effects of Air and Water Exposure to Kimberlite	Reclamation Plan, Appendix B.3.2, Section 5.3.3
	Impacts of Blasting on Air and Water Quality	Environmental Impact Assessment, Appendix B.2.1, Sections 1.11.1, 1.12.1; Air Quality Report, Appendix D.1.1, Section 3.1
4.21.1.2	Processed Kimberlite Containment Area	Final EIS, Section 2.2.4; Project Description, Appendix A.1, Section 15.0; Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Impoundment Permeability	Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Pipeline Design and Location	Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	PK Disposal	Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Characteristics and Toxicity of PK	Final EIS, Section 5.2.2; Project Description, Appendix A.1, Section 15.3; Environmental Impact Assessment, Appendix 2.1, Section 1.11.2; Evaluation of JD/01 Tailings Geochemistry, Appendix D.1.5
	Effluent Treatment and Discharge	Final EIS, Section 5.2.2; Project Description, Appendix A.1, Section 15.3; Environmental Impact Assessment, Appendix B.2.1, Section 1.11; Pilot Spray Irrigation D.2.2
	Long Lake Water Quality	Final EIS, Section 3.5.6.2; Environmental Impact Assessment, Appendix B.2.1, Section 1.11.2
	Discharge Point for Effluent	Final EIS, Section 5.3; Project Description, Appendix A.1, Section 15.3; Mine Waste and Water Management, Appendix D.2.1, Section 3.5
	Fish and Fish Habitat	Final EIS, Section 3.5.12; Environmental Impact Assessment, Appendix B.2.1, Section 1.16; Aquatic Impact Assessment, Attachment 4.1, Sections 2.3.3, 2.4.2
	Need for Control or Retention Structures	Final EIS, Sections 5.2.2, 5.3; Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Volume of Tailings and Storage Capacity	Final EIS, Section 5.2.2; Environmental Management Plan, Appendix B.3.1, Section 2.2.5; Mine Waste and Water Management, Appendix D.2.1, Section 3.5
	Impacts on Caribou and Waterfowl	Environmental Impact Assessment, Appendix B.2.1, Section 1.15.4; Environmental Effects Assessment on Wildlife, Appendix B.1.3, Section 3.2
4.21.1.3	Waste Rock, Ore and Overburden Storage	Final EIS, Section 2.3; Project Description, Appendix A.1, Section 14.0; Mine Waste and Water Management, Appendix D.2.1, Sections 4.0, 5.2
	Design Height and Location	Project Description, Appendix A.1, Section 14.0; Mine Waste and Water Management, Appendix D.2.1, Section 4.0
	Characteristics	Project Description, Appendix A.1, Section 14.0; Characterization of Waste Rock, Appendix D.1.3; Characterization of Kimberlite Ore, Appendix D.1.4; Reclamation Plan, Appendix B.3.2, Section 2.0

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Transport and Handling	Project Description, Appendix A.1, Section 14.0
	Seepage Characteristics and Volume	Characterization of Waste Rock; Appendix D.1.3; Waste Rock Test Results, Appendix D.1.6; Characterization of Kimberlite Ore, Appendix D.1.4; Mine Waste and Water Management, Appendix D.2.1, Attachment B
	Seepage Collection and Disposal	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3.2; Mine Waste and Water Management, Appendix D.2.1, Section 5.2
	Acid Rock Drainage	Characterization of Waste Rock, Appendix D.1.3; Characterization of Kimberlite Ore, Appendix D.1.4
	Metal Content of Frozen Groundwater in Waste Rock	Environmental Management Plan, Appendix B.3.1, Section 2.3.2
	Windblown Dust	Final EIS, Section 3.5.7; Environmental Impact Assessment, Appendix B.2.1, Section 1.12; Air Quality Report, Appendix D.1.1, Section 3
	Suitability of Overburden for Reclamation	Reclamation Plan, Appendix B.2.2, Sections 2.0, 5.0
	Potential for Revegetation	Final EIS, Section 3.10; Reclamation Plan, Appendix B.2.2, Section 4.0
	Disruption of Wildlife Movement	Final EIS, Section 3.5.11; Environmental Impact Assessment, Appendix B.2.1, Section 1.15.4; Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.2
4.21.1.4	Processing and Plant Infrastructure	Final EIS, Section 2.3; Project Description, Appendix A.1, Sections 3.3, 6.0
4.21.1.5	Natural Drainage Diversion	Final EIS, Section 3.5.12; Environmental Impact Assessment, Appendix B.2.1, Sections 1.16, 3.8
	Control of Melting Ice Lenses	Environmental Impact Assessment, Appendix B.2.1, Section 1.8.2
	Impacts on Fish, Waterfowl and Aquatic Mammals	No aquatic mammals; no waterfowl at diversion; Environmental Impact Assessment, Appendix B.2.1, Sections 1.16.1, 3.8; Aquatic Impact Assessment, Appendix B.2.3, Attachment 4.1 Section 3.3
4.21.1.6	Sewage and Solid Waste Management	Final EIS, Sections 3.8.1, 3.9.3.2; Environmental Impact Assessment, Appendix B.2.1, Section 1.11.3
	Wildlife Attractants	not applicable
	Receiving Water Body Effects	Environmental Impact Assessment, Appendix B.2.1, Section 1.11.3
4.21.1.7	Hazardous Materials Management	Final EIS, Section 5.4; Hazardous Materials Management, Appendix D.2.3
	Effects on Water Quality From Blasting Residues	Final EIS, Section 3.5.6.1; Environmental Impact Assessment, Appendix B.2.1, Section 1.11.1
	Wildlife Attractants	not applicable
4.21.1.8	Power	Final EIS, Sections 3.5.7, 3.9.4; Environmental Impact Assessment, Appendix B.2.1, Sections 1.12, 3.5; Air Quality Report, Appendix D.1.1, Section 4

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Generation	Final EIS, Sections 3.5.7, 3.9.4; Environmental Impact Assessment, Appendix B.2.1, Sections 1.12, 3.5; Air Quality Report, Appendix D.1.1, Section 4
	Transmission	not applicable
4.21.1.9	Air and Ground Traffic	
	Wildlife Interactions - aircraft	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.15.4, 3.7
	Wildlife Interactions - roads	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.15.4, 3.7
	Stream Crossings	Aquatic Impact Assessment, Appendix B.2.3, Attachment 4.1, Section 2.3.1
4.21.1.10	Borrow Pits	
	Dust	Environmental Impact Assessment, Appendix B.2.1, Sections 1.12, 3.5; Air Quality Report, Appendix D.1.1, Section 3
	Noise	Environmental Impact Assessment, Appendix B.2.1, Sections 1.13, 3.6
	Slope Stability	Project Description, Appendix A.1, Section 13.0
	Permafrost Thaw	Environmental Impact Assessment, Appendix B.2.1, Section 1.8.2
	Ice Lenses	Environmental Impact Assessment, Appendix B.2.1, Section 1.8.2
	Meltwater Runoff	Environmental Impact Assessment, Appendix B.2.1, Section 1.8.2
	Wildlife Interactions	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.2; Environmental Impact Assessment, Appendix B.2.1, Sections 1.15, 3.7
4.21.1.11	Site Facilities and Infrastructure	Final EIS, Section 3.0; Environmental Impact Assessment, Sections 1.0, 3.0
4.21.1.12	Processing Operations	Final EIS, Section 3.0; Environmental Impact Assessment, Sections 1.0, 3.0
4.21.1.13	Accidents and Malfunctions	Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1, Section 1.0
4.21.1.14	Exploration Programme	Environmental Impact Assessment, Appendix B.2.1, Section 4.0
4.21.1.15	Closure and Reclamation Programme	Final EIS, Section 3.10; Reclamation Plan, Appendix B.3.2
	Temporary Closure	Project Description, Appendix A.1, Section 21.1
	Final Closure	Final EIS, Section 3.10; Reclamation Plan, Appendix B.3.2
	Reclamation	Final EIS, Section 3.10; Reclamation Plan, Appendix B.3.2
4.21.2	Physical and Biological Environmental Components	
4.21.2.1	Landscape and Terrain	Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1, Sections 1.7, 1.8, 1.10, 3.1, 3.3
	Terrain Stability	Mine Waste and Water Management, Appendix D.2.1, Sections 2.0, 3.0, 4.0
	Permafrost	Environmental Impact Assessment, Appendix B.2.1, Sections 1.8, 3.1
	Ground Ice	Environmental Impact Assessment, Appendix B.2.1, Section 1.8.2

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Seismicity	Final EIS, Section 3.5.2; Environmental Impact Assessment, Appendix B.2.1, Section 1.7
	Rock Heave	Mine Waste and Water Management, Appendix D.2.1, Attachment C
	Geochemistry	Characterization of Waste Rock, Appendix D.1.3; Characterization of Kimberlite Ore, Appendix D.1.4; Waste Rock Test Results, Appendix D.1.6
	Sites of Palaeontological Significance	not applicable
	Use of TK in Evaluating Esker Importance to Wildlife and as Burial Grounds	Final EIS, Section 4.13; Traditional Knowledge, Appendix C.4
4.21.2.2	Air	Final EIS, Sections 3.2.3, 3.5.7; Air Quality Report, Appendix D.1.1
	Gaseous Emissions from Fuel Consumption	Air Quality Report, Appendix D.1.1, Section 3
	Dust	Air Quality Report, Appendix D.1.1, Section 3
	Emission Dispersion and Conversion	Air Quality Report, Appendix D.1.1, Section 4
	Biological Receptors	Environmental Impact Assessment, Appendix B.2.1, Sections 1.12, 3.5
	Greenhouse Gases	Air Quality Report, Appendix D.1.1, Section 3
	Effects on Plant Phenology and Wildlife from Altered Snow Melt	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.3
4.21.2.3	Water Quality and Quantity	Final EIS, Sections 3.5.6, 3.9.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.11, 3.4
	Blasting	Final EIS, Section 3.5.6.1; Environmental Impact Assessment, Appendix B.2.1, Sections 1.11.1, 3.4.1
	Collection and Treatment of Wastewater and Runoff	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3; Mine Waste and Water Management, Appendix 2.1, Section 5.0
	Pit De-watering	Mine Waste and Water Management, Appendix 2.1, Section 5.0; Environmental Impact Assessment, Appendix B.2.1, Section 1.11.1
	Groundwater Seepage	Mine Waste and Water Management, Appendix 2.1, Attachment B
	Water Management	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3; Mine Waste and Water Management, Appendix D.2.1, Section 5.0
	Contaminant Loading	Environmental Impact Assessment, Appendix B.2.1, Sections 1.11, 3.4
	Acid Rock Drainage, Metal Leaching	Characterization of Waste Rock, Appendix D.1.3
	Sedimentation	Final EIS, Section 3.2.6; Environmental Impact Assessment, Appendix B.2.1, Sections 1.11, 3.4
	Stream Diversions	Final EIS, Section5.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.9.2, 1.11.1; Mine Waste and Water Management, Appendix D.2.1, Section 5.2.3

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Contaminant Release	Final EIS, Sections 3.5.6, 3.6.9, 3.9.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.11, 3.4
	Accidents and Malfunctions	Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1, Section 1.0
	Water Quality Objectives (CCME)	Environmental Impact Assessment, Appendix B.2.1, Section 1.11
4.21.2.4	Vegetation	Final EIS, Section 3.5.10; Vegetation Report, Appendix B.1.2
	Plant Communities	Final EIS, Section 3.5.10; Vegetation Report, Appendix B.1.2
	Plant Phenology	Environmental Effects Assessment on Wildlife, Appendix B.2.2, Section 3.1
	Rare, Threatened or Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0; Vegetation Report, Appendix B.1.2, Section 10.0; Environmental Impact Assessment, Appendix B.2.1, Section 1.15.4
	Wildlife Dependence on Habitats and Species	Environmental Effects Assessment on Wildlife, Appendix B.2.3, Section 3.1
	Contaminant Uptake	Environmental Monitoring Plan, Appendix B.3.3, Section 5.0, Attachment 5.1
4.21.2.5	Wildlife	Final EIS, Sections 3.5.11, 3.9.7; Environmental Effects Assessment on Wildlife, Appendix B.2.3
	Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0; Environmental Effects on Wildlife, Appendix B.2.2, Section 3.1
	Habitat Loss	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.1.1
	Mortality	Environmental Effects on Wildlife, Appendix B.2.2, Sections 3.1, 3.2, 3.3
	Displacement	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.1.1
	Movement Disruption	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.3
	Altered Inter-specific Relationships (including Humans)	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Noise	Environmental Impact Assessment, Appendix B.2.1, Sections 1.13, 3.6
	Bioaccumulation of Toxins	not applicable
	Caribou	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Grizzly Bear	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Muskox	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Wolves, Wolverines, Foxes	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Small Mammals	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
4.21.2.6	Birds	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Habitat Loss	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.1.1
	Disruption of Migration	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.3
	Human Disturbance	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
	Alteration of Habitats	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.1.1
	Bioaccumulation	not applicable

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Raptors	Environmental Effects on Wildlife, Appendix B.2.2, Section 3.0
4.21.2.7	Aquatic Organisms and Habitats	Final EIS, Section 3.3.3; Aquatic Baseline Report, Appendix B.1.4
	Productive Capacity	Aquatic Impact Assessment, Appendix B.2.3, Attachment 1
	Water Quality	Final EIS, Sections 3.5.6, 3.9.3; Environmental Impact Assessment, Appendix B.2.1, Sections 1.11, 3.4
	Habitat Loss	Final EIS, Sections 3.5.12, 3.9.8; Aquatic Impact Assessment, Appendix B.2.3, Attachment 4.1, Section 2.3
	Rare, Threatened or Endangered Species	Baseline Summary Report, Appendix B.1.1, Section 12.0
	Mortality	Final EIS, Sections 3.5.12, 3.9.8; Aquatic Impact Assessment, Appendix B.2.3, Attachment 4.1, Section 2.2
	Noise (blasting)	Aquatic Impact Assessment, Appendix B.2.3, Attachment 4.1, Section 2.2
4.21.3	Biological Diversity	Final EIS, Section 3.5.13; Environmental Impact Assessment, Appendix B.2.1, Section 1.17
4.21.4	Social, Economic and Cultural Components	Final EIS, Section 4.4; Socio-Economic Effects Assessment, Appendix C.1.2
	Health	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Demographics	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Traditional Way of Life	Final EIS, Section 4.10; Land Use, Appendix C.1.3, Section 1.3; Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Cultural Well-Being	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Crime/Substance Abuse	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Archaeology Sites	Final EIS, Section 4.12.2; Heritage Resources Impact Assessment, Appendix C.3.3
	Changes in Hunting, Trapping, Guiding	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Conservation Areas and Parks	Final EIS, Section 4.10.7; Land Use, Appendix C.1.3, Section 1.7
	Navigable Waters	Permit Applications, Appendix A.2
	Industrial and Commercial Areas	not applicable
	Likely Evolution of Economies Over the Life of the Project	not applicable
	Employment, Business Opportunities	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Training	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Increased Pressure on Social Institutions	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Permanent Changes to Infrastructure and Services	not applicable
	Revenues Accruing to Governments	Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
	Temporary or Final Closure	Final EIS, Section 4.7; Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
4.21.5	Impacts of the Environment on the Project	Final EIS, Section 3.5.1.2; Environmental Impact Assessment, Appendix B.2.1, Section 1.6.2
	Effects on Project from Global Climate Change	Environmental Impact Assessment, Appendix B.2.1, Section 1.8
4.22	Cumulative Effects Assessment	Final EIS, Section 3.6, Environmental Cumulative Effects Assessment, Appendix B.2.4
	Overview of Theory and Practice	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 1.0
	Cumulative Effects With Other Projects	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 2.0
	Transboundary Impacts	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 2.0
	Influence of Biophysical Cumulative Effects on Socio-economic Systems	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 2.0
	Influence of Cumulative Socio-economic Effects on Biophysical Environment	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 2.0
	Approach to Handling Uncertainty	Environmental Cumulative Effects Assessment, Appendix B.2.4, Section 1.0
4.23	Summary of Impacts	Final EIS, Section 3.7; Environmental Impact Assessment, Appendix B.2.1, Section 1.20
4.24	Environmental Management and Mitigation	Final EIS, Sections 3.8, 5.0; Environmental Management Plan, Appendix B.3.1; Mine Waste and Water Management, Appendix D.2.1
4.24.1	Overview	
	Processed Kimberlite	Final EIS, Section 5.2.2; Environmental Management Plan, Appendix B.3.1, Section 2.2.5; Mine Waste and Water Management, Appendix D.2.1, Section 3.0
	Waste Rock	Final EIS, Section 5.2.1; Environmental Management Plan, Appendix B.3.1, Section 2.2.1; Mine Waste and Water Management, Appendix D.2.1, Section 4.0
	Domestic and Industrial Solid Wastes	Final EIS, Section 3.8.1; Environmental Management Plan, Appendix B.3.1, Sections 2.2.6, 2.2.7
	Liquid Waste	Final EIS, Section 3.8.2; Environmental Management Plan, Appendix B.3.1, Sections 2.3, 2.4; Mine Waste and Water Management, Appendix D.2.1, Section 5.0
	Spill Contingency	Final EIS, Section 5.5; Spill Prevention, Countermeasures and Control Plan, Appendix D.2.4
	Hazardous Waste	Final EIS, Section 5.4; Environmental Management Plan; Appendix B.3.1, Section 2.5
	Acid Rock Drainage	not applicable
	Emergency Response Planning	Final EIS, Section 5.6; Emergency Response Plan, Appendix D.2.5
	Water Supply	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3
	Landscape	Final EIS, Section 3.10.1; Reclamation Plan, Appendix B.3.2

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Permafrost	Environmental Management Plan, Appendix B.3.1, Section 2.6
	Water Quality	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3; Mine Waste and Water Management, Appendix 2.1, Section 5.0
	Water Management Plan	Final EIS, Section 5.3; Environmental Management Plan, Appendix B.3.1, Section 2.3; Mine Waste and Water Management, Appendix 2.1, Section 5.0
	Air Quality	Final EIS, Section 3.8.4; Environmental Management Plan, Appendix B.3.1, Section 2.7
	Vegetation	Final EIS, Section 3.10.1; Reclamation Plan, Appendix B.3.2, Sections 4.0, 5.0
	Birds	Final EIS, Section 3.8.5.1; Environmental Management Plan, Appendix B.3.1, Sections 2.9.1, 2.9.2, 2.9.3, 2.9.4, 2.9.5, 3.7, 3.8
	Traffic	Final EIS, Section 3.8.5; Environmental Management Plan, Appendix B.3.1, Section 2.9
	Human Resources	Final EIS, Section 4.7, Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4
	Public Involvement	Final EIS, Section 4.9; Socio-Economic Effects Assessment, Appendix C.1.2, Sections 2.4.7, 4.0; Community Consultation, Appendix C.5
	Education and Orientation	Environmental Management Plan, Appendix B.3.1, Section 5.0; Emergency Response Plan, Appendix D.2.5, Section 9.0; Hazardous Materials Management, Appendix D.2.3; Occupational Health and Safety Plan, Appendix C.2, Section 6.0
	Occupational Health and Safety	Final EIS, Section 4.11; Occupational Health and Safety Plan, Appendix C.2
	Site Rehabilitation	Final EIS, Section 3.10; Reclamation Plan, Appendix B.3.2
	Costs and Feasibility of Mitigation Measures	Environmental Management Plan, Appendix B.3.1, Section 10.0
	Timetables for Implementation	Environmental Management Plan, Appendix B.3.1, Section 1.0; Reclamation Plan, Appendix B.3.2
	Flexibility of Environmental Management Plans	Environmental Management Plan, Appendix B.3.1, Section 1.0
	Criteria and Indicators to Trigger Management Action	Environmental Management Plan, Appendix B.3.1, Section 1.0
	Assessment of Management Plan Effectiveness	Environmental Management Plan, Appendix B.3.1, Sections 7.0, 8.0
	Justify Trade-offs Between Cost Savings and Effectiveness	Environmental Management Plan, Appendix B.3.1, Section 10.0
	Risk Assessment of Economic or Other Conditions to Impairment of Mitigation Effectiveness	Environmental Management Plan, Appendix B.3.1, Section 10.0
	Community Consultation Agreements	Final EIS, Section 4.9
4.24.2	Management of Impacts on the Physical Environment	Final EIS, Sections 3.8, 5.1, 5.2, 5.3; Environmental Management Plan, Appendix B.3.1, Sections 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 3.3, 3.4, 3.9, 3.10
4.24.2.1	Caribou	Final EIS, Section 3.8.5.3; Environmental Management Plan, Appendix B.3.1, Section 2.9.8

TABLE 1.1 CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
4.24.2.2	Fish	Final EIS, Section 3.8.2; Environmental Management Plan, Appendix B.3.1, Section 2.10
	Compensation	Final EIS, Section 3.8.2; Environmental Management Plan, Appendix B.3.1, Section 4.0, Attachment 4.1
4.24.2.3	Bears	Final EIS, Section 3.8.5.4; Environmental Management, Appendix B.3.1, Sections 2.9.12, 3.5
4.24.2.4	Aircraft	Final EIS, Section 3.8.5.1; Environmental Impact Assessment, Appendix B.2.1, Sections 1.13, 3.6
4.24.3	Management of Impacts on Socio-Economic Environment	Final EIS, Section 4.7; Socio-Economic Effects Assessment, Appendix C.1.2, Section 4.0
4.24.3.1	Human Resources	
	Human Resources Plan	Development must be preceded by project approval and negotiation of an IIBA and engagement of contractors. Final EIS, Section 4.2.1; Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4
	Applicability of Policies to Contractors	Final EIS, Section 4.2.1; Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4.8
	Partnership in Job Development Strategy	Member of KETP; Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4.1
	Work Schedules; Provision of Transportation	Final EIS, Section 2.3; Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4
4.24.3.2	Occupational Health and Safety	Final EIS, Section 4.11; Occupational Health and Safety Plan, Appendix C.2
4.24.3.3	Nunavummiut Involvement	Final EIS, Section 4.2.1; Socio-Economic Effects Assessment, Appendix C.1.2, Section 2.4
4.24.3.4	Public Involvement	Final EIS, Section 4.9; Socio-Economic Effects Assessment, Appendix C.1.2, Sections 2.4.7, 4.0
4.24.3.5	Impact and Benefits Agreement	Final EIS, Section 4.7; Community Consultation, Appendix C.5, Sections 7.7, 8.0
4.24.3.6	Pollution Prevention	Final EIS, Section 3.8; Environmental Management Plan, Appendix B.3.1
4.25	Residual Effects	Final EIS, Section 3.9; Environmental Impact Assessment, Appendix B.2.1, Section 3.0
	Significance	Final EIS, Sections 3.4.2, 3.9; Environmental Impact Assessment, Appendix B.2.1, Sections 1.2, 3.0
	Reliability of Planned Mitigation	Final EIS, Sections 1.3.2, 2.2.8, 3.5.6.2, 3.5.11.3, 3.8.5, 5.1, 6.0; Environmental Management Plan, Appendix B.3.1, Sections 7.0, 8.0

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
	Consequences of Failure	Potential impacts prior to mitigation; Final EIS, Section 3.5; Environmental Impact Assessment, Appendix B.2.1
4.26	Monitoring and Follow-up	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3
4.26.1	Overview	
	Methodologies, Standards, Objectives	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3, Section 1.0
	Parameters	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3, Section 1.0
	Geographic Extent	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3
	Reporting	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3, Section 6.0
	Cumulative Effects	Final EIS, Section 3.11; Environmental Monitoring Plan, Appendix B.3.3
	Refinements to Mitigation and Management	Environmental Management Plan, Appendix B.3.1, Section 8.0
	Roles of Independent Experts, Government, Communities, Holders of Traditional Knowledge, Joint Monitoring Programs	Final EIS, Section 4.9; Socio-economic Effects Assessment, Appendix C.1.2, Sections 2.4.7, 4.8; Community Consultation, Appendix C.5, Section 5.0
	Assessment of Effectiveness	Environmental Management Plan, Appendix B.3.1, Sections 7.0, 8.0
	Communication of Results	Environmental Monitoring Plan, Appendix B.3.3, Section 6.0
	Length of Post-Closure Monitoring	Environmental Monitoring Plan, Appendix B.3.3; Reclamation Plan, Appendix B.3.2, Section 6.5
4.26.2	Community Liaison	Final EIS, Section 4.9; Socio-economic Effects Assessment, Appendix C.1.2, Sections 2.4.7, 4.8
4.27	Auditing and Continual Improvement	Environmental Management Plan, Appendix B.3.1, Section 8.0
4.28	Closure and Reclamation	Final EIS, Section 3.10; Reclamation Plan, Appendix B.3.2
	Facilities Targeted	Reclamation Plan, Appendix B.3.2, Sections 1.0, 5.0, 6.0
	Reclamation Goals	Reclamation Plan, Appendix B.3.2, Section 1.0
	Methods	Reclamation Plan, Appendix B.3.2
	Timeframes	Reclamation Plan, Appendix B.3.2
	Update of Plan	Reclamation Plan, Appendix B.3.2, Section 1.0
	Research	Reclamation Plan, Appendix B.3.2, Section 4.0
	Aesthetics of Abandoned Facilities	Project Description, Appendix A.1, Section 21.6
4.29	Diamond Valuation	
	Valuation of Production	Final EIS, Section 7.0
	Sorting	Final EIS, Sections 2.1, 7.0
	Marketing	Project Description, Appendix A.1, Section 22.8
4.30	Value-Added Opportunities	Final EIS, Section 7.0

TABLE 1.1		
CONCORDANCE TABLE		
NIRB Guideline Section	**Subject**	**EIS Section**
4.31	Outstanding Issues	Final EIS, Section 8.0; Community Consultation, Appendix C.5, Section 9.0
4.32	List of Consultants	Final EIS, Section 9.0
4.33	List of Organizations Consulted	Community Consultation, Appendix C.5, Section 6.0

TABLE 1.2
FINAL EIS SUPPORT DOCUMENTS APPENDED

APPENDIX A PROJECT DESCRIPTION & PERMITS

A.1 Jericho Project Description
A.2 Permit Applications

APPENDIX B BIOPHYSICAL ENVIRONMENT

B.1 Biophysical Baseline
B.1.1 Baseline Summary Report
B.1.2 Vegetation Report
B.1.3 1999 & Y2000 Wildlife Report
B.1.4 Aquatic Baseline Report
B.2 Environmental Impact
B.2.1 Environmental Impact Assessment
B.2.2 Environmental Effects Assessment on Wildlife
B.2.3 Aquatic Impact Assessment
B.2.4 Environmental Cumulative Effects Assessment
B.3 Environmental Management & Monitoring
B.3.1 Environmental Management Plan
B.3.2 Reclamation Plan
B.3.3 Environmental Monitoring Plan

APPENDIX C HUMAN ENVIRONMENT

C.1 Socio-Economic & Land Use
C.1.1 Socio-Economic Baseline
C.1.2 Socio-Economic Effects Assessment
C.1.3 Land Use
C.2 Occupational Health & Safety Plan
C.3 Heritage
C.3.1 1996 Heritage Study
C.3.2 1999 Heritage Study
C.3.3 Heritage Resources Impacts Assessment
C.4 Traditional Knowledge
C.5 Community Consultation

APPENDIX D MINE ENVIRONMENT

D.1 Mine Operation Impacts
D.1.1 Air Quality Report
D.1.2 Lake C3 Modelling
D.1.3 Characterization of Waste Rock
D.1.4 Characterization of Kimberlite Ore
D.1.5 Evaluation of JD/01 Tailings Geochemistry
D.1.6 Waste Rock Test Results
D.2 Mine Environment Management
D.2.1 Mine Waste & Water Management
D.2.2 Spray Irrigation Reports
D.2.3 Hazardous Materials Management
D.2.4 Spill Prevention, Countermeasures & Control Plan
D.2.5 Emergency Response Plan

APPENDIX E MAPS

TABLE 1.3
EXISTING PERMITS AND LICENCES

Licence Permit	Issuing Authority	Expiry Date	Comments
Water Licence NWBJER9801	Nunavut Water Board	31 Dec 02	Includes: water use and waste disposal in Nunavut associated with prospecting, surface drilling on ice drilling, operation of the bulk sample plant, domestic use and associated activities, environmental baseline data collection, demobilization of equipment, and underground bulk sampling. Reapplied for.
Crown Land Use Permit N1999C9062	Indian and Northern Affairs Canada	31 Aug 01	Includes activities at the Jericho site such as bulk sampling, quarrying, airstrip, winter roads, access roads, portal site, fuel tank farm, and laydown areas. Reapplied for.
Crown Land Use Permit N1998C0874	Indian and Northern Affairs Canada	10 Jun 01	Includes activities associated with the Jericho (Carat) camp (the area inside of the electrified fence), and all associated exploration activities on NTS 76E and 76L. Exploration activities include drilling, mapping, prospecting, sampling, and geophysics. Reapplied for.
Inuit Land Use Permit KTPC027 (Level II)	Kitikmeot Inuit Association, Kugluktuk	30 Sep 02	Includes activities located on Inuit land parcels CO-05, CO-07 and CO-08 including prospecting, sampling, ground and airborne geophysics, diamond drilling, environmental baseline studies, and all support work. Reapplied for.
Inuit Land Use Permit KTL398C036 (Level III)	Kitikmeot Inuit Association, Kugluktuk	30 Sep 03	Includes activities located on Inuit Owned Land Parcels CO-07 and CO-08 including staking, prospecting, exploration work, diamond drilling, bulk fuel storage, trenching and winter road construction

Table 3.1 Carat Lake and Lake C3 Water Balance			
Hydrologic Parameters		**Water Balance - Carat Lake**	
Mean Annual Precip (mm)[1]	330	Mean Annual Lake Precip (m^3)	903,540
Mean Annual Lake Evaporation (mm)[1]	280	Mean Annual Lake Evaporation (m^3)	766,640
Mean Annual Evapotranspiration (mm)[1]	200	Mean Annual Basin Evapotranspiration (m^3)	29,600,000
Mean Annual Runoff - Lower Bound (mm)[2]	130	Mean Annual Basin Runoff - Lower Bound (m^3)	19,240,000
Average Mean Annual Runoff (mm)	190	Mean Annual Basin Runoff - Average (m^3)	28,120,000
Mean Annual Runoff - Upper Bound (mm)[3]	250	Mean Annual Basin Runoff - Upper Bound (m^3)	37,000,000
Nominal Surface Area of Carat Lake (m^2)	2,738,000	Lower Bound Annual Lake Balance4 (m^3)	19,376,900
Volume of Carat Lake (m^3)	27,203,110	Average Annual Lake Balance[4] (m^3)	28,256,900
Drainage Basin Area (to outlet) (m^2)	148,000,000	Upper Bound Annual Lake Balance[4] (m^3)	37,136,900
		Water Balance - Lake C3	
Nominal Surface Area of Lake C3 (m^2)	679,300	Mean Annual Lake Precip (m^3)	224,169
Volume of Lake C3 (m^3)	4,743,239	Mean Annual Lake Evaporation (m^3)	190,204
Drainage Basin Area (to outlet) (m^2)	133,000,000	Mean Annual Basin Evapotranspiration (m^3)	665,000
		Mean Annual Basin Runoff - Lower Bound (m^3)	17,290,000
		Mean Annual Basin Runoff - Average (m^3)	25,270,000
		Mean Annual Basin Runoff - Upper Bound (m^3)	33,250,000
		Lower Bound Annual Lake Balance4 (m^3)	17,323,965
		Average Annual Lake Balance[4] (m^3)	25,303,965
		Upper Bound Annual Lake Balance[4] (m^3)	33,283,965

[1] Based on Regional Analysis performed by PJB and sumarized in Mar-98 memo

MAP - based on corrected archive of northern precipitation records

MALE & MAE - based on regional analysis using WREVAP model for eight stations in the NWT

[2] Lower bound estimate based on subtracting MAE from MAP

[3] Upper bound estimated based on reginal analysis comparing MAR to Catchment Area

[4] MAR + lake precipitation - lake evaporation

Table 3.2 Jericho Infrastructure Component Runoff

Component	Catchment (m^2)	MAR (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal (m^3)
			0%	0%	0%	0%	2.7%	56.9%	16.3%	9.3%	12.5%	2.2%	0%	0%	100%
1. Low Grade Ore Stockpile	130,700	130	-	-	-	-	454	9,671	2,775	1,584	2,127	381	-	-	16,991
		250	-	-	-	-	874	18,598	5,336	3,046	4,090	732	-	-	32,675
2. North Ore Stockpile	40,000	130	-	-	-	-	139	2,960	849	485	651	116	-	-	5,200
		250	-	-	-	-	267	5,692	1,633	932	1,252	224	-	-	10,000
3. Coarse Ore Stockpile	39,840	130	-	-	-	-	138	2,948	846	483	648	116	-	-	5,179
		250	-	-	-	-	266	5,669	1,626	928	1,247	223	-	-	9,960
4. Dump Site 1 Area	312,530	130	-	-	-	-	1,086	23,126	6,635	3,787	5,085	910	-	-	40,629
		250	-	-	-	-	2,089	44,472	12,759	7,283	9,780	1,750	-	-	78,133
5. Dump Site 2 Area	254,900	130	-	-	-	-	886	18,861	5,411	3,089	4,148	742	-	-	33,137
		250	-	-	-	-	1,704	36,272	10,406	5,940	7,976	1,427	-	-	63,725
6. Coarse Kimberlite Rejects Storage	166,000	130	-	-	-	-	577	12,283	3,524	2,011	2,701	483	-	-	21,580
		250	-	-	-	-	1,109	23,621	6,777	3,868	5,194	930	-	-	41,500
7. Plant Area	55,260	130	-	-	-	-	192	4,089	1,173	670	899	161	-	-	7,184
		250	-	-	-	-	369	7,863	2,256	1,288	1,729	309	-	-	13,815
8. Overburden Stockpile	189,800	130	-	-	-	-	660	14,044	4,029	2,300	3,088	553	-	-	24,674
		250	-	-	-	-	1,269	27,008	7,749	4,423	5,939	1,063	-	-	47,450
9. Pit & Drainage Area	157,700	130	-	-	-	-	548	11,669	3,348	1,911	2,566	459	-	-	20,501
		250	-	-	-	-	1,054	22,440	6,438	3,675	4,935	883	-	-	39,425

Table 3.3 Jericho PKCA Water Balance

Parameter			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subtotal
Monthly Evaporation Distribution			0%	0%	0%	0%	0%	33%	33%	23%	11%	0%	0%	0%	100%
Monthly Lake Evaporation (mm)			0	0	0	0	0	92.4	92.4	64.4	30.8	0	0	0	280 mm
Monthly Total Precipitation (mm)			9.4	10.4	13.7	15.0	24.5	33.6	48.5	55.0	43.8	41.0	21.0	14.2	330 mm
Net Precip [Ppt.-Lake Evap] (mm)			9.4	10.4	13.7	15.0	24.5	-58.8	-43.9	-9.4	13.0	41.0	21.0	14.2	50 mm
Net Precip [Ppt.-Lake Evap] (m^3)			919	1024	1340	1471	2403	-5768	-4310	-920	1273	4019	2062	1392	4,905 m^3
Monthly Tailings Water Increment (m^3)			14,015	14,015	14,015	14,015	14,015	14,015	14,015	14,015	14,015	14,015	14,015	14,015	168,175 m^3
STP Discharge to Tailings (m^3)			913	913	913	913	913	913	913	913	913	913	913	913	10,958 m^3
Monthly Runoff Distribution			0%	0%	0%	0%	3%	57%	16%	9%	13%	2%	0%	0%	100%
Monthly Runoff (m^3)	MAR =	130 mm	0	0	0	0	1,793	38,167	10,950	6,250	8,393	1,502	0	0	67,054 m^3
		250 mm	0	0	0	0	3,447	73,397	21,057	12,019	16,140	2,888	0	0	128,950 m^3
Total Monthly Inflow (m^3)	MAR =	130 mm	15,847	15,952	16,267	16,399	19,124	47,326	21,567	20,258	24,594	20,448	16,990	16,320	251,092 m^3
		250 mm	15,847	15,952	16,267	16,399	20,779	82,557	31,675	26,027	32,341	21,835	16,990	16,320	312,988 m^3
Required Discharge (m^3)	MAR =	130 mm	0	0	0	0	0	184,673	21,567	20,258	24,594	0	0	0	251,092 m^3
		250 mm	0	0	0	0	0	222,945	31,675	26,027	32,341	0	0	0	312,988 m^3
Required Discharge Rate (m^3/d)	MAR =	130 mm	0	0	0	0	0	6,156	696	653	793	0	0	0	251,092 m^3
		250 mm	0	0	0	0	0	7,431	1,022	840	1,043	0	0	0	312,988 m^3

Hydrologic Parameters	
Mean Annual Precip (mm) [1]	330
Mean Annual Lake Evaporation (mm) [1]	280
Mean Annual Evapotranspration (mm) [1]	200
Mean Annual Runoff - Lower Bound (mm) [2]	130
Mean Annual Runoff - Upper Bound (mm) [3]	250
Nominal Surface Area of Long Lake (m^2) [4]	98,100
Catchment Area of Impoundment (m^2)	613,900

Note: 1. Based on Regional Analysis performed by PJB and summarized in Mar-98 memo (Attachment 1.2)
MAP - based on corrected archive of northern precipitation records
MALE & MAE - based on regional analysis using WREVAP model for eight stations in the NWT
2. Lower bound estimate based on subtracting MAE from MAP
3. Upper bound estimate based on regional analysis comparing MAR to Catchment Area
4. Lowest current pond level (el. 515.4 m) was used to give the most conservative estimate of runoff

TABLE 3.4
PREDICTED RUNOFF FROM SNOW SURVEY DATA

Stream	Drainage Area (ha)	Area (ha)			Runoff (m^3)			
		Lake	Tundra	Valley	Lake	Tundra	Valley	Total
C1	170	4.50	95.88	69.62	3,420	65,198	81,455	150,074
C3	61	12.67	7.00	41.33	9,629	4,760	48,356	62,745

Snow Water Equivalent (cm)

Lake	Tundra	Valley
7.6	6.8	11.7

Total Runoff Estimate (MAR = 130 mm)

C1	221,000 m^3/ year
C3	79,300 m^3/year

% as Snow Runoff

C1	68%
C3	79%

TABLE 3.5							
1995 - 2000 SURFACE WATER QUALITY SUMMARY							
	CL-02	CL-05	CL-06	CL-25	CL-26	CL-27	CCREM
	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	FW Aquatic
Physical Tests							
Conductivity	5-**13**-22	6.5-**33.8**-158	5.14-**8.05**-12	12-**17**-25	15-**20**-28	13-**17**-23	
Total Dissolved Solids	7-**10**-18	8-**11**-16	7-**10**-16	11-**11**-12	12-**14**-16	10-**13**-14	
Hardness CaCO3	4.6-**5.7**-8.2	4.18-**9.07**-61.4	4.19-**5.44**-7.8	5.85-**5.94**-6.02	6.97-**7.43**-7.7	6.43-**6.71**-6.95	
pH	6.06-**6.74**-7.73	6.19-**6.63**-6.92	6.16-**6.47**-6.76	6.44-**7.05**-7.93	6.55-**7.08**-7.88	6.47-**6.95**-7.63	6.5-9.0
Total Suspended Solids	<0.3-**1.8**-7	0.15-**1.41**-5.00	0.5-**1.1**-3	<3	<3-**<3**-3	<3-**<3**-4	Note 1
Dissolved Anions							
Alkalinity-Total CaCO3	5-**6**-8	3.7-**4.68**-6.2	3.2-**4.4**-6.2	5-**5.7**-6	5-**6**-7	5-**5.7**-6	
Chloride Cl	<0.5-**0.5**-0.9	<0.5-**3.36**-39	<0.5-**0.8**-1.6	<0.5-**0.4**-0.6	<0.5-**<0.5**-0.6	<0.5-**0.5**-0.7	
Sulphate SO4	<1-**1**-3	<1-**1.2**-2.1	<1-**0.9**-1.6	1-**1.3**-2	<1-**1**-2	<1-**1.5**-3	
Nutrients							
Ammonia Nitrogen N	<0.005-**0.006**-0.14	<0.005-**0.009**-0.028	<0.005-**0.013**-0.33	<0.005	<0.005	<0.005	1.37-2.20
Nitrate Nitrogen N	<0.005-**0.005**-0.19	<0.005-**0.177**-2.5	<0.005-**0.009**-0.042	<0.005-**0.005**-0.008	0.005-**0.007**-0.008	0.0025-**0.0048**-0.007	Note 2
Nitrite Nitrogen N	<0.001-**0.001**-0.002	0.0005-**0.001**-0.002	<0.001-**<0.001**-0.001	<0.001-**<0.001**-0.001	<0.001-**<0.001**-0.001	<0.001-**<0.001**-0.001	0.06
Total Dissolved Phosphate P	<0.001-**0.002**-0.008	0.0005-**0.0047**-0.027	<0.001-**0.002**-0.003	<0.001-**0.002**-0.003	0.001-**0.003**-0.006	0.001-**0.002**-0.004	
Total Phosphate P	<0.001-**0.004**-0.01	0.0005-**0.0077**-0.039	<0.001-**0.003**-0.005	0.003-**0.005**-0.007	0.004-**0.005**-0.007	0.003-**0.005**-0.009	
Total Metals							
Aluminum T-Al	0.007-**0.019**-0.038	0.015-**0.052**-0.38	0.012-**0.026**-0.036	0.011-**0.014**-0.016	0.029-**0.03**-0.031	0.022-**0.025**-0.027	0.1, pH>6.5
Antimony T-Sb	<0.00005-**0.00005**-0.00018	<0.00005-**0.00005**-0.00008	<0.00005-**<0.00005**-0.00005	<0.00005	<0.00005	<0.00005	
Arsenic T-As	<0.0001-**0.0001**-0.0002	0.00005-**0.00016**-0.00030	<0.0001-**0.0002**-0.0003	0.0001-**0.0001**-0.0002	<0.0001	<0.0005	
Barium T-Ba	0.0012-**0.0026**-0.005	0.00181-**0.0055**-0.0379	0.00153-**0.0034**-0.005	0.00101-**0.00125**-0.00145	0.00148-**0.00163**-0.00172	0.00156-**0.00161**-0.00168	
Beryllium T-Be	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Bismuth T-Bi	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Boron T-B	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cadmium T-Cd	<0.00005-**0.00006**-0.00012	<0.00005-**0.00005**-0.0001	<0.00005	<0.00005	<0.00005	<0.00005	0.000017
Calcium T-Ca	0.97-**1.18**-1.86	0.93-**2.39**-18.2	0.993-**1.189**-1.89	1.24-**1.25**-1.27	1.5-**1.61**-1.68	1.48-**1.54**-1.60	
Chromium T-Cr	<0.0001-**0.0024B**-0.0075	0.0001-**0.0025**-0.0075	0.0001-**0.0032**-0.0075	<0.0005	<0.0005	<0.0005	0.001-0.0015
Cobalt T-Co	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Copper T-Cu	0.0009-**0.002**-0.005	0.0009-**0.002**-0.005	0.0008-**0.0028**-0.005	0.0006-**0.00067**-0.0007	0.0013-**0.0014**-0.0016	0.0012-**0.0013**-0.0014	0.002-0.004
Iron T-Fe	0.01-**0.02**-0.03	0.005-**0.025**-0.110	<0.01-**0.017**-0.03	<0.03	0.03-**0.04**-0.05	0.015-**0.023**-0.040	0.300
Lead T-Pb	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005-**0.00025**-0.00063	<0.00005	0.001-0.007
Lithium T-Li	<0.001-**0.002**-0.008	<0.001-**0.004**-0.023	<0.001-**0.004**-0.008	<0.001	<0.001	<0.001	
Magnesium T-Mg	0.5-**0.63**-0.93	0.43-**0.84**-4.7	0.442-**0.544**-0.78	0.7	0.7-**0.77**-0.8	0.7	
Manganese T-Mn	0.0013-**0.0028**-0.0049	0.00153-**0.0059**-0.0477	0.0011-**0.0025**-0.0041	0.00152-**0.0025**-0.0037	0.00459-**0.00512**-0.00605	0.00277-**0.0034**-0.00436	
Mercury T-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00001
Molybdenum T-Mo	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.073
Nickel T-Ni	0.0001-**0.0003**-0.001	0.0003-**0.0005**-0.012	0.0002-**0.0006**-0.003	0.0001	0.0003-**0.00033**-0.0004	0.0003	0.025-0.150
Phosphorus T-P	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Potassium T-K	<2	<2	<2	<2	<2	<2	
Selenium T-Se	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	0.001
Silicon T-Si	0.23-**0.33**-0.66	0.22-**0.47**-2.35	0.22-**0.30**-0.46	0.21-**0.25**-0.32	0.34-**0.40**-0.45	0.35-**0.39**-0.45	
Silver T-Ag	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0001
Sodium T-Na	<2	<2-**2**-3	<2	<2	<2	<2	
Strontium T-Sr	<0.005-**0.0055**-0.011	<0.005-**0.0171**-0.1380	0.005-**0.008**-0.013	0.0037-**0.0038**-0.0039	0.0042-**0.0046**-0.0048	0.0040-**0.0043**-0.0045	
Thallium T-Tl	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Tin T-Sn	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Titanium T-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	

TABLE 3.5							
1995 - 2000 SURFACE WATER QUALITY SUMMARY							
	CL-02	CL-05	CL-06	CL-25	CL-26	CL-27	CCREM
	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	Min-Avg-Max	FW Aquatic
Uranium T-U	0.00008-**0.00018**-0.00025	0.0001-**0.00020**-0.00025	0.0001-**0002**-0.0003	0.00012	0.00019	0.00013	
Vanadium T-V	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Zinc T-Zn	<0.001-**0.002**-0.005	<0.001-**0.002**-0.012	<0.001-**0.002**-0.003	<0.001	<0.001	<0.001	0.030
Dissolved Metals							
Aluminum D-Al	0.003-**0.009**-0.022	0.012-**0.021**-0.033	0.005-**0.020**-0.035	0.007-**0.01**-0.012	0.016-**0.019**-0.020	0.017-**0.019**-0.021	
Antimony D-Sb	<0.00005-**0.00005**-0.00011	<0.00005-**<0.00005**-0.00005	<0.00005-**<0.00005**-0.00005	<0.00005	<0.00005	<0.00005	
Arsenic D-As	<0.0001-**0.00013**-0.0002	<0.0001-**0.0001**-0.0003	<0.0001-**0.0001**-0.0003	0.0001	<0.0005	<0.0005	
Barium D-Ba	0.00123-**0.0026**-0.005	0.00184-**0.00546**-0.0375	0.00123-**0.0034**-0.005	0.00099-**0.00122**-0.0014	0.00144-**0.00156**-0.00169	0.00152-**0.00158**-0.00164	
Beryllium D-Be	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Bismuth D-Bi	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Boron D-B	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	
Cadmium D-Cd	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Calcium D-Ca	0.954-**1.17**-1.86	0.965-**2.285**-17.3	0.947-**1.19**-1.84	1.2-**1.22**-1.23	1.53-**1.63**-1.69	1.47-**1.53**-1.58	
Chromium D-Cr	<0.00005	<0.00005	0.0001-**0.0033**-0.0075	<0.00005	<0.00005	<0.00005	
Cobalt D-Co	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Copper D-Cu	0.0008-**0.0023**-0.005	0.0009-**0.0024**-0.005	0.001-**0.003**-0.005	0.0006	0.0012-**0.0013**-0.0015	0.0012-**0.00127**-0.0013	
Iron D-Fe	<0.01-**0.01**-0.02	<0.01-**0.014**-0.04	<0.01	<0.03	<0.03	<0.03	
Lead D-Pb	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Lithium D-Li	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Magnesium D-Mg	0.5-**0.6**-0.9	0.42-**0.81**-4.4	0.442-**0.547**-0.78	0.7	0.8	0.7	
Manganese D-Mn	0.00023-**0.0012**-0.0025	0.00046-**0.0048**-0.459	<0.0005	0.00113-**0.00179**-0.00287	0.00136-**0.00161**-0.00188	0.00042-**0.00083**-0.0012	
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Molybdenum D-Mo	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Nickel D-Ni	0.0002-**0.0003**-0.0005	0.0003-**0.0004**-0.0013	0.0003-**0.0004**-0.0007	<0.0001-**0.0001**-0.0002	<0.0005	<0.0005	
Phosphorus D-P	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Potassium D-K	<2	<2	<2	<2	<2	<2	
Selenium D-Se	<0.0005	<0.001	<0.0005	<0.001	<0.001	<0.001	
Silicon D-Si	0.22-**0.32**-0.65	0.20-**0.44**-2.23	0.205-**0.294**-0.49	0.2-**0.26**-0.35	0.34-**0.39**-0.44	0.35-**0.36**-0.38	
Silver D-Ag	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Sodium D-Na	<2	<2	<2	<2	<2	<2	
Strontium D-Sr	<0.001	0.0051-**0.0165**-0.133	0.0042-**0.0082**-0.013	0.0037-**0.0037**-0.0038	0.0042-**0.0046**-0.0049	0.0040-**0.0043**-0.0046	
Thallium D-Tl	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Tin D-Sn	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Titanium D-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Uranium D-U	<0.00005	<0.00005	<0.00005	<0.005	0.00017	0.00012	
Vanadium D-V	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Zinc D-Zn	<0.001-**0.002**-0.007	<0.001-**0.002**-0.01	0.001-**0.002**-0.004	<0.001-**<0.001**-0.001	<0.001-**<0.001**-0.001	<0.001	
Organic Parameters							
Total Organic Carbon C	2.2-**3.1**-4.9	0.67-**3.5**-5.8	2.7-**3.6**-4.5	2.4-**3.03**-3.7	3.9-**4.2**-4.7	3.4-**4.1**-4.8	
Note 1	ss than causes accelerated weed growth						
Note 2	und ≤100 mg/L. Increase over background of ≤10%, background >100 mg/L						

TABLE 3.6
SUMMARY OF SEDIMENT SAMPLING

Water Body	Collection Year
Cigar Lake	1995
Lake C3	1995
Carat Lake	1995, 2000
Jericho Lake	1995, 2000
Lake C1 (designated C13 in 1995)	1995, 2000
Key Lake	1996, 2000
Pocket Lake	1996
Lynne Lake	1996, 2000
Ash Lake	1996, 2000
Bay on Contwoyto Lake	1996, 2000
Control Lake	1999, 2000
Lake C3	1999, 2000
Stream C3	1999
Carat Lake, optional outfall	2000

TABLE 3.7
JERICHO SEDIMENT QUALITY SUMMARY

	Lake C1			Key Lake			Ash Lake			Lynne Lake			Contwoy. Lake			Control Lake			Lake C3			Stream C3			Criteria	
																									CSQC	CSQC
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	TEL	PEL
Physical Tests																									ug/g	ug/g
Moisture %	81.9	82.0	82.1	51.1	71.1	77.8	64.9	80.4	85.6	72.1	75.0	76.1	58.6	74.8	80.3	81.3	81.5	81.6	81.6	81.7	81.7	<0.1	<0.1	<0.1		
Total Metals (ug/g, or as indicated)																										
Aluminum T-Al	23300	24033	25100	22200	23575	24900	23800	29450	34000	23700	25975	28500	10300	16725	19200	23500	28783	34700	19000	21583	24900	7950	8400	8850		
Antimony T-Sb	<20	<20	<40	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		
Arsenic T-As	12	12	13	4	19	29	9	9	10	13	17	21	3	30	41	44	60	80	4	7	10	3	3	4	5.9	17
Barium T-Ba	110	115	123	106	177	208	118	158	190	103	111	120	46	83	97	151	162	181	92	101	113	19	26	32		
Beryllium T-Be	1.0	1.1	1.1	0.7	0.8	0.8	1.0	1.2	1.3	0.7	0.9	1.0	0.6	0.6	0.7	0.8	1.0	1.2	0.7	0.8	1.0	<0.5	<0.5	<0.5		
Boron T-B	20	20	20	13	17	20	23	24	24	11	16	24	9	14	17	10	17	24	13	14	15	<10	<10	<10		
Cadmium T-Cd	<0.1	<0.1	<0.1	0.2	0.2	0.3	<0.1	<0.1	<0.1	0.4	0.5	0.5	0.4	0.5	0.6	0.3	0.4	0.5	0.3	0.3	0.3	<0.1	<0.1	<0.1	1	4
Calcium T-Ca	3250	3333	3460	3390	3960	5020	3740	3903	4250	4140	4603	5080	2900	3250	3430	2520	3028	3570	2410	2970	3480	1530	1853	2070		
Chromium T-Cr	45	46	48	50	55	58	60	65	72	50	56	59	29	38	42	50	62	72	41	47	52	16	20	23	37.3	90
Cobalt T-Co	14	15	15	11	20	26	11	12	14	14	16	18	5	18	23	28	41	50	8	9	10	4	4	5		
Copper T-Cu	92	93	95	52	76	88	89	114	131	79	95	111	25	48	58	88	97	108	60	64	68	5	6	6	35.7	196.6
Iron T-Fe	66600	68467	70800	28800	61625	83300	41100	55275	64400	40200	49525	57700	13700	39375	49900	90600	106750	142000	23300	24633	26700	13200	14433	15100		
Lead T-Pb	10	10	10	3	6	8	3	8	10	5	8	9	2	5	7	13	18	26	8	23	52	3	4	6	35	91.3
Magnesium T-Mg	6590	6747	6950	8080	8838	9700	9950	10263	11000	7370	8235	8770	4720	6020	6600	5840	7675	9440	4980	6067	7260	4280	4670	5020		
Manganese T-Mn	1360	1437	1520	329	6177	8770	344	387	438	521	646	824	190	1083	1470	2770	5477	11600	254	285	332	99	106	112		
Mercury T-Hg	0.094	0.109	0.118	0.037	0.061	0.070	0.039	0.091	0.115	0.110	0.130	0.141	0.004	0.011	0.014	0.139	0.152	0.168	0.054	0.062	0.072	0.008	0.009	0.009	0.174	0.486
Molybdenum T-Mo	<4	<4	<8	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4		
Nickel T-Ni	23	24	25	30	41	46	33	37	42	31	34	37	23	42	49	33	38	46	25	27	29	11	12	13	18	35.9
Phosphorus T-P	1270	1300	1350	1070	1197	1290	1560	1640	1780	1580	1790	1910	1720	1767	1840	1960	2005	2070	1260	1495	1710	327	387	436		
Selenium T-Se	0.6	0.6	0.6	0.4	0.5	0.5	0.8	0.8	0.8	0.4	0.6	0.8	0.4	0.4	0.4	0.8	0.9	1.0	0.4	0.4	0.5	<0.1	<0.1	<0.1		
Silver T-Ag	<2	<2	<4	<2	<2	<2	<2	<2	<2	<2	<2	<2	4	4	4	2	2	2	<2	<2	<4	<2	<2	<2		
Sodium T-Na	272	302	349	355	508	933	271	472	753	398	407	419	232	294	329	350	394	489	268	358	469	98	127	165		
Strontium T-Sr	21	22	23	22	25	28	19	21	23	23	27	31	15	23	27	20	24	28	19	21	24	8	10	11		
Tin T-Sn	<5	<5	<10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<10	<5	<5	<5		
Titanium T-Ti	999	1040	1100	66	1084	1490	1010	1308	1580	679	1422	1820	536	1139	1380	714	1203	1690	707	1038	1420	380	411	431		
Vanadium T-V	56	59	65	54	66	74	60	83	100	65	79	92	28	46	53	46	63	79	42	49	58	18	21	23		
Zinc T-Zn	66	67	69	66	80	88	72	84	94	84	93	96	56	84	95	93	95	99	72	75	79	20	21	22	123.1	314.8
Organic Parameters																										
Total Organic Carbon C		4.16			3.29			8.26			4.20			3.25		4.58	5.12	5.67	3.05	3.75	4.94	0.15	0.15	0.15		
Particle Size																										
Gravel (>2.00mm) (%)		<0.1			<0.1			<0.1			<0.1			<0.1			<0.1			<0.1						
Sand (2.00mm - 0.063mm) (%)		2.7			3.9			4.5			1.6			3.5			5.7			1.9						
Silt (0.063mm - 4um) (%)		54			51			37.2			50.5			61			44.8			48.2						
Clay (<4um) (%)		43.3			45.1			58.3			47.9			35.5			49.5			49.9						

TABLE 3.8 AQUATIC SURVEY LOCATIONS		
Year	**Lakes**	**Streams**
1995	7	16
1996	14	56[a]
1998		16
1999	5	5
2000	6	4

[a] An additional 57 streams were investigated for a potential all-weather route.

TABLE 3.9 HYDROLOGIC PATTERN ALTERATIONS	
Natural	**Operation**
Stream C1, Open Pit area	Diversion of most of the stream to the west
Waste Dump 1, 2, Overburden Stockpile, Low Grade Ore runoff	Collection of water and discharge from a sediment control pond; no change in total volume
Plant complex area runoff	Collection and re-routing of water to sedimentation berms or the PKCA; no change in total volume; discharge from PKCA to same drainage basin
Coarse Kimberlite area runoff	Collection and re-routing of water to sedimentation berms or PKCA; no change in total volume; discharge from PKCA to Lake C3, not Key or Lynne lakes.
Withdraw up to 306,600 m^3 annually from Carat Lake	Discharge to PKCA and thence to Stream C3 and Lake C3, then back to Carat Lake. Change in pattern of discharge; little change in total volume
Stream C3	Increase in summer discharge from PKCA
Unnamed, Key lakes	Potential decrease in runoff by <5% if diverted to PKCA
Borrow Areas, Airstrip, Exploration Camp	Drainage unaltered

TABLE 3.10 HISTORIC ANNUAL FREQUENCY OF FAILURE OF EARTH FILL DAMS					
Area	**Reference**	**Failures**	**Total Dam Years**	**Period (years)**	**Rate (dams/yr)**
United States	Gruner 1963, 1967	33	1,764	40	5×10^{-4}
	Babb and Mermell 1968	12	3,100	14	3×10^{-4}
	USCOLD 1975	74	4,914	23	7×10^{-4}
	Mark and Stuart-Alexander 1977	1	4,500		2×10^{-4}

Source: Geoinstitute of ASCE 1998.

TABLE 3.11
CALCULATED ANNUAL EXPLOSIVES USE

	Open Pit				Underground			Processing		
Year	1	2	3	4	5	6	7	8	9	**Total**
Date	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Tonnes:bcm (Ore)	2.60									
Tonnes:bcm (Waste)	2.65									
Tonnes:bcm (Ovbdn)	1.80									
Total Ore (mt)	44,784	873,400	1,487,100	1,010,700	50,000	330,000	233,600			**4,029,584**
Total Ore (bcm)	17,225	335,923	571,962	388,731	19,231	126,923	89,846			**1,549,840**
Total Waste (mt)	416,502	5,249,650	6,066,600	1,687,100	57,000	-	-			**13,476,852**
Total Waste (bcm)	157,171	1,981,000	2,289,283	636,642	21,509	-	-			**5,085,605**
Total Ovbdn (mt)	770,824	816,891	-	-	-	-	-			**1,587,715**
Total Ovbdn (bcm)	428,236	453,828	-	-	-	-	-			**882,064**
Total Material (mt)	**1,232,110**	**6,939,941**	**7,553,700**	**2,697,800**	**107,000**	**330,000**	**233,600**			**19,094,151**
Total Material (bcm)	**602,631**	**2,770,751**	**2,861,245**	**1,025,372**	**40,740**	**126,923**	**89,846**			**7,517,508**

Powder Factor-op (ore)	0.8	kg/bcm	Powder Factor-ug (ore)	0.54
Powder Factor-op (waste)	0.8	kg/bcm	Powder Factor-ug (wst)	0.54
Powder Factor (ovbdn)	0.33	kg/bcm		

	1	2	3	4	5	6	7	8	9	Total
Anfo Use (Ore) kg	13,780	268,738	457,569	310,985	10,385	68,538	48,517			**1,178,512**
Anfo Use (Waste) kg	125,736	1,584,800	1,831,426	509,313	30,780	-	-			**4,082,056**
Anfo Use (Ovbdn) kg	141,318	149,763	-	-	-	-	-			**291,081**
Total Anfo Use (kg)	**280,834**	**2,003,302**	**2,288,996**	**820,298**	**41,165**	**68,538**	**48,517**			**5,260,568**

NOTE:	op	open pit
	ug	underground
	wst	waste

TABLE 3.12
PREDICTED NITROGEN CONCENTRATION IN RUNOFF AT JERICHO
(mg/L)

LOW GRADE ORE STOCKPILE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nitrate												
2002 (0)	0	0	0	0	0.10	0.08	0.08	0.08	0.09	0.08	0	0
2003 (1)	0	0	0	0	0.86	0.76	0.75	0.74	0.79	0.68	0	0
2004 (2)	0	0	0	0	1.78	1.59	1.55	1.53	1.65	1.41	0	0
2005 (3)	0	0	0	0	3.36	3.00	2.94	2.89	3.11	2.68	0	0
2006 (4)	0	0	0	0	3.52	3.14	3.07	3.02	3.25	2.80	0	0
2007 (5)	0	0	0	0	3.52	3.14	3.07	3.02	3.25	2.80	0	0
2008 (6)	0	0	0	0	3.52	3.14	3.07	3.02	3.25	2.80	0	0
2009 (7)	0	0	0	0	3.52	3.14	3.07	3.02	3.25	2.80	0	0
2010 (8)	0	0	0	0	3.52	3.14	3.07	3.02	3.25	2.80	0	0
Nitrite												
2002 (0)	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0	0
2003 (1)	0	0	0	0	0.02	0.02	0.02	0.02	0.02	0.02	0	0
2004 (2)	0	0	0	0	0.05	0.04	0.04	0.04	0.05	0.04	0	0
2005 (3)	0	0	0	0	0.09	0.08	0.08	0.08	0.09	0.07	0	0
2006 (4)	0	0	0	0	0.10	0.09	0.08	0.08	0.09	0.08	0	0
2007 (5)	0	0	0	0	0.10	0.09	0.08	0.08	0.09	0.08	0	0
2008 (6)	0	0	0	0	0.10	0.09	0.08	0.08	0.09	0.08	0	0
2009 (7)	0	0	0	0	0.10	0.09	0.08	0.08	0.09	0.08	0	0
2010 (8)	0	0	0	0	0.10	0.09	0.08	0.08	0.09	0.08	0	0
Ammonia												
2002 (0)	0	0	0	0	0.03	0.03	0.03	0.03	0.03	0.03	0	0
2003 (1)	0	0	0	0	0.29	0.26	0.26	0.25	0.27	0.23	0	0
2004 (2)	0	0	0	0	0.61	0.54	0.53	0.52	0.56	0.48	0	0
2005 (3)	0	0	0	0	1.15	1.03	1.01	0.99	1.07	0.92	0	0
2006 (4)	0	0	0	0	1.20	1.07	1.05	1.04	1.11	0.96	0	0
2007 (5)	0	0	0	0	1.20	1.07	1.05	1.04	1.11	0.96	0	0
2008 (6)	0	0	0	0	1.20	1.07	1.05	1.04	1.11	0.96	0	0
2009 (7)	0	0	0	0	1.20	1.07	1.05	1.04	1.11	0.96	0	0
2010 (8)	0	0	0	0	1.20	1.07	1.05	1.04	1.11	0.96	0	0

OVERBURDEN STOCKPILE

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Nitrate												
2002 (0)	0	0	0	0	2.033	1.814	1.775	1.749	1.881	1.617	0	0
2003 (1)	0	0	0	0	3.704	3.306	3.234	3.187	3.428	2.947	0	0
2004 (2)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2005 (3)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2006 (4)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2007 (5)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2008 (6)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2009 (7)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
2010 (8)	0	0	0	0	4.187	3.736	3.655	3.602	3.875	3.331	0	0
Nitrite												
2002 (0)	0	0	0	0	0.056	0.05	0.049	0.048	0.052	0.044	0	0
2003 (1)	0	0	0	0	0.101	0.091	0.089	0.087	0.094	0.081	0	0
2004 (2)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2005 (3)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2006 (4)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2007 (5)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2008 (6)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2009 (7)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
2010 (8)	0	0	0	0	0.115	0.102	0.1	0.099	0.106	0.091	0	0
Ammonia												
2002 (0)	0	0	0	0	0.70	0.62	0.61	0.60	0.64	0.55	0	0
2003 (1)	0	0	0	0	1.27	1.13	1.11	1.09	1.17	1.01	0	0
2004 (2)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2005 (3)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2006 (4)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2007 (5)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2008 (6)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2009 (7)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0
2010 (8)	0	0	0	0	1.43	1.28	1.25	1.23	1.33	1.14	0	0

TABLE 3.12
PREDICTED NITROGEN CONCENTRATION IN RUNOFF AT JERICHO
(mg/L)

CENTRAL LOBE STOCKPILE												
Nitrate												
2002 (0)	0	0	0	0	1.118	0.998	0.976	0.962	1.035	0.89	0	0
2003 (1)	0	0	0	0	0.46	0.411	0.402	0.396	0.426	0.366	0	0
2004 (2)	0	0	0	0	0.75	0.669	0.655	0.645	0.694	0.597	0	0
2005 (3)	0	0	0	0	0.802	0.716	0.701	0.69	0.743	0.638	0	0
2006 (4)	0	0	0	0	1.341	1.196	1.171	1.154	1.241	1.067	0	0
2007 (5)	0	0	0	0	0.827	0.738	0.722	0.712	0.766	0.658	0	0
2008 (6)	0	0	0	0	0.779	0.695	0.68	0.67	0.721	0.62	0	0
2009 (7)	0	0	0	0	7E-04	6E-04	6E-04	6E-04	6E-04	6E-04	0	0
2010 (8)	0	0	0	0	7E-04	6E-04	6E-04	6E-04	6E-04	6E-04	0	0
Nitrite												
2002 (0)	0	0	0	0	0.031	0.027	0.027	0.026	0.028	0.024	0	0
2003 (1)	0	0	0	0	0.013	0.011	0.011	0.011	0.012	0.01	0	0
2004 (2)	0	0	0	0	0.021	0.018	0.018	0.018	0.019	0.016	0	0
2005 (3)	0	0	0	0	0.022	0.02	0.019	0.019	0.02	0.017	0	0
2006 (4)	0	0	0	0	0.037	0.033	0.032	0.032	0.034	0.029	0	0
2007 (5)	0	0	0	0	0.023	0.02	0.02	0.02	0.021	0.018	0	0
2008 (6)	0	0	0	0	0.021	0.019	0.019	0.018	0.02	0.017	0	0
2009 (7)	0	0	0	0	2E-05	2E-05	2E-05	2E-05	2E-05	2E-05	0	0
2010 (8)	0	0	0	0	2E-05	2E-05	2E-05	2E-05	2E-05	2E-05	0	0
Ammonia												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.971	0.867	0.848	0.836	0.899	0.773	0	0
2004 (2)	0	0	0	0	2.997	2.675	2.617	2.579	2.774	2.385	0	0
2005 (3)	0	0	0	0	2.144	1.913	1.872	1.845	1.984	1.706	0	0
2006 (4)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2007 (5)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2008 (6)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2009 (7)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2010 (8)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0

OPEN PIT											
Nitrate											
0	0	0	0	1.118	1.00	0.98	0.96	1.04	0.89	0	0
0	0	0	0	0.46	0.41	0.40	0.40	0.43	0.37	0	0
0	0	0	0	0.75	0.67	0.65	0.65	0.69	0.60	0	0
0	0	0	0	0.802	0.716	0.701	0.69	0.743	0.638	0	0
0	0	0	0	1.341	1	1	1	1	1	0	0
0	0	0	0	0.827	1	1	1	1	1	0	0
0	0	0	0	0.779	1	1	1	1	1	0	0
0	0	0	0	7E-04	0	0	0	0	0	0	0
0	0	0	0	7E-04	0	0	0	0	0	0	0
Nitrite											
0	0	0	0	0.031	0.027	0.027	0.026	0.028	0.024	0	0
0	0	0	0	0.013	0.011	0.011	0.011	0.012	0.01	0	0
0	0	0	0	0.021	0.018	0.018	0.018	0.019	0.016	0	0
0	0	0	0	0.022	0.02	0.019	0.019	0.02	0.017	0	0
0	0	0	0	0.037	0.033	0.032	0.032	0.034	0.029	0	0
0	0	0	0	0.023	0.02	0.02	0.02	0.021	0.018	0	0
0	0	0	0	0.021	0.019	0.019	0.018	0.02	0.017	0	0
0	0	0	0	2E-05	2E-05	2E-05	2E-05	2E-05	2E-05	0	0
0	0	0	0	2E-05	2E-05	2E-05	2E-05	2E-05	2E-05	0	0
Ammonia											
0	0	0	0	0.383	0.342	0.334	0.33	0.354	0.305	0	0
0	0	0	0	0.158	0.141	0.138	0.136	0.146	0.125	0	0
0	0	0	0	0.257	0.229	0.224	0.221	0.238	0.204	0	0
0	0	0	0	0.275	0.245	0.24	0.236	0.254	0.219	0	0
0	0	0	0	0.459	0.41	0.401	0.395	0.425	0.365	0	0
0	0	0	0	0.283	0.253	0.247	0.244	0.262	0.225	0	0
0	0	0	0	0.267	0.238	0.233	0.23	0.247	0.212	0	0
0	0	0	0	2E-04	2E-04	2E-04	2E-04	2E-04	2E-04	0	0
0	0	0	0	2E-04	2E-04	2E-04	2E-04	2E-04	2E-04	0	0

TABLE 3.12
PREDICTED NITROGEN CONCENTRATION IN RUNOFF AT JERICHO
(mg/L)

WASTE DUMP 1												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Nitrate												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	2.836	2.531	2.476	2.44	2.625	2.256	0	0
2004 (2)	0	0	0	0	8.752	7.811	7.642	7.531	8.101	6.964	0	0
2005 (3)	0	0	0	0	6.26	5.587	5.466	5.387	5.794	4.981	0	0
2006 (4)	0	0	0	0	13.13	11.72	11.47	11.3	12.16	10.45	0	0
2007 (5)	0	0	0	0	13.13	11.72	11.47	11.3	12.16	10.45	0	0
2008 (6)	0	0	0	0	13.13	11.72	11.47	11.3	12.16	10.45	0	0
2009 (7)	0	0	0	0	13.13	11.72	11.47	11.3	12.16	10.45	0	0
2010 (8)	0	0	0	0	13.13	11.72	11.47	11.3	12.16	10.45	0	0
Nitrite												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.078	0.069	0.068	0.067	0.072	0.062	0	0
2004 (2)	0	0	0	0	0.24	0.214	0.209	0.206	0.222	0.191	0	0
2005 (3)	0	0	0	0	0.172	0.153	0.15	0.148	0.159	0.136	0	0
2006 (4)	0	0	0	0	0.36	0.321	0.314	0.31	0.333	0.286	0	0
2007 (5)	0	0	0	0	0.36	0.321	0.314	0.31	0.333	0.286	0	0
2008 (6)	0	0	0	0	0.36	0.321	0.314	0.31	0.333	0.286	0	0
2009 (7)	0	0	0	0	0.36	0.321	0.314	0.31	0.333	0.286	0	0
2010 (8)	0	0	0	0	0.36	0.321	0.314	0.31	0.333	0.286	0	0
Ammonia												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.971	0.867	0.848	0.836	0.899	0.773	0	0
2004 (2)	0	0	0	0	2.997	2.675	2.617	2.579	2.774	2.385	0	0
2005 (3)	0	0	0	0	2.144	1.913	1.872	1.845	1.984	1.706	0	0
2006 (4)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2007 (5)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2008 (6)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2009 (7)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0
2010 (8)	0	0	0	0	4.498	4.014	3.927	3.87	4.163	3.579	0	0

NORTH LOBE ORE STOCKPILE												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Nitrate												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.114	0.101	0.099	0.098	0.105	0.09	0	0
2004 (2)	0	0	0	0	2.046	1.826	1.786	1.76	1.894	1.628	0	0
2005 (3)	0	0	0	0	3.442	3.072	3.005	2.962	3.186	2.739	0	0
2006 (4)	0	0	0	0	3.442	3.072	3.005	2.962	3.186	2.739	0	0
2007 (5)	0	0	0	0	3.442	3.072	3.005	2.962	3.186	2.739	0	0
2008 (6)	0	0	0	0	3.442	3.072	3.005	2.962	3.186	2.739	0	0
2009 (7)	0	0	0	0	2.168	1.935	1.893	1.865	2.006	1.725	0	0
2010 (8)	0	0	0	0	0.083	0.074	0.072	0.071	0.077	0.066	0	0
Nitrite												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.003	0.003	0.003	0.003	0.003	0.002	0	0
2004 (2)	0	0	0	0	0.056	0.05	0.049	0.048	0.052	0.045	0	0
2005 (3)	0	0	0	0	0.094	0.084	0.082	0.081	0.087	0.075	0	0
2006 (4)	0	0	0	0	0.094	0.084	0.082	0.081	0.087	0.075	0	0
2007 (5)	0	0	0	0	0.094	0.084	0.082	0.081	0.087	0.075	0	0
2008 (6)	0	0	0	0	0.094	0.084	0.082	0.081	0.087	0.075	0	0
2009 (7)	0	0	0	0	0.059	0.053	0.052	0.051	0.055	0.047	0	0
2010 (8)	0	0	0	0	0.002	0.002	0.002	0.002	0.002	0.002	0	0
Ammonia												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.039	0.035	0.034	0.033	0.036	0.031	0	0
2004 (2)	0	0	0	0	0.701	0.625	0.612	0.603	0.648	0.557	0	0
2005 (3)	0	0	0	0	1.179	1.052	1.029	1.014	1.091	0.938	0	0
2006 (4)	0	0	0	0	1.179	1.052	1.029	1.014	1.091	0.938	0	0
2007 (5)	0	0	0	0	1.179	1.052	1.029	1.014	1.091	0.938	0	0
2008 (6)	0	0	0	0	1.179	1.052	1.029	1.014	1.091	0.938	0	0
2009 (7)	0	0	0	0	0.742	0.663	0.648	0.639	0.687	0.591	0	0
2010 (8)	0	0	0	0	0.028	0.025	0.025	0.024	0.026	0.023	0	0

TABLE 3.12
PREDICTED NITROGEN CONCENTRATION IN RUNOFF AT JERICHO
(mg/L)

WASTE DUMP 2												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Nitrate												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0	0	0	0	0	0	0	0
2004 (2)	0	0	0	0	0	0	0	0	0	0	0	0
2005 (3)	0	0	0	0	0.605	0.54	0.528	0.521	0.56	0.482	0	0
2006 (4)	0	0	0	0	1.861	1.661	1.625	1.602	1.723	1.481	0	0
2007 (5)	0	0	0	0	1.861	1.661	1.625	1.602	1.723	1.481	0	0
2008 (6)	0	0	0	0	1.861	1.661	1.625	1.602	1.723	1.481	0	0
2009 (7)	0	0	0	0	1.861	1.661	1.625	1.602	1.723	1.481	0	0
2010 (8)	0	0	0	0	1.861	1.661	1.625	1.602	1.723	1.481	0	0
Nitrite												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0.017	0.015	0.014	0.014	0.015	0.013	0	0
2004 (2)	0	0	0	0	0.051	0.046	0.045	0.044	0.047	0.041	0	0
2005 (3)	0	0	0	0	0.051	0.046	0.045	0.044	0.047	0.041	0	0
2006 (4)	0	0	0	0	0.051	0.046	0.045	0.044	0.047	0.041	0	0
2007 (5)	0	0	0	0	0.051	0.046	0.045	0.044	0.047	0.041	0	0
2008 (6)	0	0	0	0	0.051	0.046	0.045	0.044	0.047	0.041	0	0
2009 (7)	0	0	0	0	0	0	0	0	0	0	0	0
2010 (8)	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia												
2002 (0)	0	0	0	0	0	0	0	0	0	0	0	0
2003 (1)	0	0	0	0	0	0	0	0	0	0	0	0
2004 (2)	0	0	0	0	0	0	0	0	0	0	0	0
2005 (3)	0	0	0	0	0.207	0.185	0.181	0.178	0.192	0.165	0	0
2006 (4)	0	0	0	0	0.637	0.569	0.557	0.548	0.59	0.507	0	0
2007 (5)	0	0	0	0	0.637	0.569	0.557	0.548	0.59	0.507	0	0
2008 (6)	0	0	0	0	0.637	0.569	0.557	0.548	0.59	0.507	0	0
2009 (7)	0	0	0	0	0.637	0.569	0.557	0.548	0.59	0.507	0	0
2010 (8)	0	0	0	0	0.637	0.569	0.557	0.548	0.59	0.507	0	0

TABLE 3.13
NITROGEN LOADING FROM EXPLOSIVES USE

	OPEN PIT				UNDERGROUND		PROCESSING ORE		
Date	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
N Loss from LG Stockpile (kg)	2	21	43	81	84	84	84	84	84
N Loss from N Ore Stockpile (kg)	-	1	15	25	25	25	25	16	1
N Loss from Waste - Dump 1 (kg)[a]	-	140	434	310	651	651	651	651	651
N Loss from Waste - Dump 2 (kg)	-	-	-	28	87	87	87	87	87
N Loss from Overburden Stockpile	47	85	96	96	96	96	96	96	96
N Loss from Pit (kg)	31	198	546	798	852	861	872	873	873
N Loss from C Ore Stockpile (kg)[b]	8	3	5	6	10	6	6	0	0
N Loss from fine PK[c] (kg)	13	122	112	104	104	104	104	111	70
N Loss from coarse PK[c] (kg)	-	22	18	16	16	16	16	18	14
N Load to PKCA[c] (kg)	13	145	145	145	145	145	145	145	85
Total N Loss (kg)	**114**	**738**	**1,414**	**1,610**	**2,070**	**2,075**	**2,086**	**2,081**	**1,960**
Total N Loss to Carat Lake (kg)	**88**	**447**	**1,124**	**1,319**	**1,779**	**1,784**	**1,795**	**1,791**	**1,791**
Total N Loss to PKCA (kg)	**13**	**145**	**145**	**145**	**145**	**145**	**145**	**145**	**85**

Assumes 0.1% loss of available N per year apportioned by weight of material to each facility. No loss from N ore stockpile Years 7 and 8.
Note: All waste rock generated in Year 0 (construction year) will be crushed and used as fill at the site for roads, dams, berms, pads. N loss will therefore be spread over the entire site.
Note: Waste rock dumps assumed not to have permafrost cores throughout mine life.
Note: Loss of N in PK assumed to be 0.5% of explosives used.

[a] All waste rock will be used for construction in 2002 (Year 0)

[b] Amount stored minus amount processed; stored ore leachate to Lake C1; N from PK to PKCA and Lake C3.

[c] All potential N available in ore assumed leached in process; amount to coarse kimberlite proportional to surface moisture volume.

[d] Assumes make up water = water lost; nitrogen lost proportional to water reporting to coarse and fines.

TABLE 3.14
JERICHO PK EFFLUENT QUALITY

Parameter	Conc	CCME	Health Canada	MMLER
	(mg/L)			
Total Dissolved Solids	1155		500	
Hardness (CaCO3)	654			
pH	8.84			>5 (>6)
Total Suspended Solids (supernatant)	8	<10mg/L increase		50 (25)
Turbidity (NTU)	5.2			
Conductivity (uS/cm)	1424			
Alkalinity (CaCO3)	39			
Chloride	510		250	
Fluoride	0.35		1.5	
Sulphate	16		500	
Ammonia N	17.3	2		
Dissolved Metals				
Aluminum	0.048	0.1		
Barium	0.75		1	
Calcium	146			
Copper	0.002	0.002	1	0.6 (0.3)
Magnesium	70			
Manganese	0.0028		0.05	
Molybdenum	0.0066			
Nickel	0.025	0.025		1.0 (0.5)
Potassium	34			
Silicon	2.79			
Sodium	33		200	
Strontium	5.26			
Zinc	0.021	0.03		1(0.5)

CCME Canadian Council of Ministers of the Environment
Health Canada Drinking water guidelines
MMLER Metal Mine Liquid Effluent Regulation (of the *Fisheries Act*)

TABLE 3.15
STATIONARY AND MOBILE EMISSION SOURCES AT THE JERICHO MINE SITE

Stationary	Mobile
2 Plant diesel generators	6 Cat 777 ore trucks
2 Shop diesel generators	1 D10 dozer
1 Camp diesel generator	1 D9 dozer
1 Ore dryer	1 D6 dozer
	1 Cat 992 loader
	1 Cat 5130 shovel
	1 Cat 996 loader
	2 Service trucks
	5 Pick up trucks

TABLE 3.16 CANADIAN AIR QUALITY OBJECTIVES (mg/m^3)				
Contaminant	Averaging Period	Maximum Desirable	Maximum Acceptable	Maximum Tolerable
NO_2	1-hour 24-hour annual	- - 60	400 200 100	1000 300 -
PM_{10}	24-hour*		50	
Total Suspended Particulate	24-hour annual	- -	120 70	400 -
SO_2	1-hour 24-hour annual	450 150 30	900 300 60	- 800 -

* There is currently no Canadian standard for PM_{10} and hence the British Columbia standard is given.

TABLE 3.17 EMISSION INVENTORY FOR MOBILE AND STATIONARY SOURCES				
Source Type	NO_X	SO_2	CO	CO_2
Mobile (kg/day)	1,003	136	1,240	76,734
Mobile (tonnes/year)	276	37	341	21,102
Stationary (kg/day)	716	489	297	75,289
Stationary (tonnes/year)	261	179	108	27,480
Total (tonnes/year)	537	216	450	48,582

TABLE 3.18 HAZARDOUS SUBSTANCES INVENTORY - JERICHO MINE SITE			
Substance	**Estimates of On Hand Quantities**	**Risk of Spill**	**Comments**
Diesel	10 million litres	low	In fuel farm with containment berm
Ammonium Nitrate	2300 tonnes	low	Powder, 1 t bags, no proximity to water
High Explosives (Magnafrac™)	26 tonnes	low	Stick powder in boxes in a magazine
Blasting caps	To be determined	low	In boxes in a magazine
Hydraulic Oil	6 - 205 L barrels	low	Stored in covered warehouse in silled area
Motor Oil	5 - 205 L barrels	low	In mine shop in a silled area or outside the mine shop
Jet Fuel	24 - 205 L barrels	low	Stored at airstrip, no proximity to water
Gasoline	up to 10,000 litres	low	In fuel farm with containment berm
Varsol	205 L	low	In mine shop in silled area
Petroleum grease	50 - 20 L pails	nil	In mine shop or cold storage containers
Transmission Oil	6 - 205 litre barrels	low	In mine shop in silled area
Sulphuric acid (battery acid)	small quantities	low	In mine shop in silled area
Ethylene glycol (heating system)	not applicable	very low	In pipes in heating system
Ferrosilicon	120 t, non-hazardous		
Hydrofluoric acid	small quantities	low	In fume cupboard in plant
Hydrochloric acid	small quantities	low	In fume cupboard in plant
Acetone	small quantities	low	In fume cupboard in plant
Flocculent - Percol E-10, or equiv.	2 t, non-hazardous	low	In plant controlled drainage area
Slaked lime	to 10 t	low	Powder in bags on pallets and in container for use in controlled drainage area of plant
Floor Dry	small quantities	nil	In the accommodation complex and mine shop

TABLE 3.19

APPROXIMATE AREAS OF SURFACE DISTURBANCE BY ECOLOGICAL ZONE[1]

Component	Ecological Zones and Areas Affected (ha)[2]							
	WGBM	MBM	DBT	DRT	LK	CRH	EKD	Total
Mine								
Open Pit	2.7		3.7	3.7				10
Waste Rock Dumps	17.5		22	13				52.5
Overburden Stockpile		5.07	3	4.2				12.3
Low Grade Ore Stockpile		5.3	2.7	5.07				13.1
Coarse Kimberlite Stockpile	1.85		5.95	6.7	2.14			16.6
Roads								
Haul (22 m width)	0.7	0.4	0.9	0.9			1.1	4
Access (13 m width)	1.4		3.2	4.7		1.1		10.4
Airport (10 m width)							1.5	1.5
Airstrip							2.4	2.4
Plant-Related + Ore Stockpiles				22.7				22.7
PKCA	2.07	0.9	9.6	10.9	11	0.14		34.6
Expl Camp, Truck Wash, Explosives		0.3	0.2	2			3	5.5
Sediment Collection Ponds	0.5	0.6		1.1				2.2
Borrow Areas							34	34
Subtotal Disturbance	**26.72**	**12.57**	**51.25**	**74.97**	**13.14**	**1.24**	**42**	**221.8**
% of Total	**12.05%**	**5.67%**	**23.11%**	**33.80%**	**5.92%**	**0.56%**	**18.94%**	**100%**

Notes

[1] Based on maximum areal extent of surface disturbance

[2] WGBM = Wet grass/birch meadow, MBM = Moist birch meadow, DBT = Dry barrenground tundra DRT = Dry rocky tundra, LK = Lake, CRH = Cliffs/rocky hills, EKD = Cliffs/rocky hills, Kame deltas

TABLE 3.20. SUMMARY: ENVIRONMENTAL EFFECTS FROM JERICHO DIAMOND PROJECT ON WILDLIFE POPULATIONS

VEC \ Activity	Site development	Mining Apr - Dec	Winter road transport Jan - Apr	Air transport year round	Processing year round
Habitat cum. effects	local /long term nil	minor nil	minor nil	minor nil	nil nil
Raptors Cum. effects	minor nil	minor nil	minor nil	minor nil	nil nil
Mig. birds Cum. effects	minor nil	minor nil	minor nil	minor nil	nil nil
Small mammals Cum. effects	minor nil	minor nil	minor nil	minor nil	nil nil
Muskox cum. effects	minor nil	minor nil	minor nil	minor nil	nil nil
Caribou Cum. effects	minor minor	minor minor	minor minor	minor minor	minor minor
Carnivores Cum. effects	minor nil	minor nil	minor nil	minor nil	minor nil

TABLE 3.21 MEASURABLE REGIONAL CUMULATIVE EFFECTS POTENTIAL									
Effect	**Izok Lk**	**Ulu**	**Hope Bay**	**Snap Lk**	**George Lk**	**Lupin**	**Ekati**	**Diavik**	**Bathurst Contwoyto Road**
Air Quality[1]	No	No	No	No	No	No	No	No	Yes
Water Quality[2]	No	No	No	No	No	Unlikely	No	No	No
Hydrology[3]	No	No	No	No	No	No	No	No	No
Permafrost[4]	No	No	No	No	No	No	No	No	No
Wildlife Habitat[5]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Aquatic Habitat[6]	No	No	No	No	No	Yes	No	No	No
Wildlife[7]	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Fish/Aquatic Organisms[6]	No	No	No	No	No	Yes	No	No	No
Heritage Resources[8]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1 Excepting green house gases, principally CO_2. Cumulative contribution from all projects would be a small fraction of that of Nunavut and NWT communities.

2 All except Lupin are in entirely separate drainage systems.

3 See water quality note; Lupin's withdrawal of water from Contwoyto Lake would be unmeasurable at the Burnside River where the Jericho site drainage joins the system.

4 By its nature not subject to regional effects from mining.

5 For all sites except Lupin only applies to the Bathurst caribou herd. While the local disturbance of caribou habitat is measurable at each site, the cumulate total is a very small fraction of the total area occupied by the herd and is thus not significant.

6 Since Lupin and Jericho are in the Burnside River basin, effects on aquatic habitat are measurable for the basin, but are not significant given the very small area of disturbance compared to the total area of the drainage basin.

7 For all sites except Lupin only applies to the Bathurst caribou herd. Diavik and Ekati have shown that local effects on caribou could occur because of the presence of the proposed and existing, respectively, mine. Assuming the other projects listed would have a lesser effect than the two large diamond mines (because the projects are smaller), measurable effects could not be expected to extend beyond the local area and thus no measurable cumulative effects would occur.

8 Assumes all heritage resources in Nunavut and NWT can be viewed collectively.

TABLE 3.22 SITE AQUATIC HABITAT CUMULATIVE EFFECTS		
Project Facility/Activity	**Habitat Alternation/Loss**	**Significance After Mitigation**
Water Intake Causeway	1,400 m^2 of Carat Lake bottom covered	Moderate
Stream C1 Diversion	541 m length of Stream C1 diverted	Neutral to positive impact
Long Lake PKCA	Loss of 9 ha of lake habitat	Major for the lake; moderate for the Project area
Interruption of Stream C3 flow during/post construction	Entire stream affected	Major for the stream which is used opportunistically by fish
Increase flows in Stream C3	Entire stream affected	Neutral to positive impact
Sedimentation covering habitat	Carat Lake, Lakes C1, C3, Streams C1, C3	Negligible

TABLE 3.23 SITE CUMULATIVE AQUATIC EFFECTS		
Effect	**Water Bodies Affected**	**Significance of Effect After Mitigation**
Sedimentation	Carat Lake, Lake C1, Stream C1, Stream C3	Minor
Metals Leaching	Carat Lake, Lake C1, Stream C1, Stream C3, Lake C3	Negligible to Minor
Ammonia Leaching	Carat Lake, Lake C1, Stream C1, Stream C3	Minor
Ammonia Leaching	Lake C3	Negligible
Nitrate Leaching	Carat Lake	Moderate
Nitrate Leaching	Lake C1, Stream C1, Stream C3	Minor
Nitrate Leaching	Lake C3	Negligible
Phosphate Leaching	Stream C3, Lake C3	Negligible
Petroleum Leaching	Carat Lake, Lake C1, Stream C1, Stream C3	Negligible
Water Withdrawal	Carat Lake	Minor
Water Addition	Lake C3	Minor

TABLE 3.24
PERMANENTLY DISTURBED AREAS

Mine Unit	Area (m^2)
Open Pit	100,700
Dump #1	217,000
Dump #2	210,900
Coarse Kimberlite	91,600
Low Grade Ore	108,000
TOTAL	**728,200**

TABLE 3.25 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS ON FISH FROM JERICHO PROJECT CONSTRUCTION AND OPERATION											
		Evaluation Criteria for Assessing Significance								**Certainty**	
Residual Effect	**Project Phase**	**Magnitude**	**Geographic Extent**	**Duration**	**Frequency**	**Reversibility**	**Ecological Context**	**Residual Environmental Effects**	**Level of Confidence**	**Qualitative**	**Quantitative**
Explosives Use in the Mine Pit											
Damage to Fish Eggs	Construction	H	L	L	H	R	L	NS	H	H	L
	Operation	H	L	M	H	R	L	NS	H	H	L
	Overall							NS	H	H	L
Construction and Operation of C1 Stream Diversion											
Direct Mortality of Fish Eggs	Construction	H	L	L	M	R	H	NS	M	L	L
	Operation	M	L	L	L	R	H	NS	M	L	L
	Closure	M	L	L	L	R	H	NS	M	L	L
	Post-Closure							NS	M	L	L
	Overall							NS	M	L	L
Loss of Habitat	Construction	H	L	L	M	R	H	NS	M	L	L
	Operation	M	L	L	L	R	L	NS	M	L	L
	Closure	M	L	L	L	R	L	NS	M	L	L
	Post-Closure							NS	M	L	L
	Overall							NS	M	L	L
Reduced Invertebrate Production	Construction	H	L	L	M	R	H	NS	M	L	L
	Operation	M	L	L	L	R	L	NS	M	L	L
	Closure	M	L	L	L	R	L	NS	M	L	L
	Post-Closure							NS	M	L	L
	Overall							NS	M	L	L
Processed Kimberlite Containment Area Footprint											
Loss of fish Habitat	Construction	H	M	H	H	NR	H	S	H	H	L
	Operation	H	M	H	H	NR	H	S	H	H	L
	Closure	H	M	H	H	NR	H	S	H	H	L
	Post-Closure	H	M	H	H	NR	H	S	H	H	L
	Overall	H	M	H	H	NR	H	S	H	H	L
Direct Mortality of Fish	Construction	H	M	H	H	NR	H	S	H	H	L
	Operation	H	M	H	H	NR	H	S	H	H	L
	Closure	H	M	H	H	NR	H	S	H	H	L
	Post-Closure	H	M	H	H	NR	H	S	H	H	L
	Overall	H	M	H	H	NR	H	S	H	H	L

Residual Effect	Project Phase	Evaluation Criteria for Assessing Significance: Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological Context	Residual Environmental Effects	Level of Confidence	Certainty: Qualitative	Quantitative
Discharge from the Processed Kimberlite Containment Area											
Habitat Loss to Stream C3	Construction	H	L	H	H	R	L	NS	H	H	L
	Operation	L	L	L	L	R	L	NS	H	H	L
	Closure	H	L	H	H	NR	L	NS	H	H	L
	Post-Closure	H	H	H	H	NR	L	NS	H	H	L
	Overall							NS	H	H	L
Water Intake Causeway											
Loss of Rearing Habitat	Construction	L	L	H	H	NR	H	NS	H	H	H
	Operation	L	L	H	H	NR	H	NS	H	H	H
	Closure	L	L	H	H	NR	H	NS	H	H	H
	Post-Closure	L	L	H	H	NR	H	NS	H	H	H
	Overall	L	L	H	H	NR	H	NS	H	H	H
Loss of Spawning Habitat	Construction	L	L	H	H	NR	H	NS	H	H	H
	Operation	L	L	H	H	NR	H	NS	H	H	H
	Closure	L	L	H	H	NR	H	NS	H	H	H
	Post-Closure	L	L	H	H	NR	H	NS	H	H	H
	Overall	L	L	H	H	NR	H	NS	H	H	H

H High
M Moderate
L Low

R Reversible
NR Non-reversible

S Significant
NS Not significant

TABLE 4.1 SUMMARY OF CONSTRUCTION AND OPERATIONS WORK FORCE BY YEAR																		
Phase	**Year 1**		**Year 2**		**Year 3**		**Year 4**		**Year 5**		**Year 6**		**Year 7**		**Year 8**		**Year 9**	
	#	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**	**#**	**PY**
Open Pit	90	45	106	79.5	116	87	60	45	0	0	0	0	0	0	0	0	0	0
Underground	0	0	0	0	0	0	0	0	48	24	48	48	48	36	0	0	0	0
Plant	40	10	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Catering	16	16	16	16	16	16	16	16	16	16	16	16	16	16	10	10	10	10
Admin	3	1.5	3	1.5	3	1.5	3	1.5	3	1.5	3	1.5	3	1.5	3	1.5	3	1.5

NOTES:

#	Number of people
PY	Person year

TABLE 4.2 SUMMARY OF SOCIO -ECONOMIC EFFECTS				
Effect	**Direction**	**Kitikmeot Significance**	**Mitigation Success**	**Residual Significance**
Employment	Positive	Major	n/a	Major
Contract Opportunities	Positive	Moderate	n/a	Moderate
Job Training	Positive	Moderate	n/a	Moderate
Community Infrastructure	Neutral	Negligible	n/a	Negligible
Community Wellness	Positive & Negative	Minor	Moderate	Minor
Family Stress	Negative	Minor	Moderate	Minor
On-the-Job Tension	Negative	Minor	Major	Negligible to Minor
Current Employers	Negative	Minor	None	Minor
Temporary Closure	Negative	Major	Minor - Moderate	Moderate
Permanent Closure	Negative	Major	Minor - Moderate	Moderate
Kitikmeot Economy	Positive	Minor	n/a	Minor
Cumulative Effects	Positive & Negative	Negligible to Minor	Moderate	Negligible to Minor

TABLE 4.3 AVERAGE ANNUAL HARVEST PER COMMUNITY (1983-1989)	
As Food Sources	
caribou	1,340
muskox (not listed in the database)	
geese	620
ducks	280
ptarmigan	310
lake trout	1,490
land-locked Arctic char[1]	90
As Sources of Cash	
wolf	50
wolverine	20
fox (all)	60

1 Sea-run char are the most important source of fish food exceeding lake trout by at least a factor of two but do not occur in the Jericho area.

TABLE 4.4 WKSS REPORT APPLICABILLITY TO TRADITIONAL KNOWLEDGE PERTINENT TO THE JERICHO PROJECT			
Author	**Date**	**Title**	**Comments**
Traditional Knowledge			
Habitat			
Lutsel K'e Dene First Nation	2001	Traditional Ecological Knowledge in the Kaché Tué Study Region	Not applicable to the Jericho study area
Dogrib Treaty 11 Council	2001	Habitat of Dogrib Traditional Territory: Placenames as Indicators of Biogeographical Knowledge	Not applicable to the Jericho study area
Caribou			
Dogrib Treaty 11 Council	2001	Caribou Migration and the State of Their Habitat	Relevant traditional knowledge
N.L. Thorpe, N. Hakongak, S. Eyegetok and Qitirmiut [Kitikmeot] Elders	2001	Tuktu and Nogak Project. A Caribou Chronicle	Relevant traditional knowledge
Scientific Research			
Terrestrial			
J. Sparling	1997	Airborne Dust Level Baseline Monitoring Project	No traditional knowledge component
S. Matthews and H. Epp	2001	Vegetation Classification for the West Kitikmeot/Slave Study Region	No traditional knowledge component
S. Traynor	2001	Esker Habitat Characteristics and Traditional Use Study in the Slave Geological Province	Traditional knowledge regarding esker use by Inuit; no site-specific data for Jericho
A. Gunn	1997	Caribou Migration Patterns and the State of Their Habitat	No traditional knowledge component
A. Gunn	1998	Seasonal Movements of the Bathurst Caribou Herd. 1997 Annual Report	No traditional knowledge component
A. Gunn, M. Svoboda and J. Dragon	1998	Effect of Gravel Road- and Tailing Pond Dust on Tundra Plant Communities Near Lupin Mine, NWT	No traditional knowledge component
A. Gunn, J. Dragon, S. Papik, D. Panayi, M. Svoboda, M. Sutherland, M. D'Entremont	1998	Summer Behaviour of Bathurst Caribou at Mine Sites and Response of Caribou to Fencing and Plastic Deflector (July 1997)	Test of traditional caribou deflection fence may have applicability to the Jericho Project
B. Griffith, A. Gunn, D. Russell, J. Johnstone, K. Kielland, S. Wolfe and D.C. Douglas	2001	Bathurst Caribou Calving Ground Studies: Influence of Nutrition and Human Activity on Calving Ground Location	Not applicable to the Jericho study area
A. Gunn and J. Dragon	2001	Prevalence and Intensity of Gastro-intestinal Nematode Parasitism in the Bathurst Caribou Herd 1998 – 99	No traditional knowledge component

TABLE 4.4
WKSS REPORT APPLICABILLITY TO TRADITIONAL KNOWLEDGE PERTINENT TO THE JERICHO PROJECT

Author	Date	Title	Comments
P. McLoughlin, F. Messier, R.L. Case, R.J. Gau, R. Mulders and H.D. Cluff	1999	The Spatial Organization and Habitat Selection Patterns of Barren-Ground Grizzly Bears (*Ursus arctos*) in the Northwest Territories and Nunavut: Final Report to the West Kitikmeot/Slave Study Society	No traditional knowledge component
R.J. Gau and R. Case	2001	Grizzly Bear (*Ursus arctos*) Studies in the Northwest Territories: Final Report to the West Kitikmeot/Slave Study Component No. 1, Nutritional Ecology	No traditional knowledge component
H.D. Cluff, L.R. Walton and P.C. Paquet	2002	Esker Habitat Studies in the Slave Geological Province. Movements and Habitat Use of Wolves Denning in the Central Arctic, Northwest Territories and Nunavut, Canada	No traditional knowledge component
R. Mulders	2000	Wolverine Ecology, Distribution and Productivity in the Slave Geological Province	No traditional knowledge component
Aquatic			
A. Wilson	1997 – 2000	Investigation of Aquatic Impacts of On-Ice Exploratory Diamond Drilling. Annual Reports for 1997 to 2000.	No traditional knowledge components
G. Stephens	1999	Results from Sediment Cores Collected from an Arctic Tundra Lake, Northwest Territories	No traditional knowledge component

Relevant studies are discussed in the Traditional Knowledge report for the Jericho Project.
Community-based monitoring studies are not relevant to Nunavut as they deal with NWT aboriginal communities.

TABLE 4.5 COMMUNITIES AND ORGANIZATION PARTICIPATION IN CONSULTATION TO 2000	
Community	**Date**
Bathurst Inlet	October 15, 1996
Bathurst Inlet	October 24, 1996
Bathurst Inlet	November 7, 1996
Bathurst Inlet	February 24, 1998
Bathurst Inlet	June 19, 1999
Cambridge Bay	October 21, 1996
Cambridge Bay	February 24, 1998
Cambridge Bay NIRB, NTI, KIA, Council	May 9, 1999
Cambridge Bay NTI, KIA, KC	June 19, 1999
Cambridge Bay NIRB, NTI, KIA, KC, KEDC, NPC	November 18, 19, 1999
Cambridge Bay KIA, NTI, community	January 19, 2000
Cambridge Bay KIA, KEDC, NTI, community	February 16, 2000
Umingmaktok	October 23, 1996
Umingmaktok	February 25, 1998
Umingmaktok	June 19, 1999
Umingmkaktok	March 22, 2000
Kugluktuk Elders and members of KAA	September 9, 1996
Kugluktuk KIA, HTA, KAA, CLARC, RWED	June 19, 1996
Kugluktuk Gerry Atatahak	July 12, 1996
Kugluktuk	October 10, 1996
Kugluktuk Gerry Atatahak, BHP	October 16, 1996
Kugluktuk	October 21, 1996
Kugluktuk	December 2, 1996
Kugluktuk Community, RWED, KIA	February 25, 1998
Kugluktuk KIA, RWED, HTA	February 25, 1999
Kugluktuk KIA, SD, DIAND, HTA, WMB	May 8, 1999
Kugluktuk KIA, SD, HTA, Council	June 19, 1999
Kugluktuk SD, KHTA, Hamlet Secretariat, Employment Officer	November 17, 18, 1999
Kugluktuk SD, KHTA, Employment Officer	January 18, 2000
Kugluktuk SD, Community, DIAND, Employment Officer, Econ Dev Off	February 15, 2000
Taloyoak	February 4 and 5, 1996
Taloyoak	February 19, 1997
Pelly Bay	February 18, 1997
Gjoa Haven	February 20, 1997
Gjoa Haven NWB, Comm. Ec. Dev.	May 10, 1999
Gjoa Haven NWB, Community	January 20, 2000
Gjoa Haven NWB, Community, Empl Off, Econ Dev Off, Dev Corp	February 17, 2000
Iqaluit SD, DIAND, IHT, DFO, CLEY, CGHT	May 11, 1999

TABLE 4.5 COMMUNITIES AND ORGANIZATION PARTICIPATION IN CONSULTATION TO 2000	
Community	**Date**
Iqaluit Premier, Minister of SD	July 8, 1999
Iqaluit SD, DFO	July 9, 1999
Yellowknife RWED, DFO, EC, DIAND, WCB	May 12, 1999
Yellowknife RWED, DFO	July 9, 1999
Yellowknife EC, DFO, DIAND, NWB	November 16, 1999
Cambridge Bay community	January 19, 2000

Legend

BHP	Broken Hill Proprietary Co.
CGHT	Community Gov, Housing and Transportation
CLEY	Culture, Language, Elders and Youth
DFO	Dept of Fisheries and Oceans
DIAND	Dept of Indian Affairs and Northern Develop
EC	Environment Canada
HTA	Hunters' and Trappers' Association
IHT	Inuit Heritage Trust
KAA	Kugluktuk Angoniatit Association
KC	Kitikmeot Corporation
KEDC	Kitikmeot Economic Develop Corp.
KHTA	Kitikmeot Hunters and Trappers Assoc.
KIA	Kitikmeot Inuit Association
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NTI	Nunavut Tunngavit Inc.
NWB	Nunavut Water Board
RWED	Resources, Wildllife & Economic Develop.
SD	Sustainable Development

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Kugluktuk SD, KHTA, Employment Officer	January 18, 2000
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Taloyoak	February 4 and 5, 1996
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Gjoa Haven NWB, Comm. Ec. Dev.	May 10, 1999
Gjoa Haven NWB, Community	January 20, 2000
Gjoa Haven NWB, Community, Empl Off, Econ Dev Off, Dev Corp	February 17, 2000
Iqaluit SD, DIAND, IHT, DFO, CLEY, CGHT	May 11, 1999

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Yellowknife EC, DFO, DIAND, NWB	November 16, 1999
Cambridge Bay community	January 19, 2000

Legend

BHP Broken Hill Proprietary Co.
CGHT Community Gov, Housing and Transportation
CLEY Culture, Language, Elders and Youth
DFO Dept of Fisheries and Oceans
DIAND Dept of Indian Affairs and Northern Develop
EC Environment Canada
HTA Hunters' and Trappers' Association
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NIRB Nunavut Impact Review Board
NPC Nunavut Planning Commission
NTI Nunavut Tunngavit Inc.
NWB Nunavut Water Board
RWED Resources, Wildllife & Economic Develop.
SD Sustainable Development

TABLE 7.1 DIAMOND VALUATION BY CSO FOR BULK SAMPLE				
Valuation Date	**Lots Valued**	**Facies**	**Weight (Carats)**	**Value per Carat (US$)**
July 29, 1997 (i)	1, 2	6	4189.67	**57.97**
	3, 4	2N	331.18	**58.14**
	5, 6	6W	1794.66	**62.43**
November 17, 1997 (ii)	1	6	2227.60	**57.55**
	2	4N	1420.50	**47.74**
	3	2S	175.90	**45.03**
	4	4S	169.50	**44.69**
Total/Average			**10,139.51**	**57.70**

Notes
i) July 29, 1997 – Diamonds >10.8 carats not included in value. A total of 234.07 carats later valued at $US30,000
ii) November 17, 1997 valuation includes a total of 61.58 carats for stones >10.8 carats
iii) CSO (Central Selling Organization) now DTC (Diamond Trading Company)

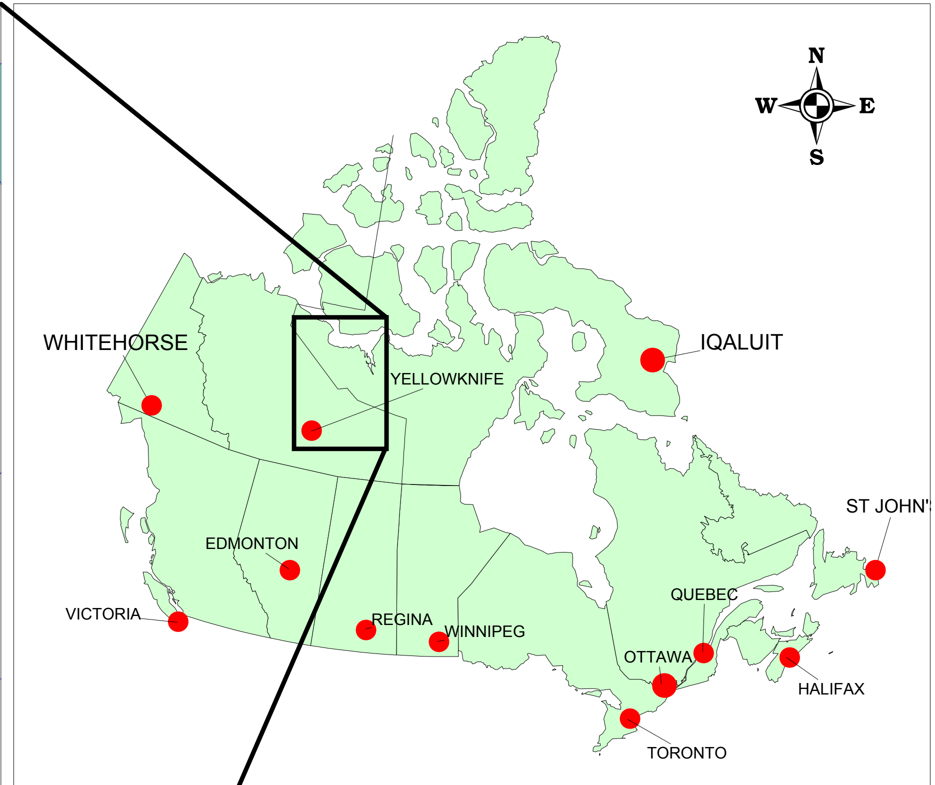
TABLE 7.2 DIAMOND VALUATION BASED ON TERRAC AND ADTEC METHODOLOGY			
Valuation Date	**Facies**	**Weight (carats)**	**Value per Carat (US$)**
July 14, 1998	2 North	330.48	**76.65**
	2 South	175.327	**33.75**
	4 North	1,419.033	**49.92**
	4 South	168.823	**38.73**
	6	6,551.72	**77.52**
	6 West	1,884.98	**62.01**
Total/Average		**10,529.63**	**69.65**

TABLE 7.3 THE COMPARISON BETWEEN THE WWW MODEL AND THE SRK MODEL		
Lobe	**WWW model (U$/ct)**	**SRK model (U$/ct)**
Size Model for the cater lobe and JDF2S	90.00	76.00
Size Model for JDF4 North lobe	71.00	60.00

TABLE 9.1
LIST OF CONSULTING FIRMS PROVIDING SERVICES FOR THE EIS

Firm	Address	Phone
AMEC Earth & Environmental Ltd.	2227 Douglas Road, Burnaby, BC, V5C 5A9	604-294-3811
Canadian Environmental and Metallurgical Inc.	1636 West 75th Ave, Vancouver, British Columbia	604-264-5536
Dowding Reynard & Associates	P.O. Box 3567, Rivonia, 2128 South Africa	011-27-11-807-1282
Fedirchuk McCullough & Associates	200, 1719 10th Ave SW, Calgary, AB T3C 0K1	403-245-5661
Griffin Works	4577 West 16th Ave, Vancouver, BC, V6R 3E8	604-224-6034
Hornal Consultants Ltd.	401-1755 West Broadway, Vancouver, B.C., V6J 4S5	604-731-2697
Hubert and Associates	1660 Evergreen Hill SW, Calgary, AB, T2Y 3B6	403-256-0017
Levelton Engineering Ltd.	150 - 12791 Clarke Place, Richmond, B.C., V6V 2H9	604-278-1411
Mike Miles and Associates Ltd.	645 Island Road, Victoria, B.C., V8S 2T7	250-595-0653
Nuna Logistics	340 Park Place, 666 Burrard St., Vancouver, B.C., V6C 2X8	604-682-4667
Outcrop	Box 394, Rankin Inlet, NU, X0C 0G0	867-645-3825
P&E Environmental Consultants Ltd.	Box 33178 Glenwood P.O., Edmonton, Alberta T5P 4V8	780-662-3697
RL&L	17312 - 106 Ave, Edmonton, AB, T5S 1H9	780-483-3499
SRK Consulting	800-580 Hornby St, Vancouver, B.C., V6C 3B6	604-681-4196
URS Corp./Norecol, Dames & Moore	1900-650 West Georgia St, Vancouver, B.C., V6C 1N7	604-681-1672

FIGURES



Property Location Map

30/6/2000

DRAFTED BY: MJ

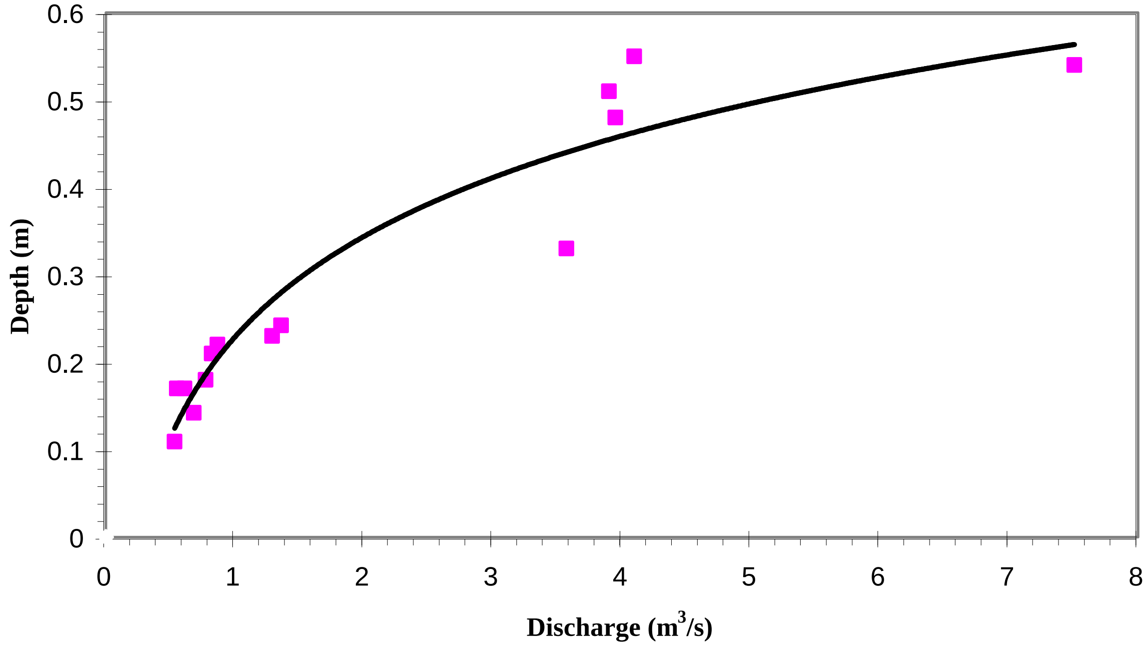
Office: Van

FIG 1.1

Tahera Corporation

FIGURE 3.1

Discharge Correlation Curve
Jericho River (Carat Lake Outflow)



Discharge Correlation Curve
Jericho River (Carat Lake Inflow)

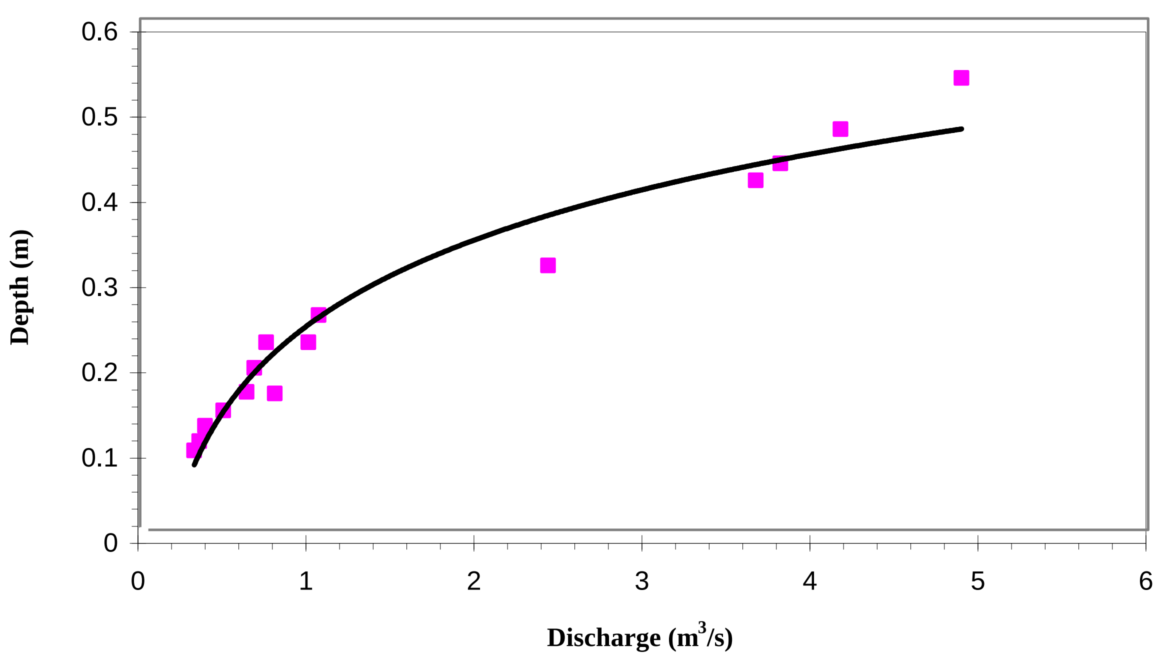
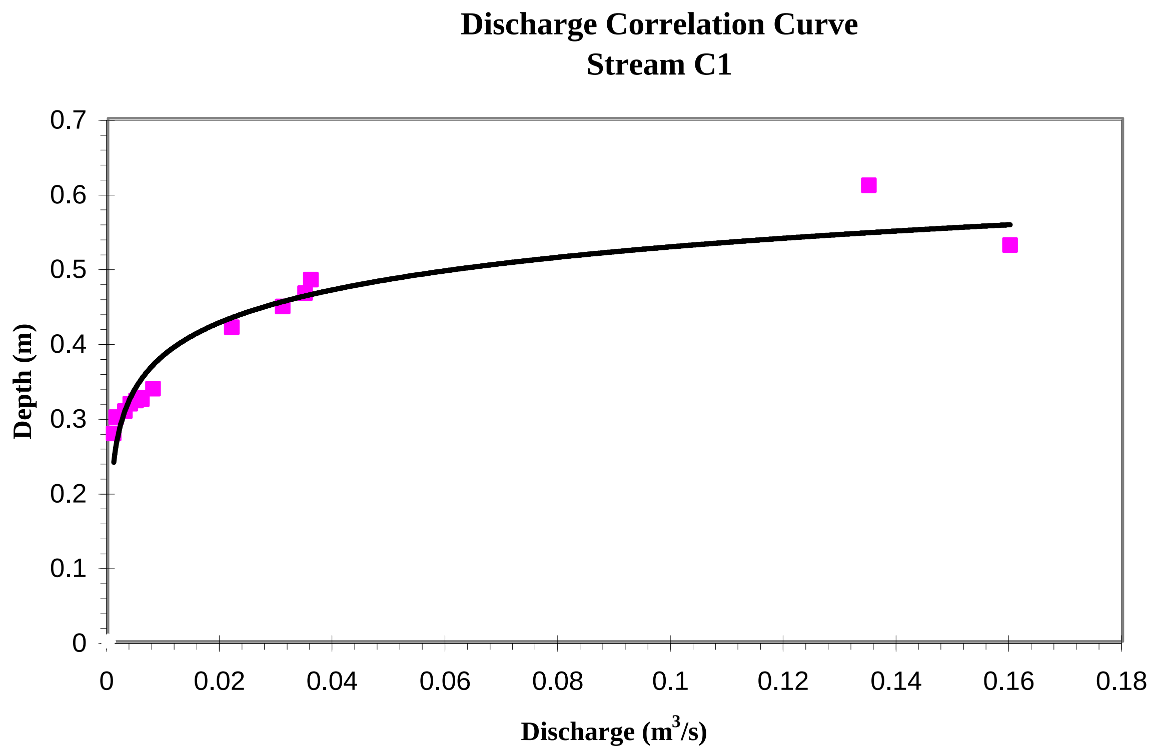
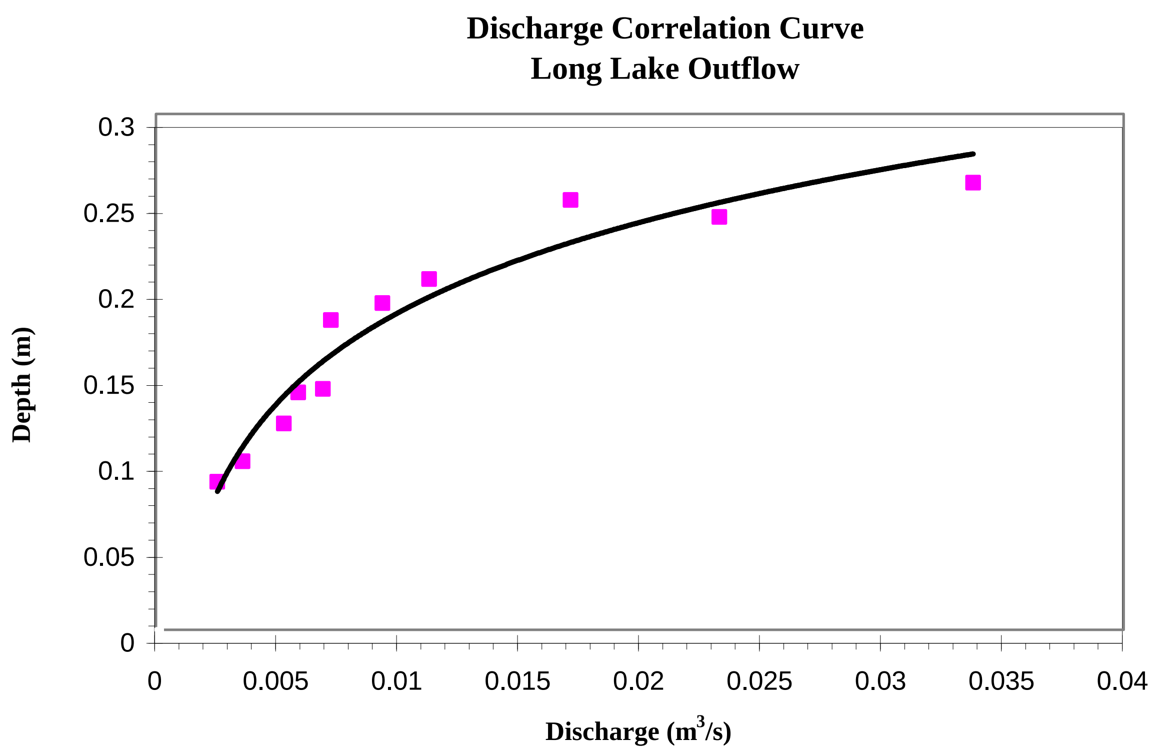


FIGURE 3.2



Discharge Correlation Curve
Stream C1
Depth (m)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
Discharge (m3/s)



Discharge Correlation Curve
Long Lake Outflow
Depth (m)
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
Discharge (m3/s)

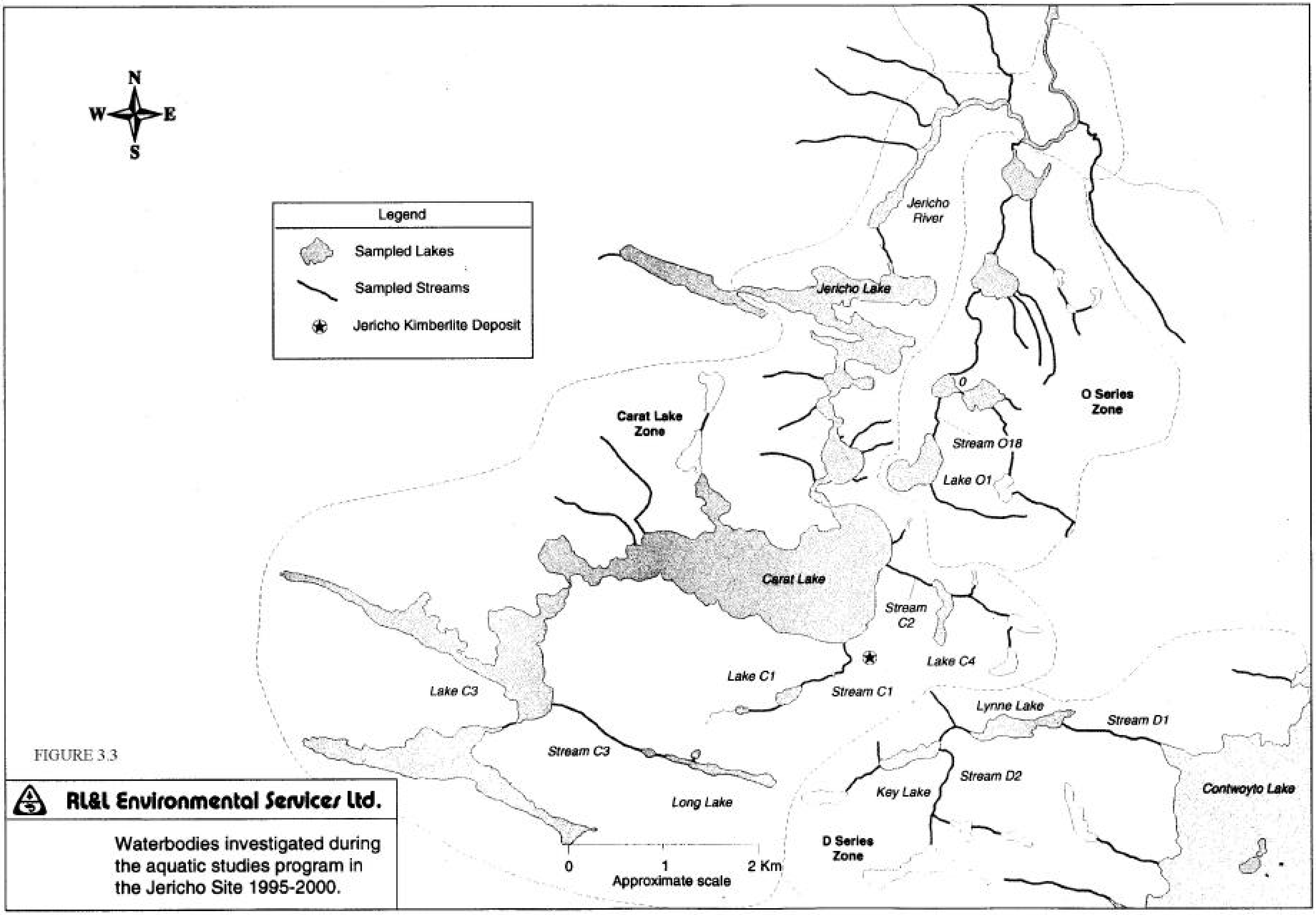


FIGURE 3.3

RL&L Environmental Services Ltd.

Waterbodies investigated during the aquatic studies program in the Jericho Site 1995-2000.

FIGURE 3.4

EXPLOSIVES NITROGEN LOSS FLOW DIAGRAM

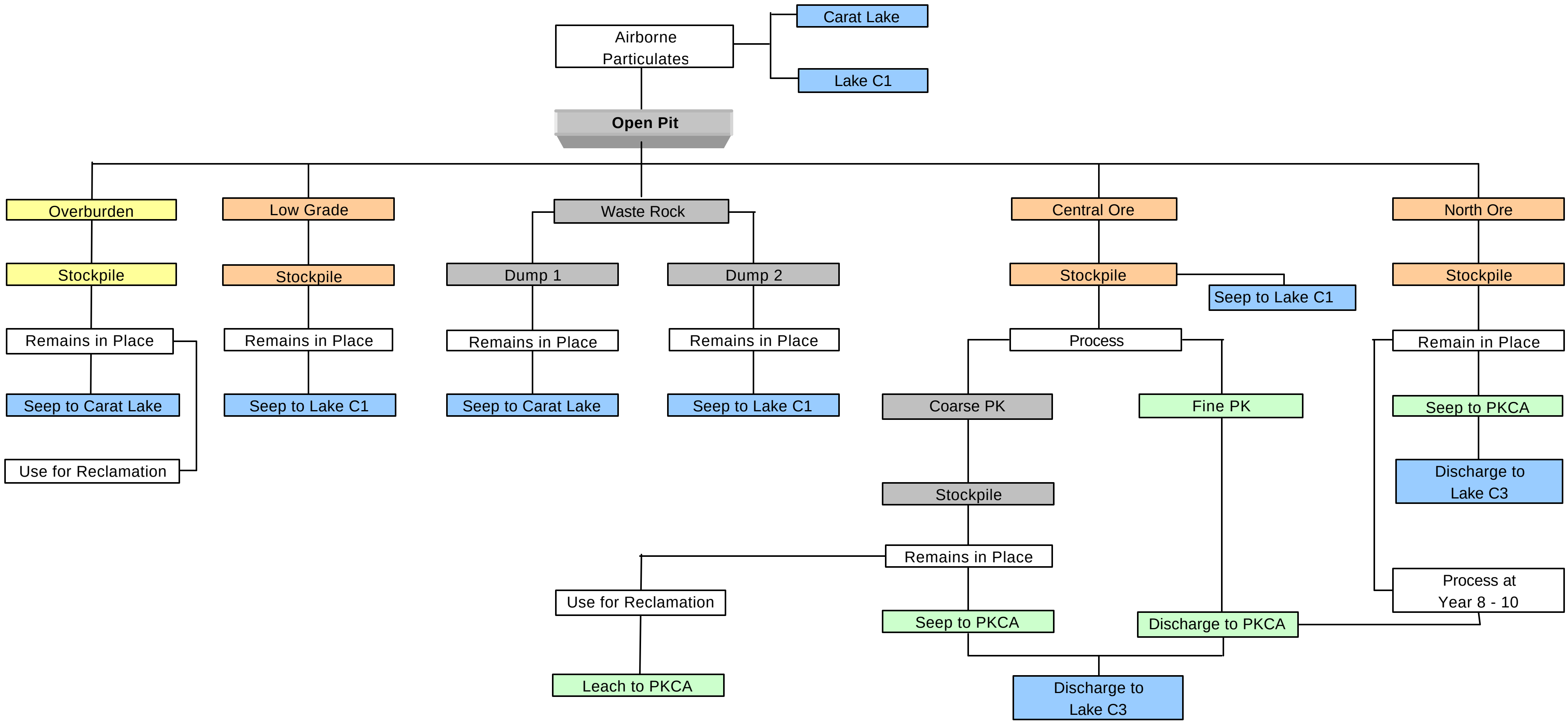


FIGURE 3.5

Dust Flow Diagram - Jericho Mine Site

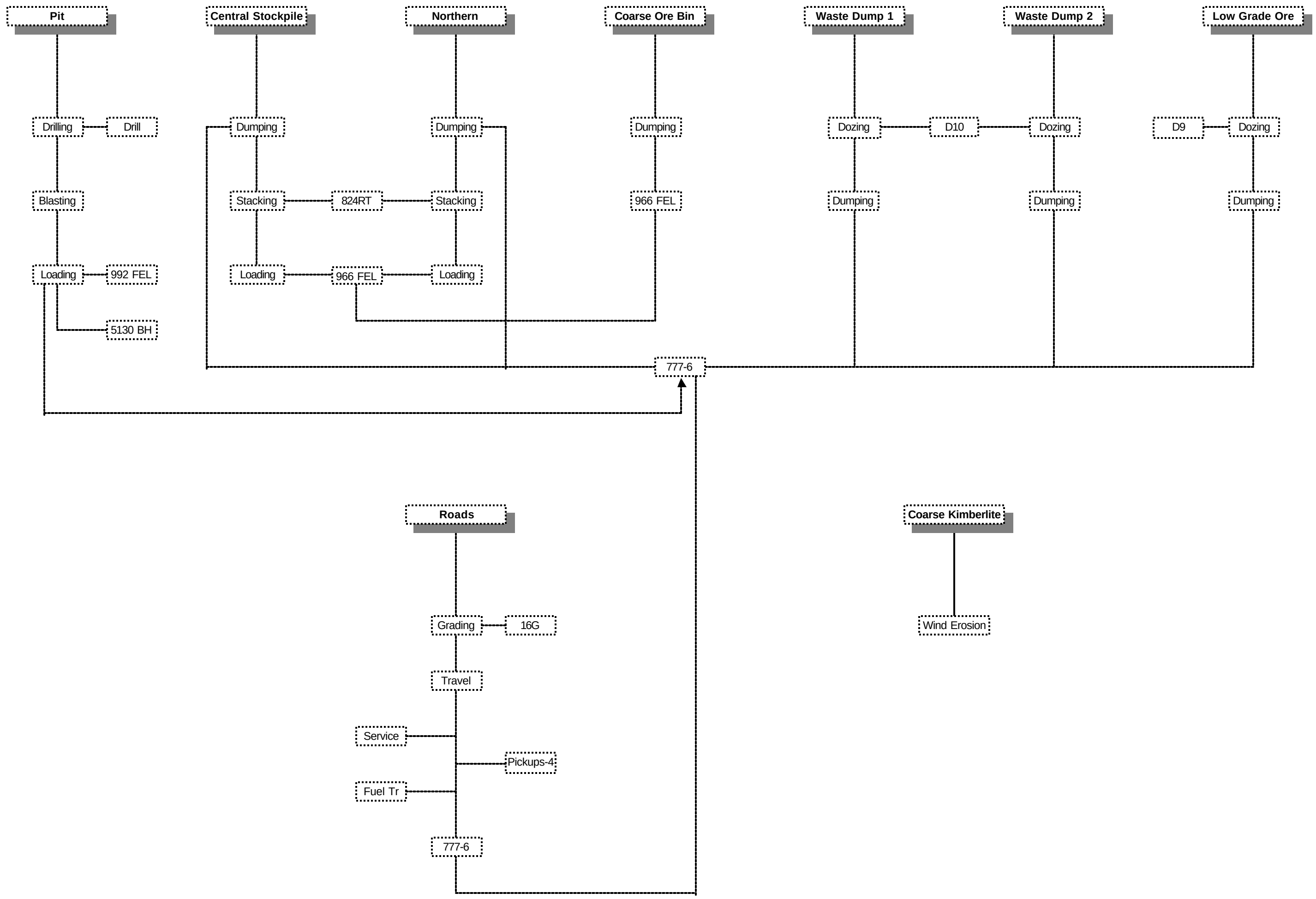


FIGURE 3.6
SIMPLIFIED LOCAL CUMULATIVE EFFECTS LINKAGES

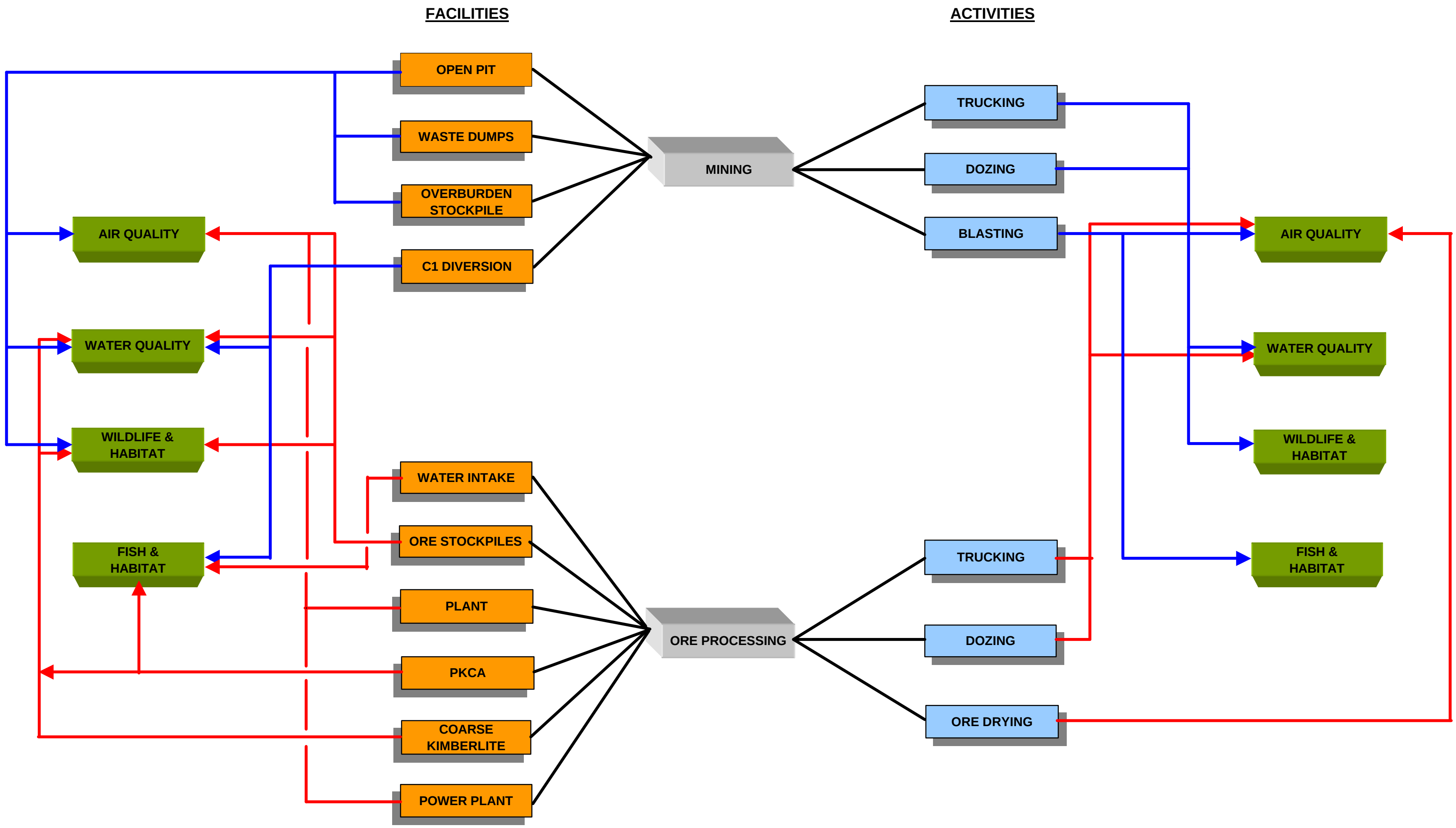
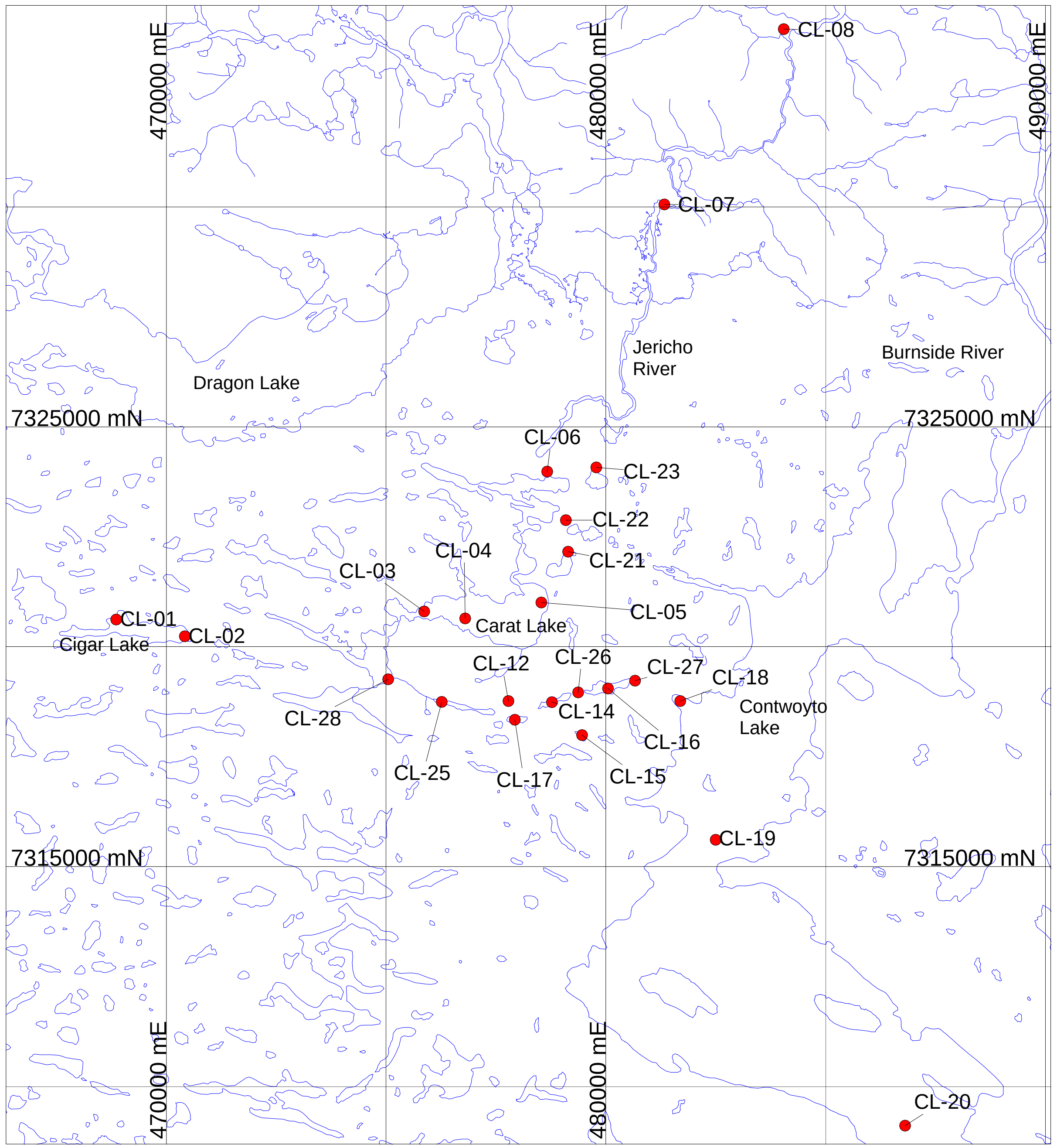
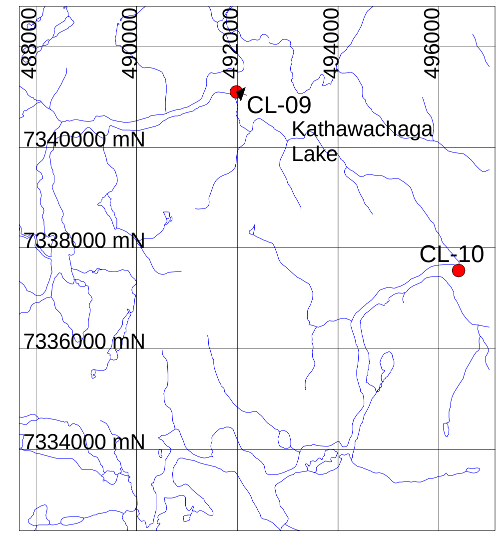
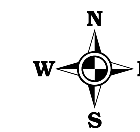


FIGURE 3.7
LOCATION MAP
HYDRO AND MINESITES

Courtesy NT Power







Tahera Corporation

Jericho - Kathawachaga Water Quality Monitoring Sites

Date:14/1/2000

Author: MJ

Office: VAN

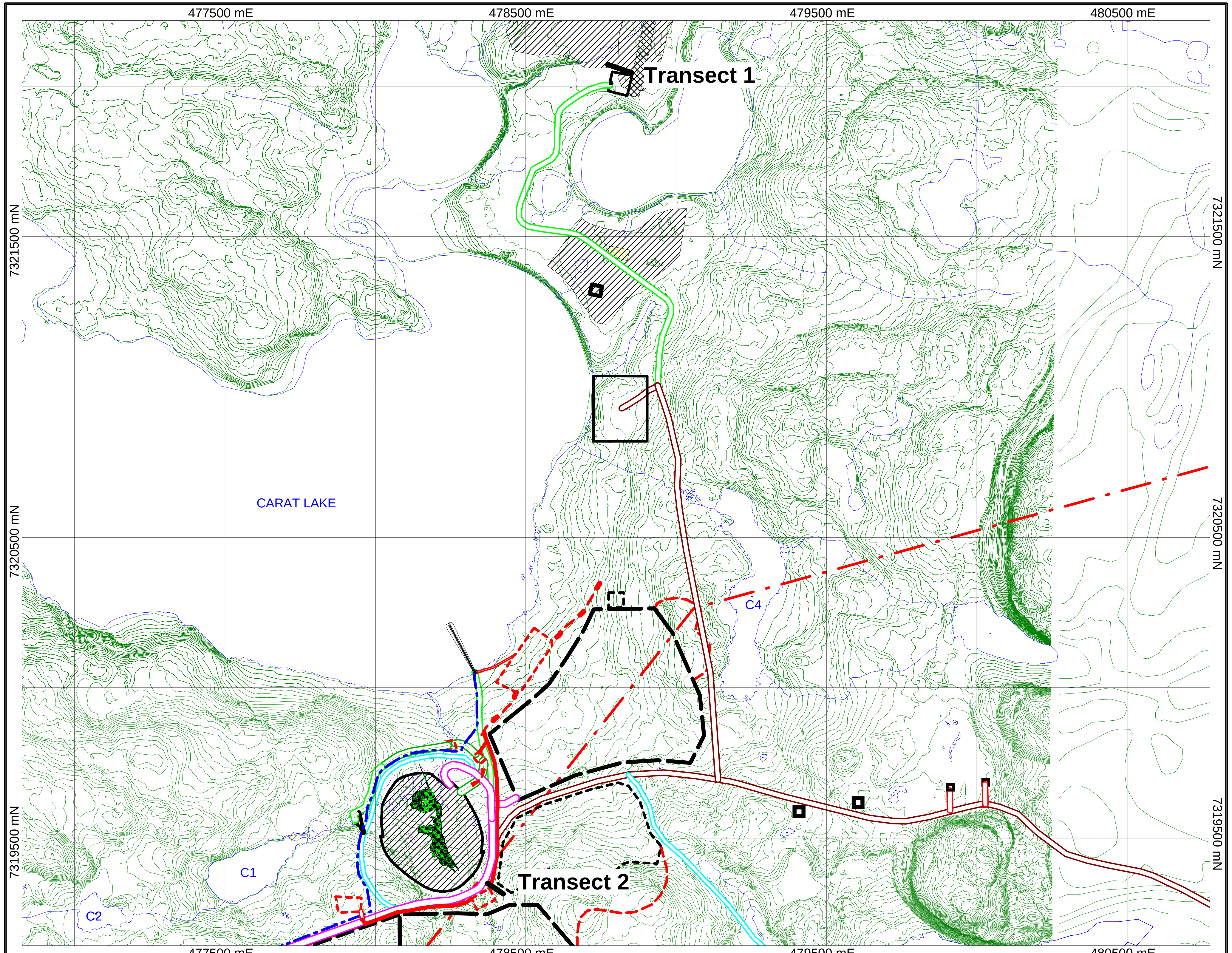
Drawing:

Figure 3.8

Scale: 1:150000 | Projection: UTM NAD 27 (Canada)

0 2.5 5 10

kilometres



N
W E
S

CORE AREA CONTOUR LINES REPRESENT 1m
OUTLYING CONTOUR LINES REPRESENT 10m

Jericho Project Vegetation Transects	
Approved By:	**FIGURE 3.9**
Date:01/11/2000	
Drafted By: M.J.	TAHERA CORPORATION
Scale: 1:15,000	Projection: UTM Zone 12 (NAD 27 for Canada)

200 0 200 400
metres

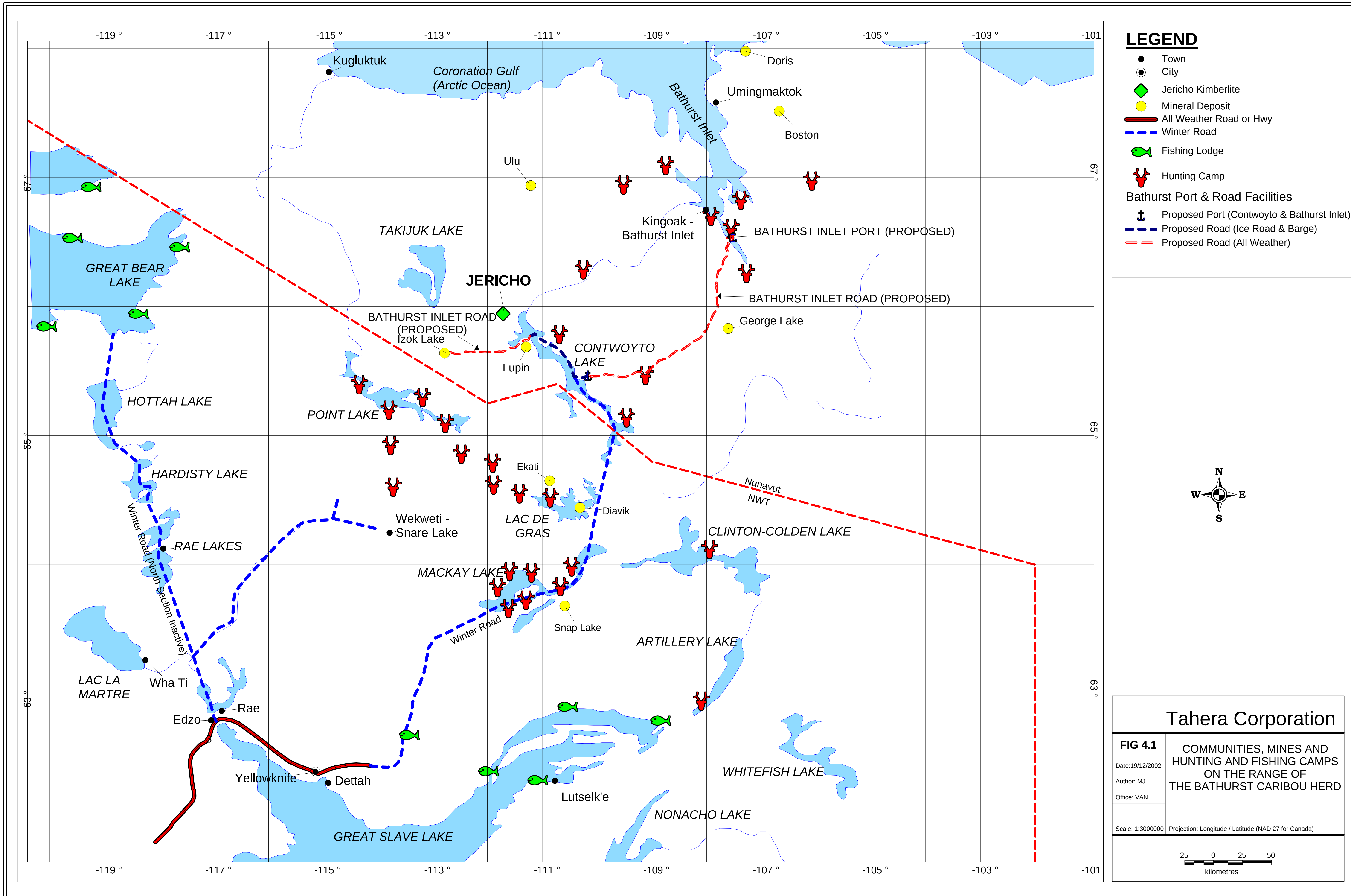


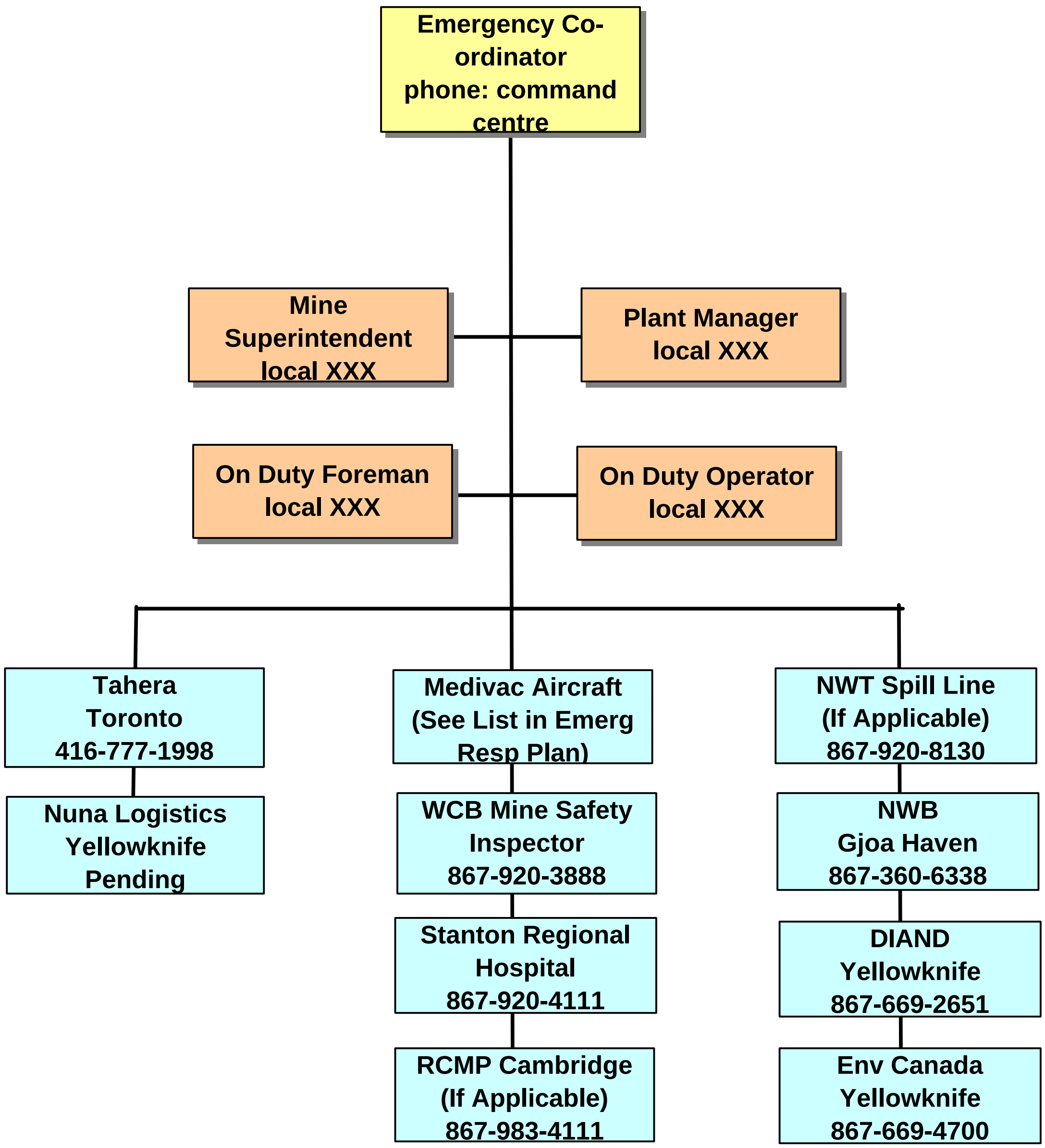
FIG 4.1

COMMUNITIES, MINES AND HUNTING AND FISHING CAMPS ON THE RANGE OF THE BATHURST CARIBOU HERD

FIGURE 4.2 PARKS AND CONSERVATION AREAS IN NUNAVUT

Courtesy Nunavut Parks Web Site

FIGURE 5.1
JERICHO MINE SITE EMERGENCY RESPONSE ORGANIZATION



ATTACHMENTS

ATTACHMENT 3.1

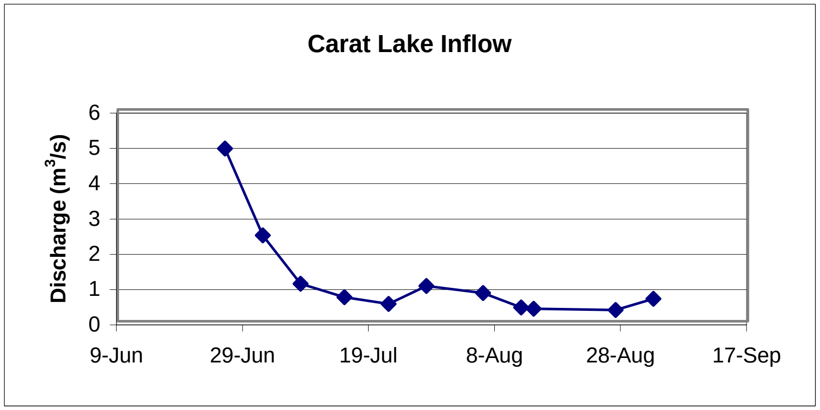
LONG-TERM CLIMATE SUMMARY

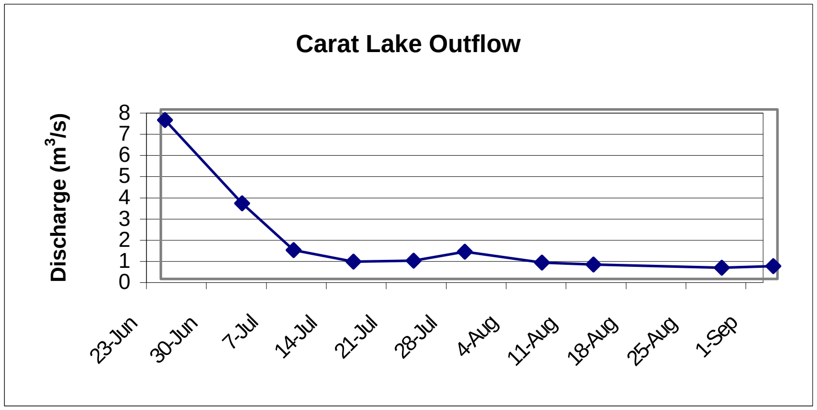
CANADIAN CLIMATE NORMALS, 1961 - 1990 CONTWOYTO LAKE DATA

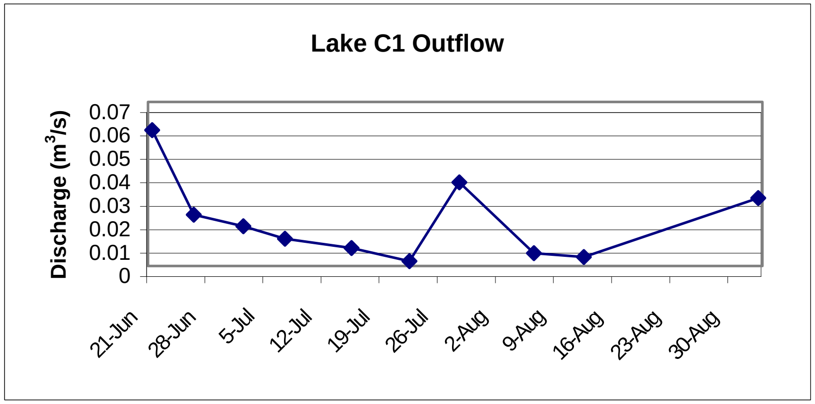
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature													
Daily Maximum (C)	-27.9	-26.9	-22.6	-11.9	-0.9	9.5	14.9	12.8	4.7	-4.9	-16.4	-24.1	-7.8
Daily Minimum (C)	-35.1	-34.4	.32.1	-22.7	-9.6	0	4.8	5.2	-0.8	-10.2	-23.9	-31.0	-15.8
Daily Mean (C)	-31.4	-30.6	-27.2	-17.2	-5.2	4.8	9.9	9.0	2.0	-7.5	-20.1	-27.5	-11.8
Extreme Maximum (C)	-2.4	-6.4	-2.8	5.6	16.7	24.4	27.2	26.0	16.7	8.3	0	-6.1	
Date	981/20	980/08	966/30	971/29	9731/27+	973/26	961/08	981/09	975/07+	963/16	969/02+	976/01+	
Extreme Minimum (C)	-48.3	-53.9	-53.3	-41.6	-33.9	-13.9	-2.2	-3.2	-11.9	-34.4	-42.6	-46.7	
Date	975/13	968/03	963/17	979/02	959/02	972/02	968/03+	979/28	980/28	972/29	978/24	970/24	
Degree-Days													
Above 18 C	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Below 18 C	1553	1373.8	1405.6	1059	721.4	396.7	250.7	279	481.2	792.6	1146.4	1413.9	10873
Above 5 C	0	0	0	0	1.2	48.6	154.9	131.1	17.7	0	0	0	354
Below 0 C	995	865.5	847.6	519	177.5	10.1	0	0.1	28.1	237.1	606.4	855.9	5142
Precipitation													
Rainfall (mm)	0	0.01	0.0T	0.5	6.2	22.2	36.2	40.1	21.5	2	0.0T	0.0T	128.71
Snowfall (cm)	7	7.8	10.2	10.7	12.1	2.9	0.0T	1.1	10.8	28.6	15.7	10.6	117.5
Precipitation (mm)	7	7.8	10.2	11.2	18.3	25.1	36.2	41.1	32.7	30.6	15.7	10.6	246.6
Extreme Daily Rainfall (mm)	0	0	0	5.2	16	28.4	24.6	40.4	27.6	8.6	0	0	
Date	981/31+	981/28+	981/31+	978/29	979/24	959/14	969/13	975/12	981/08	967/11	981/01+	981/31+	
Extreme Daily Snowfall (cm)	6.6	11.9	12.2	10.9	14	17.3	1	3.8	28.2	24.8	13	9.7	
Date	959/09	959/26	971/03	971/07	968/26	963/20	959/29	974/18	967/28	978/09	969/03	977/15	
Extreme Daily Precipitation (mm)	6.6	11.9	12.2	10.9	16	41.1	24.6	42.9	48.8	24.8	13	9.7	
Date	959/09	959/26	971/03	971/07	979/24	963/20	969/13	975/12	967/28	978/09	969/03	977/15	
Month-end Snow Cover (cm)	44	52	60	65	30	0	0	0	2	24.8	28	37	
Days With													
Maximum Temperature > 0C	0	0	0	2	16	29	31	31	24	5	0	0	137
Measurable Rainfall	0	0	0		3	6	11	13	7	1	0	0	41
Measurable Snowfall	7	7	9	8	8	2			6	15	11	9	84
Measurable Precipitation	7	7	9	9	10	8	11	13	12	15	11	9	122
Moisture													
Relative Humidity - 0600L	N	N	N	79	87	87	86	89	90	88	81	N	
Relative Humidity - 1500L	N	N	75	81	84	72	65	70	79	87	81	N	

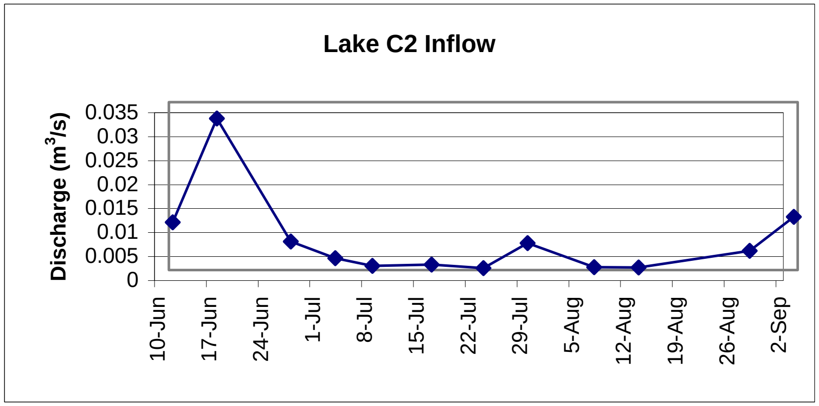
ATTACHMENT 3.2

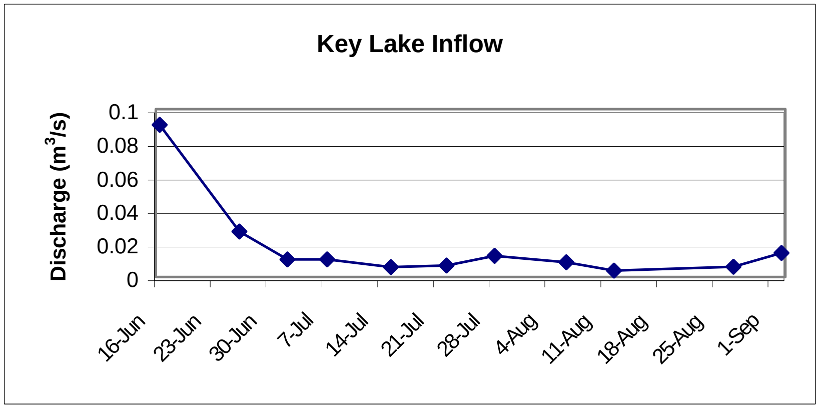
1999 STREAM DISCHARGE SUMMARY

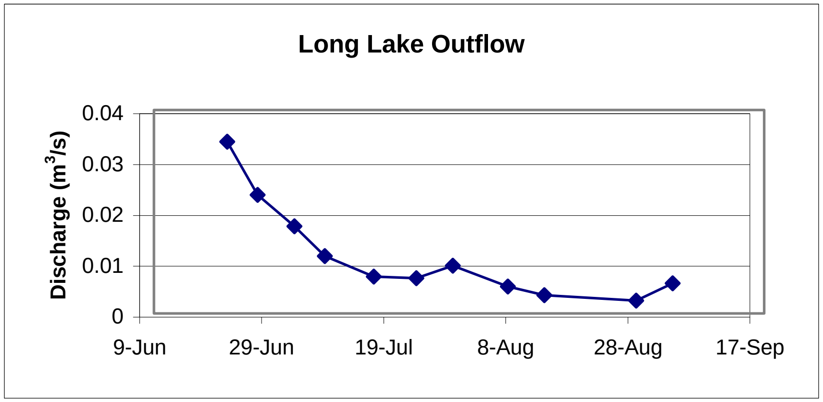

Carat Lake Inflow
Discharge (m3/s)
0
1
2
3
4
5
6
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep

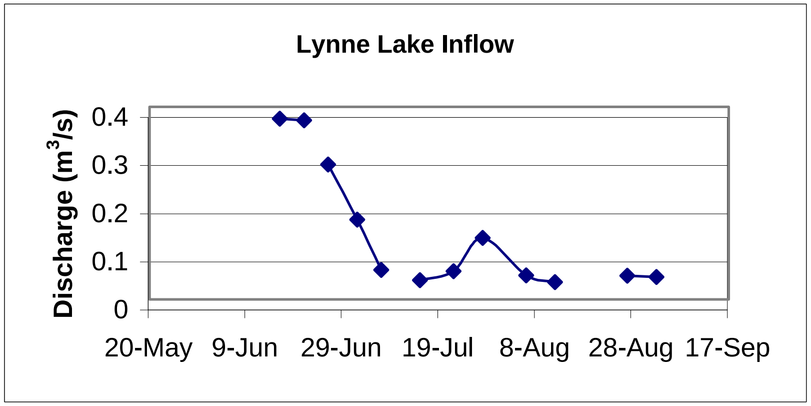

Carat Lake Outflow
Discharge (m3/s)
0
1
2
3
4
5
6
7
8
23-Jun
30-Jun
7-Jul
14-Jul
21-Jul
28-Jul
4-Aug
11-Aug
18-Aug
25-Aug
1-Sep

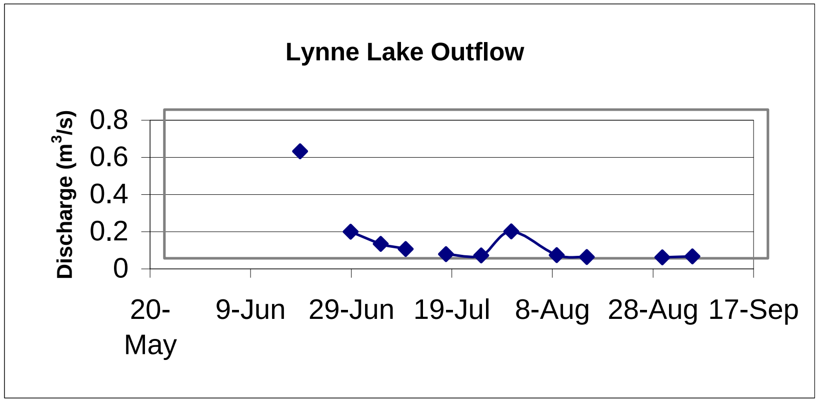

Lake C1 Outflow
Discharge (m3/s)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
21-Jun
28-Jun
5-Jul
12-Jul
19-Jul
26-Jul
2-Aug
9-Aug
16-Aug
23-Aug
30-Aug


Lake C2 Inflow
Discharge (m3/s)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
5-Aug
12-Aug
19-Aug
26-Aug
2-Sep


Key Lake Inflow
Discharge (m³/s)
0.1
0.08
0.06
0.04
0.02
0
16-Jun
23-Jun
30-Jun
7-Jul
14-Jul
21-Jul
28-Jul
4-Aug
11-Aug
18-Aug
25-Aug
1-Sep


Long Lake Outflow
Discharge (m³/s)
0.04
0.03
0.02
0.01
0
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep


Lynne Lake Inflow
Discharge (m³/s)
0.4
0.3
0.2
0.1
0
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep


Lynne Lake Outflow
Discharge (m³/s)
0.8
0.6
0.4
0.2
0
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep

ATTACHMENT 3.3

SESIMIC RISK ANALYSIS

NATURAL RESOURCES CANADA
GEOLOGICAL SURVEY OF CANADA

RESSOURCES NATURELLES CANADA
COMMISSION GEOLOGIQUE DU CANADA

SEISMIC RISK CALCULATION *

CALCUL DE RISQUE SEISMIQUE *

REQUESTED BY/ DEMANDE PAR	Bruce Ott, Tahera Corp.			
SITE	Great Bear Lake, NWT			
LOCATED AT/ SITUE AU	66.00 NORTH/NORD	111.47 WEST/OUEST		
PROBABILITY OF EXCEEDENCE PER ANNUM/ PROBABILITE DE DEPASSEMENT PAR ANNEE	0.010	0.005	0.0021	0.001
PROBABILITY OF EXCEEDENCE IN 50 YEARS/ PROBABILITE DE DEPASSEMENT EN 50 ANS	40 %	22 %	10 %	5 %
PEAK HORIZONTAL GROUND ACCELERATION (G) / ACCELERATION HORIZONTALE MAXIMALE DU SOL (G)	0.009	0.011	0.013	0.016
PEAK HORIZONTAL GROUND VELOCITY (M/SEC) / VITESSE HORIZONTALE MAXIMALE DU SOL (M/SEC)	0.027	0.032	0.040	0.047

* REFERENCES

1. NEW PROBABILISTIC STRONG SEISMIC GROUND MOTION MAPS OF CANADA: A COMPILATION OF EARTHQUAKE SOURCE ZONES, METHODS AND RESULTS. P.W. BASHAM, D.H. WEICHERT, F.M. ANGLIN, AND M.J. BERRY EARTH PHYSICS BRANCH OPEN FILE NUMBER 82-33, OTTAWA, CANADA 1982.

2. ENGINEERING APPLICATIONS OF NEW PROBABILISTIC SEISMIC GROUND-MOTION MAPS OF CANADA. A.C. HEIDEBRECHT, P.W. BASHAM, J.H. RAINER, AND M.J. BERRY CANADIAN JOURNAL OF CIVIL ENGINEERING, VOL. 10, NO. 4, P. 670-680, 1983.

3. NEW PROBABILISTIC STRONG GROUND MOTION MAPS OF CANADA. P.W. BASHAM, D.H. WEICHERT, F.M. ANGLIN, AND M.J. BERRY, BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA, VOL. 75, NO. 2, P. 563-595, 1985.

4A. SUPPLEMENT TO THE NATIONAL BUILDING CODE OF CANADA 1990, NRCC NO. 30629. CHAPTER 1: CLIMATIC INFORMATION FOR BUILDING DESIGN IN CANADA. CHAPTER 4: COMMENTARY J: EFFECTS OF EARTHQUAKES.

4B. SUPPLEMENT DU CODE NATIONAL DU BATIMENT DU CANADA 1990, CNRC NO 30629F. CHAPITRE 1: DONNEES CLIMATIQUES POUR LE CALCUL DES BATIMENTS AU CANADA. CHAPITRE 4: COMMENTAIRE J: EFFETS DES SEISMES.

Great Bear Lake, NWT

ZONING FOR ABOVE SITE/ ZONAGE DU SITE CI-DESSUS

1990 NBCC/CNBC: ZA = 0; ZV = 0; V = 0.00 M/S

ACCELERATION ZONE/ ZONE D'ACCELERATION ZA=0
ZONAL ACCELERATION/ ACCELERATION ZONALE 0.00 G

VELOCITY ZONE/ ZONE DE VITESSE ZV=0
ZONAL VELOCITY/ VITESSE ZONALE 0.00 M/S

1990 NBCC/CNBC **
SEISMIC ZONING MAPS/ CARTES DU ZONAGE SEISMIQUE

PROBABILITY LEVEL: 10% IN 50 YEARS
NIVEAU DE PROBABILITE: 10% EN 50 ANNEES

G OR M/S	ZONE	ZONAL VALUE/ VALEUR ZONALE
0.00		
	0	0.00
0.04		
	1	0.05
0.08		
	2	0.10
0.11		
	3	0.15
0.16		
	4	0.20
0.23		
	5	0.30
0.32		
	6*	0.40

* ZONE 6: NOMINAL VALUE/ VALEUR NOMINALE 0.40;
SITE-SPECIFIC STUDIES SUGGESTED FOR IMPORTANT PROJECTS/
ETUDES COMPLEMENTAIRES SUGGEREES POUR DES PROJETS D'IMPORTANCE.

** FOR NBCC APPLICATIONS, CALCULATED ZONE VALUES AT A SITE SHOULD BE REPLACED BY EFFECTIVE ZONE VALUES [ZA(EFF) OR ZV(EFF)] AS SHOWN BELOW/
POUR APPLICATIONS SELON LE CNBC, ON DOIT REMPLACER LES VALEURS ZONALES CALCULEES POUR UN SITE PAR LES VALEURS EFFECTIVES [ZA(EFF) OU ZV(EFF)] COMME MONTRE CI-DESSOUS:

1. IF/SI (ZA - ZV) > 1, ===> ZA(EFF) = ZV + 1.

OR/OU

2. IF/SI (ZA - ZV) < 1, ===> ZA(EFF) = ZV - 1.

OR/OU

3. IF/SI ZV=0 AND/ET ZA > 0, ===> ZV(EFF) = 1.

(SEE REFERENCE 2 CITED ABOVE, PAGE 677)
(VOIR PAGE 677 DE LA REFERENCE 2 CI-DESSUS) May 5 2000 14:2

ATTACHMENT 3.4

MINING SCHEDULE

MINING SCHEDULE MATERIALS SUMMARY														
Period	**Q#**	**Waste Overburden Tonnes**	**Granite Tonnes**	**Precontact Tonnes**	**Total Tonnes**	**Low Grade SU-D Tonnes**	**F1N Tonnes**	**Ore Total Tonnes**	**CU-D Tonnes**	**NU-D Tonnes**	**NL-D Tonnes**	**Total Tonnes**	**Total Pit Total Tonnes**	**Phase***
OPEN PIT														
P2-Q1	5	373,121	50,000	16	423,137	-	-	-	-	-		-	423,137	St
P2-Q2	6	397,702	300,000	66,467	764,170	8,388	36,397	44,785	160,668	-		160,668	969,622	St, Pb
P2-Q3	7													
P2-Q4	8													
P3-Q1	9													
P3-Q2	10	452,329	1,663,373	165,752	2,281,454	107,947	176,950	284,897	67,210	16,440	-	83,649	2,650,000	St, Pb, Ult
P3-Q3	11	363,236	1,874,450	106,985	2,344,671	64,356	84,051	148,406	156,923	-	-	156,923	2,650,000	Pb, Ult
P3-Q4	12	1,326	1,353,511	85,571	1,440,408	44,837	27,985	72,822	95,880	30,896	-	126,777	1,640,006	Pb, Ult
P4-Q1	13													
P4-Q2	14	-	2,038,770	156,328	2,195,098	68,082	78,389	146,471	175,804	132,627	-	308,431	2,650,000	Pb, Ult
P4-Q3	15	-	1,906,082	193,368	2,099,450	132,818	148,072	280,889	42,953	230,451	-	273,404	2,653,743	Pb, Ult
P4-Q4	16	-	956,431	250,410	1,206,841	195,650	139,227	334,877	70,163	72,725	-	142,889	1,684,607	Ult
P5-Q1	17													
P5-Q2	18	-	657,678	93,413	751,092	62,788	139,796	202,584	98,800	-	20,343	119,143	1,072,819	Ult
P5-Q3	19	-	536,532	229,623	766,155	97,894	42,483	140,378	280,310	-	137	280,447	1,186,979	Ult
P5-Q4	20	-	103,145	66,635	169,780	836	146	981	267,222	-	-	267,222	437,984	Ult
Subtotals		**1,587,715**	**11,439,973**	**1,414,568**	**14,442,255**	**783,595**	**873,495**	**1,657,090**	**1,415,933**	**483,140**	**20,480**	**1,919,552**	**18,018,897**	
UNDERGROUND														
P6-Q1	21													
P6-Q2	22													
P6-Q3	23		57,000									57,000		
P6-Q4	24								50,000			50,000		
P7-Q1	25								82,500			82,500		
P7-Q2	26								82,500			82,500		
P7-Q3	27								82,500			82,500		
P7-Q4	28								82,500			82,500		
P8-Q1	29								82,500			82,500		
P8-Q2	30								82,500			82,500		
P8-Q3	31								68,600			68,600		
Subtotals			**57,000**						**613,600**			**670,600**		
Totals		**1,587,715**	**11,496,973**	**1,414,568**	**14,442,255**	**783,595**	**873,495**	**1,657,090**	**2,029,533**	**483,140**	**20,480**	**2,590,152**	**18,018,897**	

* Phases as follows:

St = Starter pit
Pb = intermediate pushback
Ult = ultimate pit

Ore types:

CU-D = Central lobe ore, recovered grade of 1.42 ct/t
NU-D = North Lobe upper ore, recovered grade of 0.77 ct/t
NL-D = North Lobe lower ore, recovered grade of 0.71 ct/tn
SU-D = South Lobe inferred material, recovered grade of 0.37 ct/t
F1N = North F1 facies inferred material, recovered grade of 0.44 ct/t

ATTACHMENT 3.5

ECOLOGICAL ZONES DEFINITIONS

The following descriptions are based on an ecological zone classification developed for 1995 baseline studies (Canamera 1995). Canamera divided Jericho into five ecological zones (subsequently modified to seven by addition of beach shoreline and cliffs). This EIS adds lakes as waterbodies will be more directly affected than was anticipated at the time of 1995 studies.

The study area (terrestrial environment) was divided into zones, along a gradient of hygrotope (wet, moist, dry) and according to the dominant species assemblage. In the case of eskers/kame deltas, beach shorelines and cliffs the physiography of the zone was the deciding factor. Table A1 lists the zones.

TABLE A1
ECOLOGICAL ZONES IN JERICHO STUDY AREA

Hygrotope	Predominant Species Assemblage/Landform	Code
aquatic	lake	L
wet	grass/sedge meadow	WGBM
moist	birch meadow	MBM
moist	beach shoreline	BS
dry	barrenland tundra	DBT
dry	rocky tundra	DRT
dry	eskers/kame deltas	EKD
dry	cliffs/rocky hills	CRH

The components will be discussed in terms of *vascular seed plants*, which include species in the shrub, herb and graminoid layers, *non-seed/non-vascular plants*, which include species in the lichen/moss layer, and *non-vegetative components*, which include elements such as rock, exposed gravel, etc. in the non-vegetative layer. For each ecological zone, the most significant elements within each category will be discussed.

Note - very little aquatic vegetation was present along the south shore of Carrot Lake. This may be a consequence of repeated wave action on this shoreline (caused by the prevailing north winds.

Wet Grass/Sedge Meadow (WGBM)

Wet Grass/Sedge/Birch Meadows were very common around both ephemeral and non-ephemeral streams and in lowland areas. At the time of this study, sites within this zone were characterized by saturated tussocks (up to 1/2 metre in diameter) of mainly moss and shrub vegetation, surrounded by 'troughs' filled with standing surface water, where only hydrophilic plants such as grasses, sedges and rushes were able to grow.

Vascular Seed Plants: The vascular plants on the tussocks were dominated by bog rosemary (*Andromeda polifolia*), bog bilberry (*Vaccinium uliginosum*) and dwarf willow (*Salix* spp.) shrubs. Present but in lesser abundance were Labrador tea shrubs (*Ledum decumbens*) and herbs such as butterwort (*Pinguicula* sp.), louseworts (*Pedicularis* spp.) and cloudberry (*Rubus chamaemorux*),. The saturated troughs were dominated by hydrophilic graminoids such as grasses (various spp.), sedges (*Carex* spp.) cotton grasses (*Eriophorum* spp.), and rushes (various spp.).
Non-Seed/Non-Vascular Plants: Mosses (various spp.) were extremely abundant on the tussocks. Foliose and crustose lichens (various spp.) were also both present, but in low abundance. Club mosses (*Lycopodium* spp.) were present, but rare.

Non-Vegetative Components: Dead organics and fungi were moderately-abundant. Rocks and exposed gravel/sand were present in low abundance.

Wet Birch sites were common around both ephemeral and non-ephemeral streams. They were characterized by dense assemblages of dwarf birch over and around subterranean watercourses. Typically, these sites were found in small 'valley' depressions, and they were often associated with groupings of large exposed boulders (up to 1 metre diameter).

Vascular Seed Plants: Dwarf birch shrubs (*Betula glandulosa*) dominated the vascular plant layers. There was a definite 'understory' beneath the dense birch layer, strongly characterized by grasses (various spp.) and shrubs such as bog bilberry and mountain cranberry (*Vaccinium vitis-idaea*). Present but in lesser abundance were shrubs such as Labrador tea, dwarf willow (*Salix* spp.), and crowberry (*Empetrum nigrum*).

Non-Seed/Non-Vascular Plants: Mosses (various spp.) were very abundant. Some foliose and crustose lichens were also present, but in low abundance.

Non-Vegetative Components: Rocks were moderately-abundant (excepting the groupings of large boulders, which dominated where present). Dead organics and fungi were present in low abundance.

Moist Birch Meadow (MBM)

Moist Birch Meadows were found primarily on two gentle upland slopes. The 'upland' position of this zone is reflected in its hygrotope, which was dryer than that of the 'lowland' ecological zones (WGM, WBM). This zone was characterized primarily by its grass, shrub and moss species.

Vascular Seed Plants: Dwarf birch shrubs and various species of grasses dominated the vascular plant layers. Other well-represented species included shrubs such as bog bilberry, mountain cranberry and Labrador tea. Present but in low abundance were herbaceous plants such as Arctic groundsel (*Senecio atropurpureus*) and Lapland lousewort (*Pedicularis lapponica*).

Non-Seed/Non-Vascular Plants: Mosses were extremely abundant. Foliose lichens (various spp.) were also well-represented, albeit to a lesser degree. No club mosses were found.

Non-Vegetative Components: Dead organics and fungi were present in moderate abundance. Rocks and exposed gravel/sand were present in low abundance.

Dry Barrenland Tundra (DBT)

Dry Barrenland Tundra was very common on elevated slopes and plateaus throughout the entire region. In terms of hygrotope and species composition, these sites were similar to the dry birch meadows, but there were some significant differences in the relative abundance of a few components (ie. a greater coverage of non-vegetative components and a lesser coverage of mosses and grasses). This zone was characterized primarily by its shrub, lichen and moss species. Within the dry tundra, there were some microsites (determined by topography) which acted as catchments for seepage, and which exhibited a more hydrophilic species composition (eg. more bog rosemary).

Vascular Seed Plants: Dwarf birch, mountain cranberry and Labrador tea shrubs dominated the vascular plant layers. Other well-represented species included bog bilberry, white Arctic heather (*Cassiope tetragona*) and crowberry shrubs, as well as various grasses. Dwarf willow shrubs were present in lesser abundance. Very few herbaceous plants were found.

Non-Seed/Non-Vascular Plants: Both mosses and foliose lichens were abundant. Crustose lichens (various spp.) were also well-represented, albeit to a lesser degree. Crustose lichens grow mainly on exposed rock. No club mosses were found.

Non-Vegetative Components: Dead organics and fungi were present in moderate abundance, as were rocks and exposed gravel/sand.

Dry Rocky Tundra (DRT)

As with the barrenland tundra areas, the Dry Rocky Tundra zone was common throughout the entire region. However, it was typically found on higher ground, with a greater abundance of non-vegetative components (ie rocks, exposed gravel/sand). This zone was characterized primarily by these non-vegetative components.

Vascular Seed Plants: Mountain cranberry, bog bilberry and Labrador tea shrubs dominated the vascular plant layers. Other species present but in low abundance included dwarf birch, crowberry and bearberry (*Arctostaphylos* spp.) shrubs, as well as various grasses. Very few herbaceous plants were found.

Non-Seed/Non-Vascular Plants: Lichens were very abundant. Though the ‘crustose’ lichens were the most prevalent of these plants, the ‘foliose’ forms were also very wll-represented. Mosses were present in moderate abundance. No club mosses were found.

Non-Vegetative Components: Rocks were the dominant feature in this ecological zone. Gravel and exposed sand were also present in moderate abundance, as were dead organics and fungi (albeit to a slightly lesser degree).

Esker/Kame Delta (Limited Occurrence)

A large kame delta (very similar to an esker in genesis and in structure) begins east of Jericho camp and runs south to its terminus at Carrot camp. The southern portion of this delta (upon which Carrot camp sits) is within the vegetation study boundaries. Due to its limited occurrence within the study area, this feature was not assessed in the same systematic manner as the five ecological zones. Also, the vegetation was so variable that systematic measurements would have been prohibitively time-consuming.

Eskers are mainly characterized by exposed sand. Dominant species include shrubs such as dwarf birch, Labrador tea, mountain avens, bilberry, crowberry and mountain cranberry, and non-seed plants such as mosses and lichens, with grasses and sedges in the wetter sites.

Mountain avens, the official flower of the Northwest Territories (Burt, 1991) formed dense monoculture mats over parts of the kame delta. Another common plant, the moss campion, is a ‘cushion plant’; it assumes this growth form as an adaptation against drying winds and cold temperatures (Pielou, 1994).

For comparison Table A2 provides ecological zones recognized in the 1999 vegetation study. Mapping for the Project site, is however, based on the simplier Canamera classification. Burt (2000) vegetation report uses the 1999 classification.

TABLE A2
1995 AND 1999 VEGETATION ZONE COMPARISON

"Ecological Zones" , 1995	Communities in 1999 study	Notes
Wet grass/ sedge meadow	Sedge community	There are few grasses in these communities.
	Non-tussock association	This is the commonest sedge association.
	Tussock association	Not well represented on this site. Could omit and go to
		"Sedge Community" designation only.
Wet birch brush	Birch riparian community	Located IN drainage basin, characterized by taller birches.
		Usually with active stream channels.
Moist birch meadow	Birch seep	On hillsides, usually at edges of boulder fields.
Dry barrenland tundra	Heath tundra	Characterized by high proportion of plants in Ericaceae.
Dry rocky tundra	Lichen-rock community	
	Lichen-rock on boulder fields/felsenmeer	Habitat is quite different from that of bedrock outcrops.
	Lichen-rock on bedrock outcrops	Polished or fractured outcrops, very dry, water flows off.
	Lichen-rock on cliffs	Vertical orientation; lichens on a sheer surface.
Esker/Kame Delta	Ridge complex (esker)	
	Crest association	Often sand or gravel with isolated patches of vegetation.
	Slope associations (Heath with birch)	Heath with birches in fringe along slope.
	Snowbank community	No equivalent in 1995 study. Leeward slopes & cliff bases.
	Transitions	These are easily discerned communities.
	Heath tundra with boulders	50% or higher mixture; leafy veg. vs. lichen-rock
	Hummocks	Trans. between sedge assn. and heath tundra
	Avens association	Atypical association found in only one area so far.