SCREENING REPORT:

Minto Explorations Ltd.

Minto Property

Prepared Pursuant to the

Environmental Assessment and Review Process Guidelines Order, 1984

Prepared by

Regional Environmental Review Committee and

Department of Indian Affairs and Northern Development

Whitehorse, Yukon Territory

April 7, 1997

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1.0 INTRODUCTION - THE ENVIRONMENTAL ASSESSMENT PROCESS

The Minto project has been screened under the *Environmental Assessment and Review Process Guidelines Order (EARPGO)* as Minto Explorations Ltd. entered the environmental assessment process prior to the January 1995 implementation date of the Canadian Environmental Assessment Act (CEAA).

The *EARPGO* ensures that as early in the planning process as possible and before any irrevocable decisions are made, the environmental implications of all proposals for which the Federal Government has decision making authority are fully considered. The Federal Government includes in its considerations:

- the potentially significant adverse environmental effects of the proposal; and
- the social effects directly related to those environmental effects including any effects that are external to Canadian territory.

Before a project can be approved, all potentially significant adverse effects must be mitigated or compensated for.

DIAND has developed processes to meet the requirements of EARPGO as part of the Department's administration of resource management statutes. Environmental screening as part of the routine application process is referred to as Level I screening. In cases where there is the potential for significant adverse environmental effects, more detailed assessment takes place, and this is referred to as a Level II review.

DIAND carries out Level II screening with the assistance of the Regional Environmental Review Committee, or RERC. RERC is chaired by the DIAND Director of Environment and is comprised of representatives of federal and territorial government departments, the Council of Yukon First Nations and Yukon First Nations directly affected by project proposals (Appendix 1).

The assessment process is initiated by the submission of a Project Overview. RERC's evaluation of the Project Overview often results in a request for the preparation of more detailed information in the form of an Initial Environmental Evaluation (IEE). An IEE is a documented evaluation of the proposed Project, providing detailed information regarding the Project's potential environmental and related socio-economic impacts. RERC members will evaluate the adequacy of the information and the proposed

mitigation measures. Based upon the information provided, RERC members will make recommendations to DIAND as to whether the Project may proceed or not. RERC may also make recommendations on mitigation.

A Screening Report based on the IEE is prepared by DIAND under the *EARPGO*, and contains recommendations for review by DIAND senior management. The Screening Report may recommend:

- the environmental and related socio-economic impacts of the proposal are insignificant or mitigable with known technology and the project may proceed to the regulatory level (and may include recommendations on mitigation measures);
- the impacts are unknown and call for the proposal to be reassessed and re-screened, or for the proposal to be referred to an EARP Panel;
- the proposal's impacts are significant and should be referred for review by a full EARP Panel; or
- the impacts of the proposal are unacceptable and the proposal should be rejected.

For more information on the Level I and II EARP processes please refer to the DIAND publications:

"The Environmental Assessment and Review Process (EARP) Yukon Region"

"The Environmental Assessment and Review Process Level I Screening: Yukon Region"; and

"The Environmental Assessment and Review Process Level II Screening: Yukon Region".

2.0 PROJECT DESCRIPTION

2.1 Project Identification

Proponent — Minto Explorations Ltd.

Project — Minto Property - proposed hard rock copper, gold, and silver open pit mine, mill and associated facilities

File # — DIAND RERC file # 5510-4-35

IEE Submitted — To the Department of Indian Affairs and Northern Development, Yukon Region, May 17, 1995.

2.2 Overview of Project

The Minto Explorations Ltd. copper-gold-silver project is 75 km (47 miles) north northwest of Carmacks, Yukon Territory, approximately 8.8 km (5 miles) west of the Yukon River (latitude 62° 35' north, longitude 137° 15' west). The site lies within the traditional territory of the Selkirk First Nation and comprises part of settlement land parcel R-6A selected and agreed to in Land Claim Final Agreement negotiations between the Selkirk First Nation and the Governments of Canada and Yukon.[1]

The property is currently accessible by helicopter or by boat along the Yukon River for approximately ll miles downstream from Minto landing and then by road for approximately 6 miles to the property.

Copper concentrations were first detected during a program of stream sediment sampling in the Minto area in 1970. The Minto claim group was staked in 1971 and extensively explored from 1972 to 1974. The first significant drill intersection was made in July, 1973 and diamond drilling delineated an ore deposit. The DEF claim group was staked to the north of and adjoining the Minto claim group by an exploration consortium. The two claim groups cover an area of approximately 5 miles in the north-south direction by 2 miles in the east-west direction. Mineable Reserves are 5.5 million tons grading 2.21% copper, 0.019 oz. gold/ton and 0.28 oz. silver/ ton.

Minto Explorations Ltd. plan to mine 1,500 tons per day from both an open pit and possibly an underground operation. The development will consist of an open pit and underground operation, overburden and waste rock dumps, tailings storage, and conventional copper flotation mill on an area of 345 acres (141 ha.).

The mill will be designed to process 1500 dry short tons (1360 t) per day for 350 days per year. The ore will be treated by conventional flotation to produce concentrate containing from 33% to 41% copper. Tailings will be impounded

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[1] At the time of writing the subject lands are withdrawn from disposition and entry by federal orders-in-council pending the implementation of the negotiated land claim agreement. After a successful ratification, the agreements are to be formally signed by the parties and brought into effect on a subsequent date to be agreed. While the land claim agreement still permits Canada to issue a surface lease if one is applied for, Minto Explorations Ltd. may also choose to enter into a surface lease with Selkirk First Nation.

behind a dam located in the Minto Cr. valley below the waste rock disposal area. Concentrate will be trucked to Skagway, Alaska on a daily basis.

There will be a camp on site for 54 employees. This will consist of a bunkhouse, change house with lockers, kitchen and diner, recreation, management and visitor units. Total development will be done over a period of 18 months. The proposed schedule is that road construction and site preparation will likely be started in the spring of 1997 and completed in the early summer of 1997 to spring of 1998. Camp and mill footings will be constructed once site preparation has been completed. Construction of the mill, service facilities and the tailings dam and mine preproduction will then be done and production started thereafter.

A secure all-weather road will be required for the project. Minto Explorations Ltd. proposes to cross the Yukon River with a barge during open water, and use an ice bridge during the winter. The existing trail on the west side of the river has been upgraded to an all-weather road for a distance of 30 kilometres.

3.0 TRIGGER AND SCOPE -- MINTO PROJECT

The trigger for the environmental assessment of the Minto project is the requirement for Minto Explorations Ltd. to obtain a type 'A' water licence pursuant to the *Yukon Waters Act*. The *Yukon Waters Act* is federal legislation, and the water licence prepared by the Yukon Territory Water Board does not become effective until approved by the Minister of DIAND. DIAND therefore has decision making responsibility. The Minister of DIAND must fulfill his obligations pursuant to *Environmental Assessment and Review Process Guidelines Order, 1984* prior to making an affirmative regulatory decision.

An environmental assessment can also be triggered by an application for a surface lease over the mine property under the *Territorial Lands Act* or the requirement for a Mine Production Licence under the new amendments to the *Yukon Quartz Mining Act*.

A Level II screening was initiated for this project as it was determined by DIAND that the proposal had the potential to create significant environmental impacts and therefore required more detailed review than can be achieved under Level I screening.

The scope of the environmental assessment carried out for the Minto project is limited to the copper/gold/silver deposit (Minto and DEF claims) located approximately 240 km northwest of Whitehorse, on the west side of the Yukon River. The ore body is located on the upper reaches of the Minto Cr. watershed, approximately 10 km. upstream of the confluence of Minto Cr. and the Yukon River, at an elevation of 2660 ft. The proposal includes an open pit and underground operation, overburden and waste rock dumps, tailings storage, conventional copper flotation mill, and associated camp and facilities and

such aspects identified in the IEE and supporting documentation and assessed during this review.

The scope of this assessment does not include the following:

- access road barges, landings or barge crossings that were previously assessed under a separate level 1 review;
- removal and processing of ore from other than the defined body;
- heap leaching; and
- any other aspect not identified in the IEE and supporting documentation and therefore not considered in this assessment.

4.0 CHRONOLOGY OF ASSESSMENT

On August 17, 1993 Minto Explorations Ltd. submitted their Minto Property Project Proposal to DIAND. In October 21, 1993 Minto Explorations Ltd. presented the Project Proposal to the RERC.

IEE Guidelines were prepared by the RERC and sent to Minto Explorations Ltd. on January 22, 1994.

On December 14, 1994 Minto Explorations Ltd. submitted Volumes I-III of their IEE to RERC. These volumes contained a development plan and a description of the environmental baseline conditions. On May 17, 1995 Minto Explorations Ltd. submitted Volume IV Environmental Mitigation and Impact Assessment and the screening commenced. On August 31, 1995 a response letter on the IEE was sent to Minto Explorations Ltd. This letter listed the RERC's concerns with the IEE submissions.

From September 1995 to the early part of 1996 Minto Explorations Ltd. submitted additional information to the RERC to address the concerns raised.

During the summer of 1996 further correspondence was exchanged between the Chair of RERC and Minto Explorations Ltd., a site visit was done, and additional fieldwork was conducted. Additional Acid Rock Drainage testing and analysis was also done.

As a result of concerns with the foundation conditions for the proposed locations of the waste rock dumps and with the proposed dam design and diversion ditches, additional technical meetings were held with Minto Explorations Ltd. officials and their consultants during the fall and winter of 1996-97. During this time Minto Explorations Ltd. also submitted supplementary information in response to the concerns raised.

For a more detailed chronology regarding the environmental screening of this project, please refer to Appendix 2: Chronological Summary of Key Events Related to the

Environmental Screening of the Minto Project.

5.0 CONSULTATION

5.1 Public Consultation

A public distribution list was prepared for the Minto Project which included interested members of the public, Yukon Conservation Society, Yukon Chamber of Commerce, Yukon Chamber of Mines, Village of Carmacks and the Whitehorse and Yukon College libraries.

On May 18, 1995 a letter was sent to the Minto Project public distribution list. This letter informed interested members of the public that Minto Explorations Ltd. had submitted their IEE and that it was available for public review. The letter also provided information regarding the environmental assessment process and invited members of the public to submit any comments or concerns about the project. The IEE was made available at the Whitehorse and Village of Carmacks Libraries, Selkirk and Little Salmon/Carmacks First Nation Offices, the DIAND office in Carmacks and DIAND Library in Whitehorse.

DIAND encouraged Minto Explorations Ltd. to carry out, and document, a public consultation program. On June 1, 1995 Minto Explorations Ltd. hosted a public meeting in Carmacks which DIAND representatives attended.

DIAND may also hold a public meeting if interested members of the public so desire. As no significant concerns were raised at the public meeting held by Minto Explorations Ltd., and only one public concern was identified to DIAND during the rest of the assessment a DIAND sponsored public meeting was not held.

Written public concerns arising from the March 5, 1997 Draft Screening Report were requested by DIAND prior to April 4, 1997. One submission was received and the concerns were considered for the finalization of the Screening Report. The main concern outlined was the possible erosion and slumping of thickened tailings to the extent that tailings are released from the impoundment and have an impact on the Yukon River ecosystem. It was requested that dam design, a monitoring and contingency plans be in place before the Water Board hearing. A trigger was requested to be established to cease operations before any impact on the Yukon River.

Under Section 6.3 (Thickened Tailings Disposal) of this Screening Report, is a request that a Tailings Management Plan be submitted with

the Water Licence application. This plan is to include details on a twice annual tailings slope survey along with a general evaluation of the performance of the thickened tailings system to be submitted to the Water Board on a yearly basis once operations begin. Erosion of tailings will reduce the capacity of the water storage area immediately behind the dam. The Tailings Management Plan should include triggers for deciding when to make operational changes and confirmation that no further tailings be deposited when the water storage area is reduced to below 160,000 cubic metres capacity.

5.2 Consultation with First Nations

The Minto Project proposal falls within the traditional territory of the Selkirk First Nation. Selkirk First Nation has selected the lands encompassing the quartz claims and mining leases that make up the Minto Project as category A lands (Block R-6A). The Selkirk First Nation, Little Salmon/ Carmacks First Nation, Council for Yukon First Nations, and Northern Tutchone Council are represented on the RERC for this project and were provided all RERC correspondence, invited to attend RERC meetings, and were given the opportunity to identify and submit their concerns. The Selkirk First Nation was provided funds by DIAND to enable it to participate in the environmental assessment process.

DIAND staff had a number of meetings and telephone conversations with the First Nation representatives to solicit and clarify concerns regarding acid rock drainage, fisheries and wildlife, and long-term chemical and physical stability of mine components. To the extent possible the concerns raised by the First Nations have been incorporated into this Screening Report.

6.0 ENVIRONMENTAL AND SOCIOECONOMIC ISSUES, MITIGATION AND RECOMMENDATIONS

6.1 Site Access and Transportation of Materials

Potential Impact

For the road access and barge crossing off its' mineral leases, Minto Explorations Ltd. has applied for permits and authorizations from the following regulatory agencies: Canadian Coast Guard for the barge and river crossings; Department of Fisheries and Oceans for construction of the barge landings and stream crossings; Yukon Territory Water Board for the construction of the barge landing, and stream crossing, and a Land Use Permit from DIAND for road access and barge landing.

DIAND Land Resources and the Yukon Territory Water Board carried out a integrated screening of the road access and barge crossing. A copy of this report is attached as Appendix 3. For further information on the environmental assessment of the road access and barge crossings, readers should contact:

Yukon Territory Water Board, Suite 106, 200 Range Rd. Whitehorse, Yukon, Y1A 3V1 (403) 667-3980	Land Resources, DIAND 320, 300 Main St. Whitehorse, Yukon, Y1A 2B5 (403) 667-3173

The scope of the Level II assessment of the mine, mill and associated facilities includes access and the transportation of materials on the mineral claim which were not within the scope of the integrated assessment mentioned above.

Regarding site access and the transportation of materials on the mineral claim, there are no significant resources that might be impacted by the improvement of the road access. With respect to creek or stream crossings, Minto Explorations Ltd. will be required to comply with the provisions of the *Yukon Waters Act* and the *Fisheries Act*.

In regards to the transportation of materials on the road, Minto Explorations Ltd. has submitted a conceptual Spill Contingencies and Emergencies Response Plan with it's IEE. As is standard practice, the detailed plan will be reviewed during the water licence process.

RERC Recommendations

1. ***The RERC recommends that a detailed Spill Contingencies and Emergencies Response Plan be submitted with the water licence application for review and approval.***

Government agency(ies) responsible to address recommendation(s)

1. Yukon Territory Water Board.

6.2 Acid Rock Drainage (ARD) and metal leaching.

Potential Impact:

ARD and metal leaching from exposed rock and tailings would add to the baseline metal loadings in Minto Cr. and possibly have an effect on downstream aquatic resources. The following concerns had been brought forward during the review about the potential for ARD from various mine components:

1. Concerns with the interpretation of data in regards to the ARD potential of waste rock, pit walls, tailings, concentrate stockpile, low grade sulphide and oxidized ore stockpiles;

2. Concern with the amount of sampling done to characterize the ARD potential of the lithologic units;

3. Concern with the ability to segregate sulphide rich ore with ARD potential from waste during actual mining operations;

4. Concerns that long term metal leaching may occur even though the ARD potential is considered low;

5. Concern with the potential for long term leaching of metals under normal weathering conditions and the need for further examination through the use of kinetic (humidity cell) testing; and

6. Concern that the petrographic characteristics of the units have not been correlated with acid-base accounting results in order that the neutralizing contributions of the different minerals can be better understood.

Specific mitigation and recommendations for each of the potential sources are as follows.

6.2.1 Waste Rock and Pit

Mitigation

Minto Explorations Ltd. states that the number of samples collected adequately characterizes the units due to the consistent nature of the rocks throughout the deposit. Test results indicate that the waste rock ranges from moderate to high in their acid consuming capabilities. Petrochemistry studies of the wall rock adjacent to the ore mineralization and within a four mile radius of the deposit indicates that the wall rocks display a restricted range of chemical composition, reflecting their rather uniform modes.

Because the immediate deposit has not been glaciated, the natural weathering profile of the deposit has developed over many tens of thousands of years without interruption. It was noted by Minto that the existing conditions at the deposit indicate that ARD has not developed to date from any of the units that have been exposed to weathering.

Minto Explorations Ltd. notes very sharp contacts between sulphide rich ore and

acid consuming wall rocks that will be easily identified during mining so that no ore material will end up in the waste dumps.

In response to RERC concerns regarding the need for some infill testing for ARD potential Minto Explorations Ltd. submitted 38 samples for acid base accounting. 16 of the 38 samples were selected on the basis that they formed the immediate hanging and footwall zones of the various ores. Test results confirm that no or only very small amounts of sulfides occur in the hanging and footwall zones.

Even though testing indicates that the waste rock is not expected to result in ARD, Minto Explorations Ltd. has committed that no waste rock with ARD potential will be used for construction where any leachate would be discharged to lower Minto Cr. Minto Explorations Ltd. states that criteria for the selection of waste rock to be used for construction will be developed and submitted with the water licence application.

An added contingency is that runoff and any fine material from the waste dumps will flow to the mill water pond and then the main water pond where it can be treated if necessary, before final discharge to the environment.

RERC Recommendations:

1. ***The RERC recognizes that it is not possible to predict with absolute certainty that all waste rock generated will not have any ARD potential. There is also a need to confirm that exposed rock in the open pit does not, or will not generate acid. Therefore the RERC recommends that a waste rock and open pit monitoring and management plan be submitted with the water licence application. The Plan should include but not be limited to the following:***

    i. ***A description of an operational ARD sampling, testing, and reporting program to confirm waste rock characterization prior to disposal. Further ARD testing should include petrographic and mineralogic descriptions of representative samples to determine spatial, textural, and paragenic relationships between the minerals;***

    ii. ***Plans for identification, sampling and reporting on lithological units that may be encountered during mining that have not previously been identified or sampled in drill core;***

    iii. ***Sampling of waste rock peripheral to the starter pit that will be extracted later in the mine life and has not as yet been adequately characterized;***

iv. *A description of the criteria to determine the suitability of waste rock for any construction purposes (foundations, rock drains, tailings dam, roads, diversion ditches, etc.), or for disposal in waste dumps or low grade ore stockpiles;*

v. *A waste rock disposal plan and schedule;*

vi. *A water quality monitoring plan for waste dumps and open pit;*

vii. *Triggers and actions in the event that monitoring indicates poor quality runoff from the waste dumps and open pit;*

viii. *Plans for the monitoring of the physical and chemical stability of the waste rock dumps and open pit in the event of a temporary shutdown of operations;*

ix. *Criteria and timing for conducting kinetic (humidity cell) testing of any units that will remained exposed on surface in waste dumps, or the pit walls that may have the potential to generate acid or release metals in the long term;*

x. *Contingencies for the mitigation of acid generation or metal release in any units in the exposed pit walls that testing has indicated may be problematic;*

xi. *The waste rock management plan should include provisions for updating the water quality modelling of pit water, and waste rock runoff, as new information becomes available and the ultimate pit design is refined; and*

xii. *A description of the information that will be reported to the Water Board, and the frequency of reporting.*

The plan should be prepared, implemented and supervised by an appropriate certified professional.

Government agency(ies) responsible to address recommendations

6.2.2 Tailings

Mitigation

Minto had tests done to evaluate the ARD potential of tailings samples derived from metallurgical testing. All three of the tailings samples tested were overwhelmingly acid consuming. Analysis of tailings products from metallurgical testing was done. A representative sample of wet flotation tailings were submitted to B.C. Special Waste Extraction Procedure (SWEP), and Simulated Rainfall Leachability (SRL) tests. Samples of the leachate from each test were then submitted for analysis. Results indicate that tailings leachate contains very low concentrations of metals. In most cases concentrations were an order of magnitude lower than that which would be required to classify the leachate as a special waste in B.C., or would result in contamination of runoff.

A sample of tailings supernatant was submitted to acute LC_{50} and extended 30 day chronic toxicity bioassay testing. There were no mortalities in either rainbow trout or daphnia magna at 100 % concentrations over the 96 hr and 48 hr. test period. There was also 100% survival in the 100% tailings supernatant over the 30 day test period, confirming the supernatant to be non-toxic.

RERC Recommendations:

1. ***As with the waste rock, it is not possible to predict with certainty that the tailings will not develop ARD. Therefore the RERC recommends that Minto Explorations Ltd. submit with the water licence application a plan for the ongoing monitoring of tailings for ARD and leaching potential. The Plan should include but not be limited to the following:***

    i. ***A proposal for the ongoing sampling and testing of tailings for ARD potential;***

    ii. ***Triggers and contingencies in the event that testing indicates ARD potential; and***

    iii. ***A description of the information that will be reported to the Water Board, and the frequency of reporting.***

Government agency(ies) responsible to address recommendations

1. Yukon Territory Water Board

6.2.3 Ore stockpiles

Mitigation

A total of 679,000 tons (617,000 t) of partially oxidized material will be stockpiled. This material will be stockpiled on a pad of waste rock to the west of the open pit. Minto Explorations Ltd. notes that research is being done to develop reagents that will give acceptable recoveries when milling partially oxidized ores. Otherwise the stockpile will be abandoned where is.

It is expected that approximately 69,100 tons (62,800 t) of low grade material (0.5% to 0.6% Cu) will be stockpiled during the life of the mine. Minto indicates this material will be milled during periods of higher copper prices and no low grade sulfide stockpile will remain beyond the end of the life of the mine.

The oxide ore has NP/AP ratios around 6 and the sulphide ore around 4.4. Both have total sulphur less than 0.3%. With these values, Minto indicates they are unlikely to produce ARD during the mine life or over the long term.

Simulated Rainwater leachability tests and B.C. Special Waste Extraction Procedure (SWEP) tests done on samples of low grade sulphide and oxide ore showed leaching of low levels of copper (below *Metal Mining Liquid Effluent Regulation* levels). To determine whether further kinetic testing was necessary, Minto Explorations Ltd. asked their consultant to conduct a assessment of the leach test data.

The assessment of the potential impact to Minto Cr. due to leaching of copper from low grade oxidized ore material was based on two models: a mass balance model, and a loadings model. Based on the results of these models, it appears that there would be very little impact to surface water quality from the low grade oxide ore stockpile, and further test work is not necessary on these materials. Furthermore, any effluent from the stockpiles will end up in the mill water storage or main water storage impoundments and can be monitored and treated before discharge if necessary.

RERC Recommendations:

1. ***Since there is the potential for some leaching of copper, and since Minto Explorations Ltd. will need to monitor quality and quantity of water inputs into the tailings area in case treatment of the tailings water may be needed, the RERC recommends Minto Explorations Ltd. submit with the water licence application a ore stockpile water quality monitoring and action plan which should include but not be limited to the following:***

i. ***The location, method, frequency and parameters to be monitored from the ore stockpiles (including high, intermediate, low grade and oxide stockpiles);***

ii. ***Triggers and actions for the treatment of leachate from any of the stockpiles, and for the restoration and abandonment of any or all of the stockpile such that long term leaching will not pose a problem. This should include a consideration of disposing ore stockpile back into the open pit in the event that effluent quality or physical stability becomes a problem;***

iii. ***A description of how stockpiles will be addressed during periods of temporary suspension of mining activities; and***

iv. ***A description of the information that will be reported to the Water Board and the frequency of reporting.***

Government agency(ies) responsible to address recommendations

1. Yukon Territory Water Board

6.2.4 Concentrate

Mitigation

The concentrate will be stored in a covered building with a capacity of 4550 tonnes. This represents approximately 10 weeks of production and will provide enough capacity to get through spring break-up and fall freeze-up when Minto Explorations Ltd. is unable to transport concentrate. Any runoff from the concentrate will flow directly into the mill water pond where it will be recycled or directed to the water storage pond where it may again be recycled, or can be treated and released.

RERC Recommendations:

1. ***The RERC recommends that Minto Explorations Ltd. submit with the water licence application plans for monitoring the runoff from the concentrate stockpile. This plan should include but not be limited to the following:***

    i. ***The location, method, frequency and parameters to be monitored; and***

ii. A description of the information that will be reported to the Water Board and the frequency of reporting.

Government agency(ies) responsible to address recommendations

1. Yukon Territory Water Board

6.3 Thickened Tailings Disposal

Potential Impact

Minto Explorations Ltd. proposes to thicken the tailings and then discharge the thickened tailings to the tailings facility. The thickening system being proposed is based upon the technology developed by Inco Limited and by GL&V Process Equipment Group Inc., Orillia, Ontario. In the thickened tailings disposal system, tailings which are thickened to a predetermined density are pumped or flow by gravity to the disposal area and are discharged from one or more spigots from a topographic high.

A key feature of the thickened tailings disposal system is that segregation of tailings during deposition is reduced. The slimes fraction of the tailings are more disseminated throughout the deposit. This is contrary to the behaviour of a conventional tailings disposal system where the coarse-grained fractions settle out in the vicinity of the discharge point and the slimes fraction may stay in suspension for long periods.

Other thickened tailings operations visited by Minto show that the tailings mass will consolidate under its own weight and the supernatant liquor and runoff from precipitation plus a small fraction of the tailings fines will collect in the main water storage pond. The deposition of tailings is expected by Minto to be quite uniform and the deposit is formed from thin sheets of tailings. The deposition angle is ultimately determined by a number of parameters some of which can be controlled by the operator.

Minto Explorations Ltd. has used a deposition slope of 5% for estimating the capacity of the tailings disposal basin and for the general design of the system. Minto Explorations Ltd. anticipates such slopes will permit rapid surface runoff without significant erosion. A minimum tailings thickener underflow density of 66% solids by weight must be obtained consistently to achieve the predicted deposition slope of 5%. If the mine operator were unable to achieve the design slopes, the tailings impoundment capacity would be significantly reduced. To address this concern, Minto Explorations Ltd. consultant recommended that the system be designed to deliver slopes 1-1½ % greater than that required.

As such, Minto Explorations Ltd. has committed that only tailings with a density of 67.5% solids by weight will be discharged to the tailings pond, however the tailings thickener is being designed to produce an underflow density of 70% solids by weight which would allow for a deposition slope of greater than 7%. Minto Explorations Ltd. believes a significant contingency has therefore been allowed for in the basic design of the thickened tailings disposal system.

Another contingency is the option to add lime to the tailings slurry as a viscosity modifier. This will assist in thickening the tailings and ensuring an appropriate deposition slope. Minto has committed to having a lime addition skid on site at the start of production to ensure that lime can be added to the tailings slurry if required.

The following concerns had been brought forward during the review about the concept of thickened tailings:

1. Consequences on tailings impoundment capacity and integrity if the design depositional angle of tailings cannot be met;

2. Possible glaciation and ice lensing leading to potentially thaw unstable conditions within the tailings deposit; and

3. Possible erosion of tailings due to surface runoff which would decrease available water storage capacity and potentially lead to diminished effluent quality and limit reclamation efforts.

Mitigation

1. Minto Explorations Ltd. believes that with the proper thickening equipment that the desired depositional angle of tailings can be met and exceeded. Minto Explorations Ltd. has agreed that the thickener is a key component of the milling operation and has committed that no tailings below the cutoff density will be deposited onto the tailings slope. A temporary storage pond, large enough to hold three days worth of tailings will be built beside the thickener in order to allow for mill shutdown time in case the thickener goes down.

   Minto Explorations Ltd. has also proposed a monitoring plan to survey the tailings twice a year. Minto Explorations Ltd. has committed to ceasing deposition of tailings if the water storage capacity in the impoundment is reduced below 160,000 cubic metres.

2. Minto Explorations Ltd. proposes to test the tailings on a once yearly basis

for ice lensing and to modify operational procedures if ice is found to be a problem. Minto Explorations Ltd. notes that thickened tailings operations have been running for a number of years in areas where minimum temperatures approach those of the Minto mine site. No adverse operational problems have been observed.

3. Minto Explorations Ltd. has proposed diversion ditches around much of the tailings impoundment to intercept surface runoff and divert it into the water storage area. Experience from other operations has showed that erosion of thickened tailings has not been a problem. During operations the capacity of the water storage area will be reduced if erosion does occur and the commitment would hold to cease deposition of tailings when the storage capacity is reduced below 160,000 m^3.

RERC Recommendations

1. The RERC recommends that Minto Explorations Ltd. submit with it's water licence application a Tailings Management Plan. The Plan should include but not be limited to the following:

i. Final detailed designs for the thickener and other related structures of the tailings facility;

ii. A confirmation of the commitment that no unthickened tailings (<67.5% solids by weight) will be deposited into the tailings disposal area;

iii. The location, method, frequency and parameters to be monitored, including a twice annual tailings slope survey program; and

iv. Triggers for deciding when to make operational changes and confirmation that no tailings will be deposited in the tailings basin when the water storage capacity is reduced to 160,000 m^3.

v. A description of the information that will be reported to the Water Board and the frequency of reporting. This information should include but not be limited to:

a. the results of the monitoring done pursuant to the tailings management plan;

b. an evaluation of the performance of the thickened tailings

system, including available storage capacity; and

c. ***whether any contingencies were triggered in the past year, or are projected to be triggered in the coming year.***

Government agency(ies) responsible to address recommendations

1,2. Yukon Territory Water Board

6.4 Tailings Effluent Treatment

Potential Impact

The main water storage pond will receive all runoff from the mine site area as well as tailings supernatant. Minto Explorations Ltd. will be reclaiming water for milling and mining purposes, however there may be occasions when Minto will need to discharge excess water from the main water storage pond. There is a potential that the water will require treatment to remove sediments or reduce heavy metals levels such as copper, prior to discharge to the environment.

Mitigation

Minto Explorations Ltd. conducted water quality modelling to assess the potential for impacts on surface water quality. Minto Explorations Ltd. noted that total metals in background water quality already exceed the Canadian Council of Minister of the Environment (CCME) guideline levels for the protection of aquatic life for 7 metals: aluminum, calcium, chromium, copper, iron, lead and zinc.

By considering the expected tailings supernatant quality, water inputs into the pond, and flows in Minto Cr., Minto Explorations Ltd. has determined that the operation of the mine will not adversely affect water quality downstream in Minto Cr. where fish have been found. Minto expects that the main water storage pond will have adequate retention time to settle out sediment and Minto Explorations Ltd. does not expect to have to treat water before discharge.

As a contingency Minto Explorations Ltd. has made provision for the treatment of water. Minto Explorations Ltd. notes that lime would either be added to the tailings thickener as discussed above, or to the discharge from the mill water pond. Heavy metals would then be precipitated either in the tailings mass, or in the mill water pond with final polishing in the main water storage pond. Minto Explorations Ltd. states that final details on effluent treatment will be provided in the water licence application. Minto Explorations Ltd. also notes that a design

will be done for a polishing pond to be constructed below the tailings/water dam if required to provide additional retention time for water treatment.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. submit with the water licence application a tailings effluent treatment plan. The Plan should include but not be limited to the following items:***

    i. ***Detailed design for the lime treatment plant and polishing pond;***

    ii. ***The parameters to be monitored and their location, sampling methodology, and frequency;***

    iii. ***A detailed action plan for effluent treatment including effluent standards, triggers, actions and scheduling. A key objective should be the initiation of treatment well before there is the potential for the release of waters which exceed licence standards;***

    iv. ***A plan for the evaluation of any treatment sludge which may be generated to determine its composition and stability. The results of the evaluation of the treatment sludge generated shall be considered in the method proposed for abandoning the sludge. The proposed method of abandoning the sludge should be described in a sludge disposal plan submitted to the Water Board for review and approval before any sludge is disposed of.***

    v. ***A description of the information that will be reported to the Water Board and the frequency of reporting.***

Government agency(ies) responsible to address recommendations

1. Yukon Territory Water Board

6.5 Tailings/Mill Water Storage Dam

Minto Explorations Ltd. notes the maximum dam crest elevation of 2360 feet will provide adequate tailings/water retention for the complete life of the mine. The normal operating level of the water reservoir will be 2350 feet. The following sub-sections identify the concerns that were raised during the review of the proposed tailings/mill water storage dam design, and the proposed mitigation. At the end of the sub-sections are the RERC recommendations.

6.5.1 Thaw Settlement

Potential Impact

The minesite is located in a zone of discontinuous permafrost. Permafrost usually occurs in valley bottoms and north facing slopes in the area. The locations selected for the mill water and tailings dam sites are characterized by zones of warm permafrost. The presence of permafrost in fine grained materials can lead to saturation of the soils upon thawing and with the development of high pore pressures the load bearing capacity of the foundation is greatly reduced and failure of the structure could occur. A failure of the tailings dam would result in the release of large amounts of water and possibly tailings that would run down Minto Cr. and have a possible impact on downstream resources.

Mitigation

Minto Explorations Ltd. considered environmental and economic aspects before identifying a preferred location for the dam. In 1994 and 1995 Minto Explorations Ltd. drilled a series of geotechnical boreholes to evaluate foundation conditions for a dam in the Minto Cr. valley. The site chosen is detailed in an EBA Engineering Consultants Ltd. Report #0201-95-11509 Geotechnical Design Tailings/Water Dam Minto Project, Yukon. Near surface bedrock occurs along the core area of the proposed dam in this location.

Minto Explorations Ltd. has proposed to expose the sound intact bedrock under the core of the dam by removing all organic and residual material from this area. In addition they have committed that all organic and deleterious material including any ice-rich fine grained permafrost bearing soils will be excavated under the up- and down-stream shells of the dam.

Minto proposes to conduct laboratory tests to ensure all ice-rich frozen materials are identified for removal from the dam foundation. The test will be to determine the frozen bulk density of the material. Minto Explorations Ltd. proposes the cutoff between ice rich and ice poor soil to be a frozen bulk density of 1.7 Mg/m3. The moisture content and the dry bulk density will also be determined. In addition, samples will be allowed to thaw in a container to visually evaluate if there is any excess water present over that required for sample saturation.

Minto Explorations Ltd. will install piezometers and thermistors within the dam and foundation materials to monitor pore pressures and temperatures

during operations. Settlement survey points will also be set along the dam structure to monitor for movement.

6.5.2 Dam Seepage

Potential Impact

Seepage of water from the tailings impoundment may occur through the core and through the dam foundation and abutments. Seepage may be through extremely fractured rock beneath the core area of the dam or through thawing of permafrost materials peripheral to the structure. While piping may occur without permafrost being present, seepage may induce accelerated thawing of permafrost leading to preferential pathways and piping which may ultimately compromise the stability of the dam. Seepage is also a concern if it allows contaminated water to be released to the environment.

Mitigation

Minto Explorations Ltd. has committed to excavating under the core of the dam to expose sound, intact bedrock. Cracks and joints will be cleaned out and filled with grout or concrete. Irregularities in the surface will be filled with concrete to provide a good surface prior to the placement of fill. Special attention will be given to removal of fine grained ice-rich material on the upstream and downstream shells of the dam as well as compaction of fill materials against the abutments to ensure minimal seepage.

6.5.3 Spillway Design

Potential Impact

Minto Explorations Ltd. has proposed a flow-through or in-built spillway for the tailings dam. This involves the construction of the spillway over the top of the dam and allowing water to flow into and through the rock filled downstream shell. The downstream shell comprises bedrock shot rock from stripping of the pit. A concern was raised that with high flows of water over the dam, erosion of the downstream shell would occur and failure of the toe of the structure and eventually the entire dam would take place. The effects of freezing of water in the downstream shell and of ice flowing over the spillway may exacerbate erosion.

Mitigation

In response to concerns with the stability of the downstream shell, Minto has modified the original design to include a toe berm of oversize rock at the downstream toe of the dam. Stability analysis have been done and factors of safety conforming to Canadian Dam Safety Guidelines have been provided.

Minto has committed that the spillway will be altered to allow passage of the Probable Maximum Flood (PMF) on abandonment. The final estimate for PMF will be determined by assessing the additional on-site climatic data collected during operations. Revised estimates will be provided as part of the closure plan and will be incorporated into final designs. Analyses have been conducted on preliminary designs for the spillway to verify that it can preform adequately under PMF conditions. Preliminary designs indicate that upgrading will involve flattening the downstream face of the dam to an approximate slope of 5H:1V. The initial spillway will be widened over the crest of the dam and down the downstream face. The final spillway will require excavation of the upper portion of the dam core to an elevation of 2340 feet. A 4 foot thick layer of insulating material (granulite) will be placed over top of the core, and combined with a fine and coarse filter. In order to provide adequate seismic stability, the toe of the abandonment dam will have to be excavated to bedrock.

To provide frost protection of the core material under the spillway during operations, Minto has proposes to use insulating material referred to as granulite. The granulite is a lightweight, granular material manufactured in rotary kilns from natural clay. Granulite has a high insulating value, is chemically stable and environmentally safe. The original concept of a sheet pile to control reservoir levels and seepage has been replaced by a geosynthetic liner sandwiched between pressure treated timber walls. Minto acknowledges that the timbers will eventually deteriorate, but state that their presence is not required once the mine is abandoned. Minto states the timbers are only required for the duration of the mine life and will be removed during the final abandonment modifications to the spillway.

6.5.4 Dam Fill Material Specifications

Potential Impacts

Concerns were raised in the review that inadequate specifications were given for core, shell, and filter materials within the dam. If inappropriate

material is utilized for components of the dam, piping of core and filters and subsequent failure could occur.

Mitigation

Minto Explorations Ltd. is proposing to use native residuum and sand colluvium material for the core of the dam and have proposed a filter design to ensure adequate protection of core materials. Minto has provided gradation specifications for the core and filter materials. Minto Explorations Ltd. notes that the fine and coarse filters have been extended downstream of the core to the toe of the downstream shell to control seepage beneath the dam which could lead to piping of the native materials.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. prepare and submit final designs for the dam and related structures with it's water licence application. The final designs should include, but not be limited to the following:***

    i. ***Material specifications including gradation, durability, permeability, and densities;***

    ii. ***Rip-rap and downstream shell material specifications including size, gradation, soundness and durability, specific gravity, and freeze-thaw durability;***

    iii. ***Criteria for the selection of the above specifications in light of maximum design flowrates over the spillway, and operations during freezing conditions.***

    iv. ***Details of the stability analysis on the final dam design including a stability analysis of the downstream shell considering an elevated phreatic surface within the dam and the impact of flows discharging from the downstream shell;***

    v. ***Appropriate factors of safety, which meet or exceed the Canadian Dam Safety Association Guidelines;***

    vi. ***Construction Quality Assurance/Construction Quality Control (CQA/CQC) documents, detailing all aspects of construction and material specifications and testing, foundation preparation procedures, grouting and shotcreting criteria, instrumentation,***

construction supervision, and reporting etc. Minto has proposed that the criteria for the cutoff between ice rich and ice poor should be a frozen bulk density of 1.7 Mg/m3 and this should be reflected in the QA/QC manual. The QA/QC monitoring and reporting should be done by the design engineer.

2. *The submission with the water licence application should be accompanied by a monitoring and contingency plan that should include but not be limited to the following:*

    i. *Details of the dam crest settlement monitoring program including frequency and reporting methods, and plans for periodic third party assessment of the structures;*

    ii. *Plans to monitor seepage and possibilities of piping. Triggers and contingencies in case seepage detrimental to dam stability is detected should be discussed;*

    iii. *Plans for the installation of thermistors to monitor the performance of the granulite during the minelife; and*

    iv. *A description of the information that will be reported to the Water Board and the frequency of reporting.*

3. *All design drawings and specifications should be signed and stamped by an appropriate engineering professional.*

4. *Prior to closure Minto Explorations Ltd. must upgrade the dam to provide long term stability of the dam. The tailings dam and spillway should be upgraded so that it will pass PMF and be able to withstand MCE. As the dam will require modifications to meet these criteria, engineered detailed designs will be submitted to the Water Board for approval, prior to abandonment and prior to upgrading the tailings dam or associated structures. Post closure monitoring plans shall also be provided to ensure the continued integrity of the structures.*

Government agency(ies) responsible to address recommendations

1, 2,3,4. Yukon Territory Water Board

6.6 Stream Diversions

Potential Impact

Minto Explorations Ltd. have proposed to divert water (streams and runoff) from around a portion of the tailings disposal basin in order to protect the integrity of the deposited tailings. Minto Explorations Ltd. has divided the diversion ditch design into two sections. The first is in the area with no permafrost on the north side of the tailings impoundment from the mill site to the main water storage pond behind the main dam. This section will be integral with the main access road into the minesite. The other area incorporates zones where thick organics and permafrost are widespread, specifically from the airstrip to the mill water pond.

Concerns were raised regarding unwanted seepages from the diversion ditch between the mill and the main water storage dam. Unwanted seepages may affect the physical stability of the slopes on which they are constructed. These seepages could also result in erosion of tailings or sloughing of material on the slopes above the tailings impoundment which could be transported to the pond and reduce the available size of the main water storage pond and limit the ultimate capacity for tailings.

Mitigation

The access road between the mill and the main water storage pond will be used for access to the mine and for construction of the tailings/water dam for a period of approximately six months before the diversion ditch is constructed along the inside of the access road. Minto has indicated the road excavation will be inspected by an engineer and tested to determine permeabilities of the in-situ materials as outlined in the QA/QC manual submitted with the water licence application.

Minto has stated that the diversion ditch will be constructed to a engineering design specification and this specification will include a ditch liner if required. The ditches will be designed to handle 1 in 200 year storm events during operations.

Performance of this section of the diversion ditch will be observed daily and easily accessed for repairs during operations. Similarly the diversion structure from the airstrip to the mill will be integral with the airstrip access road and south waste dump.

Minto Explorations Ltd. has not allowed for a ditch along the lower

southeast side of the tailings impoundment. The company feels that any disturbance in the permafrost rich ground in this area will promote thawing and erosion.

To abandon the diversion ditch it will be moved over on top of the tailings. The geometry of the ditch will be sized to accommodate PMF design flow. A series of coarse and fine filters will be required to ensure no piping of the underlying tailings.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. prepare and submit with it's water licence application final designs for the diversion ditches. The final designs for the diversion ditch shall include, but not be limited to the following:***

    i. ***Designs for the diversion ditches including location of diversions, cross-sections, size, gradient, flowrates, velocities, riprap and filter specifications and construction details; and***

    ii. ***The QA/QC manual should outline the investigation program that will be undertaken to determine the permeabilities of the ditch subgrade and the mitigation that will be undertaken in areas where the permeabilities do not meet the specified criteria.***

2. ***The RERC recommends that prior to closure Minto Explorations Ltd. should submit final designs for decommissioning the diversion ditches. These designs should include but not be limited to the following:***

    i. ***An evaluation of the long term stability of the diversion ditch.***

Government agency(ies) responsible to address recommendations

1, 2. Yukon Territory Water Board

6.7 Waste Rock Dumps.

Potential Impact

Minto Explorations Ltd. notes that a smaller open pit will be developed initially in the form of a starter pit in Phase 1 to obtain access to the higher grade ores which will be mined early in the life of the mine. The main open pit will be developed to the north of the starter pit in Phases 2 and 3. The pit will ultimately be expanded to the south as Phase 4.

The overburden and waste quantities that must be moved during the pre-production period are 1,007,000 cubic yards (768,000 m^3) and 2,963,000 tons (2,694,000 t) respectively. A grand total of 4,048,000 cubic yards (3,090,000 t) of overburden and 23,789,000 tons (21,626,000 t) of waste will be mined and disposed of during the life of the mine. The stripping ratio will be approximately 4.9:1.

Concerns had been raised regarding the presence of thaw unstable material in the area to the west and north-west of the open pit, on north facing slopes. If waste dumps are constructed on thaw unstable ground, the dumps may creep or fail. Waste rock may then be dispersed to a wider area and may block streams or disturb a larger area than necessary. While acid rock drainage and metal leaching is not expected to be a problem from the waste dumps, to be safe it is best that waste dumps not be disturbed once they are constructed. This will ensure that new rock surfaces are not exposed, decreasing the potential for oxidation.

It is also important that the location and construction of waste dumps not result in the significant alteration of drainage courses. The altering of drainage could contribute to increased sediment or metal loading in the water. The long term stability of waste rock dumps is also contingent on any stream diversions and rock drains remaining operational in the long term. Differential settlement of the waste rock could compromise the integrity of any rock drains running through the dump. Any impoundment of water within the dump itself could lead to increased likelihood of failure.

Mitigation

Minto Explorations Ltd. has used a map with limits of solifluction (solifluction are areas susceptible to the gravity flow of soil due to saturation with water) marked on it to determine areas underlain by variable permafrost and for the initial determination of the dump layouts. Minto Explorations Ltd. proposes to locate the waste rock dump above the limits of solifluction, in an area to the north of the open pit.

Extensive diamond drilling done on the property in the 1970's and again from 1993 to 1996, has given a good indication of the depth of overburden, colluvium and residuum that can be expected in various areas and the impact on the foundation conditions for the overburden and waste rock dumps. Minto Explorations Ltd. has agreed to undertake a foundation investigation program, consisting of at least 12 geotechnical holes in 1997. The purpose of the geotechnical program is to characterize the nature and extent of permafrost (if any) and of the soils and bedrock in the area of the toe of the proposed overburden and waste rock dumps to the west of the open pit and to ensure that the dumps

will have thaw-stable foundations. The following will be recorded: organic cover; permafrost ice content and temperature; in-situ soil consistency and ground water levels. Soil samples will be collected at regular intervals and sent to the EBA laboratory in Whitehorse for soil classification.

The extent of the program will be similar to the program done in 1996 and a total of approximately 12 holes will be drilled to expected maximum depths of 33 ft (10 m). The information obtained from this program will be combined with information currently available to confirm the location of the toes of the dumps and finalize the design of the overburden and waste rock dumps. It is expected that this work will be done 1997.

Minto has proposed construction of the main waste dump in lifts with the height and extent of individual lifts to be determined by the mine planning engineer as part of the short-term mine planning. They have proposed end dumping of material which will require two 15 metre (50 ft.) wide access roads along the dump slope. Depending on the natural angle of repose, the overall slope of the dump in the area of the roads could approach 31 degrees.

Concern remains outstanding regarding the dump stability in light of the construction methods and the decision to place possible ice-rich overburden material in the main dump. As such, Minto's geotechnical consultants have recommended construction of the dump utilizing a 6 metre (20 ft.) wide bench for each 15 metre (50 ft.) vertical increase in the waste dump. Minto must address this stability concern in their final designs submitted as part of the water licence application. In addition, the criteria for acceptance and placement of overburden material must be addressed along with designs for overburden placement within the dump.

Coarse rock drains will be constructed in the small feeders to the main stem of Minto Creek. Coarse rock will also tend to accumulate at the toe of waste rock dumps by natural segregation to form a free-draining blanket at the base of the dumps. Large quantities of coarse rock can be produced readily in the open pit by varying the blast pattern as required and this coarse rock can be used to blanket larger areas to promote drainage as required. Minto has stated that no rock will be dumped into the main stem of Minto Creek.

Minto Explorations Ltd. states that localized slumps of the crests of dumps may occur and these will be dealt with as part of the ongoing dump maintenance during the life of the mine. These slumps will not have an impact on the operation or on the downstream environment. An added contingency is that runoff and any fine material from the waste dumps will flow to the mill water pond and then the main water pond where it can be treated if necessary, before

final discharge to the environment

Small quantities of waste rock mined from the open pit will be used for the construction of the downstream portion of the tailing/water dam, the rock fill south of the mill to provide a working area and the access road to the air strip. No overburden or waste rock will be disposed of to the south-east of the open pit as had previously been proposed.

The ore body is covered by up to 200 feet (60 m) of overburden to the south in an area where permafrost is expected to depths of 60 feet (18 m) . This overburden consists of silt and fine sand with varying amounts of organic material, occasional layers of peat and gravel, and permafrost. Approximately 621,000 yds ^{3} (474,000 m^3) of this overburden will be mined in Phase 1. This overburden will be stockpiled on a separate dump on east-facing slopes west of the open pit where material can be recovered and used for closing reclamation (an estimated volume of 231,000 yds$^{3)}$. Minto Explorations Ltd. states that this dump will have thaw stable foundations. This particular dump layout will permit any ice to melt and seepage to drain towards upper Minto Creek. The dump area to be reclaimed at the end of the mine will be approximately 22.0 acres (8.9 ha).

Minto has stated that no rock will be used for construction purposes (roads, dam, rock drains etc.) that will have ARD or metal leaching potential.

RERC recommendation:

1. ***The RERC recommends that Minto Explorations Ltd. provide with the water licence:***

   i. ***As a condition of the water licence, the results of the foundation investigations conducted in 1997 and the geotechnical analysis. The designs should be submitted for review and approval.***

   ii. ***Location, tonnages, configuration, and scheduling of the waste and overburden dumps, along with the criteria for acceptance and location of placement of any overburden that will be placed within the main dump;***

   iii. ***Minto shall ensure that all dumps will be constructed on thaw stable ground;***

   iv. ***Details of short and long term stability analysis conducted on all dumps shall be submitted. The analysis should consider adverse***

impacts on stability due to the inclusion of overburden material in the main dump;

v. *Discussion of stability results and the implications to the dump design, and consequences of any dump failures during operations or after closure;*

vi. *Design criteria, final design drawings, and material specifications for rock drains through the dumps, or diversion ditches or berms around the dumps; and*

vii. *Identification of alternative dump areas if the primary dump site's foundation investigations and stability evaluations indicate potential unsatisfactory performance;*

viii. *The CQA/CQC document should include the criteria for acceptance and location of placement of any overburden that will be placed within the main dump, along with criteria that will define stable dump foundation conditions.*

2. *All design drawings and specifications shall be signed and stamped by an appropriate engineering professional.*

3. *The Water Licence submission should also include a waste rock dump operational monitoring and inspection plan. This plan should include but not be limited to:*

i. *Dump foundation parameters that will be monitored (pore pressures, temperatures, etc.), their locations, and frequency of monitoring;*

ii. *Waste rock parameters that will be monitored during operations (material quality, loading rates, movement rates, etc.) their method of monitoring, frequency, and reporting procedure; and*

iii. *Remedial plans if a failure occurs during operations.*

4. *A description of the information that will be reported to the Water Board and the frequency of reporting. This information should include, but not be limited to the following:*

i. *the results of the monitoring done on the waste rock dumps;*

ii. *an evaluation of the performance of the waste dumps;*

iii. ***whether any contingencies were triggered in the past year, or are projected to be triggered in the coming year; and***

iv. ***revisions to waste disposal plans including provision for review and approval of the revisions.***

Government agency(ies) responsible to address recommendations

1, 2, 3, 4 Yukon Territory Water Board

6.8 Other Solid and Liquid Waste

Potential Impact

The potential impacts of waste disposal are as follows:

i. wastes are disposed improperly resulting in contamination of ground and surface waters; and

ii. Food wastes and such materials are disposed in a manner to attract bears and wildlife.

Mitigation

Minto Explorations Ltd. has proposed to burn combustible materials, reuse and recycle some materials, and dispose of hazardous and inert materials in an appropriate and acceptable manner.

Garbage disposal resulting in unsanitary conditions are addressed under the *General Sanitation Regulations* administered by Occupational and Environmental Health Services, Health and Welfare Canada. The *Wildlife Act* administered by the Department of Renewable Resources, YTG prohibits the disposal of garbage in a manner that encourages bears to be a public nuisance. Furthermore, Minto Explorations Ltd. will be required to comply with the storage, handling and disposal requirements contained in the *National Fire Safety Code* and the *Workplace Hazardous Materials Information System Regulations.*

RERC recommendation:

1. ***The RERC advises Minto Explorations Ltd. that pursuant to section 139 of the Yukon Quartz Mining Act, Minto Explorations Ltd. will be required to obtain a Mine Development and Production licence when the amendments to the Yukon***

Quartz Mining Act come into force. It is anticipated that solid waste management will be covered under a Development and Production licence. The RERC recommends that Minto Explorations Ltd., after consultation with Selkirk First Nation, submit to the Mineral Resources Division, Department of Indian Affairs and Northern Development, a solid waste management plan for their review, prior to disposing of any solid waste onsite.

2. ***If a surface lease is applied for under the Territorial Lands Act a solid waste management plan should be submitted as part of the surface lease application.***

Government agency(ies) responsible to address recommendations

1. Mineral Resources Division, INAC.

6.9 Water

Potential Impact

Water use may result in the following environmental impacts:

i. impact on other water users by affecting their water quality and quantity;

ii. impacts animals by affecting water bodies they use; and

iii. loss of unique or significant water bodies.

Minto Explorations Ltd. will require water for domestic purposes, and for industrial purposes such as for milling and dust suppression. Minto Explorations Ltd. will also be pumping out water that seeps into the pit.

Minto has indicated the minimum annual average supply of water required to operate the mill and for domestic purposes is 6.03 L/s of water for 7560 hours per year.

Minto proposes to collect runoff and store it in the mill water pond located south of the mill and up gradient from the tailings facility. The mill water storage pond will have a capacity of approximately 20,000 m^3. Runoff water will also be stored in the main water storage pond which is part of the tailings facility located below the mill. The main water storage pond will initially store approximately 440,000 m^3, and this capacity will be reduced as tailings are deposited. Minto has indicated a minimal water storage requirement of 160,000 m^3.

Minto expects that runoff will provide the total water required for the operation. Minto Explorations Ltd. notes that before the start of operations it will be necessary to fill the main water storage pond to the level of the overflow weir. If construction of the dam is completed in the fall just prior to freeze-up, the impacts to Minto Cr. from filling the main water storage pond will be restricted to a two-month period the following spring during freshet. Fisheries studies indicate that fish inhabit the lower reach of Minto Cr. but no fish were observed or captured in Minto Cr. above this area. Hydrological studies and predictions by Minto indicate that the filling of the main water storage pond will result in the reduction of flow to lower Minto Cr. by less than 35% when the pond is being filled, even if the filling of the pond was delayed to the summer or early fall.

Minto indicates that during operations the mill water pond is expected to overflow continuously via a culvert into a drainage channel which drains to the tailings storage basin. Inflows to the tailings storage basin will migrate to the main water storage pond and surplus water will flow continuously over the weir and down a spillway. Water will be reclaimed for industrial use from the main water storage pond. Minto Explorations Ltd. estimates that reductions at the mouth of Minto Cr. for wet and dry years would be 2.99% and 7.55% respectively. Minto does not expect that these minor reductions would have any impact on the resources at lower Minto Cr.

The estimated average water required for domestic purposes is 0.113 L/s. Minto Explorations Ltd. will be doing an evaluation to determine the feasibility of obtaining domestic water from a well should the need arise. If a well is drilled it will be in the vicinity of the mine camp which is located in the upper reaches of the Minto Cr. watershed. The rate of withdrawal of water from the well is not expected to result in any noticeable impacts to the local groundwater regime.

Water will be required for intermittent uses such as watering roads during the summer months. Minto indicates the quantities of water required will be small and will not have an impact on the water storage required.

There is a potential that open pit will depress the local groundwater regime around it. All groundwater seeping into the open pit will be stored in the open pit sump before being pumped to the mill water pond. Minto indicates there will likely be a localized depression of the groundwater table around the open pit during operations, however they believe it is unlikely that this will have any noticeable effect on downstream water bodies.

RERC Recommendations

1. ***The RERC recommends that during filling of the water storage pond, Minto***

Explorations Ltd. be required to monitor the flows in lower Minto Creek to ensure that no impacts to fisheries are occurring. In the event that monitoring indicates that there may be impacts to the fisheries, then Minto Explorations Ltd. should be required to release sufficient flows to sustain the fisheries in this area.

3. ***The RERC recommends that Minto Explorations Ltd. submit with the water licence application a plan for the monitoring of the flows in lower Minto Creek, including triggers and action plans, to ensure no impacts to the fish from filling of the water storage pond. This plan should include a description of the information that will be reported to the Water Board and the frequency of reporting.***

Government agency(ies) responsible to address recommendations

1,2. Yukon Territory Water Board

6.10 Fuel Handling/Spill Contingency

Potential Impact

The improper storage or handling of fuel or chemical reagents may result in spills. Spills of hazardous materials could then impact downstream aquatic and terrestrial resources. Furthermore the improper clean-up or response to spills may result in further contamination of land and water that should have been prevented.

Mitigation

Both diesel fuel and gasoline will be used and these will be delivered and stored in bulk. Fuel will be delivered by truck. All fuel storage tanks will be above ground and surrounded by lined berms sized to contain the largest tank volume plus 10%. The fuel handling and storage facilities will be designed using the best technology currently available for Canadian winter conditions.

Fuel will only be stored at the mine and no fuel will be stored at the barge landings. With respect to fuel storage and handling, Minto Explorations Ltd. will be required to obtain a Safety Certificate to Operate a Bulk Plant from the Fire Marshall's office.

Minto has indicated that assay laboratory reagents will be delivered in drums approximately three times per year. All drums will be on pallets and these pallets will be stored on an elevated platform in the mill. Spills that may occur will be contained within the grinding or flotation bays. Minto Explorations Ltd. has

provided a list of the reagents that they will be using for the start of production.

Minto states that the reagents will be added in liquid form directly to the grinding circuit from the delivery drum, although stage addition of reagents will be very simple to implement should this be desired. The reagent consumption per ton of ore milled will be low, with low residual reagent concentrations in the tailings stream. The reagents used for this operation are standard reagents that are widely used with low to moderate hazard ratings and none of these reagents presents a serious hazard in the event of a spill.

Minto Explorations Ltd. submitted with the IEE a conceptual Emergency Response and Spill Contingency Plan. In this plan Minto Explorations Ltd. discusses it's response to spills. As is usual practice it is anticipated that Minto Explorations Ltd. will provide an updated plan with the water licence application for review and approval.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. submit a updated and detailed Emergency Response and Spill Contingency Plan with the water licence application.***

Government agency(ies) responsible to address recommendations

1. Yukon Territory Water Board.

6.11 Heritage

Potential Impact

There is the potential for heritage resources in the area to be destroyed as a result of the construction and operation of the mine and mill.

Mitigation

An archaeological impact assessment was done in the summer of 1993. No sites were detected or are believed to exist in the vicinity of the open pit or mill site. However, there remains a possibility that heritage resources may be uncovered during construction of the mine/mill or associated infrastructure.

RERC Recommendations

The RERC recommends that Minto Explorations Ltd. should immediately

report to the Heritage Branch, Department of Tourism, Yukon Territorial Government (403) 667-5983 if any heritage resources are discovered during construction of the mine/mill or associated infrastructure.

Government agency(ies) responsible to address recommendations

Heritage Branch, Department of Tourism, YTG.

6.12 Wildlife

Potential Impact

The elements of the proposed operation will be an open pit mine, waste rock dumps, mill and ancillary facilities (including a mill water pond), tailings dam and main water storage pond, air strip and access roads. The potential impacts to wildlife can be grouped as follows:

1. **Loss of wildlife habitat through destruction or avoidance;**
2. **Loss of wildlife due to interactions with mine facilities;**
3. **Collisions between mine vehicles and animals; and**
4. **Increased hunting pressures due to improved access and hunting by mine personnel.**

6.12.1 Loss Of Wildlife Habitat Through Destruction Or Avoidance

Proposed mitigation

Minto indicates the proposed development will affect approximately 502.3 acres of wildlife habitat for the life of the mine. It should be noted that recent forest fires have likely affected the vegetation and wildlife communities in the area.

It is expected that habitat loss from mine development will result in the spatial redistribution of animals into suitable surrounding habitat with minimal losses. Information available regarding density and distribution of animals in the immediate area suggests that the adjoining wildlife habitats have additional carrying capacity and that these habitats will be able to absorb an influx of animals without taxing resources.

Both black bear and grizzly bear have been observed in the area and a bear management policy will be instituted on site. Minto Explorations Ltd.'s proposed

policy states that bear warning signs will be posted, educational literature will be distributed, a reporting system for bear sightings will be used, the company will assist in the relocation of problem bears if required and good house-keeping practices such as incinerating food wastes and proper storage will be adhered to.

Based on a mapping study of the Klaza caribou herd range the project does not appear to be within migratory range. A population of Dall sheep inhabit the east bank of the Yukon River between Minto Landing and the Pelly River confluence. It is expected that this population will not be affected by the Minto Project as the east bank barge crossing will be located upstream of the area where sheep have been observed.

Moose densities in the area are estimated at approximately 40 moose/1000 km^2 which is considered to be comparatively low.

Waterfowl were not observed in the upper Minto Cr. watershed, likely due to the absence of productive wetland habitat. Raptor habitat in the project area was minimal and it is not expected that the proposed development would impact raptor populations. One pair of peregrine falcons is known to utilize the Yukon River near the Minto Cr. confluence, but no project related activities will occur in this area.

Minto expects that there will be some effect on wildlife from mine construction and operation. They expect some degree of habituation with ungulates as noted at many mining projects. Since the project does not cut through any major migration routes and from field surveys does not lie in critical habitat, Minto expects the project to cause minimal indirect loss of caribou from loss of habitat. Some disturbance to wolf, black bear and grizzly bear is expected due to mine operations, however due to the relatively low abundance of these species in the mine site area, Minto expects little indirect impact.

With respect to abandonment, Minto Explorations Ltd. notes that it's reclamation objective is to restore the areas' capability for both forestry in terms of species and density and wildlife production in terms of habitat quality. Please refer to Section 6.13 Decommissioning Plan for further information on reclamation.

The Selkirk First Nation stated that they were interested in participating in a wildlife monitoring program. In response, Minto Explorations Ltd. has proposed that a Selkirk First Nation member be employed as environmental coordinator from the start of construction onwards.

Minto Explorations Ltd. has voluntarily proposed to do a study to determine the feasibility of locating a salmon hatchery on Big Creek. This study will be done

by the environmental coordinator and one additional Selkirk First Nation member and the cost of the study will be borne by the Company and done under the guidance of the Department of Fisheries and Oceans.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. implement it's bear management policy as proposed.***

2. ***The RERC recommends that Minto Explorations Ltd. employ a Selkirk First Nation member as a environmental coordinator as proposed.***

Agency(ies) responsible to address recommendations

1. Renewable Resources, YTG

2. Selkirk First Nation.

6.12.2 Loss Of Wildlife Due To Interactions With Mine Facilities;

Mitigation

It is unlikely that there will be any significant incidences of wildlife mortalities due to interactions with mine facilities. Mine related activities will discourage most animals from wandering around the mine site or falling into the open pit. It is anticipated that the need for fencing can be assessed through the wildlife monitoring program. It is also expected that most wildlife will avoid the tailings area. However if animals do wander into the tailings area, no problems are expected since the effluent quality is not expected to be toxic.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd's establish a fisheries and wildlife monitoring program in conjunction with Renewable Resources, YTG, and Selkirk First Nation.***

Government agency(ies) responsible to address recommendations

1. Renewable Resources, YTG, DFO, Selkirk First Nation.

6.12.3 Collisions Between Mine Vehicles And Animals

Mitigation

Truck traffic could result in collisions with wildlife. Minto Explorations Ltd. notes that neither the access road right-of-way nor the immediate area surrounding the mine appear to transect any known, well used movement corridors. The disturbed areas will cover only parts of individual home ranges and/or insignificant proportions of home territory for most wildlife species in the area. Speed limits will be posted and adhered to and well used wildlife crossings will be identified and marked with road signs to reduce the potential for road kills.

Minto Explorations Ltd. is advised that pursuant to Section 60 of the *Wildlife Act* they are to report to a Conservation Officer any fatalities of big game, lynx, fox, wolverine, raptor, or specially protected wildlife. Minto Explorations Ltd. should refer to the *Wildlife Act* and contact Renewable Resources, YTG for more information.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. post speed limits and identify well used wildlife crossings with road signs, and in areas of recognized wildlife crossings the snow berms from plowing be knocked down to allow for animals to escape traffic.***

Government agency(ies) responsible to address recommendations

1. Renewable Resources, YTG.

6.12.4 Increased Hunting Pressures Due to Improved Access and Hunting by Mine Personnel.

Proposed Mitigation

Minto Explorations Ltd. and it's employees will be required to comply with the hunting provisions of the *Wildlife Act and Regulations*. However Minto Explorations Ltd. has stated it will forbid firearms to all employees and contractors in camp and on the minesite. Minto Explorations Ltd. has indicated they will also post no hunting signs around the minesite for safety reasons and to advise the general public.

RERC recommendation:

1. ***The RERC agrees with Minto Explorations Ltd.'s commitment to forbid firearms to all employees and contractors in camp and on the minesite and to post no hunting signs around the minesite for safety reasons and to advise the general public. Minto Explorations Ltd.'s compliance with the Wildlife Act will mitigate potential environmental impacts.***

Government agency(ies) responsible to address recommendations

1. Renewable Resources, YTG (can ensure compliance with general hunting provisions).

6.13 Decommissioning Plan

Potential Impact

There is the potential for impacts to downstream resources if the open pit mine, mill and associated facilities and waste disposal sites are not abandoned properly and not monitored to ensure no problems develop.

Mitigation

Minto Explorations Ltd. has submitted a conceptual closure and reclamation plan. Minto Explorations Ltd. notes that the actions described in the plan are conceptual in nature and may be amended from time to time to reflect changes in operation and development at the mine, and to reflect the results of reclamation research.

Minto Explorations Ltd. notes that it's reclamation objective is to restore the areas' capability for both forestry in terms of species and density and wildlife production in terms of habitat quality. The project area has been divided into seven reclamation units depending on type of material and preliminary reclamation strategies. Minto Explorations Ltd. notes that the reclamation and revegetation will follow the "Guidelines for Reclamation/Revegetation in the Yukon" and "Mine Reclamation in Northwest Territories and Yukon". A Reclamation Guide will be developed with specific "How To" instructions once the mine is in production.

Minto Explorations Ltd. states that a important component of the Reclamation Plan is an ongoing Reclamation Research Program with the objective of establishing the necessary methods and materials required to implement a successful Reclamation Plan. The research program will focus on further characterizing the soils in the area, establishing test plots and documenting

revegetation. In this manner Minto Explorations Ltd. will be able to optimize species composition and ensure that self-sustaining vegetation communities can be created after closure.

Minto Explorations Ltd. has provided a phased reclamation strategy for the development of a detailed reclamation plan. It is anticipated that this strategy will be submitted with the Water Licence application and reviewed by various parties.

Minto Explorations Ltd. has also proposed to submit details on procedures to be followed in the case of suspension of activities as part of the water licence application.

RERC Recommendations

1. ***The RERC recommends that Minto Explorations Ltd. submit with the water licence application a closure reclamation plan which should include but not be limited to the following:***

    i. ***Details on methods to abandon and restore the facilities including provisions for PMF and MCE;***

    ii. ***Details on expected closure and post-closure monitoring and maintenance;***

    iii. ***Details on methods for temporary closure;***

    iv. ***A reclamation research program; and***

    v. ***A proposed schedule for the implementation of the reclamation research program, and which identifies when a detailed final and a temporary closure reclamation plan will be submitted.***

2. ***Prior to mine closure, and in accordance with the schedule identified in Item 1 v. above and as approved by the Water Board, Minto Explorations Ltd. should submit to the Water Board for review and approval, a final closure and reclamation plan. This plan should contain specific reclamation details, designs for the closure of the dam, spillway, and diversion ditches, and shall reflect the results of the research program, commitments made in the preliminary closure plan, and other monitoring programs done during the life of the operation.***

Government agency(ies) responsible to address recommendations

1,2. Yukon Territory Water Board

6.14 Security Deposit

Potential Impact

The level of security put up by Minto Explorations Ltd. should be sufficient to cover the costs of reclamation should Minto Explorations Ltd. be unable or unwilling to do so and be based upon the level of risk associated with the project.

Mitigation

Minto Explorations Ltd. has provided a preliminary reclamation cost estimate and notes that a more detailed cost estimate using DIAND's Reclamation Cost Estimation Model will be prepared. The new proposal should be relevant to the latest proposed project configuration.

RERC Recommendations

The RERC recommends that:

1. ***Adequate financial security must be provided by Minto Explorations Ltd. to cover the environmental liability associated with the Minto project and to cover costs for abandonment including dam upgrades, diversion upgrades, and reclamation work.***

2. ***DIAND, Selkirk First Nations, and the Yukon Territory Water Board should periodically review the amount of financial security to ensure that there is adequate financial security available for reclamation.***

3. ***The security should be in place within a reasonable, specified time after issuance of the water licence but in any case security must be in place to abandon the site at any stage of the operations. Security should be a term and condition of the water licence.***

Government agency(ies) responsible to address recommendations

1,2,3,4. Yukon Territory Water Board.

7.0 CONCLUSION

It is recommended that Minto Explorations Ltd. proposal, as outlined in this Screening Report, and as presented in Minto Explorations Ltd's IEE and subsequent submissions meets the requirements of the *Environmental Assessment and Review Process Guidelines Order* (EARPGO) under section 12 c. and may proceed to the regulatory process.

Section 12 c.: "The potentially adverse environmental effects that may be caused by the proposal are insignificant or mitigable with known technology, in which case the proposal may proceed or proceed with mitigation, as the case may be."

Pursuant to Section 13 of the EARPGO, it is recommended that a public review by an EARP panel of the Minto Explorations Ltd. Project is not necessary:

Section 13: "Notwithstanding the determination concerning a proposal made pursuant to Section 12, if public review is desirable, the initiating department shall refer the proposal to the Minister for public review by a panel.".

Recommended to DIAND by:

Marg Crombie,
Chair,
Regional Environmental Review Committee

Kevin McDonnell
Manager, Project Assessment
Northern Affairs Program

Appendix 1: RERC Membership

Federal Government:

- Northern Affairs Program, Department of Indian Affairs and Northern Development:

  - Environment Directorate
  - Land Resources
  - Economic Development
  - Water Resources
  - Exploration and Geological Services
  - Mineral Development

- Department of Fisheries and Oceans
- Environment Canada
- Health and Welfare Canada

Yukon Government:

- Yukon Worker's Compensation Health and Safety Board (Mine Safety)
- Transportation Planning and Programming, Community and Transportation Services
- Community Services Branch, Community and Transportation Services
- Economic Development, Economic Policy Planning and Research Branch
- Heritage Branch, Department of Tourism
- Environmental Assessment, Department of Renewable Resources

First Nations:

- Northern Tutchone Council
- Selkirk First Nation
- Little Salmon Carmacks First Nation
- CYFN

Other:

- Village of Carmacks

Appendix 2: Chronological Summary of Key Events Related to the Environmental Screening of the Minto Project

Aug. 18, 1993	Minto Explorations Ltd. submitted to DIAND copies of their Project Proposal
Oct. 21,1993	RERC meeting in Whitehorse in which Minto Explorations Ltd gave a brief overview of the project.
Dec. 17,1993	RERC comments on project proposal sent to company along with a set of draft IEE (IEE) Guidelines
Jan. 21, 1994	RERC to DIAND: "Re: Information Guidelines for the Minto Property.".
Aug. 11,1994	Site visit to Minto Property
Sept 26,1994	Site visit to Minto Property
Dec. 14,1994	RERC meeting in Whitehorse at which Minto Explorations Ltd. presented 3 volumes of their Initial Environmental Evaluation: Volumes I - Development Plan; Volume II - Environmental Setting; and Volume III - Socioeconomic Description and Impact Assessment.
Feb. 10, 1995	Minto Explorations Ltd. submitted: "Technical Feasibility Study Thickened Tailings Disposal system, Minto Project" by E.I. Robinsky.
April 19, 1995	Brief presentation by Minto Explorations Ltd. to DIAND on Volume IV of IEE. Corrections to Volume II pages 4-6 were submitted.
May 2, 1995	Minto Explorations Ltd. submitted a list of permits and approvals that will be required for the project.
May 17, 1995	RERC meeting and Minto Explorations Ltd. submitted Volume IV "Environmental Mitigation and Impact Assessment "
May 17, 1995	DIAND to RERC: "Re: Minto Explorations Limited's Initial Environmental Evaluation.".
May 18, 1995	A letter was sent to public advising of locations to view the IEE and any comments to be submitted by June 30,1995
June 1, 1995	Minto Explorations Ltd. hosted an open house at the Carmacks Community Hall

June 15,1995	Site visit to Minto Project
July 10,1995	Minto Explorations Ltd. submitted geotechnical report called "Preliminary Geotechnical Design Tailings/ Water retention Dam at Minto Project, Yukon" which was distributed to RERC for review and comment.
Aug. 1, 1995	DIAND to RERC: "Re: Timing of RERC Review of Minto Explorations Limited's Initial Environmental Evaluation.".
Aug. 2, 1995	RERC meeting in Whitehorse to discuss the Engineering Report and IEE Volume IV
August 21,1995	Minto Explorations Ltd. applied to the Yukon Territory Water Board for a type B water licence to construct two barge ramps on the Yukon River, a bridge across Big Creek and culvert in Minto Cr.
Aug. 31,1995	RERC comments on IEE sent to company.
Sept. 14, 1995	Minto Explorations Ltd. to RERC: "Re: Minto Project - IEE Review".
Sept. 20,1995	DIAND received Minto Explorations Ltd. responses to RERC comments made on the IEE
Oct. 24, 1995	Geo-engineering (MST) Ltd. "Review of the Minto Project" distributed to RERC Technical Subgroup Members
Nov. 3, 1995	Hallam Knight Piésold Ltd to RERC: "Re: Minto Explorations Ltd., Minto Property, Yukon." with attached "October 1995 Response to Regulatory Agency Review Questions on the Minto Project IEE".
Nov. 16, 1995	DIAND to RERC: "Re: Minto Project -- Minto Response to RERC Concerns.".
Dec., 1995	EBA's "Geotechnical Design Tailings/Water Dam Minto Project" report submitted.
Dec. 12, 1995	RERC technical sub-group meeting
Jan. 14, 1996	Minto Explorations Ltd. to DIAND: "Re: Minto Project - Meeting Held on December 12, 1995.".
Feb. 23, 1996	Minto Explorations Ltd. response letter to RERC technical sub-group concerns including: "Liquefaction Potential Study - Thickened Tailings Disposal System, Minto Project, Yukon, Canada" by K.T. Law; and "Report on Slurry Concentration Testing of Minto Explorations Ltd.

	Yukon Project Tailings in the Paste Production Storage Mechanism" by GL&V.
Mar. 6, 1996	DIAND to Minto Explorations Ltd.: "Re: EARP / RERC Review of Minto Project.".
Mar. 7, 1996	Minto Explorations Ltd. submitted: Tailings Thickening Test Work done at Lakefield Research" and "Detailed Schedule for Overburden and Waste Rock Disposal".
Mar. 13, 1996	Minto Explorations Ltd. to DIAND: "RE: Minto Project - Waste Rock Disposal.".
Mar. 27, 28, 1996	Scheduled Public hearings for Type A and B licences (postponed).
May 10, 1996	Minto Explorations Ltd. to DIAND: "Re: ABA and Geology Data.".
May 14, 1996	DIAND to RERC: "Re: ABA and Geology Data.".
May 17, 1996	DIAND to Minto Explorations Ltd.: "Re: Additional Acid Rock Drainage Sampling.".
May 17, 1996	RERC response letter to Minto Explorations Ltd.
May 22, 1996	RERC to Minto Explorations Ltd.: "Re: Minto Project ARD sampling.".
June 20, 1996	Minto Explorations Ltd. submits consultants review on leach test data.
June 27, 1996	Minto Explorations Ltd. To DIAND: "Re: Minto Project - Environmental Review" (submission in response to RERC letter dated May 17, 1996.).
June 28, 1996	DIAND to RERC: "Re: Addendum from Lutz Klingmann.".
July 4, 1996	Minto Explorations Ltd. initiates additional geotechnical field work.
July 17, 1996	EBA Engineering Consultants Ltd. to DIAND: "Subject: Draft Geotechnical Borehole Logs Proposed Waste Dumps and Mill Water Pond Minto Project, Yukon.".
July 19, 1996	Site visit with DIAND to review geotechnical issues.
Sept.26, 1996	Minto to DIAND: "Re: Minto Project" with attached "Minto Waste Rock Stability Evaluation" report.

Sept. 27, 1996	DIAND to RERC: "Re: Minto Waste Rock Stability Evaluation.".
Dec. 18, 1996	RERC to Minto Explorations Ltd.: "Re: Outstanding Concerns.".
Jan. 6, 1997	Minto Explorations Ltd. to RERC: "Re: Outstanding Concerns - Your Letter Dated December 18, 1996.".
Jan. 10, 1996	RERC Technical Sub-group meeting with Minto Explorations Ltd. and consultants.
Jan. 16, 1997	RERC to Minto Explorations Ltd.: "Re: Next Steps Arising From Meeting Held January 10, 1997.".
Jan. 16, 1997	Minto Explorations Ltd. response to Dec. 18, 1996 RERC letter.
Jan. 17, 1997	Minto Explorations Ltd. To RERC: "Re: Outstanding Concerns - Your Letter Dated January 16, 1997.".
Jan. 22, 1997	DIAND letter to Minto: "Re: Outstanding Concerns - Your letters dated January 16 and 17, 1997.".
Jan. 30, 1997	Teleconference between Minto Explorations Ltd. and consultants, and RERC technical sub-group.
Feb. 6, 1997	RERC to Minto Explorations Ltd.: "Follow-up to Teleconference Held on January 30, 1997.
Feb. 7, 1997	RERC Distribution: Conditional Draft Screening Report - Minto Project.
Feb. 12, 1997	Revised Preliminary Dam Design, Minto Project, YT
Feb. 21, 1997	Minto Explorations Ltd. to RERC: "Minto Project - Waste Management Plan."
Feb. 24, 1997	RERC to Minto Explorations Ltd.: "Minto Project - Possible Maximum Flood (PMF).".
Feb. 27, 1997	Technical meeting: Water Resources Division and consultant with Minto Explorations Ltd. consultant - EBA Engineering Consultants Ltd.

Appendix 3

CANADIAN ENVIRONMENTAL ASSESSMENT ACT
LEVEL I INTEGRATED SCREENING REPORT AND PROJECT SUMMARY
LAND RESOURCES DIVISION, NORTHERN AFFAIRS PROGRAM
YUKON REGION AND YUKON TERRITORY WATER BOARD

LAND USE PERMIT APPLICATION - YA5F045
MISCELLANEOUS TYPE B WATER LICENCE APPLICATION MS95-013
EXISTING ROAD RECONSTRUCTION, NEW ROAD CONSTRUCTION, BARGE LANDINGS, BRIDGE OVER BIG CREEK, CULVERT AT MINTO CREEK, ICE BRIDGE OVER YUKON RIVER, CAMPSITE AND QUARRY SITES

1. GENERAL ENVIRONMENTAL ASSESSMENT FILE INFORMATION

Application Number:	YA5F045
FEAI I.D. Reference Number:	
Project Title:	Existing road reconstruction, new road construction, barge landing bridge over Big Creek, culvert at Minto Creek, ice bridge over Yuk River, campsite and quarry sites
Alias Project Title:	DEF Claims
Proponent:	Minto Explorations Ltd., 6411 Imperial Avenue, West Vancouv B.C. V7W 2J5 Phone: (604) 921-7570 Attn: L. Klingmann
Subject Descriptors:	Transportation
A Type:	Screening
A Start Date:	16 October 1995
EA Determination:	
EA Determination Date:	16 April 1996

2. RESPONSIBLE AUTHORITY IDENTIFICATION

Lead Responsible Authority:	Northern Affairs Program
Screening Division	Land Resources - Land Use
Lead Responsible Authority Contact	Christie Tavernor, Land Resources Division, 345-300 Main S Whitehorse, Yukon, Y1A 2B5, Phone (403) 667-3236, Fax (4 667-3214
Responsible Authority Reference Number:	34
Lead Responsible Authority Trigger:	Land Use - Law List Approvals
Lead Type of Approval:	Land Use Permit and Quarry Permit
Status of Approval:	New

Other Responsible Authorities:	Yes, Yukon Territory Water Board and Canadian Coast Gua Navigable Waters Branch
Integrated Screening?	Yes
Other Triggers:	Water Licence
Other Types of Approval:	Health Canada Authorization, Septic
Project File Location:	Land Resources - Whitehorse, Yukon

3. PROJECT LOCATION

Region:	Yukon Territory
Topographic Map Sheet:	NTS 115I/11
Geographic Location Name Code:	Minto Landing
Latitude & Longitude:(Min & Max)	62°37.5'N - 137°05.5'W & 62°39.5'N - 137°13'W
Drainage Region:	Yukon
Watershed:	Yukon River
Street Name:	N/A
Nearest Community:	Pelly Crossing
Traditional Territory:	Little Salmon/Carmacks First Nation and Selkirk First Nation
Surrounding Land Status:	Federal Crown Land & Land Claims Selections (R-block)
Special Designations:	None

4. PROJECT DESCRIPTION

Physical Work:	Road, bridge and barge landings
Physical Activity	Land Use
Multiple Activities	Yes, road reconstruction, new construction, barge landings, bri culvert, campsite and quarries
Project Category Code:	Linear
Primary Undertaking	Construction
Project Description:	

Minto Explorations Ltd based out of Vancouver, B C proposes to develop a mine and mill on the site of the M Property. The mine and mill have been designed for a throughput of 477,000 tonnes of ore per year with an i mine life of 12 years. The Minto copper\gold\silver deposit is located on the west side of the Yukon I approximately 240 kilometres northwest of Whitehorse in Central Yukon. The property is currently accessible by helicopter or by boat along the Yukon River for approximately 19 kilometres and then by pick-up truck alo unimproved trail that parallels Minto Creek for approximately 10 kilometres.

A secure all-weather access road will be required for the project. The current proposal is to cross the Yukon Rive with a barge for approximately seven months of the year and to use an ice bridge during the winter months. Th existing trail on the west side of the river will be upgraded to an all-weather road for a distance of 30 kilometres

Minto's Land Use Permit application includes: new road construction, road re-construction, barge landings, bridg at Big Creek, culvert placement at Minto Creek, ice bridge over the Yukon River, quarrying and a campsite fc construction crew. Other authorities to carry out the necessary work will come from Canadian Coast Guar Navigable Waters Branch and the Yukon Territory Water Board.

5. DESCRIPTION OF ENVIRONMENT

Ecozone: Boreal Cordillera

Description of Environment: The Yukon River drains this ecoregion through many tributaries. This regi straddles the boundary between the discontinuous widespread and scattered permafrost subzones. Open black a hite spruce stands occur in valleys and on lower slopes where black spruce prevails on wetter sites and white sp a better drained sites. Best tree growth occurs along the Yukon River valleys, where white spruce, aspen, bals poplar and paper birch are constituents of mixed stands. Willow, shrub birch, Labrador tea, moss and lichens a principal understorey species.

6. CONSULTATION/REFERRAL OF APPLICATION

Public Consultation?	Yes
Date Referred to Government Departments and the Public:	16 October 1995
Deadline for Comments:	06 November 1995

FEDERAL GOVERNMENT		COMMENTS RECEIVED LAND USE	COMMENTS RECEIVED WATER BOARD	COMMENTS RECEIVED AMENDMENT LAND USE
DIAND	WATER RESOURCES	06 NOV 1995		NO RESPONSE
	LANDS DISPOSITIONS	23 OCT 1995		NO RESPONSE
	MINERAL RIGHTS	19 OCT 1995		27 MAR 1996
	MINING ENGINEERING	20 NOV 1995		22 MAR 1996
	GEOLOGY	23 OCT 1995		NO RESPONSE
	LANDS INSPECTOR	18 OCT 1995		NO RESPONSE
	FOREST RESOURCES	08 NOV 1995		21 MAR 1996
	R.M.O., CARMACKS	05 MAR 1996		NO RESPONSE
	DFO	30 OCT 1995		29 MAR 1996
	DOE	NO RESPONSE		NO RESPONSE
YUKON GOVERNMENT	RENEWABLE RESOURCES	08 NOV 1995		22 MAR 1996 01 APR 1996
	LANDS BRANCH	18 OCT 1995		21 MAR 1996
	HIGHWAYS	10 NOV 1995		01 APR 1996
	TOURISM (HERITAGE)	19 OCT 1995		NO RESPONSE
OTHER GROUPS	COUNCIL FOR YUKON FIRST NATIONS	NO RESPONSE		NO RESPONSE
	YUKON CONSERVATION SOCIETY	NO RESPONSE		NO RESPONSE
	FIRST NATIONS LITTLE SALMON/CARMACKS SELKIRK	08 FEB 1996 08 NOV 1995		NO RESPONSE
	CANADIAN PARKS AND WILDERNESS SOCIETY	NO RESPONSE		NO RESPONSE
	NORTHERN TUTCHONE COUNCIL	06 NOV 1995		NO RESPONSE
	CCG - NAVIGABLE WATERS BRANCH	15 NOV 1995		27 MAR 1996
	OUTFITTER - ROD HARDIE	08 NOV 1995		NO RESPONSE
	TRAPPER - KATHY SAM	08 NOV 1995		NO RESPONSE

Record of Comments Attached to Screening Form - **Yes**

7. DESCRIPTION OF PROJECT EFFECTS

Potential Adverse Environmental Effects of the Project:

Lands Inspector (18/10/95)

- Conflicts with R-5 Selkirk First Nation Land Claims Selection (Interim Protected)
- Road must have signage to advise that the road is "Radio Controlled"

YTG - Archaeology (19/10/95)

- Possible heritage concerns with proposed barge landing construction. The high density of sites along the Yukon Ri around Minto indicates the importance of the area to long ago peoples; other unrecognized sites may well exist along t river here. There are no concerns with the road reconstruction, new road construction, bridges, campsite and quarry sit

Fisheries and Oceans (30/10/95)

- Barge Landings - DFO Personnel will be required to determine the suitability of the site for use as a barge landing ar Detailed drawings are required, and potential mitigation identified, after consultation with DFO.

  Minto Creek Crossing - DFO is still requesting a bridge at this location

- Big Creek Crossing - require detailed design drawings for this undertaking that should indicate, along with the ove design, specifics regarding the location of the piles.

- The information received indicated a "few crossings" of Big Creek during the construction of the bridge. the unacceptable. DFO is requesting a re-evaluation of the barging option. This option includes barging the equipment t landing on the Yukon River downstream of Big Creek and walking the equipment to the other side of the creek, rather t walking the equipment through the creek.

NAP - Water Resources (06/11/95)

- Concerns about the potential for increased downstream sedimentation during the barge ramp construction in the Yu River and bridge and culvert construction in Big and Minto Creeks.

- There is an increased potential for spills into the Yukon River, Big Creek and Minto Creek associated with the construc of the barge ramps, bridge and culvert construction, construction camp operations, and the transportation and t associated with hauling mine concentrations and hazardous chemicals and materials to and from the mine site.

- In order to eliminate long-term impacts of the project, the proponent should be required to remove the Big Creek bric and reclaim the Yukon River barge ramps before the Water Licence expires.

- Yearly ice bridge on the Yukon River - there is concern that the ice bridge is properly constructed and maintained wh heavy loads are transported across the river.

- 24 man construction camp - the proponent should be made aware that camp water use exceeding 100 m^3/day will requ a Water Use Licence.

- Necessary authorizations for septic systems should be obtained from Health Canada.

Selkirk First Nation (08/11/95)

- It is our position that a positive screening report cannot be issued at this time. We offer a number of recommendations address the environmental, economic and social issues we have identified, as well as certain proposals for the furt screening and disposition of this matter.

- In this area land-related activities and authorizations should be based upon Selkirk First Nation land selections and foll from that premise.

- The application proposes the establishment of what would be the third barge and landing area on the Yukon River betwe McCabe Creek and Minto. All three locations conflict with Selkirk land selections. It is clear that a rationalized approa to river access and barge/landing facilities is required for this stretch of river.

- To the extent there are serious contaminants in the upstream portion of the Minto Creek watershed, and/or a risk of d breach or failure of containment, the effects on lower Minto Creek and the downstream receiving environment will b significant concern. Fish and wildlife values in the area were identified in a 1994 Selkirk submission to the RERC. Th is a summer and fall native salmon fishery nearby on the Yukon River.

- Selkirk would like to be involved in the completion of the study and, on an on-going basis, in the monitoring mitigation/prevention scheme. Any consultant retained in connection with the work should be jointly chosen by Selkirk the Proponent and should work together under jointly developed terms of reference

- First Nation members have traditional family traplines (registered) that will be affected by this project. Selkirk policy requ the interests of trapline holders to be addressed and, if necessary, compensated.

Forest Resources (08/11/95)

- Salvaged timber should be stored off the ground at the storage site until used. This can be done by stacking on other t on the ground.

- The route should be pre-flagged. Vegetation used in reclamation or stability work must be native. Prepared highway m must be of native Yukon species

- Rip-rap may be required for bank stabilization at the barge landings, bridge site and culvert site.

Rod Hardie - Outfitter (08/11/95)

- The Big Creek and Minto Creek drainages are conduits of game movements which annually use the Yukon River foresh and flood zones for food sources. I yearly conduct Grizzly/Black Bear and Wolf hunts along these watercourses. Th animals are usually seen feeding on spring freeze-fried salmon or freshrun October Dog Salmon which yearly run spawn in sloughs and channels both in Big Creek and the Yukon River. The project will disrupt bears especially.

- Obviously the main concern of DFO and other Yukoners is an uninterrupted continuance of the life cycle of the Sp salmon that run and spawn around July/August and the life cycle of Dog salmon that run and spawn in the late Septem October period.

- The disruption of natural run-offs could possibly silt over important spawning beds or wash them away before their ca of fingerlings is dispatched.

Kathy Sam - Trapper (08/11/95)

- Trapper in area indicates immediate direct impacts (disturbance and loss of habitat) as well as incremental or direct imp that are having a negative impact on her way of life.

- The facilities near the Yukon River will be visual to river travellers. Tourism suggests keeping the barge landings orga (fuel and drums and other facilities away from the waters edge) and screened if possible.

YTG Highways (10/11/95)

- Special treatments may be required at culvert locations (sub-cutting and backfill with clean granular material)

- Turnouts should be inter-visible with maximum spacing of no more than 30 metres. Spacing may be increased for rc used exclusively for resource development and users are equipped with radio communication.

- The barge should be designed for 170 000 lbs (77,180 kg) as per the design loading for sub-grade, culverts and the bri

- If no lease/licence is established then an agreement with Transportation Maintenance with respect to maintenance, acc and liability should be put in place prior to the expiry of the Land Use Permit (this has already been applied for)

- There may be some problems with cross-sections through much of the areas where geotextiles are to be used. S culverts (CSP's) are too short, some may require flumes or rip-rap and some additional CSP's appear necessary.

- Choice of locations for passing pull-outs is not well understood. I suggest that, if at all possible, line of sight between outs should, for operational and safety reasons be achieved.

- Big Creek Bridge - no site survey has been performed. Bridge width and length need clanfication.
- Geotechnical investigation not complete. The piled abutments may not be suitable if unfavourable sub-soil conditions a encountered.
- Once the site survey is completed, a requirement for angled walls and "dead-man" piles in the centre of the abutment m be required.

Canadian Coast Guard, Navigable Waters Branch (15/11/95)

- The barge landing plan requires a profile drawing of the shore at each landing ramp from high water to a depth of bel low water, sufficient to clarify whether dredging of materials other than removal of the boulders in the barge grounding ar is required. The steel poles used to secure the barge on the ramp are to be included on the landing plan, making cle the location in relation to high and low waterline. the plan text must make clear the nature of the work with a dozer or loac to permit the barge to dock as water levels in the Yukon River rise and fall.
- The ice bridge construction and maintenance plan is to state whether foreign materials such as timber, sawdust, grav or sand are intended to be used. Clarification of materials used in "flagging and warning signs" is to be included in the pl as well as seasonal placement and removal of these materials.

  Big Creek Crossing bridge plan must clearly indicate the abutment location in relation to high and low water stream bar so that impact on navigation can be determined. Should a navigational impact assessment determine potential requi greater than the above, the bridge will require redesign.
- Information is required on the flow characteristics in the overflow channel; the rate, depth, duration and season of flow assist determining navigability.
- Minto Creek has been determined to be non-navigable and, therefore, requires no application under the Navigable Wat Protection Act.

18 March '996 – An amendment to Minto's Land Use Permit application was received this date and was sent out once ag to the Land Use Advisory Committee members for consultation The following comments were received on this package. T amendment was actually a deletion of the barge landing site between Minto and McCabe Creek.

Canadian Coast Guard, Navigable Waters Branch (27/03/96)

- Satisfied with the new information provided Project will not significantly impact on navigation.

Fisheries and Oceans (29/03/96)

- Minto Creek Crossing - do not object to the culvert placement in Minto Creek

8. DESCRIPTION OF CUMULATIVE ENVIRONMENTAL EFFECTS

- A risk is associated with repeated crossings of the Yukon River with fuel and various other chemicals necessary for minesite. There is a potential for oil and chemical spills.
- As time goes on the trappers in area lose portions of their trapping areas.

9. MITIGATION MEASURES

- Systematic sub-surface testing should be undertaken on both sides of the Yukon River before construction proceed
- The bridge piles must be driven in above the natural boundary of the stream.
- The proponent should be required to utilize construction practices that will minimize instream works. This inclu construction of barge ramps and routine barge ramp maintenance from shore and the placement of clean fill material for barge ramp maintenance. Construction should be done from shore, If treated timbers are used on the Big C decking, then pre-treated materials should be used or timber treatments applied from shore.
- The proponent should be required to submit an Emergency Response and Spill Contingency Plan for construction operational activities. The Plan must address concentrate and chemical spillage and outline detailed response proce and measure to be undertaken during a spill. Equipment operators and truck drivers should be make aware o requirements of the Emergency Response and Spill Contingency Plan.
- The detailed procedures for constructing and operating the Yukon River ice bridge as outlined by the Company's "S Guide for the construction and Use of an Ice Bridge" should be submitted. (Submitted as requested)
- A recommendation has been put forward that a comprehensive baseline study of the lower Minto Creek estu ecosystem be developed.
- Trapper compensation may be required Proponent must enter into disucssions with any and all effected trappers.
- To reduce river traffic conflicts, upstream and downstream signage to identify the barge traffic is recommended.
- The road should be built wider in swampy areas in anticipation of shoulder settlement as there are no berms plann
- In areas of sidehill, interceptor ditches on the high side may be useful in keeping water away from the subgrade preventing erosion of the back slopes.
- Because of the sharp horizontal curves and steep to very steep grades, it is recommended that all the initial upgradi the access road be to a two lane width (26 feet) for the intervals from Minto Creek to the mine/mill site.

- The sub-deck should be treated prior to placement.

Barge Loading Ramps - Yukon River

- Construction material and debris are not allowed to become waterborne.
- The bed and banks of the water way are to be restored to their original contour and the banks are to be protected fr erosion as necessary.
- All temporary piles, false works, debris, etc. to be completely removed from the waterway.

Bridge over Big Creek

- The vertical clearance required between the design flood level and the underside of the bridge is to be no less than 1 metres.
- The horizontal clearance required in the deepest portion of the waterway shall be no less than 10.0 metres.
- Construction material and debris are not allowed to become waterborne.
- The bed and the banks of the waterway are to be restored to the original contour and the banks are to be protected fr erosion as necessary.
- All temporary piles, false works, etc. to be completely removed from the waterway.
- The Navigable Waters Works Regulations apply
- Bridge piers, if used, are to be constructed parallel to the stream flow and are not to have any sharp edges, protrusio etc into the navigational openings and are to have a streamlined upstream face
- Any rocks or debris in the vicinity of the proposed bridge are to be cleared so as to provide a clear approach for navigab passing through the navigational span of the bridge
- The proponent shall provide unimpeded access to the Minister or his representatives for inspection purposes.

Culvert at Minto Creek

- It is the opinion of Coast Guard officials that the waters of Minto Creek are non-navigable.

Ice Bridge over Yukon River

- No foreign materials (timber, sawdust or gravel) to be used in the construction or maintenance of the ice bridge.

- No modification of the river banks or bed within the natural boundaries of Big Creek is to be carried out without consultat with and written advice from DFO.
- Deleterious substances (including but not limited to fuels, lubricants, cleansers, or solvents, or other chemicals substances) must be used, transported or stored and/or disposed of in such a way that they are not to be deposited in allowed to be deposited in waters frequented by fish.
- No heavy equipment is to be operated within the natural boundaries of Big Creek without prior consultation with and writt advice from DFO.
- Hand clearing only may be conducted within 30 metres of the natural boundaries of Big Creek
- No grubbing (removal of organic soils) may take place within 30 metres of the natural boundaries until immediately p to the commencement of construction of the bridge.
- All waters which are pumped or otherwise abstracted from Big Creek or any fish bearing waters must be screene exclude fish in accordance with DFO requirements.
- All instream works to be conducted between May 7 and July 15.

When decommissioned, the area within 30 metres of the natural boundary shall be seeded and planted with local willc

Barge Landing Sites

Same as above except for:

- All instream works to be conducted between June 1 and July 15.
- Further consultation with DFO one month prior to the start of any works or undertakings to determine when and if an on inspection by DFO personnel is required, and to finalize the location.

10. SIGNIFICANCE

After taking into account the above mitigation measures, are any of the adverse environmental effects significant? No

If yes, Which Ones?

11. LIKELIHOOD OF OCCURRENCE

Are any of the above adverse, significant, environmental effects likely to occur? No

If yes, Which Ones?

12. CEAA DETERMINATION RECOMMENDATION

20(1)(a) - Significant adverse environmental effects unlikely, project may proceed.

13. FOLLOW-UP PROGRAM

Follow-up Program Required? No
Responsibility for Follow-up Program:

Follow-up Program Description (indicate if part of Licence/Permit):

Estimated Follow-up Program Termination Date:

14. SCREENING REPORT AND/OR DECISION REPORT

Public Notified of Screening: No
Public Comments on Screening: No

Record of Comments Attached to Screening Form? Yes

CEAA
YA51045
PAGE 13

16. AUTHORIZATION

Prepared By:

Signature: C. Tavernor Date: August 12, 1996

Christie Tavernor

Authorized By:

Signature: _____ Date: 96.08.13

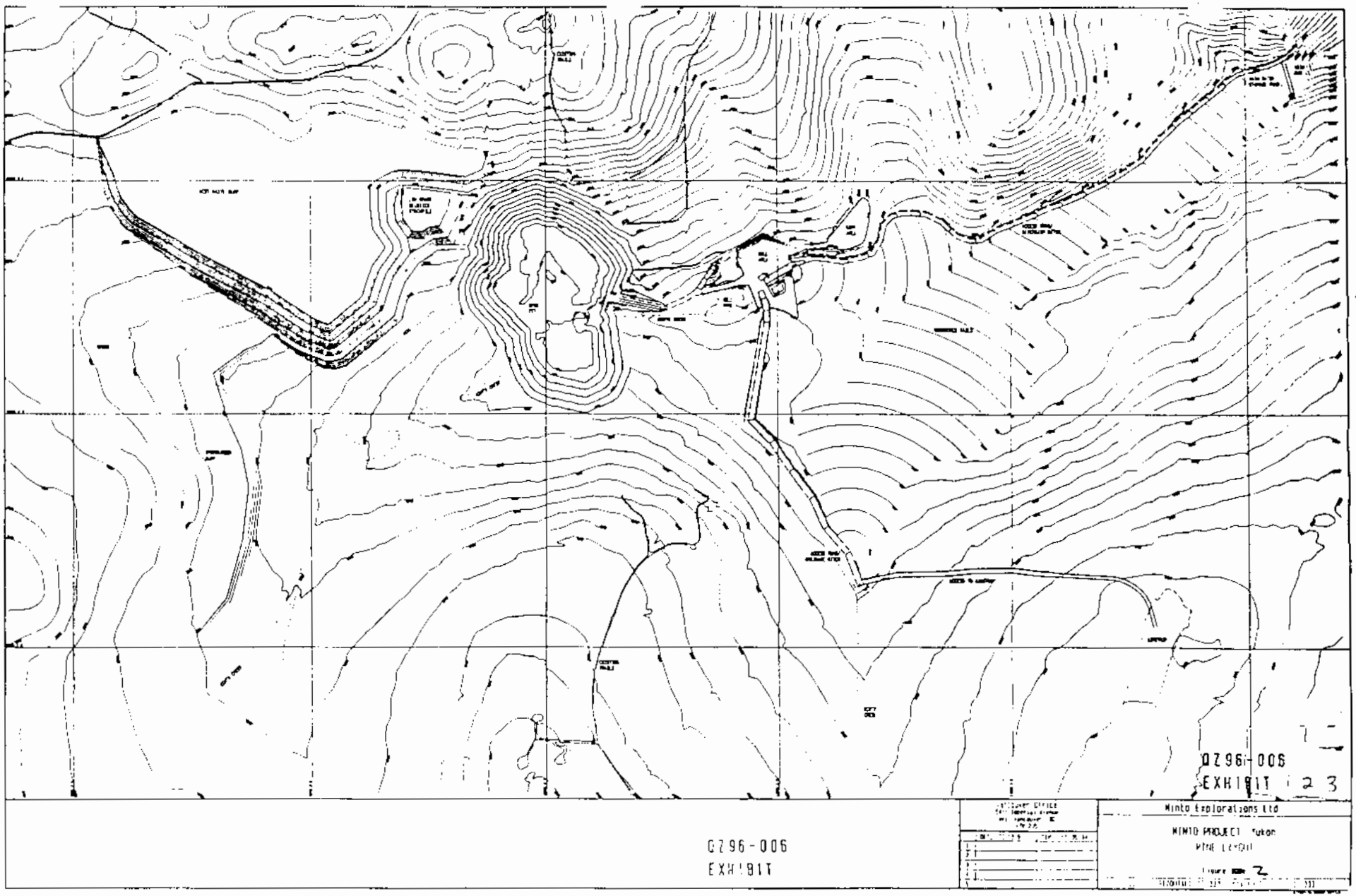
Mark Zrum, Head, Land Use

WATERBOARD AUTHORIZATION:

Authorized By

Signature: Ron W. Johnson Date 8/13/96

Ron Johnson, Chairperson



0296-006
EXHIBIT 23

0296-006
EXHIBIT

Minto Explorations Ltd

MINTO PROJECT Yukon

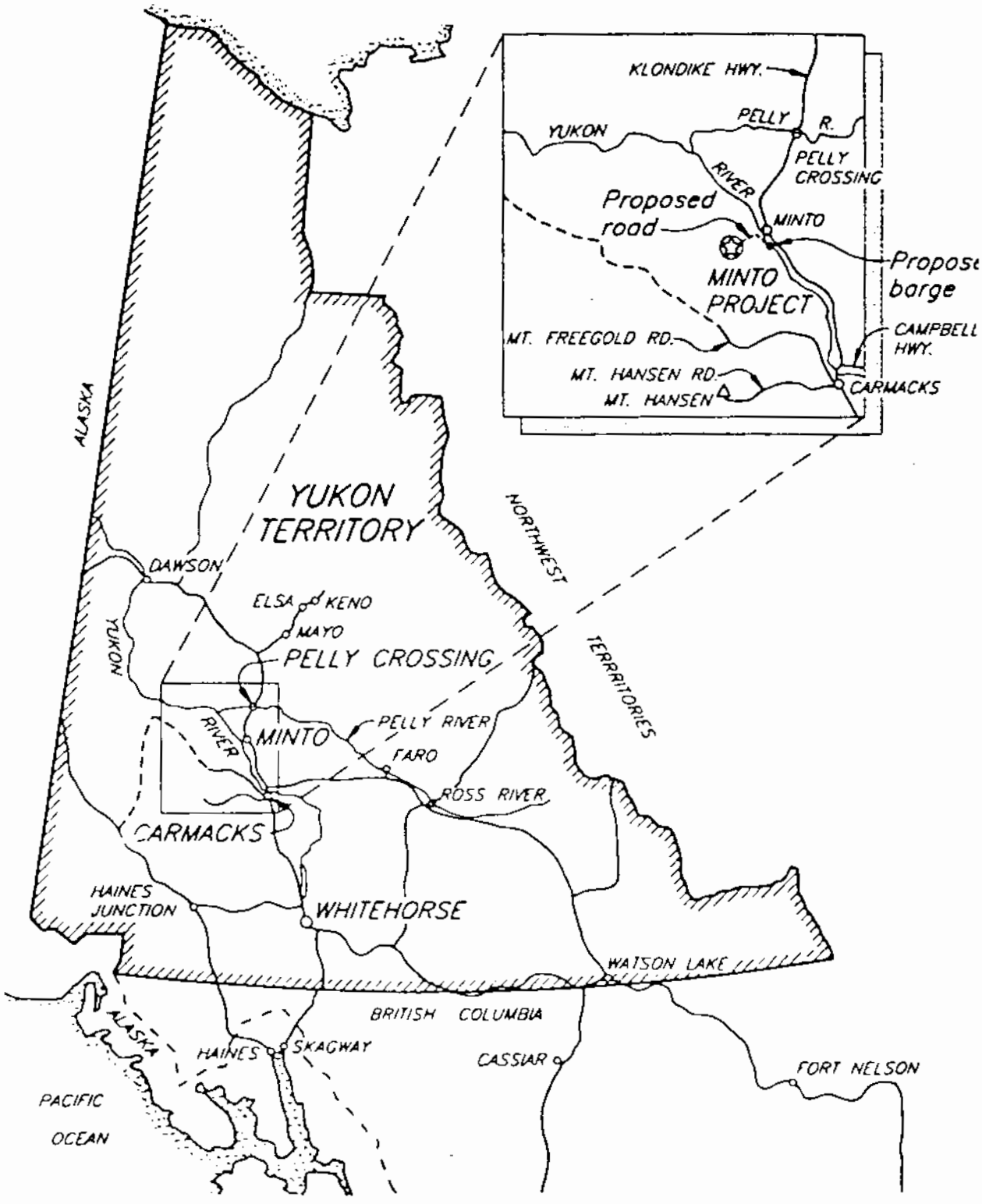
MINE LAYOUT

Figure No. 2

Figure 1

K3021.

MINTO EXPLORATIONS LTD.
MINTO PROJECT
LOCATION MAP



Dec. 8, 1994

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE 1