Attachment # 5

Department of Fisheries and Oceans

By Jordan DeGroot, dated October 26, 2001

Fisheries and Oceans | Pêches et Océans

Fish Habitat Management
P.O. Box 358
Iqaluit, Nunavut
X0A 0H0

Oct 26th, 2001

Bruce Donald
Teck Cominco Ltd.
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Canada V1A 3E1
Phone: 250-427-8256
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RE: Polaris Mine - Decommissioning and Reclamation Plans

Dear Mr. Donald:

This letter is to advise that Department of Fisheries and Oceansstaff have reviewed the above plans. Department of Fisheries and Oceans-Fish Habitat Management (DFO-FHM)concerns include decommissioning of the dock and adjacent shoreline, and removal of the Garrow Lake Dam. Additional information on the decommissioning plans will be required prior to issuance of a *Fisheries Act* authorisation:

Decommissioning of the Dock - Although plans to remove the dock with recontouring of the shoreline to approximate natural shoreline slope is considered the preferred alternative, additional detailed, finalized construction information and finalized blasting plans are required.

TeckCominco Response

- Detailed information is provided in following sections of this submission in the same order that the specific comments are identified.

Removal of the Garrow Lake Dam - Information is also required regarding the timing and construction methods used to remove the dam. Teck Cominco Ltd. does not provide sufficient assessment of the more environmentally acceptable alternative of complete dam removal and site rehabilitation. Moreover, there is good reason to defer decommissioning actions on the dam until the natural surface water elevation of Garrow Lake has been restored and monitoring reveals that erosion of the halocline and mixing with the surface waters will not occur and contaminants will be retained at depth.

TeckCominco Response

- *As above, detailed responses to the reviewer's questions have been inserted in subsequent sections of this letter in response to specific comments.*

- *The proponent does not agree with the comment that there is 'good reason to defer decommissioning actions on the dam' or that complete removal is more environmentally acceptable.*

In addition to the above, DFO-FHM has yet to receive a "No Net Loss" plan from Teck Cominco Ltd. An acceptable "No Net Loss" plan, outlining compensation measures, will be required prior to issuance of a *Fisheries Act* Authorisation.

TeckCominco Response

1. *The application for authorization by the proponent involves two distinct and separate projects. The proponent's objectives in both projects are to restore rather than to harmfully alter fish habitat. While mitigative measures are required to protect habitat while the restoration work is in progress, the objective is to avoid Harmful Alteration, Disruption, or Destruction of Fish Habitat ('HADD'). The proponent believes the submission of a no net loss plan at this stage is premature for the following reasons:*
   a) *TeckCominco believes that DFO views the lowering of Garrow Lake as an activity that has the potential for HADD. It is unclear to the proponent whether DFO's concern for HADD relates to Garrow Lake aquatic habitat or effluent water quality from the lake into Garrow Bay or both. In addition, it is not clear to the proponent what specific elements of the habitat require protection.*
      i. *If the concern for HADD relates to loss of fish habitat due to reducing the area of the surface layer in Garrow Lake, the proponent does not agree. Referring to the 'Decision Frame Work for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish Habitat' by the Department of Fisheries and Oceans Habitat Management and Science (1998), states:*

         'Consequently, when reviewing project proposals, habitat managers strive, pursuant to the No Net Loss guiding principle, to maintain the current productive capacity of fish habitats supporting Canada's fishery resources, such that the habitat is able to produce fish suitable for human consumption.'

         There is no current or historical fishing of Garrow Lake for either sport or human consumption as there has never been any fish of interest for either sport or human consumption. It is the proponents understanding that recent legal interpretations of the Fisheries Act have identified this as a key issue in the determination of whether a project presents a HADD.

         Additionally, in 1981 Garrow Lake was designated as a 'tailings impoundment area' under the Metal Mining Liquid Effluent Regulations by the Minister of Fisheries and Oceans.
      ii. *If the concern for HADD relates to the water quality of the surface layer of Garrow Lake discharging into Garrow Bay, the proponent does not agree that there is a HADD. In the remainder of this letter, we have provided detailed responses to reviewers' questions and/or comments related to the water quality issues. The proponent maintains that the metals concentrations in the surface layer of Garrow Lake and the discharge from Garrow Lake will not only remain within current Water Licence and other regulatory requirements but will improve subsequent to cessation of tailings being deposited into the bottom of the lake.*
   b) *The second component of the remedial plan is to restore the dock and adjacent shoreline to a more stable and natural configuration. The proponent has proposed this work with the specific objective of improving aquatic habitat. It is our understanding that DFO also views this proposal as beneficial provided appropriate mitigation methods are utilized during the work process. It is our understanding that DFO does not view this as a HADD contingent on appropriate construction methods being utilized.*
2. *The proponent requests further discussions with DFO in resolving the issue of whether or not there is a HADD.*

   If it is determined that there is a HADD, then discussions would be requested to develop an initial scoping of a compensation plan. Ultimately, the objective in this circumstance would be to develop a formal Approval in Principal ('AIP') in which a letter is issued by DFO outlining their conditions for the approval. A compensation plan would be part of this approval.

   If it is determined that there is no HADD or if HADD can be prevented through a series of mitigative actions, then in discussions with the proponent, DFO can develop and issue a 'Letter of

Advice' under which DFO agrees what actions are required to prevent a HADD. The proponent is of the opinion that there is no HADD and that a Letter of Advice is the appropriate approach. The letter would contain requirements for mitigative actions rather than compensation.

If you have any questions concerning the attached comments, please contact me at (867) 979-8007 or by fax at (867) 979-8039.

Sincerely,

Original Signed by:

Jordan DeGroot
Habitat Management Biologist
Fish Habitat Management
Department of Fisheries and Oceans- Eastern Arctic Area

Comments provided by Bruce Fallis on decommissioning of the dock, Garrow Lake Dam removal, and Garrow Lake water quality:

Dock Removal

"*Teck Cominco Ltd. Report for: Decommissioning of Dock Facilities at Polaris Mine Little Cornwallis Island, Nunavut*" Revision 1, October 2001, Westmar Consultants Inc.

The cover letter dated October 4, 2001 refers to "Revision 2 of our report" but the title page of the report states "Revision 1". If an updated version of the report is available, it should be provided.

TeckCominco Response

- *The cover letter from Westmar referred to Revision 2 of their report in error. The attached report referred to (Revision 1) was the most current version.*

The proposal to remove the refrigerant from the cells of the dock requires greater detail with respect to the nature of the refrigerant, the quantity of refrigerant to be recovered, the manner in which the refrigerant will be removed, and the ultimate method of disposal of the refrigerant.

TeckCominco Response

- *A review of the type and potential quantity of refrigerant, a detailed protocol for removal and methods of disposal completed. Attached is a memo describing this information in detail (Attachment #11).*

Plans for removal of the styrofoam used against the interior of the piles should also be provided.

TeckCominco Response

- *The styrofoam is above the water line only, and is comprised of sheets that are 10 ft. long, 2 ft. wide and 4 in. thick.*
- *The frozen fill will be excavated while the sheet piles are still in place, although some of the fill along the sheet piles will remain in place as long as possible to keep the interior as dry as possible during excavation.*
- *The styrofoam sheets will likely come out in large sections, but may be damaged from drilling, blasting, excavation and pile extraction, and so smaller pieces may be broken off from the larger sheets. Pieces of styrofoam that are not removed by machine will be removed by hand and disposed of at the land disposal site. Pieces of Styrofoam will not be allowed to enter the environment.*

The proposal to cut off the steel cell sheeting should be submitted to the Canadian Coast guard for review to ensure that the depth below the low tide level at which the cells will be cut, meets their specifications under the provisions of the ***Navigable Waters Protection Act***.

TeckCominco Response

- *Find attached a letter from Rick McLean A/Superintendent, Navigable Waters Protection, Coast Guard, Central and Arctic Region (Attachment #12). Mr. McLean reviewed the permits held with the Coast Guard and states that they have no interest in the project so long as the sheet piles are either extracted or cut off at least 2 metres below low tide level and the beach is re-profiled to minimize erosion.*

Details are needed with respect to the nature of the "rejects from the mine operation" that were disposed of in the dock cells and whether the level of excavation in the cells during decommissioning will leave such rejects exposed, causing leaching of contaminants into the ocean. If much of the dock fill to be left in place consists of "mine rejects" it should be removed and disposed of underground.

TeckCominco Response

- *Originally there was uncertainty regarding the source of the material to fill the dock cells. We have since acquired a video showing construction of the dock with the fill coming from the berthing area of the barge. We have also received a letter from Jean Barthe of Tower Arctic (who constructed the dock cells) confirming that the fill material originated from the barge berthing area excavation (Attachment #13).*

Pg. 1- The "detailed design work" advocated as being necessary prior to decommissioning is not a part of the report provided. Such information should be submitted IN ADVANCE of any approvals being granted to proceed. Mitigation methods to be employed to reduce sediment dispersion have not been detailed.

TeckCominco Response

- *Pg 1 of the report recommends the following design work be done prior to decommissioning:*
  1. *Prepare detailed hydrographic surveys surrounding the site.*
     - *Detailed hydrographic surveys were originally taken in order to design and install the dock facilities. As the option selected for decommissioning the dock involves excavation of shore material to a maximum of 2 metres below low tide elevation, there is no need for further hydrographic surveys to be conducted.*
  2. *Incorporate the remedial excavation proposed by Gartner Lee Ltd.*
     - *Westmar Consulting Engineers ('Westmar') have revised their drawings to reflect the remedial excavation proposed by Gartner Lee Ltd. These revised drawings are attached (Attachments #14).*
  3. *Finalize the excavation plane to minimize cut and fill volumes.*
     - *Refer to item #2. above for the appropriate drawings (Attachment #14).*
  4. *Develop detailed procedures for excavation process to ensure protection of the aquatic environment*
     - *There are four components of the decommissioning plan that require protocols to protect the aquatic environment:*
       - i *Removal of glycol from freezing pipes located in the dock.*
         The procedure is described in Attachment #11.
       - ii *Blasting of fill to be removed*
         - *Blasting will be minimized as much as possible. During the summer when the active layer has thawed, surface layers of fill can be removed without blasting. Then the next layer of fill will gradually thaw and can then also be removed without blasting. This process will be repeated if the thawing is efficient. Until this process is attempted, it can not be determined how successful it will be. Blasting will be used as a last resort and will be done during the early winter as discussed later in this letter.*
       - iii. *Sediment Control*
         - *The majority of the fill to be removed is located within the sheet pile cells in the dock area. During removal of the fill from the cells, the sheet piles will remain in place at an elevation higher than the fill. This will ensure that there is always a physical barrier between the fill being removed and the ocean.*
           In areas of the shore where there are no sheet piles to act as a silt barrier, excavation below sea level will be sequenced so there is a berm of undisturbed fill between the excavation and the ocean. The berm will be the last material below sea level to be removed. A conventional silt barrier would not be functional due to damage from random ice flows that come and go during normally ice-free periods.
           Where blasting is required to loosen fill, it will be done during the period of the year when the ocean is ice covered. In these conditions the ice will form a barrier to prevent fill from spilling into the ocean.
           The new shoreline will be graded to make it a smooth as practical to minimize the rate of erosion once it is exposed to wave action. A key aspect of the design

parameters of the shoreline is the flat slope of the new shoreline to minimize erosion rates.

- *In addition to the contractor's supervision, TeckCominco will assign an environmental monitor to regularly observe the work while in progress to ensure procedures are being followed. The observer will also monitor for signs of any sediment getting into the ocean and will have the authority to direct the contractor to take appropriate action.*

iv. *Prevention of hydrocarbon spills during the work process*

- *Equipment working on the foreshore or in the water will be inspected for potential hydrocarbon leaks and necessary repairs made. Any equipment working in the water will be steamed to remove surface oils and greases.*
- *Spill kits (hydrocarbon containment / absorbent booms) will be available in the event of a hydrocarbon spill. Operators and supervisors working near the shoreline will have training and written procedures to follow in the event of a spill.*
- *No equipment will be refueled or greased within 50 metres of the shoreline.*
- *In addition to the contractor's supervision, TeckCominco will assign an environmental monitor to regularly observe the work while in progress to ensure procedures are being followed.*

Pg. 3- The extent of the area of contaminated surface material to be deposited underground should be identified along with the techniques to be used to differentiate between contaminated and uncontaminated materials.

TeckCominco Response

- *In addition to the area around the mill and product storage building, the area of the dock and shoreline targeted for reconfiguration will have contaminated surface materials removed. The contaminated surface layer has been caused by spillage and/or tracking of fine-grained concentrates from the mill, concentrate storage and concentrate load out conveyor system. Once this layer has been excavated and transported back to the mine, the underlying dock fill will consist of uncontaminated rock originating from the barge berthing area.*
- *As the surface layers of fill are removed, field screening methods will be used to assist in identifying the separation of the contaminated surface fill from the underlying clean fill. The site currently has a laboratory that is adequate for screening level testing of fill, but it is assumed that it will not be practical to maintain this capability through to the end of the reclamation project. If an on-site lab is not practical, there are electronic tools commercially available that would be adequate for use as a screening tool. A tool such as a NITO 700 Series Multi-Element Analyzer could be utilized. The NITON instrument is a hand held analyzer that utilizes a radioisotope source to analyze for 15 metals (including Pb and Zn) and is specifically designed for this type of application. It reads bulk soil samples and is rated to detection limits of less than 150 mg/kg for zinc and less than 70 mg/kg for lead. A PID will be used as a field screening tool for hydrocarbon contamination.*
- *Once the screening tools indicate that the contaminated surface materials have been removed, confirmatory samples will be collected and shipped to a licenced commercial laboratory for confirmation.*

Materials associated with decommissioning of the temporary dock should also be disposed of underground, since the rock associated with this structure was originally identified as being well mineralized (Pb and Zn).

TeckCominco Response

- *Any mineralized rocks located above or within a metre of the low tide elevation will be removed and disposed of underground. Some of the rip-rap used to control erosion along the shoreline have been identified as containing mineralization and will be removed.*

While alternative proposals may be appropriate, regulators will base approval on plans that are approved prior to commencement of work and any deviation from such plans should receive approval prior to implementation.

Pg. 12- It is indicated that rip rap of the dimensions required is not available in any quantity on Little Cornwallis Island, however no alternative source for such materials is suggested. The source for the materials needed should be specified.

TeckCominco Response

- *Alternate sources of rip-rap off-island have not been identified for several reasons:*
  a) *A source for rock off Little Cornwallis Island would require mobilizing equipment crews to a new site, requiring the following to enable mining of rip-rap:*
     - *a new dock at that site*
     - *shelter for the crews*
     - *fuel storage*
     - *maintenance facilities*
     - *roads from the quarry to the dock and site facilities*

     A new quarry would need to be developed, rock blasted, the rip-rap loaded on a barge, transported back to Little Cornwallis Island, and then finally off loaded and placed along the shores.
  b) *Both new land leases and a mining lease would be required prior to disturbing a new site on an adjacent island. This is a difficult task in itself.*
  c) *Encapsulating the dock with rip-rap was viewed as unacceptable option due to the large area of habitat on the ocean floor that would be buried by the placing of the rip-rap.*
  d) *Clearly the costs to do the above work would be prohibitive.*

Pg. 14- Once again, the contingency measures to be implemented to minimize sediment dispersal need to be specified along with the site(s) selected for disposal of excavated materials.

TeckCominco Response

- *Refer to response to comments regarding Pg. 1 above for discussion of sediment control plans.*
- *Contaminated fill will be disposed of in the mine as detailed in the drawings in Attachment #10. Clean fill will be used for re-contouring up-slope areas of the dock.*

Pg. 15- The methods for distinguishing the materials that are contaminated with concentrate dusts should be specified.

TeckCominco Response

- *Refer to comments related to Pg. 3 of this submission above.*

The "detailed final blasting design" should be part of the proponent's application for a ***Fisheries Act*** Authorization and be evaluated and approved in advance of issuance of any Authorization.

TeckCominco Response

Blasting in the area of the dock is both very expensive and very complex to ensure that there is no harm to the aquatic environment. The complexity of the design is apparent from Appendix H of the Westmar report 'Decommissioning of Dock Facilities at Polaris Mine, Little Cornwallis Island, Nunavut – Revision 1' (Attachment # 15) submitted by Westmar with their report on decommissioning the dock. Pacific Blasting has also provided us with a specific example (Attachment # 16) of the details required to blast a row located approximately 7 metres from the outside edge of the dock structure. The example shows holes 7.9 metres deep, 7 explosive decks per hole with a maximum

charge weight per delay of 5 lbs. Each row blasted requires each one of these parameters to be changed due to changing distances from the ocean and changing hole lengths.

- *If TeckCominco is required to submit a 'detailed final blasting design' it would be necessary to assume that the entire quantity of fill to be removed would be blasted. This would require 34,500 kg of nitroglycerin type explosives. If TeckCominco were successful in removing even 1 metre of fill by non-blasting methods, then the entire blast design would need to be completely redone.*
  TeckCominco intends to remove as much of the fill as possible by mechanical means by cyclically stripping the active layer as it thaws. This will involve the removal of thawed active layer as the permafrost table degrades. It is unclear at this time if this approach will be efficient, however it is the view of TeckCominco that this approach will minimize potential environmental impact. Given the above, it is unclear the extent of blasting that may be actually be required and as a result it is not reasonable to provide a 'final' blast design at this point in time.
- *It is proposed that, as the requirements for blasting evolve during the decommissioning of the dock, a detailed blasting plan is submitted at that time that would comply with the design parameters proposed in Attachment #15. This would be submitted for final approval from DFO in advance of the work being conducted. This is normal practice within the BC Coastal region where blasting in and around aquatic environments is not an uncommon occurrence.*

Pg. 17- The timing of the detailed topographic survey needed to finalize the cross-sections and volumes for detailed design, tendering and construction should be indicated. Review of the finalized construction plans is a prerequisite to the issuance of any ***Fisheries Act*** Authorization. The timing of the detailed topographic survey is critical in this regard.

TeckCominco Response

- *Topographic surveys have been completed. Westmar has utilized this information in conjunction with information on remedial excavations to develop final cross-sections that will be given to contractors to direct their work. The cross-sections are provided in Attachment #14.*

Pg. 18 4th bullet - Uncertainty is expressed here with respect to how the sheet piles will be decommissioned. Clarification is needed so that the proposal may be assessed by the Canadian Coast Guard with respect to the need for permitting under the ***Navigable Waters Protection Act***.

TeckCominco Response

- *The Coast Guard has approved both the removal of the sheet piles or cutting them off provided they are at least two metres below low tide elevation. Refer to Attachment #12 (Letter from R. McLean of the Coast Guard).*

In summary, removal of the dock with recontouring of the shoreline to approximate natural shoreline slope is considered the preferred alternative, pending the provision of additional detailed, finalized construction information and finalized blasting plans.

Garrow Lake Dam Removal

"*Garrow Lake Dam Decommissioning, Polaris Mine Operations, Nunavut*", Project No. 0101-94-11552.002. Prepared by EBA Engineering Consultants Ltd. Edmonton, Alberta. March 2001

This report needs to be reviewed in the context of the history of the Polaris operation, taking into consideration that Garrow Lake was designated as a tailings impoundment area for use in depositing tailings at depth below the natural halocline in Garrow Lake. Failure of Cominco's tailings line resulted in the discharges of tailings into the surface waters of Garrow Lake and the elevation of lead and zinc concentrations. In order to meet the discharge limits at the outflow of Garrow Lake, the dam on Garrow Creek was constructed. It is this very dam that is the subject

of the report. The report advocates the formation of a cut through the dam to restore the Garrow Creek flow path. The report does not present a cost-benefit analysis associated with total removal of the dam vs. making a cut through the dam to reinstate flow to Garrow Creek. Such a cost benefit analysis should be provided. In the absence of such an analysis, the entire dam should be removed and the affected area decommissioned to its pre-construction state. If the tailings system had been operated as intended, there would have been no need to construct the dam. If it is decided to leave the dam in place, Teck Cominco Ltd. should post an irrevocable letter of credit to cover the cost of the removal of the dam. Any liability for the dam should not be passed on to future generations. Since the amount of material to be removed for the cut through the dam is more than a third of the total volume of material in the dam, removal of the entire dam would appear to be both logical and cost effective.

TeckCominco Response

- *Attachment #17 from A. Eglauer of EBA Engineering Consultants Ltd. ('EBA') includes a cost benefit analysis of complete removal of the dam compared to partial removal of the dam. Complete removal of the dam would at least double the cost and does not provide any additional environmental benefits.*
- *Within this submission and the submission from Environment Canada there are requests for a contingency plan in the event that the water quality discharged from in Garrow Lake becomes unacceptable. The Closure Plan proposes to remove only approximately 30% of the Garrow Lake dam. If it were to become necessary to re-construct the dam, logistically and from a cost standpoint, the reconstruction is much more practical if the majority of the dam remains intact after closure as proposed.*

Timing of the decommissioning actions is critical to the success of the undertaking. It is suggested that the work be conducted in early spring prior to the thaw to optimize vehicle traffic under frozen conditions.

TeckCominco Response

- *The proponent agrees with the reviewer's comments with regard to the timing of the dam removal. Attachment #17 from EBA also recommends removal of the dam during winter months.*

Drilling and blasting is proposed for the removal of materials but there is no assessment of the effects of blasting on the integrity of the remaining structure if the entire dam is not removed. Such an assessment should be part of the suggested cost-benefit analysis.

TeckCominco Response

- *The effects of blasting are not of concern with respect to stability of the remaining dam structure. EBA included this aspect in their cost-benefit analysis presented in Attachment #17.*

There is good reason to defer decommissioning actions on the dam until the natural surface water elevation of Garrow Lake has been restored and monitoring reveals that erosion of the halocline and mixing with the surface waters will not occur and contaminants will be retained at depth. Once the dam is removed, there is no contingency identified to restrict movement of surface waters enriched with lead and zinc out of Garrow Lake. The target discharge concentrations at the outflow of Garrow Lake at decommissioning should be based on the ALARA principle and preferably comparable to pre-development concentrations. Designation of Garrow Lake as a tailings impoundment area was based on the understanding that "Cominco Ltd. has undertaken to dispose of tailings in such a manner ... that the surface layer of Garrow Lake remain substantially unaltered." The fact that the surface waters of Garrow Lake have been substantially altered, necessitates that a plan be provided identifying the strategies to minimize contaminant discharges upon decommissioning. No forecast of the total loadings of

contaminants that will be discharged from Garrow Lake subsequent to cessation of tailings disposal has been provided. Such an estimate should be part of the decommissioning plan.

TeckCominco Response

a) With respect to comments that the surface waters have been 'substantially altered'

- *Garrow Lake was designated as a 'Tailings Impoundment Area pursuant to Subsection 5(2) of The Metal Mining Liquid Effluent Regulations' ('MMLER') under the Fisheries Act by the Minister of Fisheries and Oceans in 1981. As DFO has defined this lake as a tailings impoundment, the criteria specified in MMLER regulations are the controlling regulatory values. Within the context of the MMLER, the proponent disagrees with the reviewer that the surface layer of Garrow Lake has been 'substantially altered'. The metals concentrations within the surface waters have never exceeded the levels permitted in the MMLER.*
- *The concentrations of zinc in the surface layers of Garrow Lake have consistently remained below thresholds for the protection of aquatic life. The metals concentrations in the surface water have never exceeded the current Water Licence permit levels (0.5 mg/L). Other standards for zinc for the protection of aquatic life support this concentration. BC's Water Quality Criteria (1998 updated January 2001) recognizes that the toxicity of zinc is related to the hardness of water. The hardness of water measured in mg of CaCo3/L in the surface waters of Garrow Lake were reported by BC Research to be 700 mg/L using 1975 data. The 30 day average concentration for zinc for the protection of aquatic life would be 0.47 mg/L at this hardness. Recent sampling and analysis by Polaris staff indicates the water is at least as hard as previously reported. The CCME guideline for zinc is much lower at 0.03 mg/L but it does not provide for the mitigating effect of hardness.*

b) *The reviewer comments that target discharge concentrations at the outflow of Garrow Lake at decommissioning should be based on the ALARA principle.*

- *The ALARA principle was developed in relation to protecting people working primarily in the nuclear industry from radiation hazards. It advocates keeping exposures as low as reasonably possible taking both economic and social factors into account. The proponent is not aware of the Federal Government adopting this principle as a formal policy in the application of DFO regulations.*
- *As described in a memorandum from Mr. Paul Erickson of AXYS Environmental Consultants (Attachment #9), the discharge concentrations from Garrow Lake do not pose a significant risk under any reasonable scenario. The potential for mixing of the top two metres of the halocline are very low, but even if that unlikely event were to occur, concentrations of metals in the surface layer of water discharged into the ocean would not pose a threat to aquatic life. Mr. Peter Chapman and Ms. Cathy McPherson of EVS Environment Consultants were asked to comment on the potential effects of the discharge water quality from Garrow Lake on Garrow Bay marine organisms. Their comments are provided in Attachment #18. In summary they state:*

> *'Even assuming that worst case predictions regarding zinc concentrations in Garrow lake surface waters were to occur, removing the tailings dam to allow surface waters to flow into Garrow Creek and thus into Garrow Bay, will not create any risk of harm to the marine organisms in Garrow Bay.'*

c) *The reviewer states that the dam should be left in place as a contingency until the natural water elevation is restored and it can be demonstrated that mixing of the surface layer with the halocline will not occur.*

- *This is not necessary for protection of water quality (as discussed in both (a) and (b) above).*
  TeckCominco has been sampling the water quality of Garrow Lake for excess of 20 years and has invested in a comprehensive model that has been regularly updated. This provides TeckCominco with a high degree of certainty in regards to predictions in terms of water quality objectives and the behaviour of Garrow Lake upon closure of the Polaris Mine.
  The cost of leaving the dam in place is substantial. It is also impractical from a logistics perspective. Leaving the dam in place after the island is abandoned would require personnel returning to the island each discharge season, establishing a camp and remaining on the island to operate the siphon system. This would be required on an annual basis until the decision is made to remove the dam. At that time, substantial heavy earth moving equipment, crews, a camp and

fuel storage facilities would need to be re-established on the island. Roads would either need to left intact after mine closure or need to be re-activated to transport fill removed from the dam to the designated disposal area in Little Red Dog quarry.

- *The Closure Plan proposes that Garrow Lake dam to be decommissioned by partially removing the dam. This in itself is a contingency. If conditions were to occur that required containment of the lake surface waters, it would be possible to reconstruct the dam, as approximately 70% of the material would still be in place.*
- *If during or after mine closure, monitoring results identify a significant departure from the predicted water quality over two successive sampling periods, TeckCominco will discuss with the Water Board and through it, other regulatory agencies, the course of action that may be necessary. If there is concern for the water quality exceeding the applicable standards, then one of the options that will be considered is the re-construction of the dam for the purpose of temporarily preventing discharge while a solution is implemented.*

d) *The reviewer recommends that forecasts of the total loading of contaminants that will be discharged from Garrow Lake subsequent to cessation of tailings disposal should be part of the decommissioning plan.*

- *Mr. Erickson has updated his forecasts utilizing SNP data collected in 2001 and extended time frame for the water quality forecasts originally presented in the Closure Plan. Utilizing this data, Mr. Erickson has developed a metal loading forecast for the potential metal of concern (Zn) as requested by the reviewer. This information is provided in Attachment #9.*

Appendix B

Section 1000 pg. 1 item 3 - It is indicated here that "tailings were deposited in the reservoir upstream of the dam". The fate of these tailings as part of the decommissioning process needs to be detailed. Clarification is needed as to whether tailings are present in the area between the historic outlet of Garrow Lake and the upstream dam face.

TeckCominco Response

- *The tailings referred to in the above section are the tailings deposited into Garrow Lake as per the Water Licence. It would have been clearer to refer to this as Garrow Lake rather than 'in the reservoir upstream'. At no time have tailings been deposited in the area between the dam and Garrow Lake.*

Section 1001 pg. 1 3.0 - In addition to a coffer dam, discharge during construction should be managed with a small diameter siphon that enables work in the vicinity of the dam to be conducted under dry conditions.

TeckCominco Response

- *As an update to the plan, removal of the dam will be scheduled for early spring conditions when there is no water flowing. If there is any residual work to be later, then any flowing water will be diverted around the work as a sediment control strategy. A pump or small diameter siphon would be used under these conditions.*

Section 1002 2.0.2 b - Excavation plans require finalization and approval prior to implementation.

TeckCominco Response

The proponent agrees.

Section 1002 3.0 - "non-conventional excavation" methods should be submitted for approval at least five business days prior to proposed implementation.

TeckCominco Response

- *The proponent agrees.*

Garrow Lake Water Quality

"*Garrow Lake Dam, Effect of Removal on Lake Stability and Outflow Water Quality*", Prepared by AXYS Environmental Consulting Ltd. and Applied Ocean Sciences, March 2001.

This report assesses the possibility of halocline erosion and tilting in Garrow Lake subsequent to the return of the lake to its historic elevation (1005.7 m?). While the model predictions indicate that it is unlikely that the waters below the halocline will mix into the surface layer there appears to be no monitoring program to assess the validity of the model predictions subsequent to restoration of the lake to its historic level. Vertical profiles of water chemistry within the lake should be undertaken annually in order to verify that the modeled predictions are correct. In this regard, removal of the dam or opening of a cut through the dam, should be deferred. Once the dam is removed there is no contingency presented to address elevated contaminant levels that may arise in the surface waters of Garrow Lake. Deferred removal of the dam would provide a contingency plan should it be needed. During the monitoring period, siphoning over the dam at a rate comparable to the historic Garrow Creek flow could be undertaken.

TeckCominco Response

- *The historic lake elevation is 1005.7 m.*
- *There has been regular monitoring of the vertical profile of the lake conducted 3 times per year as per requirements of the water licence. This has been done while the lake has had both an increasing and a decreasing thickness of the surface layer.*
- *The Closure Plan for Polaris contains proposals for monitoring of the lake as recommended by the reviewer (Section 7.1 'Post Closure Monitoring' in Volume 1). The monitoring plan has been subsequently updated specifying more detail and is presented in Attachment #8. This was done in response to reviews of the Closure Plan conducted by Environment Canada.*
- *The only mechanism that can supply the energy to mix the surface layer of Garrow Lake with the top of the halocline is wind energy. Paul Erickson of AXYS in his memorandum (Attachment #9) discusses the low probability of the top 2 metres of the halocline mixing with the surface layer of Garrow Lake. Using wind data from 1961 to 1990, the peak wind speed measured that lasted for approximately one hour was 105 km/hr. This peak wind speed would need to be continuously sustained for a 2.5 hour period to cause mixing of the top 1 metre of halocline. To mix the top 2 metres of the halocline a storm event would need to maintain a maximum wind speed of 105 km/hr continuously for at least 8 hours. At the same time, the storm event must also occur during the brief (or some times non-existent) ice-free period on the lake and the direction of the wind would need to be aligned along the length of the lake. Even if this highly unlikely event were to occur, the resulting zinc metal concentration in the surface layer of the lake would be 0.31 ppm compared to the current licence limit of 0.5 ppm. In addition, as the mine will not be placing water and tailings into Garrow Lake upon cessation of mining activities, both the quantity of water and the concentration of metals discharged from the lake will be reduced. As a result, metals loading discharged from the lake will be even lower.*

  Peter Chapman and Cathy McPherson of EVS (Attachment #18) have reviewed the potential loading data and conclude that there is a lack of risk to aquatic life even if mixing of the top 2 metres of the halocline were to occur. In summary they state:

  > *'Even assuming that worst case predictions regarding zinc concentrations in Garrow lake surface waters were to occur, removing the tailings dam to allow surface waters to flow into Garrow*

Creek and thus into Garrow Bay, will not create any risk of harm to the marine organisms in Garrow Bay.'

- *The proponent strongly disagrees with the suggestion that the dam remain in place beyond 2004. The available data and facts do not identify a significant risk in partially removing the dam as planned. As previously identified by TeckCominco, the requirement to maintain the dam in place after 2004 would be extremely expensive and logistically impractical.*

The extent to which the area between the historic Garrow Lake outlet and the east face of the dam have been contaminated since construction of the dam has not been addressed. The potential for mobilization of contaminants from this area subsequent to restoration of the historic level of Garrow Lake should be addressed.

TeckCominco Response

- *The proponent assumes the above comment relates to the previous reference to' tailings being deposited in the reservoir upstream of the dam' (Appendix B, Section 1000, pg. 1 item 3 of the Garrow Lake Dam Decommissioning report by EBA). As indicated earlier, this refers to the deposition of tailings into Garrow Lake as per the conditions in the Water Licence. It was not intended to refer to deposition of tailings into the flooded area between the dam and the lake, which has never occurred.*

The extent to which the inundated shoreline of Garrow Lake is likely to erode due to meltback of the permafrost has not been addressed. In the early 1970's Kuhulu Lake east of the Nanisivik Mine suffered this fate after a dam at the outlet of the lake was removed and the water level was lowered. Increased erosion around the perimeter of the lake does not appear to have been factored into the Garrow Lake stability modeling (increased TSS and TDS, increased settling of particles, etc.)

TeckCominco Response

- *The elevation of Garrow Lake is being reduced gradually over a number of years. This allows for gradual exposure of the shoreline and the re-establishment of permafrost to pre-mining conditions. The situation at Kuhulu Lake is not comparable to Garrow Lake. In Kuhulu Lake, the dam at the outlet of the lake failed catastrophically resulting in a sudden draw down of the lake. The shoreline was re-exposed in a very short period of time not allowing for either draining of the saturated shoreline materials or the re-establishment of permafrost. It is not clear whether the erosion of concern at the lake was the result of the shoreline being re-exposed in a short time period or the scouring of the old creek bed from the flood event resulting from the dam failing. The information related to Kuhulu Lake is discussed in the letter from EBA in Attachment #17.*
- *As proposed by EBA in Attachment #17, the proponent has modified the monitoring plan presented in the Closure Plan to include both regular measuring of TSS in the surface layer of Garrow Lake and visual monitoring of the shore stability (Attachment #8).*

The original Garrow Lake discharge permit limit (pg. 1) for zinc was 0.1ppm. During operations this limit was increased to 0.5 ppm, yet it now appears that a discharge of 0.3 ppm Zn will be permitted after decommissioning. The post decommissioning zinc concentration in the outflow from Garrow Lake should be comparable to the historic concentration in the surface waters of Garrow Lake rather than merely "below 0.3 ppm". To permit an ongoing discharge above the original permit level of 0.1 ppm would be irresponsible given the associated excess loading to Garrow Bay that would result from a higher limit. The water license limits for the post-decommissioning period should be revised accordingly.

TeckCominco Response

- *The memorandum previously referred to by Paul Erickson of AXYS (Attachment #9) forecasts that metals concentrations in the surface layer of the lake will return to less than 0.1 ppm by 2010.*
- *The reviewer states that to permit ongoing discharge above the original permit level of 0.1 ppm is irresponsible. The reviewer does not present any technical basis supporting this contention. However,*
  - *As presented in Attachment #18, EVS's expert opinion is that the metals loading (even if the top 2 metres of the halocline were to mix with the surface layer) does not present any risk of harm to the marine organisms in Garrow Bay.*
  - *Under renewal of the water licence in 1993 (which approved zinc concentrations in the surface layer of Garrow Lake up to a maximum of 0.5 mg/L) which underwent an environmental screening under the Environmental Assessment and Review Process Guidelines Order, the Minister stated:*

    'I am satisfied that any potentially adverse environmental and related socioeconomic effects that may be caused by this project are insignificant or mitigable with known technology'.

    If metals concentrations were to exceed the current licence and regulatory limits, then mitigation strategies using known technologies would be required. As long as metals concentrations remained within the licence permit levels, the environmental effects were stated to be 'insignificant'.
  - *Current Metal Mining Liquid Effluent Regulations under the Fisheries Act authorize discharges of effluent from tailings impoundment (i.e. Garrow Lake) with concentrations of zinc up to 0.5 mg/L.*
  - *Forth-coming federal legislation under the Fisheries Act (Metal Mining Effluent Regulations) are expected to become law in 2002. Schedule 4 of the gazetted regulations authorize a discharge limit of 0.5 mg/L for zinc containing effluent from a tailings impoundment. Garrow Lake is specifically identified in these regulations as a 'tailings impoundment'.*

Teck Cominco strongly disagrees that the plans proposed are 'irresponsible'. *Being in compliance with current licences and regulations, proposing plans that are in compliance with current and forth-coming legislation, and having independent, expert opinions that the discharge does not present a risk to the marine environment based on science is not 'irresponsible'.*

Pg. 5 The fact that wind speeds sufficient to mix the top metre of the halocline with the surface water within an hour have occurred on site indicates the future possibility of such an event. The analysis does not examine sequential mixing, one year to another, that could result in progressive cumulative erosion of the halocline, especially if global warming results in gradual extension of the open water period on Garrow Lake thereby increasing the period for wind mixing events to occur. In theory it appears that progressive erosion of the halocline is a distinct possibility.

TeckCominco Response

- *The wind speed sufficient to mix the top metre of the halocline with the surface layer within an hour have not been measured or documented. This was stated on Page 5 of the report contrary to the reviewer's comment above. However, as stated in Attachment #9 from AXYS, Paul Erickson identifies that there was an error in Figure 4 of their report in the Closure Plan. The vertical axis in Figure 4 should have read duration in 'days' not 'hours'. The proponent assumes that this is the information that led the reviewer to believe that wind speeds have been sufficient to cause mixing of the top metre of the halocline.*
- *It should be noted that Mr. Erickson also states in the report in the Closure Plan that 'It is noteworthy that in the 18 years of mine operations, there has been no wind induced mixing of the main halocline'*

Pg. 6 - Annual monitoring of the structure of the lake (DO, Temperature, salinity/conductivity, lead and zinc) at 2 m intervals in the surface layer, 1 m intervals in the halocline, and 2 m intervals beneath the halocline should be undertaken to document post-decommissioning

changes. A post-decommissioning assessment of the presence of aquatic biota in the surface waters of Garrow Lake should be undertaken.

TeckCominco Response

- *As identified in a previous response to a question in this submission, TeckCominco has proposed regular sampling of the vertical composition of the lake substantially as requested by the reviewer. Details are included in Attachment #8.*
  With respect to the request for a post-decommissioning assessment of the presence of aquatic biota in the surface layers of Garrow Lake, TeckCominco does not agree that this is necessary for the following reasons:
  - *Garrow Lake was designated as a 'Tailings Impoundment Area' pursuant to Subsection 5(2) of The Metal Mining Liquid Effluent Regulations' under the Fisheries Act by the Minister of Fisheries and Oceans in 1981.*
    During the application period for the current Water Licence, DFO had requested studies to relate the relevance of data on metal concentrations in the water to those concentrations in fish and macro-invertebrates. The Water Licence granted did not require these studies to support the application or as a condition of the Licence.
  - *New federal Metal Mining Effluent Regulations have been gazetted and it is expected that they will come into effect in 2002. Under the proposed legislation, Garrow Lake is specifically named as a tailings impoundment area. It is one of 5 lakes in Canada with this designation. Under the proposed regulations (which will be administered by Environment Canada), there will be the requirement to conduct Environmental Effects Monitoring ('EEM'). It is important to note that under the regulations, it is required to conduct the EEM downstream of the discharge point of Garrow Lake and not in the lake.*
- *TeckCominco does not propose to conduct an assessment of the presence of aquatic biota in the surface waters of Garrow Lake. However, if Environment Canada or DFO wishes to undertake an assessment program, TeckCominco would be prepared to provide logistical support for the work while we have facilities on the island.*

Engineering Comments provided by Rick Gervais and Chris Katopodis are detailed below:

Polaris Mine Decommissioning

Cominco Ltd. plans to decommission the Polaris Mine at the southwest end of Little Cornwallis Island, Nunavut, in 2002. The mine, which produces and ships lead and zinc concentrates, is nearing the end of its life. There are two components to the proposed decommissioning plan: The Garrow Lake Dam and the Dock Facilities. Cominco Ltd. retained EBA Engineering Consultants Ltd. (EBA) to develop a closure design for the Garrow Lake Dam and Westmar to examine concepts for decommissioning the Dock Facilities and adjacent shoreline. The following comments are based on the review of the EBA (March 2001) and Westmar (October 2001) reports submitted to DFO by Cominco Ltd.

Garrow Lake Dam

The EBA report provides a fairly detailed examination of one alternative for decommissioning the Garrow Lake Dam. This alternative involves the partial removal of the dam and is heavily dependent on modelling predictions for the geothermal stability of the remaining dam

embankments. Cominco Ltd., through this report, does not provide sufficient assessment of the more environmentally acceptable alternative of complete dam removal and site rehabilitation. In our opinion, the total removal of the dam and rehabilitation of the site would be the better choice for the following reasons:

- It minimizes or eliminates potential downstream sediment problems that may result from the gradual or sudden failure of the remaining dam embankments. Such failure may occur given long-term uncertainties with regards to temperature (global warming), modeling limitations, which may prove insufficient for accurate predictions, and the channeling of flow and erosion potential of Garrow Creek through the remaining embankments.

TeckCominco Response

- *The slope of the banks of the partially removed dam are designed to be very flat (4H to 1V) and are similar in slope to the surrounding natural terrain. Complete removal of the dam does reduce the potential for slope failures any more than for the surrounding terrain.*
- *The shell material covering the residual dam structure is coarser and more erosion resistant than the natural surrounding hillsides providing a more erosion resistant cover than if the dam was completely removed.*

- According to the EBA report, removing the central portion of the dam would involve the removal of approximately 12,750 m3 of material with an additional 6,200 m3 of material to be over-excavated and then back-filled. Removal of the entire dam would involve approximately 49,000 m3 of material. A cost benefit analysis is needed to compare the alternatives of partial or complete dam removal, especially considering additional costs associated with correcting potential problems, which may result from partial dam removal.

TeckCominco Response

- *Attachment #17 from A. Eglauer of EBA Engineering Consultants Ltd. ('EBA') includes a cost benefit analysis of complete removal of the dam compared to partial removal of the dam. Complete removal of the dam would at least double the cost and does not provide environmental benefits.*
- *The consultant views that both options are technically equivalent but the complete removal of the dam is $1,249,000 compared to $450,000. Complete removal of the dam is estimated to cost more than 2.7 times the cost of partially removing the dam.*
- *The Closure Plan proposes that Garrow Lake dam to be decommissioned by partially removing the dam. This in itself is a contingency. If conditions were to occur that required containment of the lake surface waters, it would be possible to reconstruct the dam, as approximately 70% of the material would still be in place. This would require less equipment to be re-mobilized, a smaller crew, and less support facilities would be required. Potential the work could be completed in a shorter time period as well.*

- The objective of the mine decommissioning plan, which was part of the original agreement, should be to rehabilitate the site to as close to it's natural state as possible.

TeckCominco Response

The contouring of the partial removal of the dam will be done in a manner that blends it into the surrounding terrain in a way that minimizes the unnatural appearance. *Given the local conditions it would not be possible to completely eliminate the visual impact of the dam regardless of whether the dam is completely removed or not.*

Polaris Mine Dock Facilities

We agree that based on the 3 conceptual options for decommissioning the Polaris Mine Dock facilities presented in the Westmar report, the preferred option (Option 1) is the best choice to be investigated further. This option involves removing the dock 2 to 3 m below low tide (excavate or cut-off sheet piles underwater) and re-grading the beach to a low slope of 17.5H:1V for erosion control.

In reviewing the drawings in Appendix D, a significant drop off (approx. 10 m) between the proposed ground-line and the existing ground-line will still exist where the dock sheet piles are presently located (see appendix D - sections sheet 3). The report states..."regardless of whether the sheet piles are cut-off or are extracted, the frozen fill will erode very slowly, and is not expected to have an impact on seabed habitat." However, because of vertical face of the drop off at this location and since the material in this face (probably) contains fill used in the sheet pile cells, justification as to why this vertical face will experience gradual erosion while other areas are being re-graded to a 17.5V:1H slope should be provided.

TeckCominco Response

- *After reviewing construction methods further since the submission of the Westmar report, contractors have indicated their preference to cut-off the sheet piles 2 metres below low tide level rather than to completely remove them. This approach to decommissioning the dock leaves the face of the dock 2 metres below low sea level undisturbed. The Coast Guard has approved this approach as discussed earlier in this submission.*

  The sheet piles have been in place for over 20 years and remain in good condition. In addition, the residual sections of sheet pile would remain submerged, exposed to lower oxygen levels than near surface areas. Corrosion of the sheet piles will continue to be an extremely gradual resulting in a very slow process of deterioration.

  The foreshore at sea level is exposed to erosion from wave action. To minimize the erosion rates, the foreshore near sea level has been designed to a 17.5:1 slope. Wave energy reduces with depth and so slopes at increasing depth below sea level are exposed to less erosion than those at sea level.

Prior to decommissioning, the results from the required detailed design work identified in the report (and restated below) should be supplied to DFO for review before any work is undertaken.

- Prepare accurate hydrographic surveys of the surrounding site.
- Incorporate the remedial excavation proposed in "Polaris Mine Decommissioning and Reclamation Plan" by Gartner Lee Ltd.
- Finalize the excavation plane through the dock to minimize the cut and fill volumes, within the ranges discussed in this report and based on remedial excavation requirements, while protecting the aquatic environment by minimizing erosion and sedimentation.
- Develop detailed procedures for the excavation process of the dock area to ensure protection of the aquatic environment during the process.

TeckCominco Response

- *The above comments are similar to ones made by Mr. B. Fallis in the section titled 'Dock Removal' and have been responded to by TeckCominco in that section of this submission.*

- Determine the gradations of the natural beach and fill materials to evaluate their rates of erosion.
- Assess the need to perform a thermodynamic analysis on the natural beach and fill materials, to determine the suitability of the proposed beach material to resist erosion based on the beneficial effect of permafrost.

TeckCominco Response

- *Referring to the photographs in the Westmar report in Volume 2 of the Closure Plan, photograph #5 of the shoreline at Station 1800 indicates the natural beach gravel has a mean size of approximately 10 mm. Note that the date is August 10, 2000 and the shoreline is already frozen. Photograph #8 is located closer to the dock (at Station 1600 N) and the fill material is all –300 mm with a mean size of 25 mm. In general the fill material is coarser on average than the natural beach material. Other photographs in the above report show areas nearer to the dock where rip-rap has been placed on the foreshore and are not representative of the material sizes that will be present after re-contouring of the dock and adjacent shorelines.*
- *The fill material exposed upon completion of re-sloping the dock and adjacent shore will consist of material originating from the hillside immediately up slope from the dock and consequently will be the same rock types that the original natural beaches were composed of. The fill material has been blasted and excavated from the hillside and placed in the dock cells and shore area. As a result, its mean size is larger than the original beach material.*
  There is a very short period of the year where the foreshore above the high tide elevation remains thawed. As can be seen by the pictures referred to above, the exposed shoreline was frozen by mid August. The relative stability of the fill material can be seen in the photographs as evidenced by the steep slopes of the fill even in areas where they are not protected by rip-rap. The proposed flat slopes of the re-contoured beach will significantly reduce erosion rates over the current steep slopes.
- *In arctic beaches, there are two distinct areas of degradation of permafrost (Taylor, 1980). The backshore areas experience limited permafrost degradation and is generally a thermally stable environment. Given this, it is expected in the backshore areas above this high water mark and wave action on the beach profile that permafrost will protect the area from erosion. Taylor (1980) shows that in the lower beach and foreshore areas, the permafrost table tends to be deeper primarily due to brine water moving in interstitial pore spaces in the beach material. Given this, there is typically no 'beneficial' effect of permafrost in arctic foreshore areas. However, it is important to note that these comments apply to the brief ice-free period at this latitude. With respect to slope processes, solifluction lobes and nivation hollows (see Figure 3 – Surface Geology Polaris Mine Area - 1999 Environmental Site Asessment, Volume 3 of the Closure Plan) are absent in the dock areas demonstrating the stability of local slopes.*

Comments provided by Dennis Wright on blasting proposal:

Review of Blasting Proposal – Decommissioning of Dock Facilities at Polaris Mine, Little Cornwallis Island

As requested, I have reviewed the blasting plan for the decommissioning of the dock facilities at the Polaris Mine site on Little Cornwallis Island. My comments are as follows:

The document is extremely deficient in terms of information concerning the project and therefore I am unable to render any decisions or provide the proponent with any recommendations. The proponent has gone to considerable effort to calculate the weight of charge to could be used at certain distances from the sheet piling in order to meet the DFO Explosives Guidelines overpressure maximum of 100 kPa. However, basic information such as timing of the project is missing from the project description. Without this basic information, I am unable to determine if

the minimum requirements outlined in the guidelines will suffice with respect to the protection of fish and marine mammals from the harmful effects of explosives.

The proponent has also failed to provide any description of the existing biological environment. If the project is undertaken during the spring when there is still full ice cover in the area, then, marine mammals concerns will be minimized. However, if the project is to be undertaken during the open water period, the noise produced by the detonations may be disturbing to marine mammals, perhaps as far away as the walrus haul-out on Brooman Point on Bathurst Island. Similarly if pelagic fish eggs are present at the time of the blasting, the shock waves produced may be detrimental to the eggs. The DFO Explosives Guidelines provides a guideline of 13mm•sec^{-2} as to the maximum peak particle velocity permitted where eggs are incubating in the substrate. However, we do not know the overpressure required to damage pelagic eggs, and so we would implement the precautionary principle if pelagic eggs were present and require the proponent to delay blasting until the eggs had hatched and the fry had developed.

TeckCominco Response

1. *The reviewer correctly identified that the application did not contain a description of the biological environment. While the Closure Plan contains a description of the marine environment, additional information has been researched and are provided below.*
   - *A dive survey in the vicinity of the dock took place in May 1999 and reported blennies, sculpins, other small bottom feeding fish, snails, clams, crabs, and shrimp in the vicinity. BC Research also described the areas of Garrow and Polaris Bays as providing habitat for pelagic arctic fish species such as arctic cod, which would presumably be found in Crozier Strait as well. BC Research reported that walrus have been seen in Crozier Strait and that there is evidence of them feeding in the vicinity of the dock. Seals, predominantly ringed seals, are also reported to use the area. The substrate is mainly sand and silt with some rocks which has been colonized with clams, anemones, urchins and various crustaceans such as shrimp and amphipods.*
   - *The sculpin likely spawns in the early spring as the literature reports that pelagic larvae begin to show up in samples in July. Arctic cod spawn under ice midwinter (end of December to early February). Generally marine mammals are not present in the area until the ice breaks up, however Polaris staff report the occasional observation of seals during the winter months.*
2. *Timing of Blasting*

   Blasting is planned to take place when there is full ice coverage during early winter months (late September to mid December). The primary reason is to avoid impact to spawning fish. There are no pelagic eggs present during this period and fry from the previous year have had an opportunity to develop. Prior to initiating a blast, a search for marine mammals within 500 m of the dock area would be made to ensure there are no animals present.

The proponent states that it will be necessary to use an air-curtain to reduce the overpressure for certain shot configurations. However, no specifications for the construction, installation and operation of the air-curtain are provided. Similarly, the proponent gives no details as to mitigation techniques to be utilized should shaped linear charges be used to sever the sheet piling used in the dock cells.

TeckCominco Response

- *There were two references to the use of air curtains.*
  - a) *The use was proposed in relation to shaped linear charges. After receiving further information from contractors proposing to do the work, the proposal to use shaped linear charges has been deleted and consequently the use of bubble curtains are not required for this purpose.*
  - b) *The tables and discussions of blasting provided in Appendix H of the Westmar dock decommissioning report also made reference to the use of bubble curtains for blasting in near proximity to the dock face under the heading 'Blast Design' and in the attached calculation tables.*

This would be required if blasting were to be done within 1 metre of the dock face (see calculations in Table 1 of Appendix H) or if blasting were to be conducted at a time when pelagic eggs were present. TeckCominco will not blast within one metre of the dock face, and the timing of blasting as discussed above will be done when no pelagic eggs are present. The use of a bubble curtain will not be required.

As a minimum the proponent needs to complete the application forms (Appendices IV and V) provided in the DFO Explosives Guidelines, Canadian Technical Report of Fisheries and Aquatic Sciences 2107.

TeckCominco Response

- *The use of application forms in Appendices IV and V in the DFO Explosive Guidelines were not used for the following reasons:*
  - a) *Appendix IV is an 'Application Form for Authorization to Destroy Fish By Means Other Than Fishing'.*
    - *The work methods proposed to conduct the work have been developed (and deficiencies are being addressed based on submissions from DFO and others) to protect the marine environment during the work process. These include protocols for the removal of glycol from freeze pipes, sediment control measures, monitoring of the work processes, timing of the work and developing blast designs consistent with DFO guidelines.*
    - *A contractor with extensive blasting experience in and around aquatic environments was engaged to develop the designs proposed (Pacific Blasting and Demolition Ltd. in Vancouver, BC). They were contracted to ensure that the blasting designs are protective of the aquatic environment by complying with DFO guidelines with respect to controlling the maximum induced pressures in the aquatic environment and other parameters.*
  - b) *Appendix V is an 'Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat'.*
    - *The proponent's plan to decommission the dock and shoreline has the specific objectives of restoring a more natural shoreline, providing a more stable shoreline in the long term and creating additional aquatic habitat. The intent of the proponent is to enhance the aquatic habitat of the site and not to harmfully alter it. DFO in this submission agrees that the proponent's proposal is the preferred approach subject to providing more detailed information.*
    - *The application form selected for the submission ('Application for Authorization for Works or Undertakings Affecting Fish Habitat') was originally based on a request from DFO after reviewing the scope of the project as presented in the Closure Plan.*

In summary, TeckCominco does not believe that above Appendices IV and V forms are appropriate and applicable for the decommissioning of the dock facility at the Polaris Mine.