Indian and Northern Affairs Canada
www.inac.gc.ca

Affaires indiennes et du Nord Canada
www.ainc.gc.ca

Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Your file - Votre référence
NWB1NAN0208
Our file - Notre référence

October 31, 2003

Dionne Filiatrault
Senior Technical Advisor
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0E 1J0

Via facsimile

Re: Underground Mine Solid Waste Disposal Plan

On behalf of Indian and Northern Affairs Canada (INAC), I am pleased to be able to provide comment on the Nanisivik Mine Solid Waste Disposal Plan ("the Plan"), submitted to the Nunavut Water Board (NWB) by CanZinco Ltd., on August 1, 2003.

The Plan was submitted in concordance with water license NWB1NAN0208. Following a review of the submitted documents, we are pleased to have the opportunity to offer the following comments and recommendations, categorized by the section of report to which they most directly apply. Please also find included the comments provided on the Plan by Brent Murphy, EBA Engineering Consultants Ltd.

Section 2: Risk assessment

With respect to the Plan and the risk assessment model provided in Section 2, INAC submits the following recommendations:

- That those materials posing the greatest risk to human and ecosystem health be placed in the deepest and/or most inaccessible portions of the underground mine such to limit the potential of a current or future exposure pathway.
- That plans be provided for the sealing of access routes to the mine, clearly identifying how the migration of contaminants in any phase is precluded.
- That a long-term monitoring program be developed to ensure that no migration of contaminants from the underground disposal site occurs.

Section 5: Documentation

The documentation template provided by the proponent incorporates only part of the information required. It is recommended that the waste documentation template be amended to include the following information:

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- Waste disposal schedule identifying the time line and method for the placement of each type of waste material underground.
- Engineering maps to illustrate the locations and placement of all materials to be deposited as wastes.
- Documentation to identify the individual(s) responsible for the cleaning and final authorization for placement of decontaminated materials (i.e. decommissioned vehicles).

The documentation utilized and generated during the waste placement process should be sufficiently specific to establish compliance both during and following the waste disposal process.

Section 6: Disposal Plans

Several areas of concern were identified in this section:

- Following the decommissioning and removal of the tank farm, INAC strongly recommends that an assessment of ground water contamination in the active layer below, and adjacent to, the tank farm be conducted. If groundwater contamination is detected, it is requested that the following information be established:
  - The severity and extent of the current contamination.
  - The predicted future rate and direction of contaminant mobility.
  - A subsequent plan to address the contamination mitigation and remediation.

- The disposal plan for mobile equipment identifies a great deal of equipment to be disposed of underground. It is recommended that the permanent abandonment of functional vehicles and equipment be considered only as the final disposal option for these materials. As a principle of both minimizing the amount of waste material remaining at the mine site, and promoting resource re-use, it is preferred, wherever possible, that functioning equipment be salvaged for re-use.

- In all of the waste volume summary tables, no estimates have been provided for the volumes of metal or hydrocarbon contaminated soil in need of removal and subsequent underground disposal. With respect to contaminated soils, it is recommended that:
  - Reasonable estimates of contaminated soil volumes be established. While it is recognized that further site assessment may be required to determine precise volumes, the creation of volume estimates would help in the developing a space allocation and preparation plan for the deposit of these materials underground.
  - Once reasonable estimates of contaminated soil volumes are established, further details describing the selected specific disposal site characteristics and preparatory modifications (as required) be

submitted for approval.

- Ground recontouring is a necessary procedure at the reclaimed surface sites. As no source of fill is identified for recontouring, clarification with regard to contouring is requested, including:
    - An enhanced description of recountouring procedures, including identifying if additional fill is to be brought on site or if recontouring activity will occur exclusively with material currently on site.
    - The source of fill.
    - Documentation or an otherwise reasonable issuance of assurance that the material being used for fill, or otherwise exposed as a result of reclamation activity, is not a source of potential ARD generation.

- The concrete foundations for several buildings have been identified to remain intact and covered with shale as the reclamation process. INAC disagrees with this reclamation strategy and instead recommends that:
    - All concrete foundations are to be taken up and deposited in underground waste storage.
    - Soils underneath and surrounding the concrete foundations be tested for metal, hydrocarbon, and process chemical contamination. Any contaminated soils be removed and disposed of, and the site reclaimed accordingly.

If it is, however, determined that the concrete foundations are to remain in place, it is recommended that:

- Samples of the concrete foundations be tested for contaminants.
- Core samples of the soils below and surrounding the concrete foundations be tested for contamination.
- Engineering schematics indicating that the concrete and surrounding soils will be incorporated into the permafrost be provided.
- Evidence be provided that there will be no water flow to, or away from, the concrete foundations or surrounding soils.

Section 7: Placement Methods

It is requested that the placement methods, allowing 20-45% underground void space, be confirmed by an approved engineer to pose no threat of future subsidence. It is further recommended that this information be incorporated into a comprehensive assessment of long-term mine stability.

Section 8: Available storage space

It is unclear, given the excess of underground storage area identified in Section 8, why

open pits and surface areas have been identified as disposal locations for solid waste. It is recommended that all waste be deposited into the underground storage locations, and that a separate plan be submitted addressing the reclamation of the open pits. This should include, but is not necessarily exclusive to:

- Reclamation activity, including recontouring, prevention of erosion and pooling of water, and long-term stability preservation and monitoring
- Potential for ARD generation within the pits, mitigative measures, if required, and details of long-term water quality monitoring programs
- Full accounting of water flow into and out of open pit/reclaimed pit areas.

If specific conditions exist precluding the use of the underground area for waste material storage, it is requested that these circumstances be explicitly identified. Subsequent to this identification, engineering schematics should be submitted detailing the use of the open pit area(s) as solid waste disposal facilities.

Additionally, if the existing landfill is to be utilized for the placement of materials related to mine decommissioning and reclamation, it is recommended that the landfill plan be resubmitted to reflect the anticipated type and quantity of material planning to be placed in it. This should include the same degree of schedule, location, and documentation planning required of the underground storage facility.

While the Plan does represent and important progression toward the final abandonment and reclamation of the Nanisivik Mine site, INAC is unable to provide a full endorsement of the Plan in its current state and awaits the remaining information required for full assessment and endorsement.

Please do not hesitate to contact me if there are any further questions or concerns.

Best regards,

Stephanie Hawkins

Qikiqtani Regional Coordinator, Water Resources
INAC - Nunavut Regional Office
P.O. Box 100, Iqaluit, NU, X0A 0H0
(867) 975-4555
fax: (867) 975-4276
hawkinss@inac-ainc.gc.ca

cc: Susan Hardy, Government of Nunavut

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

October 30, 2003

EBA File: 1740015-006

INAC-Nunavut Regional Office
P.O. Box 2200
Iqaluit, Nunavut
X0A 0H0

Attention: Ms. Stephanie Hawkins
Qikiqtani Regional Coordinator
Water Resources

Dear Ms. Hawkins:

Re: Review of the Underground Mine Solid Waste Disposal Plan, Nanisivik Mine, Nunavut, Water License NWB1NAN0208

Further to your email notification of Friday, October 24, 2003, requesting a review of the above document, the following letter presents our review comments. The review was completed by Mr. Brent Murphy, P.Geol., Project Director for the NWT and Nunavut in consultation with Mr. Don Hayley, P.Eng., Senior Principal Engineer of EBA Engineering Consultants Ltd., and was completed over a three day period between October 28th to 30th, 2003.

The submission of the Underground Waste Disposal Plan addresses Item G16 of the Nanisivik Mine Water Licence, and will form an integral component of the overall Final Abandonment and Restoration Plan for the Nanisivik Mine which is anticipated to be submitted to the Nunavut Water Board by December 15, 2003.

The minimum content and technical considerations of an Underground Solid Waste Disposal Plan were identified in an EBA Letter dated July 30, 2002, submitted to Indian and Northern Affairs Canada, which summarized the Nunavut Water Board hearing held in Arctic Bay in July 2002. The minimum technical content of the plan included the following considerations;

- A simple classification system for waste designated for underground disposal based on type and future risk;
- Criteria for segregation of materials according to the classification system adopted;
- Allocation of available space, based on the premise that those materials that pose the greatest risk will be stored in the deepest portions of the workings:
- Placement methods and schedule for the various material types;
- Maps and sections that show typical or critical components of the disposal areas both before and after filling;

P.O. Box 2244, #201, 4916 - 49 Street, Yellowknife, Northwest Territories X1A 2P7
Tel: (867) 920-2287 - Fax: (867) 873-3324 Email: yellowknife@eba.ca - Web Site: www.eba.ca

- An evaluation of those locations that pose the greatest risk of long-term instability. Identification of monitoring where it may be required; and,
- An outline of the documentation that will confirm compliance with the disposal plan and the deliverables that will be on file following closure.

The Waste Disposal plan which was submitted addresses many of the previous listed technical considerations and is considered an adequate plan to initiate the planning and segregation of waste, however detail is lacking in the following areas and additional elaboration is requested:

- Placement methods and schedule for the various material types;
- An evaluation of those locations that pose the greatest risk of long-term instability. Identification of monitoring where it may be required should also be provided. It is understood that the mine has previously submitted documentation to address the issue of long-term stability of the mine workings. However this correspondence should be referenced in the Underground Waste Disposal Plan for information purposes;
- An outline of the documentation that will confirm compliance with the disposal plan and the deliverables that will be on file following closure: and,
- Identification of underground disposal areas for the various waste components. Underground disposal areas have been identified, but the waste components to be placed in each area have not been identified (i.e. where will hydrocarbon impacted soil be placed)

We also note that the issues raised with the filling and capping of open pits and the associated long term stability of pits as outlined in the EBA document " Review of the Nanisivik Abandonment and Restoration Plan, June 2002" were not addressed in this waste disposal plan. The following questions were identified with the use of the pits as disposal sites:

- What are the stability conditions of the pit walls?; and,
- Has wall stability been evaluated?

Any evaluations should address both the failure in rock and the overlying fill material.

Additionally, there were no details provided as to how the waste rock and cover will be placed in those pits utilized as disposal sites. Again the following questions should be addressed:

- What is the design of the waste rock and cover in the pit?;
- Are there drainage courses or seeps into the pit?;
- Will there be erosion of the cover soils?; and,
- Will a mapping and sampling program and a QA/QC program during reclamation be completed to ensure that any potentially acid generating pit walls are not left exposed?

As not all of the open pits are designated as potential waste disposal sites, it is therefore anticipated that if these issues are not addressed in the Underground Solid Waste Disposal Plan, such issues will be discussed in detail in the "Final Abandonment and Restoration Plan" scheduled for submission to the regulatory agencies in mid-December 2003.

The following general comments are also offered for your review and consideration:

- Can it be assumed that all vehicles earmarked for disposal underground are considered beyond salvage and have no appreciative value?;
- Areas containing hydrocarbons impacts are slated for soil excavation and the area excavated is to be re-contoured. If areas are excavated, will these areas be backfilled to pre-existing surface grade after removal of all hydrocarbon impacted soil, and if so, where will the fill material be extracted from?;
- It is noted that the existing plan identified that all existing building slabs will be left in place and buried with fill material as a closure approach. The following questions and issues are highlighted with this proposed approach:
    - The proponent has not identified specific contaminant levels that will remain in place under the slabs after abandonment. Charterization of these potential contaminant levels currently existing under the building slabs should occur. For example it is anticipated that high metal levels will occur in the soil under the slab for the concentrate shed and it can be anticipated that similar conditions will occur under the slab of the industrial complex, including the presence of chemicals and hydrocarbons. What are the levels of contaminants at each location?;
    - There has been no demonstration that the use of one to two metres of fill material over the concrete slabs will be sufficient to allow the permafrost to aggrade naturally and effectively render any potential contaminants inert. Technical data should be provided to demonstrate this process will be an effective mitigation measure;
- Volumes of hydrocarbon impacted soil remain to be identified, as noted in the document. These volumes must be identified as soon as possible so that planning measures can be finalized ;
- Proposed remedial measures for the site Tank Farm did not include remedial measures to address potential groundwater contaminant levels present in the active layer. Have such measures been considered? And if so what are they?
- It is noted that a significant volume of debris material will be diverted to the existing landfill. It is anticipated that the final closure plan for the landfill, scheduled for submission at the end of November 2003, will account for and address these volumes of waste material scheduled for diversion to the landfill;
- The proponent has identified an excess volume of underground storage space. On this basis, is it reasonable and/or feasible for the proponent to continue to plan on using some of the existing open pits as solid waste disposal sites? Or should the proponent plan on utilizing all existing underground storage space prior to the potential use of any open pit for disposal purposes. This proposed approach would

reduce the number of potential solid waste disposal sites across the site and would concentrate all waste underground in the former mine working, effectively in one location.

We trust that the above information meets with your requirements. Please contact our office should there be questions regarding this review.

Yours truly,
EBA Engineering Consultants Ltd.,

R. Brent Murphy, M.Sc., P.Geol.
Project Director, NWT/Nunavut

RBM/...

c.c. Mr. Bernie MacIsaac
Government of Nunavut