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

Your file - Votre référence
NWB1NAN9702
Our file - Notre référence

August 19, 2002

Phyllis Beaulieu
Acting Licensing Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0E 1J0

Sent by email to:
rbecker@polarnet.ca

Nanisivik Mine Water Licence Renewal

Please find attached the Department of Indian Affairs and Northern Development (DIAND)'s submission for the second round of comments with respect to the Nanisivik Mine water licence renewal.

This submission is our response to the Licensee's submission to the Nunavut Water Board (NWB) dated August 13, 2002 and deals with the information and comments provided in that letter. It also repeats issues that were not addressed in the Licensee's letter which INAC believe are significant enough to be worth repeating. Except for the changes noted in this submission, all of our recommendation from previous submissions still remain.

DIAND would also like to mention that we will be submitting a second document pertaining to the results of a meeting between Brodie Consulting (retained by DIAND), EBA (jointly retained by DIAND and the Government of Nunavut), Gartner Lee and BGC Engineering (both retained by CanZinco) that will take place on August 20, 2002. The purpose of this meeting is to further discuss technical issues with the Licensee's Abandonment and Restoration Plan.

If you have any concerns or questions, please feel free to contact me.

Sincerely,

Original Signed By: Michael Roy

Michael Roy
Qikiqtani Regional Coordinator, Water Resources
DIAND - Nunavut Regional Office
P.O. Box 2200, Iqaluit, NU, X0A 0H0
(867) 975-4555
fax: (867) 975-4560
roymjp@inac.gc.ca

Canada

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

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Nanisivik Mine Water Licence Renewal

As per the covering letter, the following represents the comments and concerns that the Department of Indian Affairs and Northern Development (DIAND) has on the Licensee's submission to the Nunavut Water Board (NWB) dated August 13, 2002. The submission was reviewed by DIAND, along with our consultants, EBA Engineering Consultants Ltd. (EBA) and Brodie Consulting Ltd. (Brodie).

1. Underground Storage Capacity

Our concerns with underground storage do not relate to the volume of space available underground per se, but more to the accessibility of that volume. Although accessibility includes actual entrances and passageways to reach any given storage space, it is not limited to this definition. Accessibility also includes the actual ability to place the debris or equipment in that storage space. If an underground chamber has a ceiling that's 50 feet high, although this does represent a large volume, it does not necessarily mean that the entire 50 feet of height is accessible. Will there be means for the trucks to get on top of the piles of debris to add more, or will they instead have to expand laterally, leaving an empty volume above the debris?

To alleviate our concerns, DIAND would like the Licensee to provide plans and sections of each area which is proposed to be filled, along with a description of the proposed filling method.

Related to underground storage, DIAND has yet to see any proposed waste classification or segregation system. There is mention in the Licensee's letter of the development of a plan for the disposal of equipment underground, but nothing relating to demolition or other debris or wastes. Likewise, the Licensee has yet to address the question of long term stability of the openings after pillar removal as raised by EBA in their letter on the public hearing dated July 30, 2002.

Canada

2. Acid Rock Drainage and Metal Leaching

Discussions of the assessment of the "extensive testing" aside, DIAND does agree with the Licensee in its statement that the worse areas of potential acid rock drainage (ARD), notably the waste rock stockpiles, open pits and West Twin Disposal Area, should be reclaimed in accordance with an approved reclamation plan so that ARD is not an issue in the future. However, it is the lesser known areas of potential ARD, such as sections of the roads, that currently concern us. These areas should, we hope, be identified in the Phase II ESA that is currently underway.

Related to ARD is metal leaching. The Nanisivik Mine area has a high ratio of carbonates which can potentially serve to neutralize the acidity created by ARD, depending on the specific kinetic properties of a given location. However, although the acidity of ARD may be neutralized in these locations of net neutralizing potential, the metals released during the ARD process - most notably zinc in the case of Nanisivik - do not necessarily precipitate in near-neutral conditions. DIAND would like to point out that the Licensee makes no mention of the potential of metal leaching or the assessment thereof in their recent submissions.

DIAND recommends that tests be done with respect to kinetic properties and metal release rates for several rocks types beyond only the waste rocks and tailings.

3. Tailings

The main purpose of the cover over the tailings is to keep all of the tailings frozen within a permafrost condition. According to the *Test Cell Evaluation - Nanisivik Mine - CanZinco Ltd.,* dated April 2001, Test Cell 1, which consisted of shale with an armoring layer of sand and gravel such as planned for the tailings cover, exhibited a maximum thawing of approximately 1.3 metres in 2000 (Frost Gauge #4, Table 2). Assuming an additional thickness of 0.25 metres to provide for global warming, this would indicate a minimum thickness of 1.55 metres. This thickness does not include any leeway for unusually warm years. Even the executive summary of the Licensee's report suggests a cover of 1 to 1.5 metres with an additional 0.3-metres armored cap, therefore a total cover of 1.3 to 1.8 metres.

However, the tailing cover is only part of the solution. The Licensee has yet to demonstrate whether or not the tailings below the surface are completely frozen, or whether there is an unfrozen talik present. Should significant unfrozen portions remain below the cover, the heaving from ice lense formation could result in the disruption of the surface cover, regardless of the thickness. It can also result in the expulsion of metal-rich unfrozen pore water which would ultimately end up in the reservoir.

Regarding the reservoir, the Licensee has not made any mention in their recent submission as to the ability to maintain a 1-metre water cover in the reservoir portion of the West Twin Disposal Area. Another issue raised by EBA but not addressed in the Licensee's

submission was the effects of the thickness of ice on lakes in the region and the possible entrainment of tailings from reservoir. Combined with the possible addition of metal-rich pore waters from the surface tailings, this leads to an uncertain chemical stability of the reservoir. DIAND therefore believes that the Licensee may have to reevaluated the long-term risks associated with an uncontrolled discharge from potentially contaminated water.

4. Landfill

With respect to the 2000 barrels of waste oil allegedly buried in the Nanisivik landfill site, this should serve as an indication that DIAND is clearly not comfortable with the current lack of knowledge as to what exactly is within the landfill. The Licensee claims that the volume of oil dumped is much less than that, but cannot provide any specific quantities either. DIAND therefore believes that an assessment of the landfill is still a necessity. The results that will be obtained from the Phase II ESA may provide sufficient information to determine an acceptable method of reclamation for the landfill. However, the requirement of additional assessment work on the landfill should the Phase II ESA information be deemed insufficient should remain as a possibility.

The presence of hydrocarbons aside, the Licensee has yet to provide any designs relating to the long-term leachate control at the landfill. There was mention of the use of a 1.25-metres cover in the *Closure and Reclamation Plan*, but no explanation as to how the required thickness of this cover was determined. DIAND presumes this value was determined from the calculated cover for the tailings, but the geochemistry within a landfill is by no means the same as the geochemistry of the tailings. The Licensee should therefore provide the appropriate studies and designs for the reclamation of the landfill.

5. Post-Closure Monitoring

DIAND agrees with the Licensee that the post-closure monitoring should be dynamic to reflect the changes in the system that will occur over time. This will allow for increased monitoring of any potential problems that are discovered, and allow for a reduction in monitoring for areas that are deemed to have reached "environmental stability."

The current *Closure and Reclamation Plan* post-closure monitoring section generally suggests a certain frequency of monitoring during the first three years after closure, then a lesser frequency during the fourth and fifth years after closure. Instead, DIAND recommends that only the most frequent sampling be approved for the entire post-closure monitoring period. Throughout the monitoring period, the Licensee should then have the ability to request a reduction in sampling frequency at any given location to the NWB (and other regulators) upon providing evidence that "environmental stability" has been reached in that location.

However, DIAND's main concerns is the rate at which a potential problem might be noticed. Since chemical reaction rates are proportional to the temperature, in an arctic

environment everything takes place at a very slow pace. This may create a significant lag time before problems such as acid rock drainage or metal leaching become noticeable. The year 2009 is likely too soon to notice any such effects, and thus monitoring is very likely required beyond 2009.

6. Security

DIAND would like to start by once more identifying one of the main purposes of security. Security is posted so that government (that is, the taxpayer) will not end up paying for any reclamation of an abandoned site's water-related elements. Therefore, the amount of security should generally equal the amount that government would have to pay to reclaim a given site's water related-elements.

Since government would be required to bring in its own contractors and equipment to Nanisivik, the cost estimate will no doubt be greater than for the Licensee to reclaim the site with its own equipment and personnel already on site. This is why the costs estimates are made on a third-party perspective, and not according to the costs for the Licensee to do the work.

With respect to the costs estimate, Brodie has revised his estimate according to the information and reasonable suggestions provided by the Licensee, such as the suggestion to import lime by sea lift. The revised cost estimate is just under $21.9 million. Brodie's comments and calculations can be found in the attached letter from Brodie, dated August 16, 2002.

DIAND would like to emphasize Brodie's statement that there are many uncertainties remaining with the reclamation of Nanisivik Mine, and that the costs incurred by the government could easily be greater that the total given above. As an example, Brodie pointed out that the costs being incurred at Giant Mine, Colomac Mine, Mt. Nansen Mine and Faro Mine are much higher than anticipated by most parties.

According to Brodie's calculations, $2.34 million are related to "buildings and equipment." DIAND considers this amount to be land-related, and thus it should not be included in the security for water-related issues. Subtracting $3 million (which is $2.34 million plus the contingencies) from the total leaves $18.9 million. DIAND therefore suggests that the NWB set security at no less than $18.9 million.

Although the Waters Regulations and DIAND's Mine Site Reclamation Policy do allow for the possibility of making adjustments regarding security in the case of an established mine, in this instance DIAND recommends that there be no reduction in the total amount of security to be posted by the Licensee (i.e. no reduction from the total cost of water-related reclamation, as calculated by Brodie). The Licensee has shown a record of lack of maintenance and upkeep which have or could potentially have resulted in environmental problems. DIAND would like to point out a few examples taken from various inspection

reports:

- Carpentry Shop Oil Spill (Spill #00-099): Although the spill was noted and concerns raised by both Environment Canada and DIAND in June 2000, during the inspection on July 26, 2000, (report dated 2000-08-03) which was one month after the spill, no noticeable work had been undertaken. This resulted in hydrocarbons reaching a nearby creek.

- Fuel Storage Area: On the June 27, 2000 inspection (report dated 2000-07-21), the inspector noted that the berm liner needed to be patched. Over a year later, on the July 25, 2001 inspection (report dated 2001-11-16), the Inspector notes that work had still not been done on the liner.

- Tailings Line: The Inspector noted a lack of upkeep with the tailing lines and tailings line dump ponds on the September 20, 2000 inspection (report dated 2001-01-25). On the July 25, 2001 inspection (report dated 2001-11-16), the Inspector notes that only then does the Licensee begin planning on replacing all the flanges of the tailings line after a recent flange failure caused the third tailing line spill during the year. The Inspector reminds the Licensee of the importance of satisfactory upkeep.

- In the June 29, 2001 inspection (report dated 2001-08-17), the Inspector notes that the replacement stop log for the tailings pond which was slated to be replaced the previous year had not yet been replaced.

As such, there is a consistent record indicating that the Licensee has not taken preemptive measures to deal with potential environmental problems. Because of this, DIAND does not believe that the Licensee qualifies for a reduction in the required amount of security for good environmental practices.

If you have any questions or concerns, please feel free to contact me.

Sincerely,

Original Signed By: Michael Roy

Michael Roy
Qikiqtani Regional Coordinator, Water Resources
DIAND - Nunavut Regional Office
P.O. Box 2200, Iqaluit, NU, X0A 0H0
(867) 975-4555
fax: (867) 975-4560
roymjp@inac.gc.ca

APPENDIX A

Letter from Brodie Consulting

August 16, 2002

Department of Indian Affairs and Northern Development

Government of Canada Building 969

P.O. Box 2200

Iqaluit, NU, X0A 0H0

Attention: Mr. Michael Roy

Water Resources Division

RE: NANISIVIK MINE

Dear Michael,

The following comments are presented for your consideration regarding the letter of August 13, 2002 of Nanisivik Mine to the Water Board.

Page 2, Major Issues A

The company has suggested that there is sufficient storage space in the mine for demolition and other wastes. The presentation of a single plan view drawing, not on a scale appropriate for engineering evaluation, does not constitute ample demonstration of the storage potential. In order to substantiate their claim, the company must present plans and sections of each area which is proposed to be filled, a description of the proposed filling method and an estimate of the "fillable" space in each void area. To date this has not been done. Until such time as sufficient detail is presented this issue remains as an uncertainty and is treated accordingly in DIAND's estimate for reclamation security.

Page 3, Major Issue B

The assessment of ARD and metal leaching from the sources at the site is inadequate. The level of effort to date would be barely sufficient to allow permitting for advanced exploration. The company's assertion that "extensive testing has been carried out" is incorrect. Critical rock types have not been tested for kinetic properties. No data on rates of metal release has been presented.

Page 3, Major Issue C

Information presented in the Test Cell Evaluation report, dated April 2001 clearly points to the proposed cover being non-conservative. Table 2 of that report shows thawing to depths of 111 to 155 cm in some years, depending upon the soil cover type. The company has proposed a cover consisting of shale with an armoring layer of sand and

Brodie Consulting Ltd.
572 St. Andrews Place, West Vancouver, B.C., V7S 1V8
604-922-2034 fax 604-922-9520 Email: mjohnbrodie@shaw.ca

gravel. This is represented by test cells 1 and 2. Test cell 1 has exhibited maximum thawing to 130 cm and Test Cell 2 has exhibited maximum thawing to 111 cm. Assuming an additional thickness of 25 cm to provide for global warming (and for now ignoring the potential effects of a warm year) the minimum arguable thickness would be 146 cm. The company's current approach is not conservative.

Even the executive summary of their report suggests that the cover be 1.3 to 1.8 m thick.

Page 6, Major Issue G
I have considered the company's arguments regarding the cost of lime delivery since the time of the Water Board hearing. I agree with the company that I have been too conservative in this regard. I believe that although it could still be necessary to ship some lime by air, the majority of it could be shipped by sea lift. It seems reasonable to adjust downwards my estimate of reclamation liability. Assuming that lime was shipped by sea lift and the incremental cost of air shipment, if required, was covered by the contingency, the post closure cost could be reduced to $308,000 per year. This adjustment is reflected in the following table.

The company has also raised objections about the cost of transporting personnel to the site. The nature of reclamation activities is that work is not conducted on a routine basis but rather on a constantly changing basis as areas get closed out and the focus changes. Therefore it is not appropriate to assume that transport on commercial flights will be a practical option in many cases. It would not be conservative to assume the least costly transportation alternative for personnel movement.

On page 7, paragraph 4, the company has suggested that the government would not be cost effective in it's approach to reclamation of the Nanisivik Mine, should that be necessary. The Board needs to consider that the costs being incurred at Giant Mine, Colomac Mine, Mt. Nansen Mine, and Faro Mine (subsidy to the Receiver) are much higher than anticipated by most parties. Even the least costly of these, Mt. Nansen mine which only processed 250,000 tonnes (compared to about 15 million tonnes at Nanisivik) currently costs about $1 million per year to maintain. One could easily challenge my revised annual cost of $308,000 per year as being very optimistic.

Nanisivik Mine – Revised Estimate

SUMMARY OF COSTS

Capital Costs

COMPONENT TYPE	COMPONENT NAME			TOTAL COST
OPEN PIT	0			$303,656
UNDERGROUND MINE	0			$25,000
TAILINGS	0			$5,742,848
ROCK PILE	0			$675,527
BUILDINGS AND EQUIPMENT	0			$2,342,727
CHEMICALS AND SOIL MANAGEMENT	0			$455,900
INTERIM CARE & MAINTENANCE	0			$3,183,280
MOBILIZATION/DEMOBILIZATION	0			$1,055,240
MONITORING AND MAINTENANCE	0			$290,400
POST-CLOSURE SITE MAINTENANCE				$2,627,644
	Ongoing Water Treatment Costs		$308,040	
	Discount %	#Years		
	0.03	10		
SUBTOTAL				**$16,702,221**
PROJECT MANAGEMENT	3	% of subtotal		$501,067
ENGINEERING	3	% of subtotal		$501,067
CONTINGENCY	25	% of subtotal		$4,175,555
GRAND TOTAL - CAPITAL COSTS				**$21,879,910**

According to the information presented in 2001 Annual Report of Breakwater Resources Ltd., the parent company of Nanisivik Mine CanZinco, Ltd. there is an accrual of $11,405,000 for reclamation plus $2,400,000 which it intends to spend in 2002. Therefore, by the admission of the parent company, the reclamation liability at Nanisivik Mine is at least $13.8 million. This amount is 50% greater than the amount presented at the Water Board hearing. The company has not presented any rationale for this discrepancy.

Finally, on the general issue of provision for reclamation security, there are several aspects of the mine development (waste disposal, ARD, and the critical issue of permafrost development in the talik area of the tailings) where uncertainty remains. Without further assessment by the company to present demonstrable solutions, there is risk to the Crown.

Whereas I have considered the company's argument and adjusted my calculation above, at this stage we are making detailed adjustments to a calculation and ignoring the issue of significant uncertainty in the viability of the reclamation plan. In light of this uncertainty, I believe that my revised estimate of reclamation liability indicated above could easily be less than the total cost which would be incurred by the federal government should it be necessary to assume responsibility for the site.

Please call if you have any questions.

Yours truly,

M. J. Brodie, P.Eng.