Appendix C – Nanisivik Mine Accesses Closure Plan April 2002 (updated July 2004)

Nanisivik Mine Accesses Closure Plan

Technical Services
April 2002

Updated July 2004 – Guy Lauzier, ing.

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List Appendices

Certification

I, Guy Lauzier, ing. do hereby certify that

1) I was a professional engineer registered in Nunavut at the time of writing to this document and am presently registered in the Province of Québec.
2) At the time of writing of the document, I was employed as Manager of Technical Service with Breakwater Resources.
3) The only change that should be brought about in the report is located in figure 1. Based on new information, material must be pushed under the brow at least 5m. (see figure.)
4) I am not aware of any additional material fact or material change with respect to the subject matter of the technical report.
5) I hereby consent on the use of this report for submission to any Provincial or Territorial regulatory authority.

Introduction

The permanent cessation of mining activities at Nanisivik has been scheduled for the end of September 2002. After that date some underground activities in the Main Mine will continue such as waste and refuse disposal. The final closure of the openings in the Main Mine may be as late as 2004 to coincide with other reclamation activities.

This report enumerates all raises, stope openings, adits, drifts, highwalls and other openings to surface that were created by mining activities and that could create a hazard. The opening location, hazard and the method of making safe are addressed for each enumerated opening.

This report has been completed to comply with Part XVII of the Mine Health and Safety Regulations for the Cessation of Work (17.03)

Location of Openings

The location of the openings to surface, the hazards posed and remedial actions required are summarized in **Table 1**. A detailed discussion of the openings, hazards and remedial actions to be taken are presented in the section "**Detailed Description of Openings**". The map included in **Appendix I** shows the general location of each opening.

Table 1: Mining Related Openings to Surface

ID	Location	Easting	Northing	Hazard	Remedial Action
P1	Lower Adit, Access to crusher and mine, N/E of DMS	16,470E	15,811N	Open portal Fall/Entry	Backfill and contour

	plant				
P2	00 Portal, Main entrance at west end of mine	16,755E	15,591N	Open Portal Fall/Entry	Backfill and contour
P3	01 Portal, Ventilation opening west end of mine	16,825E	15,538N	Open Portal Bulkheaded Fall/Entry	Backfill and contour
P4	09 South Portal, North side of Twin Lakes Creek – east of Anfo Plant	17,367E	15,420N	Open portal (culverted) Entry	Backfill and contour
P5	17 North Portal, North end of N/S stretch of road to East Pit	17,887E	15,927N	Open portal (culverted) Entry	Backfill and contour
P6	39 Portal, East end of mine opening into East Pit	19,370E	15,788N	Open Portal Fall/Entry	Backfill and contour
P7	88 Portal, Main entrance at East end of mine	19,562E	15,774N	Open portal Fall/Entry	Backfill and contour
P8	K Baseline Portal, East side of N/S draw east of East Pit	20,431E	15580N	Ice filled portal (culverted) Fall	Backfill and contour
P9	Ocean View Portal, At end of East Pit Ocean View road	21,214E	16,223N	Ice filled Portal Fall	Backfill and contour
P10	Area 14 Portal, SE of East Pit	20,373E	14,086N	None	Backfilled and contoured
R1	Shale Hill Raise, North side of road from 17 North to East Pit	18,775E	16,200N	Ice filled Raise None at present	Remove cover, Backfill and contour
R2	Ocean View West Raise, West end of underground workings	21,090E	16,116N	Ice filled Raise None at present	Remove cover, Backfill and contour
R3	Ocean View East Raise, East end of underground workings	21,375E	16,130N	Ice filled Raise None at Present	Remove cover, Backfill and contour
R4	Area 14 Raise, North west end of	20,350E	14,318N	None	Backfilled and contoured

	underground workings				
H1	West Open Pit high wall, includes 00 and 01 portals	16,825E	15,538N	Fall	Backfill and contour
H2	East Open Pit high wall, includes 39 portal	19,358E	15,760N	Fall	Backfill and contour
H3	East Trench high wall	19,600E	15,600N	Fall	Backfill and contour
H4	Ocean View Pit high wall	21,688E	16,175N	Fall	Backfill and contour

Description Of Hazards

The various hazards have been summarized with a description in Table 2. The necessary remedial actions required to address the hazards is further defined in Table 3.

Table 2: Description of Hazards

Hazard	Description
Entry	Possible unauthorized access to underground workings
Fall	Possible Fall over unprotected openings or over existing fencing
None at present	Applies to raises that have protective covers installed, most are ice filled and would pose a possible fall/water hazard in summer if uncovered
None	Opening has already been backfilled and contoured

The solutions or remedial actions for each type of hazard are summarized in Table 3.

Table 3: Summary Description of Remedial Action Methods

Hazard	Remedial Action Method
Entry	Backfill and contour – includes the removal of any infrastructure
Fall	Backfill and contour – includes the removal of any infrastructure
None at present	Remove coverings in summer to asses status – backfill and contour if completely frozen.
None	None

Detailed Description of Openings

The descriptions below give details of the openings and the proposed remedial action to be taken in addressing any hazards.

Lower Adit

The Lower Adit is the main access into the underground crusher and fine ore bin as well as a secondary access to the Main Mine. The adit was originally cut at 3.0 x 5.5 meters and contains the feed belt from the fine ore bin to the DMS plant and Mill in a covered galley way. The collar of the adit was cemented resulting in a 5.0m by 3.0m opening with a 1.0m thick cover of cement above and 0.25m thick walls inside the solid rock and up to 0.5m thick outside the solid rock. The cement roof outside of the solid rock is supported with steel beams fixed to the walls. The area above the cement was subsequently filled with fine non-acid generating material.

The remedial measures to be taken at the Lower Adit are the removal of all the fine ore transporting infrastructure and galley way and filling the adit to 1.0m above the opening to prevent entry. Final contouring will be done with a non-acid generating cap of 1.25m.

00 Portal

The 00 Portal is the principal access at the western extremity of the mine. The portal measures 5 x 5m in cross section and currently has an automatic roll up rubber door installed for ventilation control. There is also a fenced catch berm 4m above the opening as a further safety measure.

The remedial measures to be taken at 00 Portal are backfilling to 1.0m above the opening and removal of the fencing above the portal. Final filling and contouring will be done as prescribed for the **"West Pit Highwall"** and detailed in **Figure 1.** below.

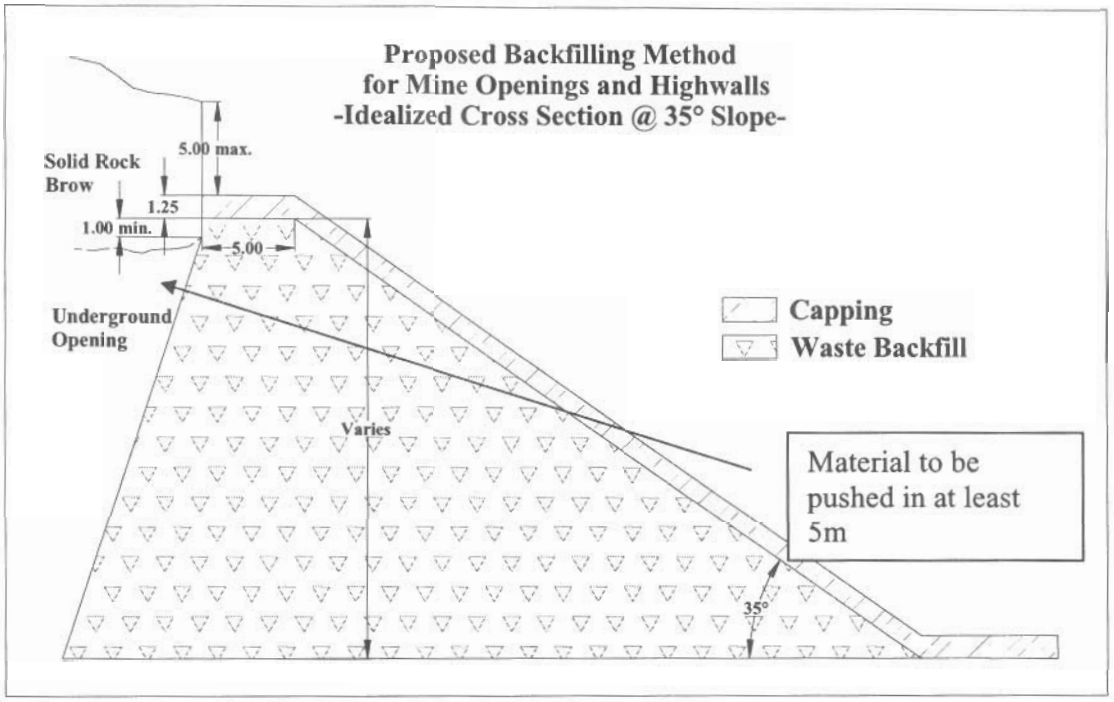

Figure 1. Proposed Backfilling Method for Mine Openings and Highwalls

01 Portal

The 01 Portal houses the main ventilation fans. The four 75hp fans are mounted in a steel bulkhead on a pad approximately 18m wide by 12m high and extending 10m into the underground side of the opening. The pad is constructed of mine waste and shale in a permanently frozen state. The size of the bulkhead is 22m by 4m and there is a fenced catch berm 4m above the opening as a further safety measure.

The remedial measures to be taken at 01 Portal include the removal of the ventilation fans and backfilling the area under the brow with waste material. The bulkhead will be left intact. Final filling and contouring as prescribed for the "**West Pit Highwall**" and detailed in **Figure 1.** will further eliminate any hazards created by this opening.

09 South Portal

The 09 South Portal is a culverted entry giving access to the Main Mine on the south side of 09 Block. The 09 south drift is 5 x 5m in cross section. The culvert is round with a diameter of 5m and a length of 28m. The bottom of the culvert is filled to provide a smooth floor. The culvert extends 13m inside the solid shale of 09 south drift, leaving 15m exposed on surface.

The remedial measures to be taken at 09 South Portal include crushing the culvert, backfilling with waste to 1m above the top of the opening and final contouring with

1.25m of non-acid generating material to prevent entry. Upon completion, all trash and unused material will have been removed.

17 North Portal

The 17 North Portal is a culverted entry giving access to the Main Mine and the former compressor room on the north side of 16 block in the Main Mine. The 17 North Decline is 5 x 5m in cross section and the culvert is half round with a diameter of 5m and a length of 28m. The culvert is supported by a 0.25m thick by 2m high retaining wall on either side and extends 5m inside the solid dolostone of the drift. This leaves 23m exposed on surface.

The remedial measures to be taken at 17 North Portal include crushing the culvert, backfilling with waste to 1m above the opening and final contouring with 1.25m of non-acid generating material. Upon completion of this work, all trash, outbuildings and scrap steel will have been removed.

39 Portal

The 39 Portal was the main access into the East end of the Main Mine for much of the mine life. However, recent mining has removed all the pillars within the extreme east end of the mine itself and the remaining material in the rib between the mine and the East Open Pit has been removed resulting in an opening of over 50m wide by 12 to 15m high. The brow above varies from 3 to 8m in height and is partially fenced. This opening is currently being backfilled with old mine waste in order to seal the opening.

The remedial measures to be taken at 39 Portal include backfilling with waste to 1.0m above the opening and removal of all trash, outbuildings, fencing and scrap steel. Final contouring as prescribed for the "**East Pit Highwall**" will further eliminate any hazards created by this opening.

88 Portal

The 88 Portal is an entrance at the east end of the lower lenses of the mine. It has a cross section of 5 x 5m and is used as the main access at that end of the mine. The 3.5m brow above is fenced for safety.

The remedial measures required at 88 Portal include backfilling with waste to 1.0m above the opening and final contouring with a 1.25m cap of non-acid generating material. Upon completion of this work, all trash, fencing and scrap steel will have been removed.

K Baseline Portal

The K Baseline portal is a culverted entry formerly used to access the K Baseline orebody. The K Baseline decline is 5 x 5m in cross section and the culvert is half round

with a diameter of 5m and a length of 28m. The culvert is supported by an retaining wall 1.0m wide by 2.4m high retaining wall on either side and extends 3m inside the solid dolostone of the drift. Of the remaining 25 meters all but approximately 5m has been covered with waste material. The portal has been inactive for a period of nearly 10 years and ice has completely filled the access to a point 20 meters inside the culvert.

The remedial measures to be taken at K Baseline Portal include crushing the portion of the culvert that is still accessible, backfilling with waste to 1.0m above the high spot in the culvert and final contouring with a 1.25m cap of non-acid generating material. Upon completion of this work all trash, fencing and scrap steel will have been removed.

Ocean View Portal

The Ocean View Portal is a bare rock entrance into the north side of the Ocean View underground workings and has a cross section of 5 x 5m. The 5m brow above is fenced for safety. The portal has been inactive for a period of over 7 years and has completely filled with ice.

The remedial measures to be taken at the Ocean View Portal include backfilling with waste to 1.0m above the opening and final contouring with a 1.25m cap of non-acid generating material. Upon completion of this work all trash, outbuildings, fencing and scrap steel will have been removed.

Area 14 Portal

The Area 14 Portal is a bare rock portal that provided access to the Area 14 underground workings. Mining ceased in this area 15 years ago and the portal was backfilled with waste then covered and contoured with shale in 1987 and 88.

No further remedial measures are required at Area 14.

Shale Hill Raise

This raise to surface from the underground workings of the Shale Hill zone provided ventilation for the area. The top of the 3m diameter by 47m raise is sealed with an old 3m diameter steel tank with the bottom cut out and with two adaptors in the top for 36 inch ventilation fans. The tank was fixed to a cemented collar at the top of the raise. The steel tank is still in place, but the fans have been removed. Due to the height of this raise and the existence of further openings below it has not filled it.

The remedial action required here includes removal of the steel tank and backfilling the opening with dolomite and/or shale to the original surface elevation. This work will be done during the summer months to ensure that the raise is open and not plugged with ice which could impede proper filling. In order to ensure that the collar remains completely within the zone of permafrost a further 3m of non-acid generating waste will be put over the raise. **Figure 2**. illustrates the proposed capping cover.

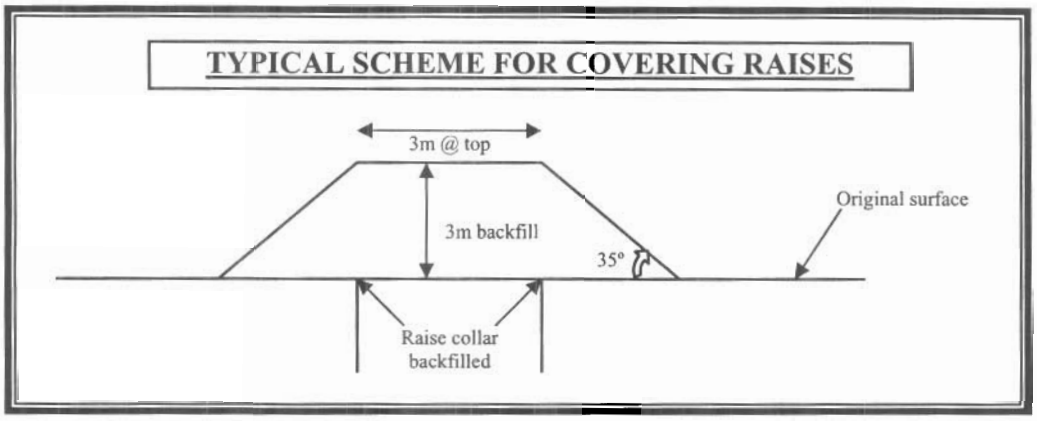

Figure 2. Typical Scheme for Covering Raises

Ocean View East Raise

The Ocean View East raise is situated at the extreme east end of the Ocean View underground workings. The 4m by 4m raise is 10m deep and provided ventilation for the workings. The raise is currently covered with a wooden wind deflector with a locked door. Access was blocked by snow at the time of writing of this report but it is expected that due to the length of inactivity, this raise will be filled with ice.

Remedial action required here includes removal of the wooden wind deflector and backfilling the remaining opening with dolomite and/or shale to the original surface elevation. This work will be done during the summer months to ensure that the filling of ice is solid and to allow a deeper area to fill (due to surface thaw). In order to ensure that the collar remains completely within the zone of permafrost a further 3m of non-acid generating waste will be put over the raise. **Figure 2.** illustrates the capping procedure to be used.

Ocean View West Raise

The Ocean View West raise is located near the west end of the Ocean View underground workings. The 3m diameter raise is 26m deep and provided ventilation for the workings. The raise is covered by a steel enclosure with a locked wooden cover. Due to the long period of inactivity, ice has filled the raise to just below the surface level.

The remedial action required includes removal of the steel enclosure and backfilling the remaining opening with waste rock to the original surface elevation. This work will be done during the summer months to ensure that the filling of ice is solid and to allow a deeper area to fill (due to surface thaw). In order to ensure that the collar remains completely within the zone of permafrost a further 3m of non-acid generating waste will be put over the raise. **Figure 2.** illustrates the capping procedure to be used.

Area 14 Raise

The Area 14 raise has a cross section of 5m by 5m and a depth of 8m. Mining ceased in this area 15 years ago and the raise was completely backfilled to the floor of the underground workings with waste then covered and contoured with shale in the summer of 1987 and 88.

No further remedial measures are required at Area 14.

West Pit Highwall

The West Pit highwall is the surface expression of the limits of open pit mining carried out over the years. It has a total lateral extent of 188m and varies in height depending on location. The area between both 00 and 01 portals has been backfilled to within 2 to 4m of the brow above. A safety berm of average width of 3m also exists on the longer uphill side of the high wall.

Filling along the highwall is in progress. The remaining backfilling will be done with waste, approved solid refuse and reject material from the DMS plant. Contouring will be done with a 1.25m cap of non-acid generating material. The final filling and contouring against the highwall and the mine openings will be done so as to limit any vertical face to a maximum of 5m. **Figure 2.** shows the proposed method of filling and capping. Upon completion of this work all trash and scrap steel will have been removed.

East Pit Highwall

The East Pit highwall is the surface expression of the limits of open pit mining carried out over the years. It has a total lateral extent of 163m and varies in height depending on location. The top of the highwall is fenced. The bottom of the pit has also been silled out to the East Lower Lens underground workings.

Backfilling of the East Pit highwall is currently in progress. The East Lower Lens sill area in the center of the pit will be filled with waste material to the ultimate pit elevation. Filling and final contouring against the highwall and the mine openings will be done at the natural angle of repose of 35° and to a height that will limit any vertical face to a minimum of 5m. **Figure 2.** shows the proposed method of filling and capping. Upon completion of this work all trash and scrap steel will have been removed.

East Trench Highwall

The East Trench highwall is 24m wide by 75m long and 20m deep at the west end.

The backfilling of the opening will be done with reclaimed waste rock from around the pit. Final contouring will be done with a 1.25m cap of non-acid generating material. The backfilling and final contouring will be done so as to limit any vertical face to a

maximum 5m height. Upon completion of this work all trash and scrap steel will have been removed.

Ocean View Pit Highwall

The Ocean View Pit highwall is the surface expression of the limits of open pit mining carried out recently to the east of the Ocean View underground workings. The highwall has a total lateral extent of 300m and averages 4m in height. There is an additional 4m deep by 5m wide cut completely within the limits of the overall pit.

The ultimate pit wall has a maximum height of 5m at the south wall. The area will be backfilled with mine waste and final contouring will be done with the overburden material removed from the pit. Given the gentle slope of the local topography and the shallow nature of the pit, no vertical drops from the highwall will be left.

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