

APPENDIX III.5

QUARRY MANAGEMENT PLAN

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
Table of Contents.....	III.5-i
1.0 INTRODUCTION.....	III.5-1
2.0 USE OF QUARRY MATERIALS.....	III.5-2
3.0 GRANITE QUARRIES	III.5-4
4.0 ESKER QUARRY.....	III.5-5
5.0 UNITS, ACRONYMS, AND GLOSSARY.....	III.5-7

LIST OF TABLES

Table III.5-1	Location, Size, and Use of Granite Quarries	III.5-4
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LIST OF FIGURES

Figure III.5-1	Esker Quarry and Access Road	III.5-3
Figure III.5-2	North Pile Quarry Sequencing Plan.....	III.5-6

1.0 INTRODUCTION

Granite from the underground mine will be crushed on site for construction and operation purposes, since it is not potentially acid generating (PAG). However, the quantity of granite available from the underground mine will be insufficient to meet construction and operation needs and metavolcanic waste rock cannot be used due to its potential for acid generation. Consequently, quarries (granite and sand) will be required during all phases of the project as a source of non-PAG rock. This quarry management plan will be implemented to effectively control items such as quarry size and operational protocols to minimize disturbances to the environment. Annual applications for quarry permits will be submitted prior to any such operations. All work will be done in accordance with the Northwest Territories quarrying regulations.

Quarried materials will be needed from two general locations:

- within the footprint of the north pile for granite; and,
- within an esker, located 9-kilometres (km) south of the mine site (Figure III.5-1), for sand.

2.0 USE OF QUARRY MATERIALS

Quarried materials will be used for the following purposes:

- construction:
 - crushed rock for construction fill (*e.g.*, airstrip, roads, backfill for concrete foundations, *etc.*);
 - crushed rock for production of concrete for equipment and building foundations;
 - sand for bedding; and,
 - sand for production of concrete for equipment and building foundations.
- operations and closure:
 - capping of north pile for closure;
 - crushed rock for production of concrete for underground support pillars;
 - crushed rock for maintenance of roads and other surfaces; and,
 - sand for production of concrete for underground support pillars.

Figure III.5-1 Esker Quarry and Access Road

3.0 GRANITE QUARRIES

A total of three granite quarries will be used for construction or operations, as shown in Table III.5-1.

Table III.5-1 Location, Size, and Use of Granite Quarries

Quarry Location	Approximate Area (ha)	Estimated Volume (m ³)	Year of Use	Frequency of Use	Quarry Rock Destination
quarry 1 east cell of north pile	6	200,000 (over 24 months of construction)	0 (i.e., construction)	daily	plant site construction
quarry 2 starter cell of north pile	8	200,000 over 12 months of construction)	0 (i.e., construction)	daily	airstrip construction
quarry 3 west cell of north pile	15	130,000	2 – 22 (i.e., operations)	daily	underground backfill
		520,000 (typically approx. 26,000/yr)			north pile capping

Drilling, blasting, crushing, and transportation operations will occur generally on a daily basis for quarries 1 and 2 during the construction period. Materials from these quarries will be loaded by front-end loaders into haul trucks, which will transport the material to specific areas for construction purposes. These quarries will subsequently form part of the north pile.

Drilling, blasting, crushing, and transportation operations for quarry 3 will occur generally less frequently (typically between once per day and one day per week). Rock from this quarry will be loaded by front end loaders into haul trucks, which will transport the rock to the north pile for closure capping or to the aggregate crushing plant, where the rock will be crushed and stockpiled for use in concrete production for underground support pillars and for general site use (e.g., road maintenance). It is expected that sufficient rock will be quarried and stockpiled for up to a week's consumption for backfill operations.

Quarry 3 would be operated in the southwest corner as late as possible. Before the north pile expands into this area, sufficient rock will be stockpiled on the reclaimed quarry 2 to complete the north pile reclamation. Eventually all three quarries will become part of the north pile. As such, they will be covered with processed kimberlite and overlain with the granite cap.

4.0 ESKER QUARRY

Sand will be quarried from the esker used previously for the advanced exploration program (Figure III.5-1). This esker was chosen for four reasons: suitability of material, proximity to site via winter road, distance from a waterbody (>100 m from nearest waterbody as per the *Mackenzie Valley Land Use Regulations*), avoidance of known archaeological sites (based on literature review and field surveys), and avoidance of wildlife dens (based on field surveys).

Sand from the esker will be used as a bedding material and intermittently for concrete manufacture during construction. Current test work indicates that the fine rock needed in the manufacture of high strength concrete pillars for underground can be obtained from crushed rock quarried on-site. This greatly reduces the need for esker sand, but some requirements are anticipated. Approximately 25,000 m³ of sand will be needed for site construction and as bedding material for liners during 2004 and 2005. A further 50,000 m³ of esker material may be needed during the 22-year mine production period. Based on this requirement, it is expected that access to the esker will be required in 2004 and 2005, and on three or four subsequent occasions during the mine operating period. On each occasion, about 13,000 m³ of material would be brought to the site over a winter road (Figure III.5-1) and stockpiled on a rock/sand storage pad adjacent to the active north pile quarry site.

The esker will be accessed by ice road only (Figure III.5-1), during which time haul trucks will travel between the construction site and esker on a daily basis for the loading and transport of sand. The construction, operation, and closure of the winter road to the esker quarry will conform to the same standards that are in place for the operation of the winter access road from MacKay Lake to the site. The esker quarry site will be operated for a period of approximately six to eight weeks during the winter months. Material will be scraped from the surface using a dozer to a depth of 2 m to 3 m, ensuring that the bottom of the working area remains above surrounding landforms to ensure positive drainage. Equipment to be used during esker quarrying will include dozers, front-end loaders, trucks, and possibly a portable screening plant. A ridge of esker material will be maintained around the perimeter of the work area to minimize erosion from the work site during subsequent summer months.

At the completion of each esker-quarrying program, all pit slopes will be contoured to the satisfaction of the land use inspector to ensure minimal potential for erosion or danger to wildlife and a thorough cleanup suitable for final decommissioning and reclamation of the site will be carried out.

Figure III.5-2 North Pile Quarry Sequencing Plan

5.0 UNITS, ACRONYMS, AND GLOSSARY

UNITS

ha	hectare
km	kilometre
m	metre
m ³	cubic metre

ACRONYMS

non-PAG	non-acid generating
PAG	potentially acid generating
yr	year

GLOSSARY

aggregate	supplements waste rock; composed of mineral crystals of one or more kinds or of mineral rock fragments
esker	a long, low, narrow, sinuous, steep-sided ridge or mound composed of irregularly stratified sand and gravel that was deposited by a subglacial or englacial stream flowing between ice walls or in an ice tunnel of a continuously retreating glacier, and was left behind when the ice melted; may be branching and is often discontinuous, and its course is usually at a high angle to the edge of the glacier; eskers range in length from less than a kilometre to more than 160 kilometres, and in height from 3 to 30 metres
kimberlite	an agglomerate biotite-peridotite that occurs in pipes especially in southern Africa and that often contains diamonds
metavolcanic	consists mainly of well-foliated high-grade amphibolites
mine footprint	the area covered by the mine site

non-acid generating (non-PAG)	pure granitic rock that does not have structures containing visible sulphides
potentially acid generating (PAG)	metavolcanic rock and granitic rock with visible sulphides