Maddhapara Granite Mining Company Limited (MGMCL)

(A Company of Petrobangla)

Maddhapara, Parbatipur, Dinajpur

MINE CLOSURE PLAN

1. Introduction:

Name of the Company	:	Maddhapara Granite Mining Company Limited (MGMCL)
Controlling Corporation	:	Bangladesh Oil, Gas & Mineral Corporation (Petrobangla)
Administrative Ministry	:	Energy & Mineral Resources Division Ministry Of Power, Energy & Mineral Resources

Maddhapara Granite Mine is the first underground hardrock mine of the world. located at Maddhapra village under Parbatipur Thana, District of Dinajpur in Rangpur Division. The aproximate geographical coordinates of the mine site is 25°33'15"N to 25°34'15"N latitude and 89°3'30"E to 89°4'53"E longitude. The mine is connected with asphalted highways. It is also connected with broad and narrow (mixed) gauge railway from nearby Parbatipur Railway Station. The nearest Saidpur Airport is located in 40 Km from mine site and connected with asphalted highways.

In 1974, Geological Survey of Bangladesh (GSB) discovered presence of Hard rock (granite, granodiorite, gneiss) at a depth ranging from 136m to 152m below the surface at Maddhapara, Dinajpur. A Canadian Consultant Company M/S SNC Ltd., Canada conducted a feasibility study on Maddhapara hard rock deposit during 1975-77. Then a market survey and financial and economical evaluation study report was conducted by M/S Nippon Koei Co. Ltd., Japan in 1990. A Hydro-geological study was also conducted in 1984-85 by Australian Ground Water Co. Ltd. All the feasibility studies reported the positive outcome for establishing an Underground mine for production of hardrock.

A total of 106.33 acres of surface land for MGMCL was acquired for the mine. The land was mixed of agricultural private land and forest areas owned by Forest Department. There are no sites of archaeological or cultural significance within or near the Project Site. There are no indigenous people at or near the project area.

To meet the growing demand of boulders, crushed stone, concrete blocks and stone dust for usage of river embankments, railways, construction of high rise and multistoried buildings, roads and highways etc. a project was undertaken to develop an underground mine to produce 1.65 million MT of hard rock annually in the Maddhapara region. The mine area is 1 km in east-west direction and 1.2 km in south-north direction.

1.1 Geology:

Geological structure in Maddhapara and its surroundings was found by geophysical prospecting and exploratory drilling. In this zone the basement is in minimum depth of 140m from surface. Statigraphical succession of hard rock deposit lies in Precambrian basement complex (granodiorite and others) and subsequently Tura formation, Dupitila formation, Madhupur clay and alluvium from bottom to top.

1.2 Hydrogeology

Maddhapara Mine experiences moderates rate of water inflow into the underground operations. There exist two kinds of aquifers in the mine area i.e., the overburden aquifer and the fissure artesian aquifer (basement aquifer).

The overburden aquifer is an aquifer that covers both Dupitila and Tura formations. It has the thickness of 134 m on an average and the filtration co-efficient of 34 m/day. The fissure artesian aquifer is a basement aquifer that was formed with penetration of the ground water into the fissure pores of rock. The fissure artesian aquifer is about 150 m thick and has the filtration co-efficient of 0.196 m /day at maximum and 0.024 m/day at minimum.

1.3 Reserve:

In the mining area of 1.2 Km^2, the reserve of hard rock is approximately 174 million metric ton. The minable reserve is about 70 million metric ton with 42% extraction is considered. So far almost 11.50 million metric ton of hardrock has been extracted.

1.4 Mining Method:

The underground hard rock mine has been developed with two (2) vertical shafts: cage shaft and skip shaft and horizontal roadways at -228m, -246m and -270m levels in the underground.

The permanent roadways are arched shaped in cross-section and vary from 2.7m to 3.1m in height and 2.6m to 4.6m in width. The roof of the permanent roadways adopts bolting, combined support of shotcrete as per requirement of rock category to prevent downfall and breakout of rocks in the roadways.

The method of mining is Room and Pillar Sub-level stoping method. The stopes dimension is W=20m x H=60m x L=230m with in between pillar width 30m. The stopes are divided by safety pillars for geo-technically stable configuration of the mine. Hence, there is no subsidence.

The stoping method involves Fan pattern Long Hole drilling at Sub level (-228m), Ventilation level (-246m) and Production level (-270m) of the stopes followed by charging of explosives and blasting by detonating the explosives. Upon blasting rocks are drifted to the loading niches/drifts at the Production Level (-270m). Secondary blasting is also done to break the bigger chunks of stone at the Production Level. Every stope is provided with waterproof stopping as soon as the rock is extracted to ensure safe condition in the underground.

All the water of the mine is collected in two water sumps, a total volume of 2320 m^3, at the -270m level and allow collecting 12h water inflow. Underground main pump station is equipped with 5 pumps with capacity 250 m^3/hr. Ventilation in underground roadways is maintained centrally by Main fan ventilation system located on the surface near skip shaft. Two induced type main fan having capacity of 100 m^3/s works in parallel. Fresh air is supplied through cage shaft and return air through skip shaft.

2. Objectives of the Mine Closure Plan:

The various objectives of mine closure planning are as follows:

a) To ensure best utilization of invaluable underground mine for further use of non-mining operation;

b) To allow a productive and sustainable after-use of the site;

c) To alleviate of eliminate environmental damage and thereby encourage environmental sustainability;

d) To minimize adverse socio-economic impacts.

2.1 Reason for Closure:

The reasons for closure of mining operations such as exhaustion of mineable hardrock, lack of demand, uneconomic operations, natural calamity, directives from statutory organization or court etc. should be specified.

2.2 Closure Plan Preparation:

Mine Closure Planning is a progressive process which should undergo ongoing review, development and continuous improvement throughout the life of the mine.

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3. Closure Plan:

a) Mine site:

Maddhapara Granite Mine is the sole underground hardrock mine in the country. After completion of mining of the rocks from stopes the mine will remain geo-technically stable and all the underground permanent roadways will be available safe for use. Considering the investment incurred with this sole underground hard rock mine in the country and prevailing safe condition after discontinuation of production of the mine, there is possibility for use of the mine for further non mining operation like some underground mines in the different parts of the world. In this context for non mining activities in the underground after mining is discontinued or stopes are exhausted, the following limited plants /facilities need to be continued to run:

1. Shaft and winder operation
2. Permanent roadway facilities
3. Main ventilation Fan
4. Compressor House
5. Substation
6. Generator house
7. Workshop
8. Deep tube well

The underground mine can be turned into a museum. People can be allowed to visit underground mine on payment for having an exceptional experience and acquire some knowledge about mining. Hence, there will be scope for earning revenues to incur operational cost of the mine

b) Handling of Equipment/Machinery in Plant/facilities of the mine:

The handling of mining machinery after the closure of Maddhapara underground mine is a crucial aspect of mine decommissioning and reclamation. After the closure of the mine operation a detailed inventory of equipment/machinery in plant/facilities not required for non mining operation, both in underground and surface is to be made for having the salvage value left with them. The list of equipment prepared will be made available for potential purchasers. Prospective purchasers could be invited and asked to submit sealed bids. Equipment disposal is to be carried out complying environment protection laws to prevent contamination from machinery fluids (e.g., oil, fuel, hydraulic fluids).

c) <u>Infrastructure:</u>

Infrastructure management after mining operations cease is essential to support communities, and contribute to sustainable development of the country. By properly decommissioning, rehabilitating, and repurposing infrastructure in the mine area there will be possibility to take role in the development of the country. Effective infrastructure management will ensure safety, minimize environmental impact, and will support repurposing the buildings.

The infrastructure of the mine site after mine site can be used for developing a Technical Mining Institute from where the students of different Universities/Polytechnic Institutes studying on Mining and Geology can acquire practical knowledge to develop themselves for their career in the mining industry abroad as well as flourish mining sector of the country.

Secondly, the mine site is established with a large substation and a big mechanical workshop. In the mine different types of equipment and machinery both in mechanical and electrical field are operated. So, there is also a good scope to establish a vocational institute for building technical manpower required for the development of the country from where the students will have on hand experience.

After evacuation of the buildings of the mine site they can be converted to use for the purpose of establishing a Technical Mining Institute upon receiving Government Approval, and serve for the community and the country.

d) <u>Reclamation of land:</u>

Reclaiming an underground granite mine after closure is a long-term process that involves stabilizing mine openings, restoring ecosystems, and repurposing the land for future use. A well-planned reclamation project not only mitigates environmental damage but also benefits local communities by providing sustainable land use opportunities.

Reclaiming land after the closure of the mine is a crucial step to restore the environment, ensure safety, and make them suitable for future use. It is a long-term process that involves restoring ecosystems, and repurposing the land for future use such as plantation.

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The steps of Land reclamation are as follows:

1. Making land free- The surface area in the mine area is covered with crushing and sorting plants, intake railway, stackyards of different sizes of rocks, yards occupied with scraps etc. After discontinuation of mine operation these facilities will not be required. The lands in these facilities will be reclaimed.

2. Soil Reconditioning- If topsoil was removed during mining operations, it will be needed to be restored to facilitate plant growth. Organic matter and fertilizers may be added to enhance soil fertility. Safe disposal or repurposing of tailings and waste rock should be ensured.

3. Afforestation and Re-Vegetation- Native plants and trees are introduced to restore biodiversity. Fast-growing grasses and deep-rooted trees help prevent soil erosion and stabilize the land.

e) Water Quality Management:

Underground dewatering operation will be continued after seize of mining operation. It should be ensured that the existing constructed drainage channels and wetlands are in proper condition to control surface water flow and treat runoff water naturally. Rainwater can collect sediments, residual dust, or contaminants (e.g., oils or greases from machinery) and carry them into nearby river. In this respect proper mitigation measures is to be taken.

Proper Water Management will have various benefits like protecting aquatic ecosystems and downstream water users, preventing legal and regulatory penalties, building trust and good will with local communities and will help sustainable land use post-mining.

f) Air Quality Management:

The Main Fan Ventilation system operation will be continued for keeping proper condition in the underground for both human and equipment. Trees and shrubs should be planted as natural windbreaks to reduce dust dispersion and improve air quality. Proper Air Management will ensure air quality standards are maintained to compliant with air quality regulations.

g) Waste Management:

Waste Management after the closure of the mine is a critical aspect of the mine closure process to ensure that waste materials like residual explosives, oils, lubricants, and chemicals used during mining operations do not harm the environment, human health, or local ecosystems. There are also infrastructure waste means materials from decommissioned structures, including equipment, pipelines, electrical wiring, and concrete which also needs to be addressed in waste management.

h) Explosive Magazine:

The magazine house of the mine for storing explosives has 10 compartments and occupies 2.57 acre of land in the surface. The capacity of explosive magazine and is ammonium nitrate house is 260 metric ton and 320 metric ton respectively. The following measures can be taken for the magazine after the mine closure:

- All explosives and detonators must be removed and either relocated to another licensed facility or safely destroyed.
- The magazine must be thoroughly cleaned to remove any explosive residue.
- The magazine could be preserved as part of educational exhibit or the government agency like military forces can take over the facility for continued use.

i) Reduce of economic impact:

At the time of closure of the mine the available manpower can be redeployed to reduce the economic impact-

- Employment in post mining operation of the mine providing scope for a portion of jobless people to join the occupation back.
- Employment in the proposed Mining Institute providing occupation connected to the mining industry.
- Providing younger groups training in mechanical/electrical field to build up their career in different industry.

j) Management of community facilities:

The community facilities developed during the mine life like health facilities, educational facilities etc. would be continued even after the mine closure.

4. Closure Cost:

Mine closure planning needs periodic reviewing and revision during its life cycle. The cost of the closure includes dismantling of structures, cleaning of sites, rehabilitation of machinery, plantation, land reclamation, landscaping, environmental monitoring, non mining operation of the mine, miscellaneous charges etc. A source of fund for incurring Mine Closing Cost as follows is to be generated 5 years before mine closure date:

Activity wise Break-up of Closure Cost

Sl No.	Activity	% of Total Mine Closure Cost	Amount (BDT in Lakhs)	Remarks
A	Dismantling of Structures			
B	Landscaping			
C	Plantation			
D	Post Closure Env Monitoring/Testing of Parameters			
E	Miscellaneous and other mitigative measures			
F	Development of Technical Mining Institure			
G	Non mining operational cost			
	Total=	100		

Total Cost Required for Mine Closure= ....BDT

Source of fund for Mine Closure:..........................