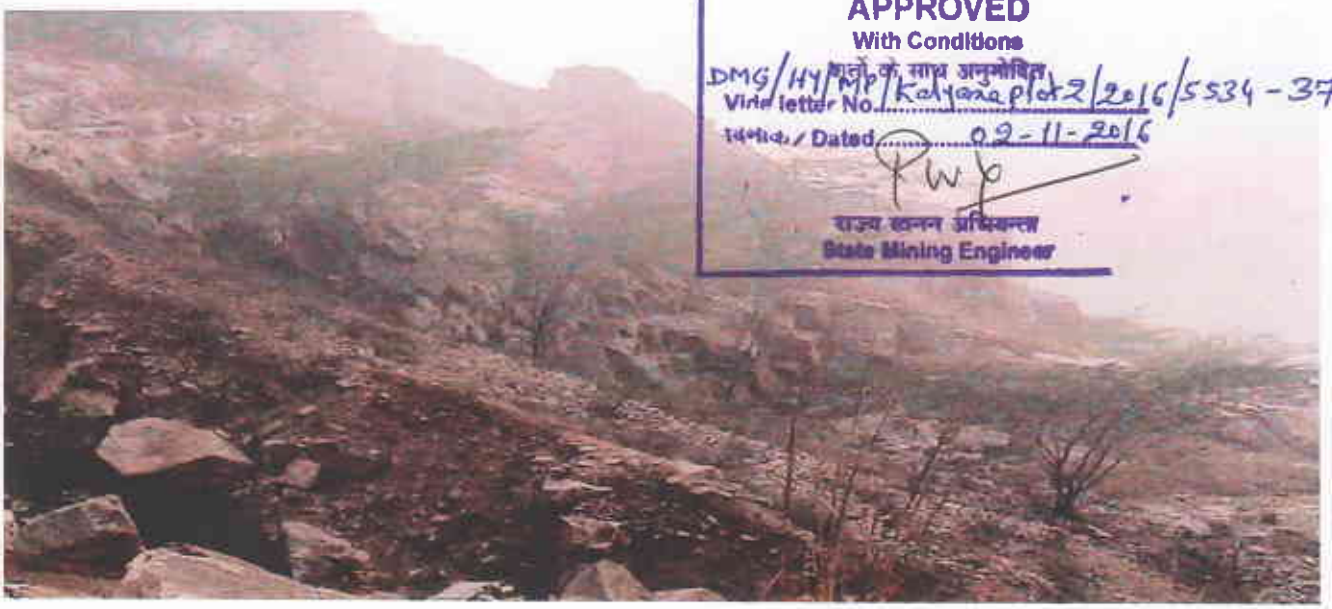
MINING PLAN AND PROGRESSIVE MINE CLOSURE PLAN
OF
STONE ALONG WITH ASSOCIATED MINOR MINERALS

VILLAGE: KALYANA PLOT-2
DISTRICT: BHIWANI
STATE: HARYANA
(Area-29.50 Hectares)

खान एवं भूविज्ञान विभाग, हरियाणा, चण्डीगढ़
Department of Mines and Geology,
Haryana, Chandigarh
APPROVED
With Conditions
शर्तों के साथ अनुमोदित
DMG/HY/MP/Kalyana plot2/2016/5534-37
Vide letter No.
Dated 02-11-2016
राज्य खनन अभियन्ता
State Mining Engineer



Submitted To: DMG, HARYANA

APPLICANT

M/s. SBIPL Projects Ltd,
11/102, East End Apartments,
MayurVihar, Phase-I, New Delhi

PREPARED BY

S.N. SHARMA
RQP/DDN/0135/2001-A
House No. 282, sector 11-D,
Faridabad (Haryana)

INDEX

List of Annexure

LIST OF PLATES

Sr.no.	Description	Plate no.
1	Key Plan	1
2	Location Plan	2
3	Surface Geological plan	3
4	Geological cross sections	4
5	Plan showing the position of mine working and dump at the end of 1st Year	5
6	Plan showing the position of mine working and dump at the end of 2nd Year	6
7	Plan showing the position of mine working and dump at the end of 3rd Year	7
8	Plan showing the position of mine working and dump at the end of 4th Year	8
9	Plan showing the position of mine working and dump at the end of 5th Year	9
10	Sections showing the position of mine Working and dump at the end of 1st to 5th Year	10
11	Progressive mine closure plan	11
12	Conceptual mining plan	12
13	Section showing the conceptual pit limit	13
14	Environmental Plan	14

CHAPTER -1

INTRODUCTION

1.0 Introduction

M/s SBIPL Projects Limited,11/102, East End Apartments, Mayur Vihar, Phase-1, Extn. New Delhi stood the highest bidder for the auction of theKalyana mine held on 23 & 24 February 2016 for Stone along with Associated minor minerals(Minor Minerals) of Dadri Tehsil, District : Bhiwani (Haryana)

The Letter of intent has been issued to M/s SBIPL Projects Limited,11/102, East End Apartments, Mayur Vihar, Phase-1, Extn. New Delhiby Director of Mines & Geology, State Govt. of Haryana, Chandigarh vide Memo No. DMG/HY/ML/Kalyana /2016/2010 dated 11-04-2016for Mining of " Stone along with Associated minor minerals in Kalyana over an area of 29.50 hectares in Tehsil Dadri district Bhiwani,Haryana for a period of 12 years (Annexure - I).

The applicant is involved in the mining business for last many years. The applicant can invest necessary funds for the scientific and systematic development of mines including land rejuvenation and progressive reclamation programme and other measures necessary to protect the quality of the environment and human health etc. The objective of preparation of this Mining Plan and Progressive Mine Closure Plan is to fulfill the conditions stipulated by the Department of Mines & Geology, Haryana required under Haryana Minor Mineral Concession Rules, 2012.

Furthermore, mining of mineral is no doubt essential for industrial growth and for providing better standard of living. But, in order to maintain the balance in the eco-system and sustainability of the mining area and the nearby areas a scientific mining scheme and progressive mine closure plan is required. Therefore, the same is prepared as per the guidelines for the mining plan/mining scheme covering all-important aspects required in respect of minor minerals.

CHAPTER -2

GENERAL DETAILS

1.0. General:

1.1 Name of the Applicant: M/s SBIPL Projects Limited,11/102, East End Apartments, Mayur Vihar, Phase-1, Extn. New Delhi

1.2 Status of the Applicant:- It is a Private Limited Company and copy of company registration is attached as Annexure-2

1.3 Mineral or Minerals for which the Applicant has a mining lease:

"Stone along with Associated Minor Minerals"

1.4 Details of the land covered in the 'M.L. Area' is as under: -

District: Bhiwani

State: Haryana.

Taluka: Dadri.

Village	Khasra no.	Area in hect.
Kalyana Plot No. 2	216	29.50 hectares

Boundary Pillar

(BP-A) : Lat : N 28^{0}34' 2.5" Long : E 76 ^{0}11' 24.9"

(BP-B): Lat : N 28^0 34'10.1", Long : E 76 ^{0}11' 33.2"

(BP-C): Lat : N 28^0 34'12.94", Long : E 76 ^{0} 11' 31.06"

(BP-D): Lat : N 28^0 34' 12.94",Long : E 76^0 12'0.1"

(BP-E): Lat : N 28^0 34' 4.62", Long : E 76^0 12'5.73"

(BP-F): Lat : N 28^0 34' 3.89", Long : E 76^0 12'3.89"

(BP-G): Lat : N 28^0 34' 2.5", Long : E 76^0 12'2.5"

APPROVED
P. K. Sharma
S.M.E.

These co-ordinates have been indicated on Plate No. 2.

1.5 Period for which mining lease is granted: 12 years w.e.f the date of grant of Environmental Clearance by competent authority or on expiry of a period of 12 months from date of issuance of LOI(Annexure-1)

1.6. Name, Address and registration number of the person who Prepared this plan.-

The applicant assigned the work of preparation of Mining Plan to

S.N.Sharma(Consent letter enclosed as Annexure -3)
(Registration. No RQP/DDN/0135/2001/A.)
House No. 282 Sector 11-D Faridabad (Haryana)
Phone no. 09560848579
E mail : sn_sharma1959@ rediffmail.com

2.0. Location and accessibility

The mine is located in the revenue estates of Villages Kalyana in Distt. Bhiwani, Haryana and is about 15 Kms from CharkhiDadri ,District Bhiwani, The lease area lies between the latitudinal parallel falling in the survey of India Topo Sheet No. 53-D/2. The lease area is located on the katcha road and then a metalled road upto village Kalyana and is easily approachable from Charkhi Dadri, Bhiwani and other important towns.

A general location and vicinity map are attached as Plate no.1

Key plan: key plan on 1: 50,000 scale covering an area in a radius of 5 km showing salient features as per Rule 28(5) (a)of MCDR, 1988 has been prepared on Toposheet no.53 D/2 (Plate no. 2)the area is marked on the enclosed key map. The deposit lies between Latitude 28 34'2.5" to 28^0 34'12.94"and Longitude$76^0$11'24.9" to$76^0$12'5.73"(Plate no. 2)

Infrastructure facilitiesare as detailed below

Nearest railway station	CharkhiDadri (17 km)
Police station	CharkhiDadri
Post office	Charkhidadri
Medical facilities	CharkhiDadri and Bhiwani
Electricity	Electrical supply is available in all nearby villages.
Education facilities	Most of the nearby villages have secondary schools and for higher education institutes are available at CharkiDadri, Bhiwani, Rohtak& other nearby towns
Mode of transportation of mineral	Mineral stone will be transported by tippers/ trucks. Loaded trucks will travel on Kuccha road made for plying of trucks up to the crushers in the nearby area. Village Kalyana is connected with metaled roadwhich is further joins the Dadri and nearby villages.

PART-A

CHAPTER -3

GEOLOGY, LITHOLOGY& RESERVES

3.0 GEOLOGY, LITHOLOGY& RESERVES:

3.1.1 Physiographic, Drainage and Climate

There is no perennial river passing through the district.Physiographicaly the district consists of flat and level plain interrupted from place to place by clusters of sand dunes, isolated hillocks and rocky ridges. A few isolated rocky ridges elevated sharply from the plain occur in the south central portion of the district. The lease area is consists of Hilly terrain.

The lease area does not have any water body. There are dry nalahas in which water flows during rains for a short duration, otherwise they remain dry for the rest of the months. The rain water from these nalas drains either into local Johars or in agriculture fields.

The area allotted for mining is located 2 Km. North of village Kalyana-2. The allotted area for mining is having hilly terrain with some undulations and thin soil patches. It comprises of Quartzite as the main country rock. The highest altitude of the area is 435mRL and lowest altitude is 217 mRL. It is government waste land. General drainage pattern is towards North Eastern part of the allotted area. There is no protected or reserved forest in the lease area. There is no habitation within allotted area.

3.1.2 Hydrogeology

The geological formation met within the district are ferruginouschiastolite schist associated argillaceous rocks of Aravalli group, Alwarquartzite of Delhi system, malani suite of volcanics of lower Vindhyanage, Older alluvial deposits of Quaternary age and Aeolian sands of recent age the out crops are, however, limited to small parts of the district , Older aluvium occurs

extensively in the area consisting of interbedded , lenticular, interfingering deposits of gravel sand ,soil , clay andKanker mixed in various proportions. The youngest formations are Aeolian deposits, which are unconsolidated surface sands covering large area in the western part of the district, these deposits occur as sand dunes at the surface and consist of sands.Ground water occurs in alluvium and Aeolian sands and under lying jointed and fractured hard rock formations also form the aquifers, in alluvium, sands, silt, kankar and gravel form the water bearing zones. In-shallow aquifers zones, ground water occurs underwater table conditions whereas in the deeper zones, confined/semi -confined condition exist, hard rocks comprising of Aravalli group of rocks, Malani suite of volcanic and Alwar Quartzite of Delhi system are water bearing but have yet not been explored thoroughly.

3.1.3 CLIMATE& RAINFAL:

The climate of Bhiwani district can be classified as tropical steppe, semi -arid and hot which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrates into the district. There are four seasons in a year. The hot weather season starts from mid-March to last week of the June followed by the south- west monsoon which lasts up to September. The transit ion period from September to October forms the post –monsoon season. The winter season starts late in November and remains up to first week of March. The normal annual rainfall of the district is 420 mm which is unevenly distributed over the area 22 days. The south west monsoon sets in from last week of June and withdraws in end of September, contributed about 85% of annual rainfall. July and August are the wet test months. Rest 15% rainfall is received during non-monsoon period in the wake of western disturbances and thunder storms. Generally rainfall in the district increases from southwest to northeast.

Normal Annual Rainfall:	420 mm
Normal monsoon Rainfall:	355 mm
Temperature	

Mean Maximum: 41°C (May & June)

Normal Rain days: 22

3.2 REGIONALGEOLOGYOFTHEAREA

Regionally the area belongs to the Alwar Series of Delhi Super Group. The regional stratigraphic sequence in Mohindergarh and Bhiwani District is as follows:

	Ajabgarh series	Biotite-schist, phyllites, quartzite and impure biotitic limestones and calciphyres.
Delhi System	*Alwar series*	Quartzites, arkose, conglomerates and mica-schists with bedded lavas.
	Rialo series	Rialo limestone and Rialo marble, quartzite

3.3 LOCAL GEOLOGY: The areas were surveyed geologically. A Geological plan (Plate no.3) and sections (Plate no.4) are prepared on 1:1000 scales.

DESCRIPTION OF FORMATION

The different formations of the area belong to Alwar Series of Delhi Super Group. The following sequences have been observed in the area.

- Alluvium
- Quartzite (Stone along with Associated minor minerals)

The description of different formation found in the area is as under

QUARTZITE (BUILDING STONE)

This type of formation covers the major part of the hills in the area.

It is reddish, bluish and gray in color, semi friable to hard and fine grained in nature. Quartzite occurs mostly as building stone extending over the entire length and width of the lease area.

The Quartzite is exposed in the area. The only pit existing in the area is given below:

P. K. Sharma
S.M.E.

Pit-1: -Length: 150 m, Width: 110 m, Depth: 35 m
Pit-2: -Length: 160m, Width: 145m, Depth: 30 m

STRUCTURE

The general strike of quartzite is N 15^0-20^0 E to S 15^0-20^0 W with dips of 75^0 to 80^0 due SE.

The strike and dip of the quartzite bands is not uniform since there are structural disturbances.

ORIGIN AND CONTROL OF MINERALISATION

Quartzite is a metamorphosed product of sand stone, which have undergone low degree metamorphism.

3.3 DETAILS OFEXPLORATION

(A) ALREADY CARRIED OUT IN THE AREA

The allotted area was previously worked by some other lessee / LOI holder. It is reported that the mining in this area is continued for the last more than fifty years. The mineral is exposed and the abandoned pits clearly reveal the occurrence of mineral in the whole area so, there is no need of further prospecting in this area.

(B) PROPOSED TO BE CARRIED OUT

The mineral is exposed upto the lowermost level of 217 mRL& the top most part of the hill at 435 mRL, therefore no further exploration is required to be carried out in the allotted area.

3.4 METHOD OF RESERVE ESTIMATION

Methods of estimation of reserves of quartzite:-

1) The total mineral resources and reserves have been calculated by cross-sectional area method. In this method the cross-sectional area of section line is multiplied by the influence of the section line to arrive at volume.
2) The reserves are calculated on the basis of established width, thickness and strike length/influence of the mineralized formation in the area where good pits are available such area in put under proved category.

3) In the allotted area, the mineral is exposed at the lowermost level of 217 mRL to the top most part of the hill at 435 mRL. So, the occurrence of mineral is considered for total thickness of mineral exposed under proved category of reserve.

4) The further 20 m depth is considered for probable category of reserves below the proved category.

5) Similarly, further 10 m depth is considered for possible category of reserves below the proved category.

6) The bulk density of Stone along with Associated minor minerals(quartzite) is considered 2.5 which is further multiplied by volume to arrive at the tonnage

1. The Section wise reserves for road metal and masonry stone(quartzite) aresummarized here below: -

Cross section line	Cross sectional area	Influence length(m)	Bulk Density	Proved Reserves MT	Probable Reserves MT	Possible Reserves MT
A-A'	2704 6315 3157	266	2.5	1798160	4199475	2099405
B-B'	47504 6397 3198	217	2.5	25770920	3470373	1734915
C-C'	33342 6409 3205	159	2.5	13253445	2547578	1273988
D-D'	3368 6422 3211	223	2.5	1877660	3580265	1790133
E-E'	1942 6435 3217	165	2.5	801075	2654438	1327013
Total Geological Reserves				43501260	16452129	8225454
Total Mineable reserves				681,7884		

The mineral reserves are computed as per UNFC. The reserves are as follows: -

Reserves of Stone

Total Mineral Resources (A+B)	Code	Reserves
A. Mineral Reserves	111	4,35,01260tonne
1. Proved Mineral Reserves	121 & 122	1,64,52,129tonne
2. Probable Mineral Reserves		
B. Remaining Mineral	211	82,25,454 tonne
1. Feasibility Mineral Resources	221 & 222	Nil
2. Prefeasibility Mineral Resources	331	Nil
3. Measured Mineral Resources	332	Nil
4. Indicated Mineral Resources	333	Nil
5. Inferred Mineral Resources	334	Nil
6. Reconnaissance Mineral Resources		

C. Details of UNFC classification

UNFC is a three digit code based system, the economic viability axis representing the first digit, the feasibility axis the second digit and the geological axis the third digit. Each digit provided.
Codes 1, 2 and 3 in decreasing order. The highest category of resources under UNFC system has code (111) and for lowest category the code is (334).

Code (111): This code is provided for the economically mineable part of the measured mineral resources (proved category reserves).

Code (121): This code is provided for the economically mineable part of the indicated mineral resources (probable category reserves).

Code (211): The part of the measured mineral resources (proved category), which as per feasibility study has not found economically mineable. The

reserves blocked in 7.5 meters buffer zone and 45 meters from permanent structure.

Code (222): The part of the indicated mineral resources (probable category), which as per feasibility study has not found economically mineable. The reserves blocked in 7.5 meters buffer zone and 45 meters from permanent structure.

Code (333): Tonnage, Grade and mineral contents can be estimated with low level of confidence and resources are also inferred from geological.

Life of mine

The area for Stone and associated minorminerals has been consented for a period of 10 years from the date of registration. Accordingly, the annual production targets have been planned, the average proposed production (ROM) will be about 56 lakh MT/year and life of the mine will be 12 years.

CHPATER 4

MINING

4.1 Site Appreciation

Our experts (Geologist, Mining Engineer) visited the mine site and found that the allotted area comprised of long and narrow hill range. Two shallow excavated old pits exist in the allotted area revealing that the area has been worked for building stone in the past. Existing road length is about 1650 m.The shape of the pit shows that no systematic mining has been done. Now it is proposed to undertake systematic and scientific mining for excavation of road metal and masonry stone/building stone during the lease period. Pre-production Activities

4.2 Pre-production Activities:

As a pre-production activity, roads from crusher to top most entry to the initial mining area, from mining faces to the proposed dump area, from ground level to the mining area, to the mines office complex, and to the garage / workshop will be developed. Access roads / haul roads from topmost bench to benches at lower levels shall be developed gradually. As mining operations advance to lower levels, larger face lengths and width shall be available. Face management, which is a continuous process, shall be taken into account to secure shortest (average) lead distance up to crusher / dump yard as also to prevent clustering of dumpers. Following activities shall be undertaken during quarry development phase:

- Removal of vegetation and top soil to expose quartzite beds
- To make the access road to the mine working area.
- Provision and construction of access roads from ground level to mines office complex, workshop, entrance to mine faces.

Present breakup of land use in the lease area

Sr.no	Details	Area in hectares
1	Pits (Broken Area)	15.67
2	Dump	0.0
3	Road	0.0
4	Plantation	0.0
5	Infrastructure	0.0
6	Undisturbed land	13.83
	Total	29.50

4.1 Pit Design Parameters:-

In view of the geological setting of the deposit it is proposed to work the mine by mechanized open cast method using shovel and dumper combination. The rate of production is proposed 56, 00,000 MT/year (18,667 T per day) by the following mentioned parameters so that not only the production is achieved but mine also takes a proper / regular shape and size .

Sr.no	Particulars	Dimensions with unit
1	Final Bench Height and width	9mx15m (with intermediate safety berm of 8 m)
2	Working Bench Width	15-20m
3	Overall Ultimate pit slope	45^{O}
4	Bench Alignment and bench slope	Parallel to each other; 80^{0}
5	Face length	All along the strike length
6	Depth of pit (Below General Ground)	40 m
7	Blast hole diameter	100-110mm
8	Inclination of blast hole	Vertical
9	Width of Haul Road	12m
10	Gradient of haul Road	1 in 16

I) Ultimate Pit slope

II) Bench Height and width

III) Face length

IV) Bench Alignment

V) Direction of face advance

VI) Depth of pit.

4.1.i Ultimate pit slope: -

Quartzite rock is hard and compact. Once the pit reaches the ultimate limit which is proposed 210MRL, it is necessary that it does not start collapsing due to weathering and other effects. This can be achieved by planning

ultimate pit slope at a maximum of 45 degree to avoid collapse of the pit sides. There is no overburden except a thin sol cover. Entire mineral produced will be useful.

4.1.ii Bench height and width

Since the host rock quartzite is hard and compact, the same parameters are considered for making benches. In view of mechanized method of mining to be adopted, the bench height is proposed 9.0mtrs. Operating bench width will be 15-20 mtrs which will finally reduce to 6.5 mtrs while working bench below with intermediate safety berm of 8 m. Formation of benches in this manner will result in an overall safe slope of 45^0 or less in the ultimate pit position.

4.1.iii Face length :-

The following parameters have been followed to arrive at the face length to facilitate the required production of 56, 00,000 MT mineral

Since one pit is planned to develop in the area to obtain targeted production, the optimum face length available along the strike length is sufficient to cater to the optimum production required. The face length will attain the maximum length at the end of 1 st year.

4.1. iv Bench alignment: -

The benches are gradually aligned to give a regular shape. In general the benches will advance in all directions parallel to each other. Since geological formation in the area is of simple nature, there will not be difficulty in maintaining the proposed bench alignment.

4.1.V Depth of pit:

The reserves up to 40m below the ground level (217 MRL) are proposed to be worked. The surface level reserves will not be depleted during the next 12

years. The workings will start at 435 MRL and will reach up to 217 MRL(Ground Level) at the end of 5th year as detailed in the year wise plans Plate no.5-9 and Sections plate no.10.

The elevation of the hill top is 435 MRL, the ground level is 217 MRL .

4.3 Development during the First five years:

As the area has been worked in the past un-systematically, certain pre-production development work is required to align the mine road and to reach the top of the hill for mining. The construction of garland parapet, wire fencing etc, shall be provided year wise and will be shifted along with the development of pit. A mineral, soil and dump stack yard (2.0 hectares) area Is ear marked. Soil stack yard (100mx80m) is proposed to stack the soil generated during the mining.

For making stacking yard, ground is almost level. A boundary wall around soil stack yard shall be made. The position of fencing, drain, toe wall, dump yard size and soil stack yard size, plantation etc at the end of 5th year is as detailed below and shown in the Year wise Plans at Plate no.5-9 and Sections Plate no.10.

Year	Toe wall around dumps	Drain at the end of 5th year	Drain around dumps	Fencing at the end of 5th year
At the end of 5thyear	770m	2090 m	1500m	6200m

Dump yard size = 100mx80 m

Temporary Mineral StackYard= 140x100

Working area occupied at the end of5th year will be= 20.40 Hectares

Approach road from mine to mineral stack yard, soil stack yard and dump yard and site services shall also be made.

4.4 Year wise Production &Development for the first five years

It is proposed to work the mine from top down ward for which a mine road is proposed between 217 MRL to 435 MRL. About 1136mtr length will be developed during first year. During the preparation of road mineral will be mined (1136x10x5x2.5=1.15lakh ton. The position of benches and the production from individual benches year wise is as follows:-

Year	Bench level At the end of each year	Total Production during year in lakh Tones
1t	435 to 325 mRL	50,00,000
2nd	335 to 285 mRL	55,00,000
3rd	295 to255 mRL	56,00,000
4th	265 to 255 mRL	56,00,000
5th	235 to 205 mTL	56,00,000

During the plan period the benches will be advanced as shown in plat No. 5-9 and sections plate no.10 to achieve the targeted production.

4.4.2 Proposed rate of production when the mine fully developed

The proposed rate of production of 56, 00,000 MT/year shall be achieved by the end of 5th year. The rate of production shall be maintained up to the end of lease period.

4.4.3 Mine able Reserves and Anticipated Life of the mines

As discussed in the chapter of geology, the insitu geological reserves are calculated 6,81,78,843 MT.As per the proposed method of mining and occurrence of mineral 89.5 % geological reserves (5,50,31,630 MT) are mineable. The life of the mine is therefore assessed as 12 years at the proposed rate of 56, 00,000 tons of mineral / year.

4.4.4 Proposed Method of Mining

The present mining operations are designed to be carried out by mechanized open cast mining method. The entire mining operations proposed are mechanized. Apart of mining, the loading and transportation up to stack yard shall be done mechanically. It is proposed to load in the trucks/dumpers directly to the destinations and mineral is not usually put up in this stack yard to avoid the double handling. In the present operation the bench height shall be 9mtrs. Each bench will advance one by one. While carrying out the mining operations in accordance with the above provision the overall pit slope shall be maintained the 45^0 the mineral bearing rocks being hard and compact.

4.5 Conceptual Mine Plan Parameter

The detailed mining plan has been prepared with a project life of 12 years. The mining is conceived as one long open mine pit. The opencast mechanized mining method has been considered feasible for exploitation of the deposit.

The aspects of geotechnical behavior of quarry rocks have also been taken into consideration to ascertain the suitable mine pit slopes. The major rock of the quarry is quartzite with clay intercalations and could be classified in the category of harder rock strata. The conceptualized mine pits are based on appropriate overall slope angle broadly confirming to prevailing norms of mine safety department for harder rock strata. The broad configurations of mine pit slope are shown in the enclosed drawing (Plate2) and the broad details are as follows –

- Overall Slope – 45 degree
- Bench Height – 9 meters
- Bench Width – Operating width of Bench will be 15-20 mtrs.
- Individual Bench Slope – 80 degree
- Burden of Holes - 4 meters
- Spacing of Holes - 5 meters

The breakup of present land use and at the end of 5th year

Breakup of land use in the lease area (In Hectares)

Sr.no	Details	Existing land use (ha)	At the end of 5th year (ha)
1	Pits (Broken Area)	15.67	27.70
2	Dump	0.0	0.0
4	Plantation	0.0	1.17
5	Infrastructure	0.0	0.01
6	Undisturbed land	13.83	0.62
	Total	29.50	29.50

4.5.0 Extent of Mechanization:

Description for the calculation of adequacy and type of machinery and equipment proposed to be used in different mining operations are enumerated below:-

Targeted Production= 56, 00,000 MT per Annum

Working days per annum = 300

Production per day = 18,667 MT

4.5.1 Drilling

a) Tonnage of mineral excavated per hole = 9m x 4m x 5m x 2.5= 450 T

b) No. of holes required per day= 18,667 T/450 T = 41.48 or say 42

c) Total meterage of drilling/day= 42 holes x 9.5m = 399 m

d) Capacity of each drill machine= 10 m per hour or 80 m per shift or 160 m per day

e) Hence no of drill machines= Drilling required per day/capacity of drilling per day = 399/160 = 2.49 or say 3 Nos of drill machine

Thus, It is proposed to use drill machines of 100 - 110mm dia. As per the production target of about 18,667 MT (7467 M^3 per day) it is estimated that about 42 holes of 9.5 m depth per day (399 m per day) will be required to maintain the proposed production targets. Therefore at least 3 drill machines of higher drilling rate (10 m/hour) with availability of 75% of time as well and 80 % utilization hours will be required.

The details of machinery and performance will be as under

Sr.no	Details	
1	A machine can drill total of meters in a shift	100-110m
2	Total drill meters required per day	399 m
3	Total no of machines required per day	2.5
4	20% consideration for maintenance and spare capacity	0.50
5	Total no of machines required (4.80 say 5)	3

4.5.2 Loading Equipment, Haulage and Other Mining Machinery

Hydraulic Excavator:-

The productivity of excavator is decided based on the following consideration i.e. two shifts per day working and 300 days in a year

	Excavator Category	Capacity
A	Diesel Hydraulic shovel	3.2 m³
B	Fill Factor	90 %
C	Tonnage Factor	2.50
D	Availability of excavator	80 %
E	Utilization of excavator	80%

For arriving at the rate of production per hour in case of the mine under reference, the following formula is applicable:

Q= C x F x T x BD x BF/Tc

Where Q= Per hour handling of excavator in T

C= Bucket Capacity in cubic metres = 3.2 cum

F = 0.90

T = Time in seconds = 3600

Bf = Operating efficiency = 0.90

BD = Blasted Mass = 1.4

Tc = Time cycle per pass at 90 degree swing = 45 seconds

Thus Q = 3.2 x 0.9 x 3600 x 1.4 x 0.90/45 = 290 T per Hour

Per Excavator Per Day Output = Hourly capacity of excavator x effective hour per day = 290 x 12 = 3480 T

Therefore No of Excavators required = Total Handling per day/Handling by excavator per day = 18,667 / 3480 = 5.36 or say 6 Nos + 1 excavators will be ready standby. Therefore total 7 nos of excavators are required for this project.

Hauling Equipment:

For calculation of number of dumpers, it is the lead from the mine to the destination which will determine the no of dumpers. Based on calculations, it is established that total 50 Nos of 25 MT capacity dumpers would be sufficient to execute the rated production at an average lead of 1.5 Km (one way with average speed of dumper 20 Kmph) However, including the standby equipment, total requirement of dumper works out to be 55 Nos. of 25 MT capacities.

Hydraulic Rock Breaker:

To minimize the secondary blasting and to contain the accidents due to fly rocks, it is proposed to deploy Hydraulic rock breakers for breaking of big boulders generated consequently upon primary blasting, at working face site.

Thus, the total population of the equipment and other ancillaries as per above assumptions and calculations, are summarized in below table:-

S.No.	Equipment	Size	Nos
1	Hydraulic Excavator for Loading of mineral	3.2cu.m	6
2	Rock breaker (Hydraulic Excavator) as substitute to secondary blasting	1.6 cum	2
3	Rear dumpers for transportation of mineral from mine to destination	25T	50
4	Drill Machine with compressor of 365 cfm capacity.	100-110mm	3
5	Track chain Dozer	350 HP	1
6	Pay loader (General Purpose, loading etc.)	145 HP	1
7	Crane	40T	1
8	Tyre handler	-	1
9	Water sprinkler	10 KL	1
10	Mobile Maintenance van		1
11	Tractor	50hp	1
12	Tractor mounted compressor		1

Requirement of Diesel for operations of Heavy Earth Moving Machines and ancillary equipment:

Quantity of Diesel / Energy fuel Consumption per day: -

S. No.	Machine	Details of Diesel requirements	Consumption of Diesel (in ltr.)
1.	Dumper	(Considering diesel consumption by the dumper is 3 km / ltr.) Total Diesel consumption / 50 Dumper = 50 x 60 = 3000ltr.	3000
2.	Excavator	Hourly Consumption = 15ltr / Shovel/ excavator 16hour diesel consumption = 15x 16x 8= 1200ltr.	1920
3.	Dozer& Payloader	Diesel consumption 12ltr / hr 10 hrs diesel consumption = 12 x10 = 120ltr x2= 240	240
4.	Wagon Drill/ Air Compressor	No. of Compressor- 5 compressors Diesel consumption by 5 compressors in 10 hour working = 5 x15 x 10 = 750 ltr.	750.
6.	Explosive Van		40
7.	Maintenance Van		60
8.	Water Tanker		30
9.	Light Vehicles		30
		TotalDiesel requirements	**6070**

CHAPTER 5

BLASTING

5.1 Drilling and blasting Parameters:-

5.1 Blasting Parameters:-

Following parameters were considered for proper and adequate blast design.

- Drilling
- Selection of Hole Diameter
- Required Production
- Terrain
- Material Characteristics
- Type and Size of Excavating and Hauling Equipment
- Bench Height
- Explosives Type and Size
- Burden and Spacing
- Stemming
- Timing/Delays
- Scaled Distance (Peak Particle Velocity)
- Weather and Atmospheric Conditions
- Time of Day

For mining of building stone drilling and blasting is required. The job of drilling and blasting is of continues nature

Considering the time frame of mining and total requirement of material, the daily mineral production works out to be 18,667 MT (7467 cum). The above target will be utilized to frame the pattern and size of blast. The blasting parameters are described as below.

Item	Values
Bench height (m)	09
Hole depth (m) (including sub-grade drilling)	10
Burden (m)	4.0
Spacing (m)	5.0

Volume (m^3)	4x5x9=
Tonnage yield (t)	180x2.5=450 T
Powder Factor (assumed)	8t/kg of explosive
Charge per hole (kg)	450 T/8 = 56.25 Kg
Total quantity of rock to be Broken per day (ton)	56,00,000 t/ 300 days = 18,667 TPD
Explosive required for blasting per day	18,667/8 =2416 kg
Blasting Frequency (Every day)	1
Explosive required per blast per day	2416 kg
No. of holes per day	20,000 t (Production/day)/450 t (Tonnage per hole)=43 Holes
No of holes per blast	43

5.2 Type of Explosives

Emulsion Primer charge (20% of charge per hole)

ANFO column charge 80 % of charge per hole

5.2.1 Initiation System and minimum charge per delay

Delay milliseconds delay detonators

Drilling pattern staggered

Firing pattern V pattern

5.3 Secondary Blasting

Large sized fragments should be reduced to acceptable size by drilling shallow holes (0.75-1.2m). The pattern will be as follows

Depth of hole 0.75 -1.2m

Diameter of holes 38 mm

Diameter of explosive 25 mm

Quantity of explosive 65 gms

Firing pattern Instantaneous

Secondary blasting is proposed but it will be minimized by deploying hydraulic rock breaker for breaking large size stone/boulders.

fixthe maximum number of shots to be fired by a blaster differently fromthe limits specified in this sub-regulation.

4 The number of detonators issued to, and in the possession of, a blaster during his shift shall not exceed the maximum number of shots that he is permitted tofire under sub -regulation (5).

Regulation: 161Shotfiring tools –

1 Every blaster on duty shall be provided with –

a suitable electric lamp or torch ;

b a tool, made entirely of wood, suitable for charging and stemmingshotholes;

c a scraper made of brass or wood suitable for cleaning out shotholes;

d where fuses are used, a knife for cutting off fuses an, unless machine cappedfuses are provided, also a pair of suitable crimpers for crimpingdetonators; and

e where detonators are used, a pricker made of wood or a non-ferrousmetal for priming cartridges.

2 No tool or appliance other than that provided as above shall be used by a blaster.

Regulation 162. Drilling, charging, stemming and firing of shotholes –

1 No drill shall be used for boring a shot hole unless it allows a clearance of at least 0.3 centimeter over the diameter of the cartridge of explosive which it is intended to use.

2 No shot hole shall be charged before it is thoroughly cleaned.

3 Before any shot hole is charged, the direction of the hole shall, where practicable, be distinctly marked on the roof or other convenient place.

4 No detonator shall be inserted into a priming cartridge until immediately before it is to be use. Detonators once inserted into a priming cartridge shall not be taken out.

5 Unless otherwise permitted by the Chief Inspector by an order in writing and subject to such conditions as he may specify therein, the charge in any shot hole shall consist of one or more complete cartridges of the same diameter and the same type of explosive.

6 The blaster shall, to the best of his judgment, ensure that no charge in a shot hole is over-charged of under-charged, having regard to the task to be performed.

7 No shot hole shall be fired by a fuse less than 1.2 meters in length.

8 Every shot hole shall be stemmed with sufficient an suitable non-inflammable stemming so as to prevent the shot from blowing out. Only sand loosely filled in, or soft clay lightly pressed home, or a compact but not hard mixture of sand and clay or water shall be used as stemming.

9 In charging or stemming a shot hole, no metallic tool, scraper or rod shall be used; an no explosive shall be forcibly pressed into a hole of insufficient size.

10 No shot shall be fired except in a properly drilled, charged and stemmed shot hole.

12 All surplus explosives shall be removed from the vicinity of a shot hole before a light is brought near it for the purpose of lighting the fuse.

13 As far as practicable, a shot shall be fired by the same blaster who charged it.

14 In any mine in which explosives other than gunpowder are used, every shot shall, if so required by the Regional Inspector, be fired electrically.

15 No more than 10 holes shall be fired in one round unless they are fired electrically or by means of an igniter cord.

16 No shot hole shall be charged except those which are to be fired in that round; and all shot holes which have be charged shall be fired in one round.

17 Where a large number of shots has to be fired, a shot firing shall, as far as practicable, be carried out between shifts.

18 No person shall remove any stemming otherwise than by means of water or an approved device, or pull out nay detonator lead or remove any explosive from any charged shot hole.

Regulation 163 Electric Shot firing.– Where shots are fired electrically, the following provisions shall have effect, namely :-

1

A No shot shall be fired except by means of a suitable shot firing apparatus; and the number of shots fired at any one time by the apparatus shall not exceed the number for which it is designed.

B Every electrical shot firing apparatus shall be so constructed and used that –

i it can only be operated by a removable handle or plug. This handle or plug shall not be placed in position until a shot is about to be fired and shall be removed as soon as a shot has-been fired; and

ii the firing circuit is made an broken either automatically or by means of a push-button switch.

C

(i) No apparatus shall be used which is defective; an every apparatus shall m once at least in every three months, be cleaned an thoroughly overhauled by a competent person.

2 No current from a signaling, lighting or power circuit shall be used for firing shots.

3 The blaster shall –

(a) retain the key of the firing apparatus in his possession throughout his shift;

(b) use a well- insulated cable of sufficient length to permit him to take proper shelter, and in no case, shall this cable be less than 20 meters in length;

(c) Before coupling the cable to the firing apparatus, couple up the cable himself to the detonator leads;

(d) Take care to prevent the cable from coming into contact with any power or lighting cable or other electrical apparatus;

(e) Take adequate precautions to protect electrical conductors and apparatus from injury;

(f) Himself couple the cable to the firing apparatus; an before doing so, see that all persons in the vicinity have taken proper shelter as provided under regulation 164; and

(g) After firing the shots and before entering the place of firing, disconnect the cable from the firing apparatus.

4 Where more than one shot are to be fire at the same time:-

(a) care shall be taken that all connections are properly made;

(b) all shots if fired belowground shall be connected in series;

(c) the circuit shall be tested either for electrical resistance or for continuitybefore connecting it to the firing apparatus. Such a test shall be made withan apparatus specifically designed for the purpose and after the provisionsof regulation 164 have been complied with; and

(d) the cable to the shotfiring apparatus shall be connected last.