

EXECUTIVE SUMMARY

1. PREAMBLE

Minerals are the chief source of present phase of industrialization, and play an important role in the present phase of the national economy and overall development of the nation.

India is endowed with significant mineral resources. India produces 89 minerals out of which 4 are fuel minerals, 11 metallic, 52 non-metallic and 22 minor minerals.

Life Indices: Some Important non-fuel Minerals			
S. No.	Mineral/Ore/Metal	Recoverable reserves estimated as on 1.4.2000 (Based on exploration/prospecting)	Life Index (years)
		Figure in million tonnes unless otherwise specified	
	1	2	3
1	Bauxite	2462*	211
2	Copper metal (tonnes)	5297,000	80
3	Lead metal (tonnes)	2381,000	45
4	Zinc metal (tonnes)	9707,000	45
5	Gold metal (tonnes)	68*	Not Estimated
6	Iron ore	13460*	131
7	Chromite Ore	97	46
8	Magnesite	245*	542
9	Manganese Ore	167*	47
10	Limestone	75679*	254
11	Phosphorite (Rock Phosphate)	142	79
12	Sillimanite	516*	Very large
II	Garnet	52*	90
16	Kyanite (tonnes)	2817000*	265
17	Dolomite	4387*	438
18	Diamond (Thousand carats)	982*	19

		* Recoverable reserves estimated as on 1.4.1995. Estimates as on 1.4.2000 under preparation.	
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Shri Yogesh kumar Paliwal is an individual lessee and engaged in production of Marble. The concern is proposed to have mining activity of Marble at Village Jujhawal, Tehsil- Bahoriband, and District Katni in the state of Madhya Pradesh, MP for the anticipated production of ore by 19000 tonnes per annum.

In order to assess the likely impacts on environment due to ongoing mining activity and to have a tool of environment management, Shri Vinod Agrawal has submitted the Rapid Environment Impact Assessment study report for mining project.

2. LOCATION

7.09 Ha of Marble query lease area is located in village –Jujhawal, Taluka Bahoriband, Katni District (M.P.). Land use of the area is part of agriculture land and part of waste revenue land. The query lease was sanctioned under proposed for Marble.

District / State	Taluka	Village	Khasara No	Area
Katni (MP)	Bahoriband	Jujhawal	1114 (part), 1115 (part), 1116, 1118, 1119/2, 1120, 1122/1, 1122/2, 1161 (part)	7.090 Ha

3. ENVIRONMENTAL SETTING

Topography of the area is gentle rolling type of topography, having slope towards North and south direction. Highest elevation of the area is 417 situated towards northern side of the area. Differences between

highest and lowest elevation is 3m. The area lies at the cross section of 23°37'42" To 23°37'54" and 80°11'06" To 80°11'15" and is covered under Toposheet no 64A/2. Average MRL of the area is 420-417AMSL.

Details of Project Settings

S. No.	Particulars	Details
1	Latitude	23°37'42" To 23°37'54" N
2	Longitude	80°11'06" To 80°11'15" E
3	Height above mean sea level	420-417AMSL
4	Nearest City	Sleemnabad about 7 km and major city is Katni – 34 km in North direction
5	Nearest Railway Station	Sleemnabad – 9.0 Km- East
6	Nearest Airport	Jabalpur located at about 60 km from the mines by road.
7	Nearest Highway	NH-7 Jabalpur -Varanasi
8	Nearest Village	Jujhawal-1.5 km -SW
9	Hills/Valley	No
10	Ecological Sensitive Zone	No national parks and sanctuary
11	Reserve Forest	Jujhawal RF- 1.0km - N Amoch RF – 4.5km - S
12	Historical Place	No
13	Nearest River/ Nalla	Katni Nadi – NE - 3.0km Sahar Nadi - NW- 8.0km Cannel- West- 7.5 km Bahuriband Tank- NW- 10km Silpuri N- SE- 9km Baher N – NE-8km
14	Annual Climatic Conditions	Max. Temperature – 48.2°C Min ^m Temperature – 4.0 °C Average Rainfall–1140-1900 mm

4. TRANSPORT

The lease area is situated at a distance of 34 km South of Katni (district headquarters). Approach from district head quarter Katni to lease area is as follows Katni to village Sleemnabad is 27 km on NH-7

is southwest of Katni. From Sleemnabad to lease area is 7km south west of sleemanbad approachable by all seasoning Damar road.

Schooling facility upto middle standard, post office and medical facility is available at village Jujhawal at 1.5km in west direction and higher schooling, college railway & guest house and post office facility is available at village Sleemnabad 9km in east. Area falls under jurisdiction of police station Sleemnabad.

5. REASON FOR ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The impact of mine on the environment depends to a large extent on its location with respect to Human settlements, meteorological conditions, ambient air quality, water bodies, agricultural and forest land etc.

Most of the adverse impacts of mines are amenable to technological control by providing necessary preventive and control measures and finally through effective environmental management of the operating mines. Keeping in view the likely impacts of mines on environment, this Rapid environment impact assessment report has been prepared for submission to State Pollution Control Board and Ministry for Environment and Forests (MoEF) for clearance of the proposed additional mining area.

6. PROJECT DESCRIPTION

6.1 RESERVES

Reserves of Marble are calculated by graphical method, and categorization done for proved, and probable reserves. Only central part of the lease area considered for mineralization. Phyllite band in along the strike plane has been noticed in existing pit – A towards northern side and further the litho logs of the dug well reveals the same litho logs of soil and phyllite is continue in the northern direction

hence therefore the northern part is considered as non mineralised while the southern left as unexplored area till the results of the proposed exploration. As the upper surface is semi weathered and fractured hence waste is taken 60% and recoverable marble is considered 40% and marble below the weathered marble which will have the recovery of 60% and rest will be waste with 40%.

PROVED

Referring to litho logs of the working pits and vertical dip where it has been noticed that the average 6m weathered marble with 40% block able recovery exposed in the central part of the lease further it underlying the compact marble and the thickness of the compact marble under vertical dip assumed that at least 10m depth influence will be there with 60% block recovery thus under this category the proved thickness is 16m.

PROBABLE

On the basis of vertical dip it is assumed that at least 100% depth influence of proved thickness of 60% recovery below the proved reserves will be the true thickness under the probable category, hence the probable thickness is 10m below the probable reserve.

GEOLOGICAL RESERVES FOR THE JUJHAWAL MARBLE

Category	Area in m2	Thickness in m2	Volume in m3	Mine waste 60% m3	Marble 40% m3	Tonnage of Marble
Proved	17550	6	105300	63180	42120	111618
Ore depleted intones						25440
Left ore in tonnes						86178

Category	Area in m2	Thickness in m2	Volume in m3	Mine waste 60% m3	Marble 40% m3	Tonnage of Marble
Proved	17550	10	175500	70200	105300	279045
Probable	17550	10	175500	70200	105300	279045
Total						558090

AREA CALCULATED GRAPHICALLY, BULK DENSITY OF MARBLE IS 2.65 T/CM

6.2 Mineable Reserves & Anticipated Life of the Mine

Mineable reserves are those reserves, which are left after deducting reserves blocked in benches and reserves blocked in barrier zone from total geological reserves.

Reserves blocked in barrier zone are calculated graphically. Area of barrier zone is calculated graphically and multiplied by the average thickness of marble, considered for reserves estimation i.e. 16m for proved (40% and 60% recovery) & 10m for probable (60% recovery), Recovery percentage of marble is considered 40% & 60%, therefore the bulk density of marble multiplies 40% & 60% recovery, obtained value from barrier zone area, and ore blocked in benches is calculated by graphical method. Area of each bench along the entire barrier zone area is calculated graphically, individual graphical area of each bench is multiplied by the bulk density of marble (2.65T/CC*) and the volume is obtained by 40% & 60%, of marble blocked in the benches. Ore blocked in benches and barrier zone is calculated upto depth of proved probable and category. Mineral blocked in benches is calculated by considering ultimate angle of slope of benches 45°. The details of mineable reserves are given below.

CATEGORY (IN M.T)	RESERVES IN M.T	BARRIER ZONE	BENCHES M.T	LEFT MINEABLE M.T
PROVED	365223	51755	109567	203901
PROBABLE	279045	36968	111618	130459
TOATL				334360

Total mineable reserves 334360M.T

GRADE

Rock of the area is fine grained, contains higher percentage of calcium, magnesia & silica which provided hardness and compactness therefore it is suitable for block mining.

MINE LIFE

Mine life estimated by taking mineable reserves of marble and maximum yearly production of marble is 18868 say 19000MT per year. $334360/19000= 18$ year.

The working of anticipated life of mine is on preliminary studies. After exploration as proposed in this mining plan, of bed ore deposit and dump ore deposit, the total reserves are likely to go up and life of mine will increase accordingly.

6.3 Mining Method

As the central part of the lease area is mineralized for the marble while the southern part is yet to explore for which the proposed exploration in the form of vertical core bore hole of 30m depth having 4" diameter in the south direction at coordinate E-210 S-275 which will done before end of the fifth year of the mining plan year.

SALIENT FEATURES OF THE MODE OF WORKING

The purpose mining of marble blocks will carry out using by making the holes by the LD-4 vertically and horizontally. Holes are matched for cutting purpose then diamond chain put in to holes for cutting of blocks. The blocks will sell from the mine site for further processing of slab cutting hired Truck / dumpers will use for transportation of blocks from mine site and will be continue to till mining activity.

Proposals and adoption of mining procedure will carry out mining efforts will be made to increase the production. Proposed mining will be carried out by open cast mechanized mining method. Separate benches will be made in soil and marble. Proposed production assumed to be for the first bench is 40% and for second bench it will be 60% of sizeable block. Soil and weathered rock will be removed using excavator with tipper combination will be dumped in the

northwest and southeast of the barrier zone which will be retained through the retaining wall. Soil and waste in the form of weathered rock fractured, jointed and unsized blocks up to 40-60% by volume will be generated during the proposed mining will dump year wise as per mentioned in the above table in northwest and southeast of the barren zone. During the development and production the proper shape of pit will be developed will reach to the RL 404m During the proposed mining site services, DG room and separate lavatory for male and female is already under construction with plantation of 20 trees per annum will be done along the eastern boundary of the area.

In the early phase mining for the development purpose the principle of mining is being adopted with LD4, Wire saw, excavator hydraulic bags are involved bags are involved which are broadly discussed below:

PRINCIPAL OF BLOCK MINING

1. **Wire saw:** - One selection of suitable block which has physical quality color, grain size polish behavior with the diamond tools and concern block should be without cracks and fractured.
2. The principle of block mining is to get three free faces known as the gali (along the strike) and toda (across the strike). The basic purpose to prepare the gali and toda is to get proper space for block cutting in L shape (combination of gali and toda) therefore the first gali then toda is developed with blasting parameter (if require) which localized for proper functioning of wire saw machine approximately 3-6 m space.
3. After getting the L shape vertical and horizontal hole required depth or height of the bench then making the thread alignment in the rectangular shape the holes are drilled with LD-4 portable DTH drill machine. After getting the bore hole drilled then

diamond wire saw machine to cut bottom with diamonds pearls followed by both vertical cuts making rock free from all the sides and now this block is pushed with help of pneumatic bags or water bags with hydraulic jack "Power jack" and cut down blocks are lifting two the surface by crane or pock land machine and waste material is keeping at the required place with the help of dumpers / tractor.

4. **Details of machinery:** The following machineries are deployed for the block mining of marble are as follows:

Excavator Machine L&T – Capacity – 1.9 Tonnes: One

J.C.B.: Two

Wire Saw of 4:- 20HP-1 & 40 HP - 3

LD4: - One

D.G. Set: - 62.5KVA

Compressor LPS 200 Model: One

Drill Machine J/H-3

Dumper: - Hired

Derrick Crane: One

6.4 Proposed Rate of Production

It will be about 19000 tonnes per year of saleable Marble for full year after complete development of the query.

6.5 Loading

Loading of Marble will be done by Crane to the trolley/trucks and will be sending to the end users. The overburden will be removed and stacked in a place in the surface. Subsequently it will be mechanically loaded to the tipper for onward dumping to the predetermined space in the lease boundary.

6.6 Hauling/Transport

The Marble will be transported to the sorting yards by means of tubs on tracks.

6.7 Mine Drainage

During the proposed five year mining, seepage of ground water will not affect the mining working because depth of ground water is about 20m-22mbgl (RL 397m-395m) and the proposed mining activity is up 13.5m (RL 404m) therefore ground water will not affect the mining work. During the lease period proposed mining activity is up to 26m (RL 391m) therefore ground water will be affect the mining work.

6.8 Solid Waste Management

The waste produced during mining operations consists of top soil & weathered (weathered, fractured jointed) from marble. During the proposed mining about 698m³ soil and 23617 m³ mine waste (weathered fractured jointed and etc) will be generate which will be placed in the north eastern and south-western part of the lease area respectively. During the fifth year to lease period about 126307cum mine waste will be generated which will be placed in the north of the lease area. Total 169132cum mine waste and top soil will be generated during lease period.

Year	Top Soil (cu m)	Development (Cum)	weathered (cu m)	Sub-grade mineral (tonnes)	Total waste in cum
1 st	NIL	4896	1958	Nil	1958
2 nd	405	14889	7364	Nil	7769
3 rd	NIL	13632	6931	Nil	6931
4 th	293	14777	7364	Nil	7657
Total	698	48194	23617	Nil	24315

6.8.1 Maximum Height & Spread of Dump:

As mentioned earlier the area was worked for Marble block. Since 6 dumps will be created during marble mining operations, so that 2.4240ha area requires for waste dumps & Top soil dumps.

Detail of weathered marble dump

Year	Quantity in cum	Length in m		Width in m		Height in m	Angle	Dump no.	Location
		Top	Bott.	Top	Bott				
2 nd	1958	45	60	8	11	3	35	MW2	SW
3 rd	7364	45	60	12.5	17	7	35	MW3	SW
4 th	6931	45	60	12.5	17	7	35	MW4	SW
5 th	7364	45	60	12.5	17	7	35	MW5	SW
Area covered by weathered marble dump 3720m ²									
6 th to lease period	126307	197	262	45	60	8	35		North
Area covered by waste dumps 15720m ²									

Detail of soil dump

Year	Quantity in cum	Length in m		Width in m		Height in m	Angle	Dump no.	Location
		Top	Bott.	Top	Bott				
6 th to lease period	18510	181	240	15	20	5	35		East
Area covered by soil dumps 4800m ²									

6.9 Resource Requirement

The present proposal is to carry out mining for Marble at Village Jujhawal, Tehsil Bahoriband, Dist Katni (MP) for efficient operation of the Query all necessary utilities will be made available, a brief description of the same is given below.

6.9.1 Storage facility

It is proposed to provide adequate storage facilities for the excavated mineral, explosives and waste dumps, which is generated/used during mining process. Proposed excavated minerals and waste dumps will be kept in the existing mining lease area.

6.9.2 Project Cost

Project	Estimated Cost in Lac of Rupees
Mining of Marble	Rs10.0 Lac

6.9.3 Electric System

The power requirement for the project has been met by M P State Electricity Board, which is available at village Jujhawal.

6.9.4 Water Supply

The total fresh water needs to be pumped is about 30KL per day for consumption of domestic and mining purpose. This quantity of water will be taken from the ground water. The details of water balance of existing /proposed mining project are given below:

WATER BALANCE OF MINING PROJECT

Process		Total
a) Mine Site		
Wire saw	20kl	20kl
Dust suppression	6kl	6kl
Green Belt	2kl	2kl
b) Domestic		
Drinking & Washing	2kl	2kl
Total (A + B)	30kl	30kl
Domestic waste water	1.2kl	1.2kl

7. EXISTING ENVIRONMENT SCENARIO

7.1 Climate

The climatic condition of this area is semi arid. The maximum temperature goes upto 48.2°C during summer in the month of May and the minimum temperature goes down to 4.0°C during winter in the month of January. The average annual rainfall is observed to be 1140-1900 mm. The winds in the area are light to moderate during summer and winter. However, the speed of the wind increases during the end of the summer season and monsoon season.

The brief discussion over the meteorological condition of the area is as below:

- **Temperature:** The winter season starts from December and continues till the end of February. January is the coolest month with the mean daily maximum temperature at 34°C and the mean daily minimum temperature at 12°C. Both the night and day temperatures increase rapidly during the onset of the pre-monsoon season from March to May. During pre-monsoon season, the mean maximum temperature (May) was observed to be 48.2°C with the mean minimum temperature (March) at 22°C. The mean maximum temperature in the monsoon season (Sep.) observed to be 34°C whereas the mean minimum temperature was observed to be 16°C. By the end of September with the onset of post-monsoon, the day temperatures increase slightly, with the mean maximum temperature at 26°C and the mean minimum temperature at 12°C.
- **Relative Humidity:** The air is generally humid in this region during the monsoon when the average relative humidity at 0830 hr. was observed to be with a maximum of 100% and a minimum of 52%. Similarly, at 1730 hr., the average value was observed to be with a maximum of 94% and a minimum of 60%. Generally, the weather during Post monsoon seasons was observed to be with a maximum of 90% and a minimum of 15%.
- **Rainfall:** Monsoon in the area comes from southwesterly winds. The average annual rainfall based on the last 10-year IMD data, was observed to be 1140-1900 mm. The monsoon sets in the month of June and continues till mid observed in the evenings, with clear mornings. During the monsoon season, both in the mornings and evenings, the skies were found to be clouded.
- **Cloud:** 30 years average data reveal that maximum cloud cover was observed around 7.0 oktas in the month of July, August.

Whereas cloud cover was observed around 2.2 (in oktas) in the month of November, December, January, February and March.

• **Wind Pattern**

Generally light to moderate winds prevails throughout the year. Winds were light and moderate particularly during the morning hours. While during the afternoon hours the winds were stronger. A review of the wind rose diagram shows that predominant winds are mostly from S, SSE, NW, WNW, W and N directions followed by W direction.

• **Wind Patterns during study period**

The predominant directions of wind were observed from NW; WNW & W.

7.2 AIR QUALITY

To establish the ambient air quality, sampling and testing were conducted. Air sampling stations were established at eight (8) locations around the proposed mining area to assess the background air pollution levels.

COMPARISON OF AIR SAMPLING RESULTS WITH CPCB NORMS

	A1	A2	A3	A4	A5	A6	A7	A8	CPCB Norms	
									Indl. & Mixed used area	Residential & Rural Area
15th March to 14th June 2008										
SPM Concentration										
Average	144.66	152.91	131.91	135.66	126.83	192.91	155	156.12	500	200
Maximum	168	178	154	160	160	250	177	178		
Minimum	120	128	102	116	80	134	108	134		
RPM Concentration										
Average	70.75	66.75	46.75	7675	43.45	92.87	65.29	65.33	150	100
Maximum	92	86	66	94	62	130	89	84		
Minimum	50	44	30	54	22	42	42	48		
SO2 Concentration										
Average	8.74	6.96	5.64	14.82	5.78	13.625	10.4	10.4	120	80
Maximum	9.6	8.2	6.45	17.9	6.98	16.4	12.8	12.8		
Minimum	7.2	5.65	4.7	9.6	4.67	10.4	8.2	8.2		

NOX Concentration										
Average	10.46	9.39	6.53	17.73	8.29	16.62	13.0	13.0	120	80
Maximum	11.6	10.92	7.12	19.8	10.75	18.9	16.2	16.2		
Minimum	9.6	8.07	5.98	15.2	7.06	13.3	10.2	10.2		

7.3 NOISE LEVEL

Ambient noise levels were measured at different locations (same as ambient air monitoring locations for two days on hourly basis) to establish present scenario which shall be described as follows.

- All the values are well within the norms prescribed by CPCB for industrial and commercial area.
- Main source of noise are traffic movements.

7.4 WATER QUALITY

Surface Water

The Surface water bodies in the study area mainly Katni Nadi, Sarur Nadi, Canal, Behar Nadi, Silpuri Nadi & Bahoriband Tank located NE, NW, W, NE, SE & NW direction at about 3km, 8km, 7.5km, 8km, 9km & 10km respectably from mine. The water from Katni Nadi, Behar Nadi, Silpuri Nadi & Sarur Nadi is used for domestic as well as drinking purpose. The water from canal & Bahoriband Tank is used for irrigation purpose. In addition, most of the water bodies are dry during the summer months excluding those water bodies (worked out quarries), which are situated in the study area. These water bodies are filled with rainwater and seepage/discharge water from abandoned mine works.

The data conform to the water quality standards for most of the parameters. The dissolved oxygen levels range between 4.2 to 4.8 mg/l, Total Hardness ranges from 510 to 660 mg/l; BOD levels are as low as 6.8 to 10.7 mg/l. The heavy metal content has been observed within the limit. The analysis of the sample indicates that the organic pollution of River is insignificant. The physico-chemical and biological

analysis revealed that all the parameters are well within the prescribed limits of IS: 2296.

Ground Water

Water supply in the most of the villages depends on ground water resources. Well water is used for domestic as well as irrigation purposes. Ground Water quality analysis was carried out at 5 locations and the frequency of sampling was once /month/station. Ground water samples were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on ground water. The samples were collected and analysed as per the procedures specified in "standard Methods for the examination of water & Wastewater" published by American Public Health association (APHA). pH in ground water sample was observed to be in the range 7.3 to 7.6 while conductivity was observed in the range of 1030-1110 umhos/cm. The value of alkalinity and hardness were observed in the range of 178 – 222mg/l and 210 to 280 mg/l respectively. Whereas heavy metal was found to be within the limit.

The physico-chemical and biological analysis revealed that all the parameters were well within the prescribed limits of IS: 10500.

7.5 SOIL QUALITY

Five locations within 10 km radius of the project site were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface and homogenized. The homogenized samples were analyzed for physical and chemical characteristics. For general characterisation of soil a few random samples from the study area to the depth of about 15 cm were collected. Soil samples so collected were brought to the laboratory for analysis.

It has been observed that the texture of the soil was observed to be clay. The organic carbon was found to be in the range of 2.2% to 2.8% The nitrogen and phosphorus were observed to be in the ranges of 478 to 568Kg/ha and 32 to 46kg/ha respectively the pH range at the soil vary in between 5.82 to 6.32. The soil has high percentage of iron, zinc and chloride.

7.6 **Biological Environment**

Flora

(i) Forest

Three vegetation types are found in the buffer zone (i.e. within the 10 Km radius of mining project), moist deciduous forest, dry deciduous forest and grassland. The forest cover in buffer zone is reported in the range of 11.98%. The moist deciduous forest type is dominated by Sal or Sarai (*Shorea robusta*). This dipterocarp is commonly associated with *Terminalia* sp., *syzygium cumnil* and *largerstromia parviflora*. The forest floor in the valley bottom is commonly vegetated with *Fleminga* spp. However, on the lower slopes *Dendrocalamus strictus* becomes the dominant undergrowth. The dry deciduous forest with discontinuous canopy, but has many more species common species are *Anogeissus latifolia*, *Terminalia* spp. *Gamelina* sp. *Gardenia latifolia*, *sterculia uresna* and *Bauhinia retusa*. The understory is generally bamboo on the slopes and grass with shrubs on the flat ground.

The forest trees are in healthy appearance and showed no stress symptoms. The forest floor showed significant organic matter accumulation in the soil, due to which seed, germination and establishment of saplings are in healthy state. Trees are planted in

garden and along roadside as avenue and roadside plantation, respectively.

(ii) Grassland:

Grassland of the region is secondary in origin and has originated due to frost, fire and ungulate browsing. However, some browsing and frost resistant trees such as *Butea monspersma*, *Cassia fistula*, *Diospyros Melanoxylon* and *Zizyphus jujube* have encroached the grass land especially at the edge of the forest. The large trees which dot the grassland such as *shorea robusta*, *erminalia spp.*, *Ficus spp.* And *Madhuca indica* is probably relicts of the original vegetation or their descendents.

(iii) Agriculture

The predominant crops grown here are Soyabeen, Rice, Wheat, Tuar etc.

AGRICULTURAL CROPS

Family name	Botanical name	Local name
Malvaceae	<i>Abelmoschus esculentus</i>	Bhendi
Fabaceae	<i>Cajanus cajan</i>	Tur
Solanaceae	<i>Capsicum annum</i>	Merchi
Chenopodiaceae	<i>Chemopodium album</i>	
Fabaceae	<i>Cicer arieantum</i>	Chena
Cucurbiataceae	<i>Coccinia indica</i>	Kundru
Cucurbiataceae	<i>Cucumis sativus</i>	Kakidi
Fabaceae	<i>Dolichus lablab</i>	Wahl
Cucurbiataceae	<i>Lagenaria siceraria</i>	Kaddu
Cucurbiataceae	<i>Momordica choranta</i>	Kerala

Fauna:

The climate, rainfall and vegetation type contribute to decide the type of faunal community in the area. In the region the flat hilltops, varying

degree of slopes and Rolling Meadows in the valley create diverse type of habitats and form ideal niches for varied forms of animals.

LIST OF FLORA & FAUNA OF THE STUDY AREA

NATURALLY OCCURRING SPECIES	
Kohu (<i>Terminalia arjuna</i>)	Karanji (<i>Pongamia pinnata</i>)
Sisham (<i>Dalbergia sissoo</i>)	Babul (<i>Acacia arabica</i>)
Neem (<i>Azadirachta indica</i>)	Kachnar (<i>Bauhinia variegata</i>)
Akasneem (<i>Millingtonia hertonsia</i>)	Bargad (<i>Ficus bengalensis</i>)
Gular (<i>Ficus glomerata</i>)	Jamun (<i>Syzygium cumini</i>)
Aam (<i>Mangifera indica</i>)	Palas (<i>Butea monosperma</i>)
Mahua (<i>Madhuca latifolia</i>)	Ber (<i>Zizyphus mauritiana</i>)
Bel (<i>Aegle marmelos</i>)	Saj (<i>Terminalia tomentosa</i>)
Kanker (<i>Flacorita indica</i>)	Tendu (<i>Diospyros melanoxyton</i>)
	Reunjha (<i>Acacia leucophloea</i>)
CULTIVATED TREES GROWING IN THE VILLAGES	
Bargad (<i>Ficus bengalensis</i>)	Gular (<i>Ficus glomerata</i>)
Pipal (<i>Ficus religiosa</i>)	Imli (<i>Tamarindus indica</i>)
Aam (<i>Mangifera indica</i>)	Jamun (<i>Syzygium cumini</i>)
Munga (<i>Moringa olderfera</i>)	Ber (<i>Zizyphus mauritiana</i>)
Bel (<i>Aegle marmelos</i>)	Lasora (<i>Cordia dichotoma</i>)
Neem (<i>Azadirachta indica</i>)	Mahua (<i>Madhuca latifolia</i>)
Sitaphal (<i>Anona squamosa</i>)	
LIST OF FAUNA OF THE STUDY AREA	
Bengal Monkey (<i>Macacus rhesus</i>)	Jungle cat (<i>Felischaus</i>)
Mongoose (<i>Herpestes mingo</i>)	Sambhar (<i>Crevus unicolor</i>)
Kalmuha monkey (<i>Semnapthecus on lellccs</i>)	Common hawcuckoo (<i>Cuculus micropterces</i>)
House sparrow (<i>Passer domesticus</i>)	House crow (<i>carvus splendens</i>)
Common maina (<i>Acrido tehras tristis</i>)	

7.7 LAND USE PATTERN

Present land use pattern of the 7.09 hectares mining lease area is as given below:

Land Use Pattern of Mining Lease Area

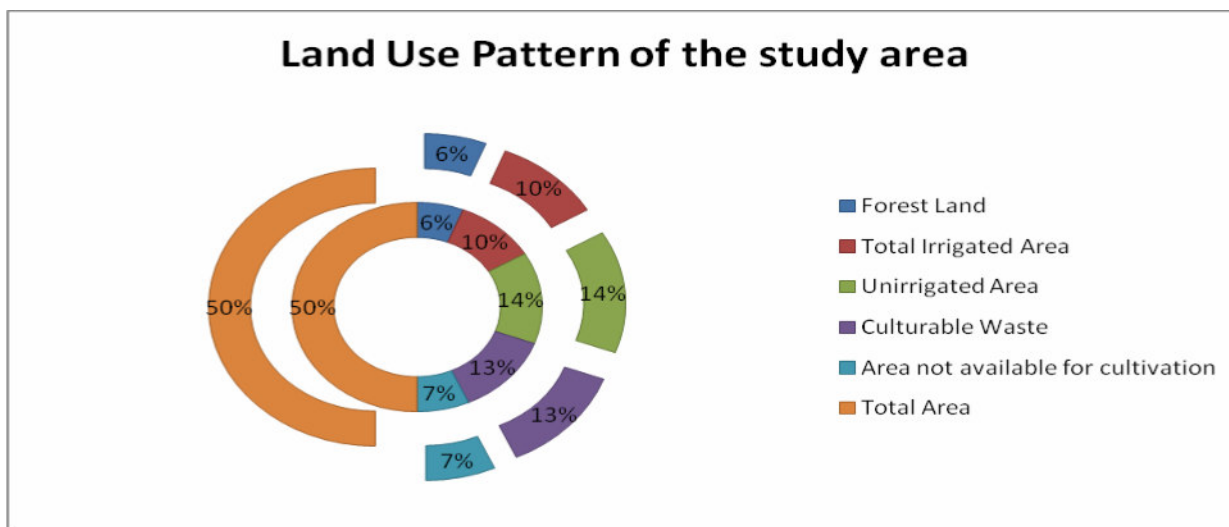
Items	Existing	At the end of mine life
Total lease area	7.09ha	
Total Mineable area	1.755ha	Nil
Geological Reserve	558090.00 tonnes	Nil
Ultimate depth of mining	2-10m	26
Ultimate pit slope	30	30
Area under dumps	0.646ha	2.424 ha
Area under pits	0.744ha	1.755ha
Overburden quantity	26936cum	150622cum
Area to be reclaimed	Nil	Nil
Infrastructure & Road	0.045	0.045
Mineral storage	Nil	Nil
Plantation	0.02ha	2.0ha

The study area covers about 14712 ha. For computation of the land use pattern in the study area based on the village-wise land-use data given in the census records, the geographical area of all settlements covered within the study area, though many villages in the peripheries of the circular study area are partially covered. Perfect delineation and quantification of land uses for the partially covered parts of villages of the study area is not possible, hence the entire village area is considered for the study, irrespective of its coverage within the village boundary.

The land use is classified into four types – viz. forests, area under cultivation, culturable waste and the area not available for cultivation. The land under cultivation is further sub-divided into two types viz. irrigated and un-irrigated.

Land-use Pattern in the Study Area

S. N.	Particulars	Study Area (ha)	Percentage Coverage
1.	Forest Land	1762	11.97661773
2.	Land under Cultivation		
	a) Irrigated Land	3089	20.99646547
	b) Un irrigated Land	4176	28.38499184
3.	Culturable Waste Land	3696	25.1223491
4.	Area not available for cultivation	1989	13.51957586
	Total Area	14712	100



7.8 SOCIO-ECONOMIC CONDITIONS

The study area comprises of total 34 Villages. These villages fall under one tehsil – Bahoriband. The demographic details have been abstracted from Primary Census Abstract- 2001(CD) of Madhya Pradesh obtained from Office of Registrar General India, New Delhi.

The salient features of the study area are as follows:

- Total population of the villages in the study area is 34126
- The total no of household in the study area is 7245
- Sex ratio (no. of females per 1000 males) is 946
- The literacy rate in the study area is 64.2%
- The percentage of scheduled tribe in the study area is 23.56% while only 9.72% population is of scheduled caste
- Out of total population maximum people are workers i.e. 55.22% Followed by main workers 49% and marginal workers 51%.

ESTIMATED BASIC STATISTICS OF THE STUDY AREA

1. Households	7245
2. Population	34126
Male	17532
Female	16594
3. Schedule Tribe	8039
4. Schedule Cast	3317
5. Literacy Rate	64.2%
6. Occupational Pattern:	
(A) Main workers (% of total population)	49%
i) Cultivators (% of main worker)	46.66%
ii) Agricultural Labors (% of main worker)	38.35%
iii) Other Workers (% of main worker)	15.99%
(B) Marginal Workers (% of total population)	51%

8. IMPACT ASSESSMENT

Mining activities is bound to have an adverse impact on existent environment. An understanding of the nature and extent of various impacts is essential in devising the methods and advance planning to

mitigate the impacts and ultimately restore the land to useful conditions.

9. IMPACT EVALUATION

An attempt has been made to evaluate the impact of project in terms of both quality and quantity by using modified matrix method for crucial environmental parameters. The environmental impact evaluation of possible effects as a result of proposed mining area is primarily based on study of objectives, process, surrounding environment etc. The aspects such as water, air, land and related issues have been assessed on the basis of mining operations for similar activity. The environmental impacts identify the possible relationship of proposed mining operations with respect to environmental parameters. Their relationship can be beneficial or adverse and can be further classified as short term, long term, reversible, irreversible, local or regional. The evaluation of the impact of proposed activity are presented in Table below

Parameters	Weight PIU	Baseline EIU (a)	Without EMP EIU (b)	With EMP EIU (c)	Change EIU (c-b)	Change EIU (c-a)
Biological Environment	300	205	194	206	12	+1
Environmental Pollution	450	344	315	344	29	0
Aesthetic	100	77	63	75	12	-2
Human Interest	150	119	111	129	18	+ 10
Grand Total	1000	745	683	754	71	+9

10. ENVIRONMENT MANAGEMENT PLAN

10.1 Reclamation of Land

No reclamation will be done during lease period because depth wise mineral will be anticipated. Since further exploration is proposed to completely delineate ore bearing areas within the leasehold, complete reclamation programme cannot be given at this juncture but waste will be spread in worked out areas to the maximum extent possible.

Proposed mining is being carried out by open cast manual method in the mining lease area. It is a working query and production is concentrated in central part of the query lease area. The area proposed to be excavated in at the end of lease period is about 1.7550 Ha. Presently the area covered by pits and queries is 0.744 ha. While, the Area covered by the top soil and waste dumps are about 0.646ha. Considering the rate of production, it has been estimated that almost 492 cum of overburden will be generated average on monthly basis. The waste produced during mining operations consists of top soil & weathered (weathered, fractured jointed) from marble. During the proposed mining about 698m³ soil and 23617 m³ mine waste (weathered fractured jointed and etc) will be generate which will be placed in the north eastern and south-western part of the lease area respectively. During the fifth year to lease period about 126307cum mine waste will be generated which will be placed in the north of the lease area. Total 169132cum mine waste and top soil will be generated during lease period.

The top soil is removed by excavator and transported by manual to the temporary dumping yard of soil in the near by proved non-mineralised area. The soil dumps are kept for not more then six months to

preserve its fertility. After proper levelling to backfilled area by dozer the soil spared over the backfilled area for plantation purpose.

The year wise generation of OB and mine waste as given in following table:

Year	Top Soil (cu m)	Development (Cum)	weathered (cu m)	Sub-grade mineral (tonnes)	Total waste in cum
1 st year	NIL	4896	1958	Nil	1958
2 nd	405	14889	7364	Nil	7769
3 rd	NIL	13632	6931	Nil	6931
4 th	293	14777	7364	Nil	7657
Total	698	48194	23617	Nil	24315

- (1) Area to be covered by dumps - 2.424ha
- (2) Area to be reclaimed - Nil
- (3) Area to be rehabilitated by way of afforestation - 2.0Ha

10.2 Green Belt Development

The massive afforestation planned for the project shall generate a forest having greater tree density (about 10 trees for first five year per 90m²). The proposed extensive will enhance the vegetation quality as well as aesthetic quality of the area. Thus there is no adverse impact is envisaged over biological environment due to proposed mining activity.

In initial stage the green belt will be developed in following manner.

S. No.	Year	Afforestation in Ha	Plantation in No.
1	1 st	0.0180	20
2	2 nd	0.0180	20
3	3 rd	0.0180	20
4	4 th	0.0180	20
5	5 th	0.0180	20
Total		0.09	100

During the course of mine and after mining the proposed plantation is at the rate of 2000 saplings per hectare, except for reclamation mine areas,

for which the density is 1500 saplings per hectare. The proposed green cover including greenbelt is 0.02 ha. The total number of saplings to be planted during the entire life of mine shall be 3200no. Considering the estimated cost of planting and maintaining a sapling for one year as about Rs.1000/-, the afforestation plan for the ML area is given in Table.

Table
Afforestation Plan for the ML Area

Interval of Mining Operation	Reclaimed Mine Pit Area		Afforestation other than Reclaimed Area	
	Area (ha)	No. of Saplings	Area (ha)	No. of Saplings
1 to 5 years	-	-	0.09	100
5 to 10 years	-	-	0.2	200
10 to the end of the mine			1.71	2900
Total	-	-	2.0	3200

The plantation will be done during rainy season July to September every year. The plantation will be done on dumps, around ultimate pit limits, in quarry and open area etc. Following precautions shall be taken for survival and protection of plantation: Plantation shall be done during rainy season;

- Inter-cultural operations like weeding, soil turning basin making.
- Watering to the plants with regular interval till well developed;
- Organic and inorganic fertilizers shall be put for proper development of plants;
- Spraying of insecticides, pesticides and growth regulators for disease free growth of plants;
- Pruning and trimming of plants shall be done at regular interval;

- Barbed wire fences shall be provided around plantation and any fences damaged by miscreants and cattle shall be repaired frequently to prevent the animal nuisance; and
- Watchmen shall be employed to prevent the cutting of trees by outsiders and also control of public movement through planted area.

10.3 Measures to Improve Socio-Economic Conditions

The impacts of the project would be felt in an integrated manner on the socio-economic environment in the study area. There is no village in core zone and further no displacement is required for the proposed project and therefore impact will be positive side rather negative. The impacts on the different components viz employment, housing, educational, and medical and transport facilities, fuel availability, economics, status, health agriculture is not significant because size of project is very small. However, it would definitely increase the employment opportunity (primary as well as secondary) in the project area. Some of these impacts would be beneficial.

- The project will have a strong positive employment and income effect, both direct as well as indirect.
- Migrant-Non migrant ratio shall shift towards migrant side. This will happen because of (i) better employment opportunities due to this project and (ii) relatively low agricultural yield through traditional agricultural practice with monocrops.
- The project shall speed up the growing view on importance of education among people in study area.
- The project is going to bring about changes in the pattern of demand from food to non-food items if sufficient income is generated.

- The project is not going to influence the existing traditional agricultural situation significantly. It may help to improve agricultural production by way of providing additional income to the farms from supplementary sources.
- People perceive that the project will bring handful gains by way of creating significant job opportunities along with development of social infrastructure.

10.4 Air Pollution Control Measures

Following measures shall be taken to mitigate the effect of mining operation over ambient air environment:

1. Regular spraying of water by water sprinkling system over haulage roads.
2. To reduce dust generation during loading operation water shall be sprayed over the muck pile to the loaded;
3. To reduce dust generation during plying of dumpers on the haul road. Water sprinkling is done at frequent intervals. Water sprinklers shall be installed at the mine haulage road;
4. To reduce spread of dust, plantation along the mining lease boundary and plantation shall be also done along haul roads.
5. Periodic maintenance of haulage roads.
6. All over burden dumps shall be stabilized with legumes and grass to prevent the erosion of soil and arrest the dust emission during windy days.

In addition to the above following additional mitigation measures shall be adopted and it is expected to continue in future also:

1. Dust due to drilling shall be minimised by using wet drilling method like water injection system.

2. Dust mask shall be provided to all workers working in dusty atmosphere.
3. Tree Saplings shall be planted at the periphery of mining lease
4. Regular maintenance of vehicles and machinery's shall be carried out in order to control emissions;
5. A good house keeping and proper maintenance shall be practiced which will help in controlling pollution.

10.5 Noise Pollution Control Measures

The main sources of noise in mining activity are drilling, blasting, material handling machinery, loading equipment, etc. Following mitigation measures should be taken to control noise pollution:

1. Wherever the noise levels exceed 85 dBA, workers should be provided with earmuffs, ear plugs etc.
2. Hydraulic drills shall be used for drilling;
3. All moving parts of machine shall be properly lubricated;
4. Non-moving parts of machine shall be properly fastened;
5. A barrier of overburden at mine boundaries shall be made and three rows of trees are proposed to be planted to reduce propagation of noise;
6. Noise barriers, silencers and enclosures shall be incorporated for equipments, which emit high noise levels.
7. All the basic equipments and various machinery shall be kept well maintained.
8. Thick green belt around the mining pit and along the haulage roads.
9. As far as possible heavy and noisy workers shall be avoided during nighttime.

10.6 Water Pollution Control measures

Following measures have been taken to avoid accumulation of water:

1. Pump having required capacity shall be installed to lift accumulated rain water from working pit.
2. There shall not be no over flow on wash off from dumps nor is there any beneficiation plant. Only rainwater is pumped out of the mine;
3. There is no toxic constituent in water and soil so water collected in sump is free from any toxic substances.
4. A silt-settling tank shall be constructed in northern barrier zone area to settle heavy particle before discharging water into drain.
5. Quality of water accumulated in the working pit may be checked during monsoon.
6. It shall be ensured that silt content in the mines discharged is minimum.
7. It shall be ensured that quality of drinking water for the worker is hygienic and good sanitation system is available.

11.0 Conclusion

The Marble mining project of Shri Yogesh kumar Paliwal, village – Jujhawal, Tehsil Barhoriband, Katni District (MP) will be environmental compatible to the surrounding due to the high standards of pollution control measures to be adopted during the operation activity. Thus it can be safely stated that the mining activities will not have any adverse effect on the surroundings, if the proper environmental management plan is adopted.