

## 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				
SL. No.	Minerals	Unit	Total Resources as per UNFC, 1.4.2005	Life Index* (Years)
1.	Bauxite	Tonnes	3289817	204
2.	Copper	Tonnes	Ore : 1394426 Metal: 11417.72	220**
3.	Lead & Zinc	Tonnes	Ore : 522580 Lead Metal: 7207.25 Zinc Metal: 24259.68 Lead & Zinc Metal: 118.45	82**
4.	Gold	Tonnes	Ore (Primary) 90289237 Metal(Primary) 491.12 Ore (Placer) 6121000 Metal(Placer) 5.86	240**
5.	Iron Ore	Tonnes	Haematite 14630388 Magnetite 10619481	104
6	Chromite	Tonnes	213063	47
7.	Magnesite	Tonnes	337882	603
8.	Manganese Ore	Tonnes	378569	113
9.	Lime Stone	Tonnes	175328914	364
10	Rock Phosphate	Tonnes	305308576	94
11	Sillimanite	Tonnes	74339869	Very large

12	Garnet	Tonnes	57655633	61
13	Kyanite	Tonnes	102613223	Very large
14.	Dolomite	Tonnes	7533108	522
15	Diamond	Carats	4581913	41

The State is enriched with steel grade, refractory grade and low silica dolomite. 1152.66 million tonnes of dolomite deposits are spread over in the districts of Balaghat, Chhatarpur, Sagar, Mandla, Jabalpur, Katni, Sidhi, Narshinghpur, Seoni, Jhabua, Alirajpur, Khandwa and Dewas.

Presently Dolomite Mining project is located at village – Panwani, Tahsil Alirajpur; Alirajpur District (MP). 8.093 Ha mining lease area is being operated by the lessee M/s Laxminarayan Mining Co., Alirajpur having office at 213, Pratapganj Marg, Alirajpur and Dist. Alirajpur & lessee is private individual. The mining activity in the lease area has been under worked. For Dolomite, fresh lease grant to M/s Laxminarayan Mining Co. for period of 10year from 05.07.2000 to 04.07.2010.

In order to assess the likely impacts on environment due to ongoing mining activity and to have a tool of environment management, M/s Laxminarayan Mining Co. has submitted the Rapid Environment Impact Assessment study report for mining project.

## 2. LOCATION

8.093Ha of Dolomite Mining lease area is located in village –Panwani Taluka & Dist. Alirajpur (M.P.). Presently land use of the area is Govt. Waste revenue land. The mining lease was sanctioned under proposed for Dolomite.

District/ State	Taluka	Village	Khasara No	Area
Alirajpur (MP)	Alirajpur	Panwani	51/1	8.093 Ha

## 3. ENVIRONMENTAL SETTING

The area for which mining lease is being granted is an undulating terrain. It comprises of moderate sloping high ridges, small mounds and surrounded by agricultural lands. The mounds are stretching east to west and general slope of the area is due north. The area also comprises of moderately sloping high ridges. The mining lease area of the dolomite at Panwani village in Alirajpur area is located between latitude 22°22': 22°25'

and longitude 74°25': 74°30' and marked in Toposheet no. 46 J/7. The general height of the area is around 343m.

#### Details of Project Settings

S. No.	Particulars	Details
1	Latitude	22°22': 22°25'N
2	Longitude	74°25': 74°30' E
3	Height above mean sea level	343AMSL
4	Nearest City	Alirajpur about 11 km
5	Nearest Railway Station	-
6	Nearest Airport	Indore located at about 250 km from the mines by road.
7	Nearest Highway	Alirajpur- Dahod State highway
8	Nearest Village	Ghatwani - 1.0 km
9	Hills/Valley	No
10	Ecological Sensitive Zone	No national parks and sanctuary
11	Reserve Forest	Kotbu RF- 3.0km - ES Kathiwara RF - 4.5km - NW Kathiwara PF - 3.5km - NW
12	Historical Place	No
13	Nearest River/ Nalla	Hatni Nadi - NE - 6.0km Sukar Nadi - NW- 3.0km Orsang River- NW- 10.0 km Sukta Nadi- SW- 10km Nahkinand Nalla- E- 2km
14	Annual Climatic Conditions	Max. Temperature - 43°C Min <sup>m</sup> Temperature - 11.0 °C Average Rainfall-96-1740 mm

#### 4. TRANSPORT

The proposed lease area is accessible by tar road from tehsil headquarter Alirajpur upto Panwani (11km) on Alirajpur - Dahod state highway and from there is a diversion fair weather road upto Panwani village. The distance of the mine site from the diversion is 1km. From this diversion an all weather road started which goes through Village - Panwani and it passes through several villages. Panwani village is located on 2 kilometer on this road. The mine site is located at a distance of 1.0 km on the southern outskirts of the Ghatwani village and connected through a kutcha road at present.

#### 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**

The area for which mining lease is being granted is an undulating terrain. It comprises of moderate sloping high ridges, small mounds and surrounded by agricultural lands. Almost on the entire area there are outcrops of dolomite. Only at some places there is a soil cover of only about 0.3 meter to 0.8m thickness. Even the upper most layer of dolomite is saleable. The minerals of crystalline type and whitish to buff white in colour.

**Clay:** Clay is brown in color and is formed due to decomposition of Intrusive Granite. It is found to occur as a thin layer. The average thickness of Clay is considered to be about 0.3m to 0.8m. There is no top soil in the area.

**Dolomite:** The area is full of out crops, exposures of Dolomite. It is medium to coarse grain to crystalline. The formation maintains strike to NW-SE with dip 35 to 45 degree towards North-East.

### **6.1 RESERVES**

The Insitu Reserve has been calculated by cross section method. In this method the cross section area of ore body has been multiplied by the distance between two consecutive sections to calculate has been multiplied by B. D. to calculate the Instiu Reserve. There are few working pits where dolomite has been exposed 3m to 6m and it is continuing beyond that depth also. Dolomite has been exposed in the working pits are around 6m (max). It is observed from the existing working pits as well

as from the surrounding that dolomite has been exposed in the area around 6m and thickness of dolomite deposit is considered 6m for estimation of geological reserve.

Following points are considered while estimating geological reserves.

- (i) The area is in mound shape and in the form of plateau and the whole area is considered mineralised and considered a single block. The area has been calculated by adopting graphical method and estimation of reserve of dolomite has been made
- (ii) The working limits are considered within 7.5m of the boundary.

The average thickness of the dolomite bed is considered upto 10m for estimation of geological reserves. Specific gravity of dolomite is considered 2.5t/cum

#### **Grade**

The Dolomite of the applied is area is mainly of medium grade and the R.O.M. is mainly low silica and low Iron metal grade. The face sample when chemically examined gave the following results.

Chemical Composition	Sample %
LOI	45.2
SiO <sub>3</sub>	2.22
Al <sub>2</sub> O <sub>3</sub>	0.55
Fe <sub>2</sub> O <sub>3</sub>	0.28
R2O3	2
MgO	20.37
CaO	30.85

#### **Geological Reserve**

In the proposed lease area prospecting operation has been carried out by putting trial pits and dolomite has been encountered in the trial pits. Dolomite has been proved upto 10m thickness in the working pits and it is continuing below also. The area has been divided into one block and calculating the reserves for whole area and subsequently summing up the total. The thickness of dolomite bed for estimating geological reserve is considered 10m.

Block	Thickness(m)	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )	Reserve (tonnes)
A	10	80930	809300	2023250
<i>Total Reserve</i>			<i>2023250T</i>	

The above mentioned geological reserve has been estimated while considering the area is virgin. But actual practice mining activities has been carried out in the area and dolomite has been mined out. So, actual geological reserve will be available after deducting the dolomite which has been mined out since opening. This has been estimated by measuring the excavated area and find out the volume and reserve. The dolomite mined out in the area since opening is estimated to be around 52750t. so, available estimated geological reserve is 1970500T. In the approved mining plan, geological reserves in proved, probable & possible reserves category were workout for dolomite as below:

#### **Dolomite reserves as per Mining plan**

<b>Category</b>	<b>Thickness(m)</b>	<b>Area (m<sup>2</sup>)</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Reserve (tonnes)</b>
Proved	06	73964	443784	1109460
	02	6966	13932	34830
	<b>Total</b>			<b>1144290</b>
Probable	2	73964	147928	369820
	2	6966	13932	34830
	<b>Total</b>			<b>404650</b>
Possible	2	73964	147928	369820
	2	6966	13932	34830
	<b>Total</b>			<b>404650</b>
<b>Total</b>				<b>1953590</b>

S.G = 2.5cum/T

#### **6.2 Recoverable Reserve:-**

It has been that assumed ore recovery of 90% while estimation of ore reserve in the mining plan is not matching with actual recovery during mining operation. Also recovery widely varies from place to place due to erratic, bouldery and heterogeneous nature of central Indian dolomite Plateau. Therefore, it is essential to carry out detailed exploration for better assessment of average ore recovery and subsequently reserve with quality of the deposit. For better assessment of dolomite quality, various trial pits were made in various locations of the mine and chemical analysis

indicates that dolomite is of chemical and suitable for pesticides, ceramic & detergent manufacturing.

### Life of the mine

The balance reserve of Dolomite at Panwani dolomite Mine stands at 656208 tones. Therefore, life of the mine will be 656208 Tonnes/4000 Tonnes = 164.05 years or say 164 years. Where 4000 tones of recoverable Dolomite is considered as production per annum.

### 6.3 Salient Feature of the mine

The general details of the mining lease area are given below:

S. No.	Particulars	Details
1	Type of Mine	Open Cast
2	Mining Lease Area	8.093Ha
3.	Mineable Area	8.093 Ha
4.	Existing Pits & Quarries	0.7540Ha
5.	Existing Dumps	0.1050ha
6.	Infrastructure and road	0.2190ha
7.	Mineral Storage	Nil
8.	Plantation	0.1155ha
9.	Barren Land	6.8995Ha
10.	Geological Reserve	1144290 tonnes
11.	Recoverable Reserve	656208.00tonnes
12.	Method of mining	Manual
13.	Ultimate Depth of Mining	7m up to 336mRL
14.	Ultimate Pit Slope	45°
15.	Present capacity of mines	4000 tonnes per annum
16.	Expected Life of Mines	164years
17.	Lease Period	10 year
18	Thickness of top soil/OB	
	Minimum	0.3 m
	Maximum	0.8 m
	Average	0.55 m
19	Stripping Ratio	1:0.1
20	Existing mode to transportation of Dolomite	Road
21	Area to be covered under dumps	0.2410ha
22	Area covered under pit	0.9326Ha
23	Area to be reclaimed by lease period end	Nil
24	Area to be covered under plantation by lease period end	0.2155ha
25	Average mRL	343AMSL
28	Ground water table	
29	Monsoon period	10m bgl (333mRL)

	Dry month	20m bgl (323mRL)
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#### 6.4 Mining Method

As per local geology, the area for which mining lease is being granted is an undulating terrain. Almost on the entire area there are outcrops of dolomite. Only at some places there is a soil cover of only about 0.3m - 0.8m thickness. Even the upper most layer of dolomite is saleable. Thus as per the criteria of the mining method, opencast mining method has been adopted and same will be continue in future in Panwani Mine The mining operations will be mainly carried out by manual means.

##### (a) Present mining method:

Present mining operation has been carried out by manual method of mining using hand tools such as spades, hammer, crowbar, chisel etc. loading of mineral in to truck/ dumper will be done manually by head load using can basket and tasla etc.

The mining operation has been mainly carried out by manual means. The removal of waste material as clay material and these dumps will be keeps in mining limit barrier zone of the applied area. The mineral will be loading to the trucks and tractors will be done manually. During the five year haulage road will be developed at the gradient of 1:16. Whenever the hard formation will come then occasional blasting may in use.

##### (i) Already carried out in the area:-

There are six pits (five old pits and one working pit) in the area. Details of pits excavated within the applied area are given as follows;

PIT NO.	SIZE M.		
	Length	Width	Depth
Old PIT 1	62	20	2
Old PIT 2	30	15	3
Old PIT 3	60	23	3
Old PIT 4	68	22	3
Old PIT 5	50	25	4

Working pit 1	46	25	4
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**(ii) Future Planning:-**

Presently the working pit no. 1 is working for the production. In future also working done in same pit.

**6.5 Development / production: -**

As the mining Scheme period started from 2005 to 2010 therefore the proposed working is given for year i.e. 2005-2010 and the mining method will be the same as proposed as one development/production bench of 1.5m thus during the plan period total depth will be 10m (average). The working face will be having slope of 45 degree.

Soil and mine waste will be place in the eastern part of the lease area. During the five year plantation will be done in northeastern part (barrier zone) of the lease area. During the first five year separate lavatory for male and female will be constructed in east barrier zone area. Advance of benches will not be less then height of benches, slope of benches will be 45°.

Mining is proposed to be done by manual method by forming single bench. During first five years a total of one bench in dolomite will have to be formed (there is no overburden except a few centimeters of top soil). The face will advance in all directions.

On the basis of estimation of development during first five years or Mining plan period, the following is worked out:

The figures are rounded of the nearest zero.

**Year wise development for the first five years**

Year	Top Soil (cu m)	Overburden (cu m)	Sub-grade mineral (tonnes)	Total waste in cum
1 <sup>st</sup> year	NIL	225	Nil	225
2 <sup>nd</sup>	Nil	225	Nil	225
3 <sup>rd</sup>	NIL	235	Nil	235
4 <sup>th</sup>	Nil	245	Nil	245
5 <sup>th</sup>	Nil	250	Nil	250
Total	Nil	1180	Nil	1180

Year wise Production for the ensuing first five years period

**Year wise production for the first five years**

<b>Year</b>	<b>Volume Tones</b>	<b>Production 90% T</b>	<b>Mineralized reject T 5%</b>	<b>Waste &amp; other reject 5 % (tonnes)</b>
1 <sup>st</sup>	4444	4000	222	222
2 <sup>nd</sup>	4444	4000	222	222
3 <sup>rd</sup>	4444	4000	222	222
4 <sup>th</sup>	4444	4000	222	222
5 <sup>th</sup>	4444	4000	222	222
<b>Total</b>	22220	20000	1110	1110

**6.6 Proposed Rate of Production**

It will be about 4000 tonnes per year of saleable Dolomite for full year after complete development of the mine.

**6.7 Loading**

Loading of Dolomite will be done by manual 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.

**6.8 Hauling/Transport**

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

**6.9 Mine Drainage**

The water table as seen in a nearby well goes down 323 MRL i.e. 20 meters below surface during summer and rise upto 333 MRL during rainy season. At the end of the lease period, the deepest working is likely to reach to 336 MRL (7m bgl). Therefore, the water table will remain much below the bottom most mine workings even during the rainy season. Thus, no de watering of the underground water will be required. Topographically general slope of the area is towards west.

**6.10 Solid Waste Management**

Practically, there is no overburden except a few cms of top soil at some places. Therefore, practically there is no developmental work involved

before commencement of mineral production. Only some work of road construction will be needed for the transportation of the mineral from the mine to its destination.

The waste produced during mining operations consists of top soil, intrusive granite & Dolomite. Presently 3000cum mine waste has been generated during last mining period. During the proposed mining about 3400m<sup>3</sup> soil, overburden and mineral reject will be generate which will be placed in the mining barrier zone of the lease area. Total 6400cum mine waste and top soil will be generated during lease period.

<b>Year</b>	<b>Top Soil (cu m)</b>	<b>Overburden (cu m)</b>	<b>Other waste (tonnes)</b>	<b>Total waste in cum</b>
1 <sup>st</sup> year	NIL	225	444	669
2 <sup>nd</sup>	Nil	225	444	669
3 <sup>rd</sup>	NIL	235	444	679
4 <sup>th</sup>	Nil	245	444	689
5 <sup>th</sup>	Nil	250	444	694
Total	Nil	1180	2220	3400

#### **6.10.1 Maximum Height & Spread of Dump:**

There will be no generation of waste at the mine. The minerals rejects obtained at the mine will be stacked along the boundary barrier in the form of blanket. The maximum height of the reject dump will be kept at 3 meters. The total area required for reject will be 2410 Sqm. The mineral reject will be sold after screening.

#### **6.11 Resource Requirement**

The present proposal is to carry out mining for Dolomite at Village Panwani, Tehsil & Dist. Alirajpur (MP) for efficient operation of the mine 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 Dolomite	<b>Rs6.75 Lac</b>

### 6.9.3 Electric System

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

### 6.9.4 Water Supply

The total fresh water needs to be pumped is about 5 KL per day for consumption of domestic and mining purpose. This quantity of water will be taken from the 1km distance towards the northeast direction. The details of water balance of existing /proposed mining project are given below:

#### WATER BALANCE OF MINING PROJECT

Process	Total	
<b>a) Mine Site</b>		
Dust suppression	3kl	3kl
Green Belt	1kl	1kl
<b>b) Domestic</b>		
Drinking & Washing	1kl	1kl
<b>Total (A + B)</b>	<b>5kl</b>	<b>5kl</b>
<b>Domestic waste water</b>	<b>0.7kl</b>	<b>0.7kl</b>

## 7. EXISTING ENVIRONMENT SCENARIO

### 7.1 Climate

The climatic condition of this area is semi arid. The maximum temperature goes upto 43°C during summer in the month of May and the minimum temperature goes down to 11.0°C during winter in the month of January. The annual rainfall is observed to be 1200 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 24°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 43.0°C with the mean minimum temperature (March) at 24°C. The mean maximum temperature in the monsoon season (Sep.) observed to be 54°C whereas the mean minimum temperature was observed to be 18°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 rainfall in the area is very erratic. The average annual rainfall based on the last 10-year IMD data, was observed to be 96-1740 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, SE, SSW, ESE, EEN and E directions followed by WNW direction.

- **Wind Patterns during study period**

The predominant directions of wind were observed from SSW; WNW, SSE, EEN, ESE & SE.

## 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
<b>15<sup>th</sup> Sep. to 14<sup>th</sup> Dec. 2008</b>										
<b>SPM Concentration</b>										
Average	<b>118.1</b>	<b>144.66</b>	<b>152.91</b>	<b>154.70</b>	<b>169.25</b>	<b>126.83</b>	<b>155</b>	<b>160.25</b>	500	200
Maximum	<b>144</b>	<b>168</b>	<b>178</b>	<b>176</b>	<b>195</b>	<b>160</b>	<b>177</b>	<b>184</b>		
Minimum	<b>96</b>	<b>120</b>	<b>128</b>	<b>108</b>	<b>130</b>	<b>80</b>	<b>108</b>	<b>120</b>		
<b>RPM Concentration</b>										
Average	<b>66.83</b>	<b>70.25</b>	<b>66.75</b>	<b>65.45</b>	<b>68.75</b>	<b>43.45</b>	<b>65.29</b>	<b>66.17</b>	150	100
Maximum	<b>88</b>	<b>92</b>	<b>86</b>	<b>84</b>	<b>94</b>	<b>62</b>	<b>89</b>	<b>88</b>		
Minimum	<b>48</b>	<b>50</b>	<b>44</b>	<b>42</b>	<b>48</b>	<b>22</b>	<b>42</b>	<b>44</b>		
<b>SO2 Concentration</b>										
Average	<b>12.97</b>	<b>8.74</b>	<b>6.96</b>	<b>10.36</b>	<b>12.07</b>	<b>5.78</b>	<b>10.4</b>	<b>11.43</b>		

Maximum	<b>15.5</b>	<b>9.6</b>	<b>8.2</b>	<b>12.2</b>	<b>14.4</b>	<b>6.98</b>	<b>12.8</b>	<b>12.32</b>	120	80
Minimum	<b>11.1</b>	<b>7.2</b>	<b>5.65</b>	<b>8.1</b>	<b>8.6</b>	<b>4.67</b>	<b>8.2</b>	<b>10.2</b>		
<b>NOX Concentration</b>										
Average	<b>15.95</b>	<b>10.46</b>	<b>9.39</b>	<b>12.98</b>	<b>15.51</b>	<b>8.29</b>	<b>13.0</b>	<b>12.54</b>	120	80
Maximum	<b>18.5</b>	<b>11.6</b>	<b>10.92</b>	<b>15.8</b>	<b>18.2</b>	<b>10.75</b>	<b>16.2</b>	<b>13.54</b>		
Minimum	<b>13.8</b>	<b>9.6</b>	<b>8.07</b>	<b>10.12</b>	<b>12.9</b>	<b>7.06</b>	<b>10.2</b>	<b>11.42</b>		

### 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 Sukur Nadi, Orsang Nadi, Hatni River & Nahlinand Nalla located NW, NW, NE & E direction at about 3.0km, 10km, 6km & 2km respectively from mine. The water from Sukur, Orsang Nadi, & Hatni Nadi is used for domestic as well as drinking 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 3.5 to 3.9 mg/l, Total Hardness ranges from 624 to 680 mg/l; BOD levels are as low as 5 to 8 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 4 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 7.23 to 7.63 while conductivity was observed in the range of 936-963  $\mu$ mohos/cm. The value of alkalinity and hardness were observed in the range of 120-160mg/l and 460 to 534 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 sandy Silty nature. The organic carbon was found to be in the range of 1.25% to 1.5% The nitrogen and phosphorus were observed to be in the ranges of 264 to 340Kg/ha and 24 to 34kg/ha respectively the pH range at the soil vary in between 6.12 to 7.23. The soil has medium 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 5.24%. The moist deciduous forest type is dominated by Sal or Sarai (*Shorea robusta*). This dipterocarp is commonly associated with *Terminalia* sp., *Syzygium cumini* and *Lagerströmia parviflora*. The forest floor in the valley bottom is commonly vegetated with *Flemingia* 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. *Gmelina* sp. *Gardenia latifolia*, *Sterculia urens* 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 monspesia*, *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*, *Terminalia* spp., *Ficus* spp. And *Madhuca indica* is probably relicts of the original vegetation or their descendents.

**(iii) Agriculture**

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

**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.

### 7.7 LAND USE PATTERN

Present land use pattern of the 8.093 hectares mining lease area is as given below:

**Land Use Pattern of Mining Lease Area**

Items	Existing	At the end of lease period
<b>Total lease area</b>	<b>8.093ha</b>	
Total Mineable area	8.093ha	
Geological Reserve	1144290 tonnes	-
Recoverable reserve	656208T	
Ultimate depth of mining	2-4m	7m
Ultimate pit slope	45	45
Area under dumps	0.1050ha	0.2410 ha
Area under pits	0.6966ha	0.9326ha
Overburden quantity	3000cum	6400cum
Area to be reclaimed	Nil	Nil
Infrastructure & Road	0.2190	0.2190
Mineral storage	Nil	0.01
Plantation	0.1155ha	0.2155ha

The study area covers about 24464 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	Percentage
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		(ha)	Coverage
1.	Forest Land	1283	5.24
2.	Land under Cultivation		
	a) Irrigated Land	2895	11.83
	b) Un irrigated Land	14363	58.71
3.	Culturable Waste Land	2702	11.04
4.	Area not available for cultivation	3221	13.17
	<b>Total Area</b>	24464	100.00

## 7.8 SOCIO-ECONOMIC CONDITIONS

The study area comprises of total 38 Villages. These villages fall under one tehsil – Alirajpur. 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 44013
- The total no of household in the study area is 6669
- Sex ratio (no. of females per 1000 males) is 1016
- The literacy rate in the study area is 19.70%
- The percentage of scheduled tribe in the study area is 93.59% while only 3.36% population is of scheduled caste
- Out of total population maximum people are workers i.e. 56.28% Followed by main workers 63.94% and marginal workers 36.06%.

### ESTIMATED BASIC STATISTICS OF THE STUDY AREA

S. No.	Detail	Working Population
<b>1</b>	Households	6669
<b>2</b>	Total Population	44013
<b>2.1</b>	Male	21831
<b>2.2</b>	Female	22182
<b>2.3</b>	Schedule Tribe	41193
<b>2.4</b>	Schedule Cast	1479
<b>3.0</b>	Literacy Rate	19.70
<b>4.0</b>	Sex ratio (No. of Female per 1000 Male	1016
<b>5.0</b>	Occupational Pattern:	
<b>5.1</b>	Total Working Population (% of total population )	56.28%
<b>5.1.1</b>	Total Main Worker (% of total Working Population	63.94%
<b>5.1.2</b>	Marginal Workers (% of total Working Population)	36.06%

	Cultivators (% of worker)	77.04%
	Agricultural Labors (% of worker)	14.29%
	Household Worker (% of worker)	1.00%
	Other Workers (% of worker)	7.30%
	Total Non Workers (% of total Population)	42.72%

## 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
<b>Grand Total</b>	<b>1000</b>	<b>745</b>	<b>683</b>	<b>754</b>	<b>71</b>	<b>+9</b>

## 10. ENVIRONMENT MANAGEMENT PLAN

### 10.1 Reclamation of Land

During lease period of mining there will no piece of land measured for reclamation because the mineral deposit is very thick. At the end of the lease period, the deepest working is likely to reach to 336 MRL. Moreover initially only the mineral deposit in the mounds will be extracted from the area the worked out pits will be converted into pounds and suitable protective arrangement will be made by making bunds around the pits. The pound may be used for irrigation as well as for agriculture purpose. 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.

### 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 90m<sup>2</sup>). 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 <sup>st</sup>	0.020	30
2	2 <sup>nd</sup>	0.020	30
3	3 <sup>rd</sup>	0.020	30
4	4 <sup>th</sup>	0.020	30
5	5 <sup>th</sup>	0.020	30
Total		0.1	150

During the course of mine and after mining the proposed plantation is at the rate of 1500 saplings per hectare, for which the density is 1500 saplings per hectare. The proposed green cover including greenbelt is 0.1155 ha. The total number of saplings to be planted during the entire life of mine shall be 300no. Considering the estimated cost of planting and maintaining a sapling for one year as about Rs.1000/-.

#### 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

Presently			0.1155	150
1 to the end of the lease period	-	-	0.1	150
Total	-	-	0.2155	300

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 Dolomite mining project of M/s Laxminarayan Mining Co., village – Panwani, Tehsil & Dist. Alirajpur (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.