

CHAPTER - 9

EXECUTIVE SUMMARY

9.0 INTRODUCTION OF PROJECT & PROPONENT

The project is being proposed by M/s. Shri Mahalaxmi limestone Project Proponent - Jitendra Agrawal S/o. Late Sh. Bhagwan Das Agrawal for limestone Mining Project located in Address :Cool Home Apartment Third Floor House No. B 302, Daldal Seoni Mowa, City/Post office – Raipur Tehsil - Raipur, District- Raipur (C.G). The estimated project cost is Rs 100.05 lacs. The proponent has applied for mining lease in the name of limestone Mining Project, over an area of 1.21 Ha. at Village Dhansuli, Tehsil Tilda & District- Raipur, Chhattisgarh. It has been proposed to collect limestone Mining Capacity– Max.15207.6 m³ per year /38019 TPY of lime stone Mining Project annually as per approved mining plan As per the MOEF, New Delhi Gazette dated 14th September 2006 amended in December 2009 and April 2011, the proposed mining project is categorized as category “B1”.

9.1 LOCATION

The mining project area is located in Khasra No. 543/4, 540/5, 543/11, 543/14 in Village Dhansuli, Tehsil Tilda & District- Raipur, Chhattisgarh. The mining lease / proposed project area falls in Survey of India Toposheet No. 54G/15. The mine lease area is located between as follows:

	Boundry Point	Latitude(N)	Longitude(E)
Project Site co-ordinates	BL1	21°24'41.44"N	81°51'4.71"E
	BL2	21°24'40.81"N	81°51'0.50"E
	BL3	21°24'41.65"N	81°51'0.37"E
	BL4	21°24'41.97"N	81°51'2.24"E
	BL5	21°24'43.40"N	81°51'2.08"E
	BL6	21°24'44.22"N	81°51'6.53"E
	BL7	21°24'41.95"N	81°51'7.00"E
	BL8	21°24'41.81"N	81°51'7.56"E
	BL9	21°24'37.19"N	81°51'8.68"E
	BL10	21°24'37.57"N	81°51'10.03"E
	BL11	21°24'36.56"N	81°51'10.27"E
	BL12	21°24'35.97"N	81°51'5.23"E
	BL13	21°24'39.52"N	81°51'4.97"E
	BL14	21°24'40.07"N	81°51'4.66"E

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	BL15	21°24'40.49"N	81°51'4.81"E
Minerals of mine	Limestone Mining Project		
Nearest Railway Station	Siliyari Railway Station -10.0 Km in West direction from the project site.		
Nearest Airport	Raipur Airport - 27.50 Km in South West direction from the project site.		
Nearest Highway/State Highway	NH 200 at 17.60 km towards west (Raipur-Simga Road) from the project site/ SH 9 at 1.30 km towards South (Raipur- Balodabazar Road).		

9.2 MINING PROCESS

9.2.1 The procedure of Limestone Mining process is:

The proposed mining method will include the following steps:

The mode of working will be open cast semi-mechanized method of mining with low capacity blast. Small scale drilling and blasting will be carried out for exploration of stone. Heavy hammer and hardened chisels will yield the sufficient quantity of stone. Further the stone will be sized and dressed by stone crusher according to the customer's specifications, demand of market and stacked on the mine surface. Crushing will be done with the help of stone crushing plant which will be installed within granted area. Loading of sized stone chip will be done semi mechanized with the help of local labors.

The gradient of the ramps with benches will be maintained to 1:15 i.e. 15 meter long ramp for every 1 meter depth. Width of ramp will be 3-4 meter.

Width of benches will be maintained similar to height of benches. The quarry will be developed in 6 benches of 3 m height x 3 m width each and 7th bench i.e. last bench of 3m height only. However during advancement of mining operation the mine will be worked into 1.5 m -1.5 m height of sub-benches. For Mineral conservation finally at mine boundary benches will be converted to 3m (H) X 3m (W) each as detailed in table below-

Bench Number	Bench Specification	Bench Height	Bench Width along the periphery
1st Quarry Bench	Soil + Mineral Bench	3.0 m	3.0 m
2nd Quarry Bench	Mineral Bench	3.0 m	3.0 m
3rd Quarry Bench	Mineral Bench	3.0 m	3.0 m
4th Quarry Bench	Mineral Bench	3.0 m	3.0 m
5th Quarry Bench	Mineral Bench	3.0 m	3.0 m
6th Quarry Bench	Mineral Bench	3.0 m	3.0 m
7th Quarry Bench	Mineral Bench	3.0 m	

9.2.2 Drilling:

After end of plan period steps will be as per instruction of mining authorities as per CG MMR2015.

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9.2.3 Blasting:

Average daily production in the quarry is 126.73 tons per day. As operation in the quarry is small in scale. Production during subsequent year will also expected at same level.

As the planned operation in the quarry is small in scale, blasting pattern will be kept simple row blasting with simple blasting parameters. Low intensity scientific controlled blasting will be done.

Blasting parameters & blast impact and control measure are discussed below-

9.3.4 Blasting Parameters:

Blast pattern	As daily production is not in large scale, therefore, Row Blasting will be done
Dia. of the whole	100 m
Powder Factor	4-5 ton/kg will be maintained
Total production	38019 t/year
Daily Production	126.73 tons
Tonnage per blast hole	33.75 MT
Total Blast Hole per day	4
Drill Meter age	6

9.2.5 Storage of Explosives-

The blasting will be conducted on the contract basis through approved blasting contractor, therefore no need to install magazine at quarry site.

9.2.6 Loading and Transportation:

Wheel loaders/excavators will be used for loading of Ore/ waste material. Dumpers of 50.69 m³ per day appropriate capacity will be deployed for hauling ore to the Crushing plant or mineral stock and waste material to dump yard.

1. Excavator/Loader

SN	Discription	Values
1.	Annual production of stone (Max.)	15207.6 m ³
2.	Number of working days in a year	300
3.	Daily excavation / production of stone	50.69 m ³
4.	Loading Capacity of excavation per shift per day (L)	$L = (B \times Q \times N \times T \times E) / S$
5.	Bucket Capacity (B)	1.25 m ³
6.	Quantity of filling - 80% - (Q)	1 m ³
7.	Average number of loading cycle per hour taking 180 sec. in each round = 3600 sec./180 sec. = 20 cycle - (N)	20 cycle
8.	Number of effective working hour per shift (Time = T)	5 hours
9.	Efficiency of utilisation of machine - 65% - (E)	0.65
10.	Sweel Fector due to voides and gapes (S)	1.5
11.	Loading capacity per day will be (L) $L = (1.25 \times 1 \times 20 \times 5 \times 0.65) / 1.5$	54.17 m ³
12.	Number of excavator required (50.69 cum / 54.17 cum)	Say 1 Nos.

2. Dumper/Tipper

S. No	Description	Values
1.	Daily excavation/production of stone	50.69 m ³
2.	Maximum Capacity of Machine	4 m ³
3.	One Machine can carry (75% for safety measures)	3.00 m ³
4.	Number of trips required per day $50.69/3=16.9$	17.00 trips
5	Number of trips carried by one machine per day per shift	15.0 trips
6	Number of Machines required per day $(17/15)=$	2.0 Nos.

3. Other Machineries

S. No	Machine	Details	
		Type	No's
1	Miscellaneous	Trackers	1
		Water Tanker with water sprinkler	1
		Dewatering pumps	2
		Rock breaker	2
		Compressor	2
		Jack Hammer	2

Average daily number of man power to be deployed (number, capacity etc.)

9.2.7 Year Wise Production

S. No	Year	Production	S. No	Year	Production
1.	1 st Year	9,992.81 MT	6.	6 th Year	37,584.38 MT
2.	2 nd Year	14,989.22 MT	7.	7 th Year	37,513.13 MT
3.	3 rd Year	38,011.88 MT	8.	8 th Year	38,019.00 MT
4.	4 th Year	37,913.91 MT	9.	9 th Year	37,691.25 MT
5.	5 th Year	37,760.72 MT	10.	10 th Year	37,855.13 MT
Total Production 3,27,331.41 MT					

9.2.8 Generation of Waste

Top Soil - total 4289.25 cum: Soil will be stacked near lease boundary and used in plantation. The maximum height of top soil dump will be 1.5m.

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Area with topsoil	17,157.00 Square meter
Thickness of topsoil	0.25 meter
Volume of topsoil to be generated	4289.25 m ³
Swell Factor 20%	4289.25 X 20% = 857.85 m ³
Swelled volume of topsoil	4289.25 + 857.85 = 5147 m ³
Area available for dumping of topsoil - (i) Total area along with mine boundary (ii) Additional owned/rented area out of lease area (iii) Total area available for further dumping (i + ii)	7324.00 m ² 0.00 m ² 7324.00 m ²
Height of Dump = (Volume/Area)	5147.10 / 7324 = 0.7 m
Angle of slop	45 ⁰
Actual Height of Dump	0.70 X 90 / 45 ⁰ = 1.41 approx. = 1.5 meter

9.2.9 Skilled Labours: Taking standard working capacity of a labour to work on 15 ton stone per day, for 15207.6 cum or 38019 T. of production in 300 working days a year, 9 labours per day will be required for mining operation.

Apart from above driver, machine operators, Mine supervisors etc. will also be required.

9.2.10 Restriction of mining:

The target testing and advanced stages of exploration require larger field camps and the use of heavy equipment at the worksite. Only trained workers or authorized visitors shall be permitted onto worksites where heavy equipment is operating.

Only properly licensed and trained personnel shall operate heavy equipment. Workers shall be constantly vigilant and never approach heavy equipment unless they are certain the operator knows where they are, what they intend to do and where they intend to go.

Crews shall be fully trained for the job. They shall be provided with appropriate personal protective equipment (e.g., hard hats, steel-toed boots, hearing protection, gloves, goggles and dust masks) Drill rigs shall comply with all safety requirements (e.g., guards that cover all moving parts of machinery, high pressure air hoses secured with clamps and safety chains)

Describe briefly prospecting / exploration work done to date viz. geological mapping with the evidence already existing about the mineral deposit in the area or in the vicinity. (Attach Geological Report)-

As per report of mining inspector issued under rule 6B of C.G.MMR 2015 the geological reserve is observed and calculated till the depth of 21 meter including 0.25 meter of top soil. There are several mines which are having depth more than 21 meter and shows the availability of lime stone. Therefore prospecting is not required at this stage of plan.

Five representative samples were drawn from the applied area for chemicle analysis. Annalysis was conducted by Regional Office, Directorate of Geology and Mining, Raipur C.G. Analysis report is annexed with the plan. Details of chemicle annalysis are as aunder-

Details of samples analysis indicating type of sample with grade of mineral :-

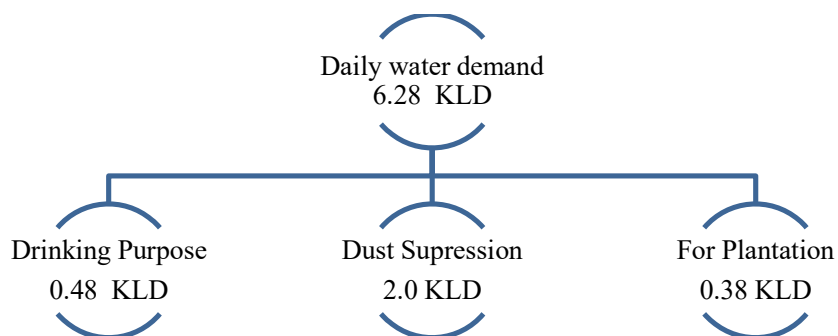
Five representative samples were collected and tested for chemical analysis. This sample was analyzed for its chemical composition and the chemical analysis composition is given below:

S. No	Sample No.	SiO ₂ %	Fe ₂ O ₃ %	Al ₂ O ₃ %	CaO %	MgO %	LOI %	Total
1	DH - 1	19.88	6.82	2.60	38.58	0.64	30.86	99.38
2	DH - 2	18.52	6.60	2.40	38.13	1.93	31.91	99.49
3	DH - 3	19.74	6.22	1.90	38.35	1.61	31.73	99.55
4	DH - 4	20.24	6.02	2.00	37.68	1.93	31.53	99.40
5	DH - 5	20.20	7.00	2.00	37.91	1.29	31.03	99.43

Stone of above grade falls under Chhattisgarh Minor Minerals Rule 2015.

9.3 WATER SUPPLY

In the limestone Mining Project there is as such no need of water to carry out operations. Water will be required for drinking purpose and dust suppression. The number of working people is 18 so the water required for drinking purpose for the workers will be around 0.48 KLD, for Plantation will be 3.80 KLD & for the dust suppression will be 2.00 KLD, making the total water requirement will be 6.28 KLD. This water will be supplied from the nearby area.



9.4 BASE LINE DATA

This section contains the description of baseline studies of the 10 km radius of the area surrounding “Limestone Mine” at Khasra No. 543/4, 540/5, 543/11, 543/14, Area 2.813 Ha. Village Dhansuli, Tehsil

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Tilda & District- Raipur, Chhattisgarh. The site analysis for Air, Water, Noise, Soil, Ecology and Biodiversity and Socio-Economy is already under process and the description given below is the secondary data such that public hearing could be conducted as soon as possible to avert the delay of the project. The intimation of EIA study as required in B1 Category of Limestone Mining Project is already been done at the Director & Secretary(SEAC), Directorate of Environment, govt. of Chhattisgarh., the Regional Officer, Regional Pollution Control Board, District Raipur, Chhattisgarh . The data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed.

Environmental data has been collected in relation to proposed mining for. :-

- (a) Air
- (b) Noise
- (c) Water
- (d) Soil
- (e) Ecology and Biodiversity
- (f) Socio-economy

Table 9.1: BASELINE ENVIRONMENTAL STATUS

Attribute	Baseline status
Ambient Air Quality	<p>Ambient Air Quality Monitoring reveals that the maximum & minimum concentrations of PM10 for all the 10 monitoring stations were found to be ranging between 87.50 µg/m³ (AQ5) and 68.36 µg/m³ (AQ2) and the maximum & minimum concentrations of PM 2.5 for all the 10 monitoring stations were found to be ranging between 33.98 µg/m³ (AQ4) and 46.57 µg/m³. (AQ5)</p> <p>As far as the gaseous pollutants SO₂ and NO₂ are concerned, the prescribed CPCB limit of 80 µg/m³ for residential and rural area has never surpassed at any station. The maximum and minimum concentration of SO₂ was found at AQ5 with a value 15.73 µg/m³ & and at AQ7 with a value 10.12 µg/m³. The maximum concentrations of NO₂ were found at AQ5 with a value 31.54 µg/m³ and minimum at AQ10 with a value 19.03 µg/m³</p>
Noise Levels	<p>When mining activity is in progress the noise is being created by Drilling and Blasting, mining equipment's, transportation and other means are minimized by noise absorbing media and proper maintenance of mining equipment's. The ambient noise level in the</p>

	<p>study area were found project site minimum/Maximum is 37.6 & 49.5 dBA in the day time in project site. During night minimum/maximum 42.5 & 59.4 dBA in the night time. The ambient noise level data are within the prescribed limit by MOEF&CC & State PCB. The analytical data shows there is no impact nearby villages/habitant.</p>
Water Quality	<p>Surface water Observation:</p> <p>The analysis results indicate that the pH ranges between 6.63 and 7.51. Dissolved Oxygen (DO) was observed in the range of 6.2 to 7.6 mg/l. COD values were observed to be in the range of 9.60 to 60.80 mg/l and BOD values were observed to be in the range of 3.25 to 16.0 mg/l. The Iron and Nitrate were found to be in the range of 0.08 to 0.24 mg/l and 0.43 to 1.84 mg/l respectively. Bacteriological examination of surface water samples revealed the presence of total coliform in range of 0.68 X103 ml to 1.8 X103 ml.</p> <p>Ground water Observations:</p> <p>Analysis of results of ground water reveals the following: -</p> <p>pH varies found between 6.86 to 7.82.</p> <p>Total hardness varies between 88 mg/l to 288 mg/l.</p> <p>Total dissolved solids(TDS) varies from 188 mg/l to 470 mg/l.</p> <p>Chloride varies from 39.42 mg/l to 84.78 mg/l .</p> <p>Iron found from 0.6 mg/l to 0.11 mg/l.</p>
Soil Quality	<p>The analysis results show that soil is basic in nature as pH value ranges from 7.24 to 7.88, Phosphorus (61.28 to 71.81 Kg/ha.), Potassium (92.22 mg/Kg to 149.60 mg/Kg) and Electric conductivity (254.4 mg/Kg to 364.1 mg/Kg),the SAR 0.59 to 0.89 & nutrient ration has been satisfactory level</p>
Ecology and Bio-diversity	<p>There are no Ecologically Sensitive Areas present in the study area.</p>
Socio-economy	<p>Limestone Mining Project at Khasra No. 543/4, 540/5, 543/11, 543/14, Area 2.813 Ha. Located in Village Dhansuli, Tehsil Tilda & District- Raipur, Chhattisgarh Will throw opportunities to local people for both direct and indirect employment.</p> <p>The study area is still lacking in education, health, housing, water,</p>

	electricity etc. It is expected that same will improve to a great extent due to proposed mining project and associated industrial and business activities.
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9.5 BIOLOGICAL ENVIRONMENT

9.5.1 INTRODUCTION

Biological study of the ecosystem is essential to understand the impact of industrialization and urbanization on existing flora and fauna of the study area. Studies on various aspects of ecosystem play an important role in identifying sensitive issues for under taking appropriate action to mitigate the impact, if any.

The biological study was under taken as a part of the EIA study report to understand the present status of ecosystem prevailing in the study area, to compare it with past condition with the help of available data, to predict changes in the biological environment as a result of present activities and to suggest measures for maintaining its health.

A survey was conducted to study the flora & fauna in 10 km radius. Some of the information was gathered from the local habitants. All the collected data were classified to interpret the impact of pollution on the flora and fauna of that region. Survey of the wild plants as well as cultivated crop plants was made and all the available information was recorded.

9.5.2 OBJECTIVE OF THE STUDY

The present study was undertaken with the following objectives:

- i. To understand the spectrum of domestic and wild biodiversity of the study area, prospects like impact, if any, of the existing enterprise on the local biodiversity and to suggest mitigation measures for vulnerable biota.
- ii. To assess the biodiversity and to understand the natural resource potential.
- iii. To assess the nature and distribution of vegetation in and around the existing mining activity.
- iv. Devise management & conservation measures for biodiversity.

The proposed project site i.e. core area is the water channel, which has few aquatic plants only. However, the nearby areas i.e. buffer area is having different types of plants (herbs, shrubs and trees). The Raipur district covered mixed variety of vegetation mainly bushes. The tress like Shishum, Neem, Mango tree and Jamun tree, Eucalyptus and Babool are also found in sufficient numbers.

➤ Methodology

The present study was carried out in given steps:

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I. The entire study area was divided into three categories namely; highly disturbed area, moderately disturbed area and mildly disturbed area, on the basis of prevalence of the wind in the region i.e. wind rose diagram, and proximity to the mining industry.

II. Selection of sampling locations in these categories was made with reference to topography, land use, vegetation pattern, etc. The observations were taken on natural vegetation, roadside plantation and non-forest area (agricultural field, in plain areas, village wasteland, etc.) for quantitative representation of different species.

III. To study the species diversity, standard method of analyzing vegetation i.e. Quadrat Sampling was done for determination of vegetation composition and richness.

IV. Comparative analysis of the outcome of the Quadrat Sampling was done to understand the frequency, dominance and abundance of species observed in the different zones of disturbance.

➤ **Commonly found flora in the district:-**

Dhak (*Butea monosperma*), Teak (*Tectona grandis*), Mahua (*Madhuca indica*), Babool (*Acacia nilotica*) and Tendu (*Diospyros melanoxylon*), Siris (*Albizia lebbek*), Aam (*Mangifera indica*), Jamun (*Syzygium cumini*), Bail (*Aegle marmelos*), Tut (*Morus alba*), Bargad (*Ficus bengalensis*), Neem (*Azadirachta indica*), Peepal (*Ficus religiosa*), Safeda (*Eucalyptus umbelatus*), Sisam (*Dalbergia sissoo*), etc.

➤ **Commonly found fauna in the district:-**

Many domestic mammal species were reported from buffer zone during the field survey. Common domestic animals like Buffalo, cow, goat etc. can be noticed in open grass fields while grazing. Small mammals like Indian palm squirrel (*Funambulus palmarum*) and field mouse (*Apodemus sylvaticus*) are noticed in vicinity of the village. Inquiry from village people regarding wild animals reveals that monkey (*Macaca mulata*), Indian hare (*Lepus nigricollis*), mongoose (*Herpestes edwardsii*), jackal (*Canis aureus*), etc. are often seen in the area.

The bird population that were commonly noticed during field survey are Common teal (*Anas crecca*), Red wattled lapwing etc.. House crow (*Corvus splendens*), House sparrow (*Passer domesticus*), Common Myna (*Gracula religiosa*) are of common occurrence.

The reptilians species commonly reported are Garden lizard (*Calotes versicolor*) and *Eutropis macularia* along shady places in agricultural field or where growth of bushes is noticed. Among non-poisonous snakes rat snakes (*Ptyas mucosus*) are commonly noticed in field, followed by poisonous snakes like Cobra (*Naja naja*) and Banded krait (*Bungarus multicinctus*) are occasionally encounter by the farmers.

➤ **Commonly grown Agricultural Crops in the district:-**

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Traditionally rain fed and irrigated agriculture is common. The main crops grown are rice, maize, pigeon pea, sorghum, pearl millet, moong beans during kharif and wheat, Bengal gram, green peas, rapeseed and mustard and lentil during rabi season. Sugarcane is the main cash crop. Rice–wheat cropping system is more predominant. Amongst the fruit crops, mango and guava, and amongst the vegetable crops potato, onion, brinjal, tomato, cauliflower and cabbage are important.

➤ **Fishes & Amphibians:-**

The fish species which are commonly found in the water bodies of district are Labeo bata (Bhangon or Bata), Gudusia chapara (Chappera or Palla), Labeo rohita (Rohu), Catla catla (Theila), etc.

Amphibians are commonly found at the places along the margin of aquatic and terrestrial systems. Some of the commonly reported species are Bufo melanostictus (common Indian toad), Euphlyctis cyanophlyctis (Indian skipper frog), Hoplobatrachus tigerinus (Indian bull frog), etc.

➤ **Anticipated Impacts and Evaluation**

The mining activity will have insignificant affect on the existing flora and fauna. Data have been collected from various Government Departments such as forests, agriculture, fisheries, animal husbandry and various offices to establish the pre-project biological environmental conditions. There are no endangered species, wildlife sanctuary, wildlife corridors or ecosensitive area near the core zone. The purpose of the project itself is to save the flora around the project area from excessive erosion and floods. It was found that the limestone mining activity will not have any significant impact on the biological environment of the region.

• **Mitigation Measures**

Since, there is no migratory route of birds or grazing route of domesticated animal is reported, hence there will be no impact anticipated. Mining activity will be confined upto a required depth from ground level/ water level whichever is less.

Table 9.2 Anticipated impact and mitigation measures for biological environment

Impact predicted	Suggestive measures
Disturbance to free movement / living of wild fauna viz. Birds, Reptiles etc.	<ul style="list-style-type: none"> • If birds are noticed crossing the core zone, they will not be disturbed at all; • Labourers will not be allowed to discards food, plastic etc., which can attract animals/birds near the core site; • Only low polluting vehicles having PUC will be allowed for carrying mining materials. • Noise level will be maintained within permissible limit

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	(silent zone 50 dB(A) during day time or residential zone 55 dB(A)) as per noise pollution (regulation and control), rules, 2000, of CPCB norms
Disturbance of riparian ecosystem/wetlands	<ul style="list-style-type: none"> The riparian ecosystem or the wetlands will not be destroyed by the mine owners
Monitoring of upstream and downstream water quality	<ul style="list-style-type: none"> Water quality will be monitored from upstream and downstream area to assess the impact on water quality and plankton. The mining activity will be controlled to maintain the clean water conditions.

**Table 9.3 ANTICIPATED ENVIRONMENTAL IMPACTS AND ACTION PLAN PROPOSED FOR
MITIGATION**

Environmental Component	Project Activities	Impacts	Action Plan Proposed
Air Quality	Drilling and Blasting	Dust (SPM) and gases (NOx) are produced during drilling and blasting operations	<p>Use of dust aprons on drilling equipment and adopting wet drilling methods.</p> <p>Limited blasting during adverse weather conditions.</p> <p>Optimized confinement of blasting charges.</p> <p>Development of greenbelt.</p>
	Overburden removal, extraction of stone, Loading / unloading of overburden and stone, disposal of overburden at dump site within ML area	Increase in SPM levels in ambient air due to dust generation and NOx concentration levels in ambient air due to vehicular emissions.	<p>Exposed area will be limited to the minimum required for mining operations.</p> <p>Installation of spray systems for dust suppression at dumping yards and stockpiles.</p> <p>Minimization of drop distance for all materials-handling process through appropriate design of operations.</p>
	Transportation of overburden and stone within ML area	Increase in SPM level due to dust generation and NOx concentration levels in ambient air due to vehicular emissions.	<p>Regular watering of haul and access roads using dedicated water trucks.</p> <p>Maintenance of vehicle.</p> <p>Haul roads will be clearly defined using marker posts so that vehicle traffic are controlled in the area.</p> <p>Roads no longer required will be re-vegetated as soon as possible.</p> <p>Haul roads to be maintained by surface grading to minimize excessive road surface wearing.</p>

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	General equipment operations	Elevated SPM and NO _x concentrations in ambient air.	Regular maintenance of all equipment to minimize particulate matter emissions from diesel engines.
	All activities	Excessive occupational exposures to airborne particulate matter.	Occupational exposures to air pollutants will be assessed at regular intervals. Where exposures exceed the permissible limits, appropriate engineered controls, management measures or, as a last resort, the provision of personal protective equipment will be implemented.
Noise Levels and Ground Vibrations	Blasting	High impulsive noise levels, overpressure and ground vibrations impacts and noise related community annoyance	Prior to commencement of normal blasting operations (if required), a series of trial blasts will be undertaken to facilitate accurate prediction of impacts from normal blasting. This will require monitoring of overpressure and ground vibration in at least two locations surrounding the mine. The monitoring will continue throughout the duration of the blasting program. Where monitoring determines a significant impact, blast designs may need to be modified and scheduled to occur during non-enhancing weather conditions.
	General activities including machine operations and transportation of overburden and stone within the ML area.	Increase in noise levels occupational hazard due to noise exposures and increase in ambient noise levels.	<p>An analysis of measured noise levels, meteorological parameters, and site operations will be undertaken to determine the risk of excessive noise impacts during operations.</p> <p>A detailed review of noise emissions and impacts from project activities will be carried out at regular intervals during the project life.</p> <p>Occupational noise exposures will be assessed. Where LA_{eq} (8 hour) noise exposures have the potential to exceed 85 dB(A), mitigation through engineered noise controls, management measures or, as a last resort, through the provision of personal protective equipment will be implemented.</p> <p>Regular noise monitoring will be carried-out.</p> <p>Procedures to document and act upon community complaints will be implemented.</p>
Water Resources and Quality	—	Changes to hydraulic regime.	Mining will not intersect water table. Garland drains will be constructed to divert the surface water so as not to enter the

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		Deterioration in surface/ground water quality of receiving body.	mine. Diverted water will be joined to the nearest water course so that there is hardly any change to hydraulic regime. Mine water will be collected in the mine sump which will act as settling tank and then discharged to the surface.
	Water required for mine (dust suppression systems, workshop, domestic facilities and greenbelt development) and domestic consumption at colony	Depletion of natural resource. Reduction in groundwater availability for domestic and for irrigation purposes. Changes to hydraulic regime.	Mine sump water will be utilized for industrial purpose in the mine as far as possible. Water conservation methods will be practiced. Rainwater collection and reuse system will be implemented. The volumes of water supplied to the site through extraction from dug bore wells will be monitored to ensure drawdown do not affect adjacent water users.
Hydrogeology and Drainage pattern	Mining activities	May change regional hydrology and drainage pattern of the area.	Garland drains will be constructed all around the mine to lead the surface water to the nearest water course so that there is hardly any change to Hydrogeology and drainage pattern.
Land use and Soil Characteristics	Commencement of Mining operations.	Existing landuse of the core zone will alter. Impact due to clearing of existing plantations in the mining area. Impact due to settling of air borne dust. Land degradation due to disposal of solid wastes. Exposure of top soils to wind and water erosion.	Prior to each phase of mining, update and implement the relevant EMP to include phase-specific control and mitigation measures. Vegetation clearance to occur immediately prior to soil and overburden stripping. Install diversion drains and sediment fences prior to starting earthworks Minimize the area and time of ground disturbance by progressively rehabilitating disturbed areas Dust suppression on exposed areas using water trucks and automatic sprinkling systems Contour overburden dumps to minimize erosion
Flora and Fauna	Mine development and operations	Displacement or loss of existing	Disturbed areas will be stabilized as soon as possible. Locally native species will be

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		fauna. Loss of vegetation	used in landscaping works for non-hardstand areas. Compact fencing around mine area will be provided to obstruct unusual entry of animals
Environmental Pollution, Health, Safety	Overall Mining operation	<p>Annoyance, sleep disturbance, and health impacts from noise emissions that exceed the safe limits.</p> <p>Community annoyance from dust deposition. Potential for risk of harm to personnel and the local community.</p> <p>Contamination of land and water through inappropriate disposal of waste products, including sewage and hazardous wastes. This may result in adverse impacts on surface water users.</p>	<p>Implementation of noise and fugitive dust emission controls and management measures.</p> <p>Implementation of water quality management, conservation and control measures.</p> <p>Development of an emergency response plan that includes installation of emergency response equipment to combat events such as fire. All personnel required to handle hazardous materials will be provided with personal protective equipment suitable for the hazardous material being handled. On-site first aid facilities will be provided and employees will be extended to the local community in emergencies.</p>
Socio-economic Aspects	Mining operations	Increase in employment opportunities both direct and indirect thereby increasing economic status of people of the region.	Increase of direct employment will be progressive during operational phase of project whereas there will also be financial improvement to the local population who are engaged and would engaged himself in the services to the transport sectors because of increased transportation vehicle and meeting the allied facilities such as eateries and vehicle repairing outlets.

9.6 LAND ENVIRONMENT

This section includes the study of natural features like topography, climate etc. Land use/ Land cover map.

➤ **Topography**

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The topography of the area is flat land. Few out crop of stone are shown across the granted area, however in most of the part stone is buried under the soil in the granted area. The general slope is towards west. Maximum Altitude of the applied area is 292 m AMSL at eastern part while lowest side is 290 m ASML at western part of granted area. Therefore, granted area has been surveyed in contour interval of 1 meter and shown on plan accordingly. Granted area is devoid of any vegetation. The climate of the area is sub-tropical with hot summer.

➤ **Rainfall & Climate:**

Raipur is endowed with high rainfall. Areas of chronic shortfall are few and localized. The district receives its rainfall mainly from the south-west monsoon which usually sets in the third/fourth week of June and spread over a period from late June to early October with heaviest shower in the months of July and August. The normal rainfall in the district is 1319 mm and the average is 1323 mm in the year 2011. Raipur district has a tropical wet and dry climate; temperatures remain moderate throughout the year, except from March to June, which can be extremely hot. The highest temperature goes up to 43°C and observed in the months of May and June. Winters last from November to January and are mild and the lowest falls up to 13 °C and observed in the months of December and January.

➤ **Impact on Land Use**

The area is having undulating surface surrounded by agricultural and barren land. The area is partially covered by alluvial soil. The proposed area and surround areas are mostly private land owned by individual. Presently the existing quarry lies in 2.813 ha area.

The potential adverse impact of opencast stone mining will be in the form of change in land use pattern. So reclamation of mined out land will be given due importance as a step for sound land resource management in the form of reclaimed land and water body.

No adverse impact is anticipated on land use of buffer zone associated due to the existing stone mine project, as all the activities will be confined within the project site only. Stone mined out from the mine is being and continued to be used as limestone of different sizes for Dam construction, embankment works etc. After crushing into different sizes of aggregates from 6mm to 63mm, the product can be used in construction and road projects.

9.7 WATER ENVIRONMENT

9.7.1 Impact on Surface Water

At present scenario there is no any seasonal or perennial source of water is passing through the lease area. During the rainy season, there may be accumulation of surface water, which is proposed to be pumped out to keep the working area dry and it is being utilized for dust suppression.

The limestone mineral found in the area is non-toxic in nature. There will be no outside discharge of

liquid effluent from the mine site. It is, therefore, apparent that there will be negligible impact of mining on the surface water regime.

9.7.2 Impact on Ground Water

Ground water pollution can take place only if the mining rejects contain toxic substances, which get leached by the precipitation water and percolate to the ground water table thus polluting it. Any nearby wells or other sources of water can be rendered unfit for drinking and even for industrial use.

This is not the case with this deposit as the mineral or topsoil does not contain any harmful ingredients. Moreover, stone constitutes of fairly inert and chemically non-reactive ingredients.

It is noticed from nearby dug wells and bore wells that the ground water table is available below 30 meters of the normal surface level. As the mining operation has been proposed to be carried out much above the ground water table there would not be any adverse effect on the ground water.

The ground water available in the nearby well, borewell is analysed and it is found within the prescribed standard of CPCB and it is also being and will be continued to be adopted the remedial measures to keep the water quality within the prescribed standard.

9.7.3 Mitigation Measures for Water Environment

- Adequate control measures are being and will be continued to be adopted to check not
- Only the wash-off from soil erosion but also uncontrolled flow of mine water. The measures to be adopted are Garland drain will be provided at the toe of the dumps, to channelize the runoff water from dumps into the water reservoir (i.e. mined out pits) & around the active pits to restrict rainy water from entering in to the working pit.
- Retaining walls having water holes will be provided along the toe of the dumps to avoid the soil wash out & around the active pit to prevent fall of human/animal in to the working pit.
- Dumps slopes are being stabilized followed by plantation to avoid soil erosion.
- No waste water is being discharged from the mining activities.

9.8 AIR ENVIRONMENT

➤ Anticipated impacts and evaluation

Information on air quality was studied and various modeling techniques predicted that the mining activity is not likely to affect the air quality in a significant manner. However, loading of limestone, its transportation and unloading operations may cause some deterioration in air quality due to handling dry materials. In the present case, only wet materials will be handled, thus eliminating problems of fugitive dust. Also, the collection and lifting of minerals will be done manually without any blasting. Therefore

the dust generated is likely to be insignificant as compared to mining processes involving drilling, blasting, mechanized loading etc.

➤ **Air Modeling**

In general, mining operations generate substantial quantities of airborne respirable dust, which may lead to the development of respirable diseases in mine workers. The increasing trend of mining leads to release of huge amount of dust. These air borne dust particles, generally below 100 micron in size, are nuisance particulates and cause health hazards as an ill effect of mining activities. Extraction activities like drilling, blasting, material handling and transport are a potential source of air pollution. Therefore, a detailed study on emission sources and quantification of pollutant concentration by means of dispersion modeling is required to assess the environmental impact of a mine. On the basis of the predicted increments to air pollutant concentrations, an effective mitigation and environmental plan can be devised for sensitive areas. In case of limestone Mining Project, as there is no blasting and drilling activities, the impacts may only be caused by material handling and transportation activities of mostly wet limestone and the same are minimal.

FUGITIVE DUST- MODELING

Air quality modeling was done using line source model as published by USEPA “Workbook of Dispersion Modeling” by Turner, for transportation through roads and the empirical emission factor equations from USEPA. Emission factors to be used in Line source Dispersion equation is adopted from formula as given below:

$$E = k * (1.7) * (s/12) * (S/48) * (W/2.7)^{0.7} * (w/4)^{0.5} * (365-p/365) \text{ kg/VKT} \text{----- (1)}$$

Where

E = Emission Rate (kg/VKT)

k= Particle size multiplier = (0.36)

s = Silt Content of the Road surface material (%) = 10%

S = Mean Vehicle Speed (km/hr) = 20 km/hr

W=Mean Vehicle Weight (tonnes) = 10 tonnes

w= Mean number of wheels = 8

p= Number of days with at least 0.254 mm of precipitation per year = 60

f = frequency of Vehicle movement in no per hour = 2 vehicles / hour

Thus using equation (1)

$$E = 0.61766 \text{ kg/VKT}$$

$$E = 0.0003 \text{ g/sec/m}$$

Concentration of the fugitive dust was calculated using the empirical equations for unpaved roads published by USEPA- AP42. The Concentration of the fugitive Dust is given below:

$$C = (2/\pi)^{1/2} (E / \sigma z v) \text{ Exp-} [(h^2) / (2 \sigma z^2)] \times 10^6 \text{ ----- (2)}$$

Where

C = Hourly Concentration in microgram/ m³

E = Emission Rate = 0.0003 g/sec/m

v = Wind Speed =4 m/s

h = 0 m

Modeling was done for an infinite line source assuming unpaved road. For conservative calculation wind was assumed to blow at a velocity of 4 m/s perpendicular to the road. The results for 24 hourly concentration values are given in the Fig. 4.1:

➤ **Mitigation measures**

The only air pollution sources are the road transport network of the trucks/dumpers. The dust suppression measures like the following will be resorted:

- Water sprinkling will be done on the roads regularly. This will reduce dust emission further by 75%.
- Care will be taken to prevent spillage by covering the carrying vehicles with tarpaulin and sprinkling of water, if dry.
- Fortnightly scraping of road in order to keep the roads almost leveled. This will ensure smooth flow of vehicles and also prevent spillage.
- Overloading will be kept under check by giving prior awareness.
- Proper Tuning of vehicles to keep the gas emissions under check.
- Plantation of trees along the road sides helps to reduce the impact of dust in the nearby villages.

9.9 NOISE ENVIRONMENT

Day and night sound pressure levels L_{eq} is often used to describe the community noise exposure, which includes 10 dB (A) night time penalty.

The monitored noise level during the base line period within the core zone and buffer zone has been found to be within the prescribed CPCB standards which will also be confined within the limit by

undertaking more plantations within the mining area especially in the direction of habitation to act as a sound barrier.

9.9.1 Impact due to Ground Vibrations

Ground vibration, fly rock, air blast, noise, dust and fumes are the deleterious effects of blasting on environment. The explosive energy sets up a seismic wave in the ground, which can cause significant damage to structures and disturbance to human occupants. It causes major damages to the pit configuration too.

When an explosive charge is fired inside the blast hole, it is instantly converted into hot gases, which exert intense pressure on the blast hole walls. High intensity shock waves propagate radically in all directions and cause the rock particles to oscillate. Dust will be generated during operational activity i.e. loading & unloading, drilling, blasting and crushing etc. During blasting the large amount of dust forcibly comes out from the blasting holes, controlled blasting and sprinkling of water to form a content for suppression of dust in the blasting area.

Ground vibration from mine blasting is expressed by amplitude, frequency and duration of blast. The variables, which influence ground vibrations, are controllable and non-controllable. The non-controllable variables include general surface terrain, type and depth of overburden and wind. Similarly, the controllable variables include type of explosives, charge per delay, delay interval, direction of blast progression, burden, spacing and specific charge and coupling ratio.

The oscillation of rock particles is called Particle Velocity and its maximum value is called Peak Particle Velocity (PPV), which is measured in millimeter per second.

As the distance increases, the PPV value is likely to reduce. The ground vibrations generated by blasting during the mining operations will be well within the standards prescribed by DGMS by controlled blasting. Ground vibrations are not likely to affect the structures in the vicinity of mine lease area.

By adopting controlled blasting, the problems will be greatly minimized at mines. The impacts are also minimized by choosing proper detonating system, optimizing total charge and charge/delay.

9.9.2 Measures for Minimizing Adverse Impacts

➤ Noise Control Measures

- The following control measures are being and will be continued to be adopted to keep the ambient noise levels well below the limits:
- Drilling is being carried out with the help of sharp drill bits which will help in reducing noise.
- Secondary blasting is being totally avoided and Hydraulic rock breaker is being used for breaking limestone.

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- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay is being maintained.
- The blasting is being carried out during favorable atmospheric condition and less human activity timings;
- Proper maintenance, oiling and greasing of machines at regular intervals is being done to reduce generation of noise.
- The prime movers/diesel engines are properly maintained;
- Provision of sound insulated chambers for the workers deployed on machines (HEMM) producing higher levels of noise;
- Proper designing of plant & machinery by providing inbuilt mechanism like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment.
- Green Belt/Plantation is being developed around the mining activity area and along haul roads. The plantation minimizes propagation of noise.
- Personal Protective Equipment (PPE) like ear muffs/ear plugs is being provided to the operators of HEMM and persons working near HEMM; and
- Reducing the exposure time of workers to the higher noise levels.
- Periodical monitoring of noise will be done.

➤ **Measures to Control Ground Vibration**

The controlled blasting will minimize ground level vibrations of the mine blasting. Dust will be generated during operational activity i.e.loading & unloading,drilling,blasting and crushing etc. The measures that are generally followed and currently proposed for abatement of ground vibration, air blast and fly rocks are detailed below:

- Proper quantity of explosive, suitable stemming materials and appropriate delay system are being adopted to avoid overcharging and for safe blasting.
- Adequate safe distance from blasting is being maintained.
- Blasting operations is carried out only during day time.
- The charge per delay is minimized and preferably more number of delays is used per blasts;
- During blasting, other activities in the immediate vicinity is temporarily stopped;
- Drilling parameters like overburden, depth, diameter and spacing is properly designed to give proper blast.

9.10 TRAFFIC ANALYSIS

The roads connect from the mine site to SH- 9 at 1.30 km towards South (Raipur- Balodabazar Road)/NH 200 at 17.60 km towards west (Raipur-Simga Road) from the project site. These roads are wide enough to facilitate easy and smooth movement of heavy duty trucks. Highway trucks/trolleys ply regularly and these will easily accommodate additional trucks/tippers per day.

Traffic analysis is carried out by understanding the existing carrying capacity of the roads near to the project site and the connecting main roads in the area. Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity.

The Detailed traffic study has been discussed under **Chapter 4**.

9.11 SOCIO-ECONOMIC ENVIRONMENT

The implementation of the limestone Mining Project will generate both direct and indirect employment. Besides, it will provide a check on existing system of mining operation. Since the quarries will be allotted on lease basis, mining operation will be legally valid and it will bring income to the state exchequer. The project will also provide impetus to industrialization of the area. Where transfer of limestone into bajri is necessary crushing units will come up. It is expected that intending entrepreneurs will venture to set up micro and small scale units in the near future making the area a mixed society, dependent on industry, trade and business. At present agriculture is the main occupation of the people as more than half of the population depends on it. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities rather in agriculture. Thus there will be a gradual shifting of population from agriculture to mining and industry. Further, the mining and industrial activities in the area may lead to rapid increase in population and thereby urbanization. Due to urbanization of the area, employment opportunities will further increase.

9.12 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Proper environmental management plan are proposed for “limestone Mining Project” to mitigate the impact during the mining operation.

- a. Proper blasting pattern will be followed by the blasters for effective rock fragmentation and generation of minimal fine dust to open atmosphere.
- b. Regular water sprinkling at dust emanating sources viz., drilling, blasting and transportation through haulage roads, etc. will be carried out.
- c. Periodic maintenance of transport vehicles and equipment will be carried out to check emission levels.

- d. Greenbelt will be developed that will act as a pollution sink.
- e. Overloading of trucks will be avoided and carrying the rocks in covered trucks will be taken up to minimize pollution level.

9.13 ENVIRONMENTAL MANAGEMENT PLAN IMPLEMENTATION

Environmental Management Plan serves no purpose if it is not implemented with true spirit. Some loopholes in the EMP can also be detected afterwards when it is implanted and monitored. Thus, an implementation and monitoring programme has to be prepared.

The major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management will strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas for eco-friendly mining:

- a. Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.
- b. Collection of soil samples at strategic locations once in every two years and analysis thereof with regard to deleterious constituents, if any.
- c. Measurement of water level fluctuations in the nearby ponds dug wells and bore wells.
- d. Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done in every six months for first two years, thereafter once a year.
- e. Plantation/afforestation will be done as per program i.e. road sides and near civic amenities, which will be allotted by Government bodies. Post plantation, the area will be regularly monitored in every two years for evaluation of success rate. For selection of plant species local people will also be involved.

9.14 BUDGET ALLOCATION FOR EMP IMPLEMENTATION

Table 9.4 Cost of EMP & CER

S.N	Particulars	Amount (in Rs.)
1	Corporate Environment Responsibility (CER)	
	COP 1,00,05,000 X 2% = 2,00,100/-	2,01,000
2	Development & Maintenance of Green Belt, Dust Suppression and other environment management cost	2,00,000
	Total::	4,01,000

9.15 MONITORING SCHEDULE AND PARAMETERS:

Table 9.5 Monitoring Schedule and Parameters

S No	Description of Parameters	Schedule and Duration of Monitoring/Execution
1	Air Quality: e) In the vicinity of the mine f) In the vicinity of the transportation Network g) Dust suppression on roads h) Scraping/ bulldozing of road to shift accumulated dust to the sides	24 hourly samples twice a week for one month in each season except monsoon season Regularly in non- monsoon months and whenever occurrence of fugitive dust takes place Fortnightly
2	Water Quality near or around the site: c) Surface water quality d) Ground water quality	Once in a season for 4 seasons in a year
3	Ambient Noise Level	Twice a year for two years & then once a year
4	Soil Quality	Once in two years on project monitoring area
5	Inventory of Flora(tree plantation, survival etc.) & Fauna	Once in two years on project monitoring area
6	Socio-economic condition of local, population, physical survey	Once in 3 years

9.16 BENEFITS OF MINING

- i. Generating useful economic resource for construction.
- ii. Generating employment.
- iii. Improvement in socio economic conditions of the people of the study area.
- iv. Improvements in physical infrastructure.
- v. Improvements in Social Infrastructure.
- vi. Increase in Employment Potential.
- vii. Contribution to the Exchequer.
- viii. Prevention of illegal mining.
- ix. During and Post-mining enhancement of green cover.