EXECUTIVE SUMMARY

FOR

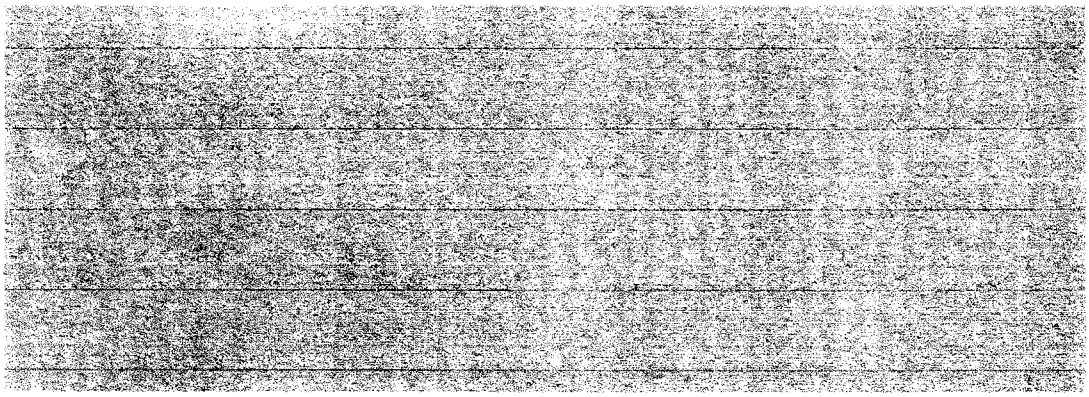
DOLOMITE MINE

OF

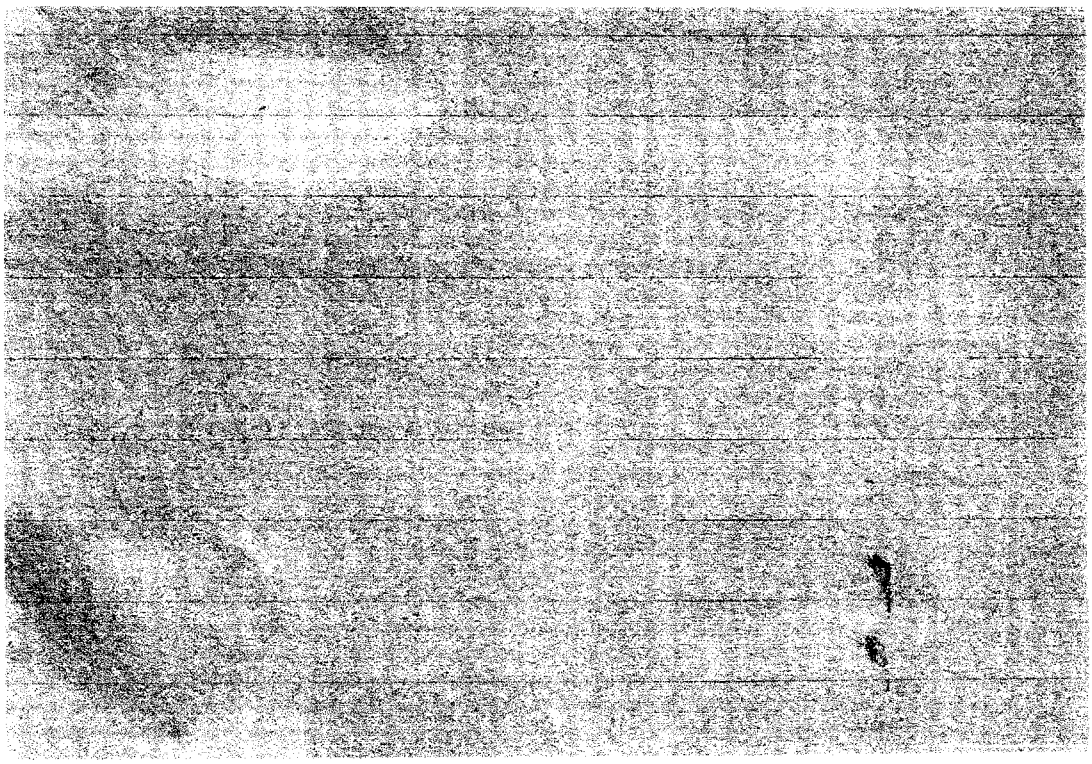
VILLAGE PENDRIDIH,

BILHA TEHSIL,

BILASPUR DISTRICT (C.G)



M/S GUPTA STONE MINES



DRAFT ENVIRONMENT IMPACT ASSESSMENT REPORT

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ES. EXECUTIVE SUMMARY

ES.1 INTRODUCTION

Environmental Impact Assessment (EIA) is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision making tool, which guides the decision makers in taking appropriate decisions for proposed projects. EIA systematically examines both beneficial and adverse consequences of the proposed project and ensure that these impacts are taken into account during the project designing.

ES.2 PROJECT DESCRIPTION

ES.2.1 The Project and its Location

The M/s Gupta Stone Mines dolomite mining projects lies in Pendridih village, Bilha Tehsil, Bilaspur District in Chhattisgarh. The area lies in the latitude of 21°59'25.79"N to 21° 59'41.15"N and longitude of 82°03'35.78"E to 82°03'45.18"E. The project falls under Category "B" as per EIA Notification 2006 and as amended so far.
The silent features of the project site are given in **Table**

Table: Salient Features of the Project Site

Project Site	Village-Pendridih, Tehsil-Bilha, District-Bilaspur and State Chhattisgarh
Site Coordinate (Refer **Figure 1.3** for map of coordinates superimposed on topographical sheet)	Latitude 21°59'25.79"N to 21° 59'41.15"N Longitude 82°03'35.78"E to 82°03'45.18"E
Elevation above MSL	Maximum Elevation – 291 mRL Minimum Elevation – 285 mRL
Nearest Highway	NH, about 375 m towards East
Nearest Town/Village	Pendridih-300m towards North Bilha-3.2 km South East direction
Nearest Railway Line	Bilha Railway station, about 3.58 km towards South East
Nearest Airport	Bilaspur (Chakarbhata) Airport, about 4.9 km towards East direction
Nearest Reserve Forests	No RF lies within the study area
Ecological Sensitive Zones	NIL
Seismicity	Seismic Zone I

ES.2.2 Project Proponent

M/s Gupta Stone Mines has been submitted the application and presented to the State Expert Appraisal Committee (SEAC) Chhattisgarh on [illegible] meetings. With reference to the technical presentation before SEAC Chhattisgarh; the committee recommended to prepare the combined EIA report for the area under Category B1 as per the latest amendments to the EIA Notification 2006.

The letter of intent for carrying out prospecting work for dolomite over an area of 6.683 Ha in village – Pendridih, Tahsil – Bilha, District – Bilaspur was granted to M/s Gupta Stone Mines, proprietor Shri Dwarika Gupta, Bilha and the licence agreement has been signed with the State Govt. on 21 /09/2015 for one year i. e. upto 20/09/2016.

Thereafter, the prospecting work has been carried out and submitted to the competent Authorities. Accordingly, the State Govt. has issued a Letter of Intent for submission of Quarry Plan for the same vide State Govt. Letter No.– F 3-4 / 2017 / 12 Naya Raipur dated 05/12/2017 and duly approved vide letter no. **1687-90/Mining-2/Q.P./F.No.77/2015 New Raipur, Dated 6 April 2018.**

Thus, the Quarry Plan of the above said area has been prepared and submitted to the State Govt. under Rule 24 of Chhattisgarh Minor Mineral Rules, 2015.

ES.2.3 Proposed rate of production and life of the mine of the project area:

The Proposed rate of production and life of the mine of the project is depicted

S. No.	Name of the Mine	Area (Ha)	Life of mine	Production Capacity
1	M/s Gupta Stone Mines	6.683	49	50000 TPA

ES.2.4 Topography

The entire [illegible] area is almost a flat land, having gentle slope towards southern direction. The general surface level of the area is 289 mRL. The maximum contour level is 291 mRL towards northern direction and minimum is 285 mRL towards southern direction.

ES.3 REGIONAL AND GEOLOGICAL SETTING

ES.3.1 Regional Geology

The dolomite and associated formation which is occurring near this village is a part of Chhattisgarh Synclinorium and belonging to Hirri Formation of the Raipur Group of Chhattisgarh Supergroup. The dolomite deposit is almost horizontally bedded with local dip

from 3^0 to 5^0 towards north. The general strike of the dolomite bed is east-west. The interacratonic Chhattisgarh Basin is crescent shaped and covers about 33,000 sq km area in the center to eastern part of Chhattisgarh and adjoining parts of Orissa. The basin has a maximum length of about 300 km along ENE-WSW direction. The maximum thickness of sediments is estimated to more than 2 km and is epicontinental or stable shelf type.

The regional geology of the Chhattisgarh Supergroup as per GSI Publication on 2006 is as under:

	Group	Formation	Member	
CHHATTISGARH SUPERGROUP	Raipur Group	Intrusives		Dolerite dyke
		Maniyari (70 m)		Purple shale with dolomite, dolomitic limestone and gypsum
		Hirri (70 m+)		**Grey dolomite, argillaceous dolomite**
		Terenga (180 m ?)	Bilha	Purple dolomitic argillite
			Dagauri	Green clay, chert and shale intercalation (tuffaceous?)
			Kusmi	Pink to purple calcareous shale
		Chandi (67 m)	Nipania	Purple and bedded limestone Purple argillaceous stromatolitic dolomite
			Pendri / Deodongar	Purple and grey stromatolitic limestone and dolomite with flaggy limestone-shale intercalation / ferruginous glauconitic arenite and shale
		Gunderdehi	Newari	Pink and buff stromatolitic limestone and dolomite
			Andha / Dotopar	Predominantly pink, purple and grey shale with limestone intercalation / arenite / buff to green shale member in the middle
		Charmuriya (490 m)	Bagbura	Purple limestone (phosphatic)
			Kasdol	Dark grey bedded limestone / argillaceous limestone with minor shale intercalations
			Ranidhar	Cherty limestone and dolomite (phosphatic at places)
			Sirpur	Chert and clay intercalation
	Chadrapur Group	Kanspather		White to pinkish glauconite quartz arenite
		Chapordih (20-200 m)		Purple, green, grey and black shale with fine quartz arenite intercalation
		Lohardih (20 m)		Ferruginous purple arkose and gritty wacke arenite with shale partings and conglomerate at the base
		Unconformity		
	Singora Group	Chhuipali (300 m?)		Stromatolitic limestone and dolomite at the upper part Variegated shale with minor bedded limestone, chert, siltstone intercalations
		Bhalukona(20		Quartz arenite / siltstone and minor shale

		m)		
		Saripali (60 m)		Variegated shale with minor siltstone and limestone Porcellanite, tuff / tuffite
		Rahikhol (20 m+)		Feldspathic arenite, arkose and conglomerate at the base
		Unconformity		
		Basement		Archaean and Lower Proterozoic rocks

ES.3.2 Local Geology

Geology of the area: Dolomite is flaggy in nature, predominantly grey in color, fine to medium-grained, hard and compact and found to be associated with thin shale bands at places.

Locally, following lithological sequence is occurring in the area:

Top soil / overburden

Bedded dolomite

Shaly / siliceous band

Top soil/overburden: The top soil is mainly black cotton soil with an average thickness of 1.54 m. But, only top 0.5 m soil is fertile in nature. The weightage average thickness of top soil has been estimated considering the thickness encountered in boreholes as under:

BH No	Area (sq m)	Thickness of soil (m)
1	16658	0
2	8585	3
3	7710	1
4	8790	2
5	6150	3
6	7400	3
7	11540	1
Total	66833	1.54
		Say 1.50 m

Dolomite: The dolomite of the area is having light grey colour, massive form, vitreous Lusture and streak white, having hardness about 3, specific gravity has been considered as 2.6. The thickness of dolomite is considered based on weightage average thickness encountered in boreholes which is 20.20 m.

BH No.	Area (sq m)	Thickness of Dolomite (m)
1	16658	21
2	8585	19
3	7710	21
4	8790	18

5	6150	21
6	7400	15
7	11540	24
Total	66833	20.20

Dolomitic shale and shale: Below the dolomite bands or/and in between the bands, bands of dolomitic shale and shale are encountered. This is having blackish in colour, flaky in nature, dull Lusture, having hardness about 2.5, specific gravity has been considered as 2.5. The thickness of shale bands are about 8 to 9 m as encountered in boreholes.

Structure of the area: The area is almost flat with a general ground sloping towards southern direction. The dolomite is nearly flat showing sub-horizontal dips at places from 2^0 to 5^0, towards northern direction in nearby working mines.

ES.4 RESERVES

Estimation of Reserves

The exposed dolomite deposit is found to be entire applied area, the volume of the deposit is computed by cross sectional area method by multiplying the cross sectional area.

The cross sections were drawn perpendicular to the strike direction, the cross sectional area of the individual sections are calculated to arrive at sectional area, the area thus arrived is multiplied by the sectional influence (Average).

The details of minerals reserves are described below in **Table**

Table:- Total Reserve & Resource estimation table

S.No.	Name of the Mine	Total Geological Reserve (MT)	Total Blocked Reserve (MT)	Total Mineable Reserve (MT)	Average Production Capacity (in tonnes)	Life of the Mine (Yrs)
1	M/s Gupta Stone Mines	4780555	1305008	3475547	50000	49

ES.5 MINING

The proposed method of mining will be open-cast semi-mechanized under by using dozer fitted with ripper, wagon drill (80 mm dia) and sometimes jack hammer of 32 mm dia will also be used for drilling and subsequent blasting, and for reduction of oversized boulders generated during the blasting to loadable size will be by hydraulic rock breaker. Thereafter, ROM will be transported by excavator/dumper combination to the C & S Plant for further processing.

A crushing and screening plant is already installed at village Hardi which is about 3 km from the applied lease area.

The sequence of working will be as under:

(i) The haulage road will be constructed by maintaining a gradient of 1:16 with width of about 12 m for to & fro movement of dumpers.

(ii) Initially, the development will be carried out on the central part of the lease area by removing OB of about 1.50 m thick (top soil 0.50 m + OB 1.00 m) from 289.5 to 288 mRL and this will form the first bench (OB bench). The top soil and OB will be removed separately by using dozer fitted with ripper.

(iii) The top soil will be separately stacked within the lease area for future utilization in plantation.

(iv) The OB will be transported to the dump yard within the 7.5 m zone thereafter top soil will be spreaded over the dump and covered by plantation.

(v) After removal of OB, production of dolomite will start with a bench height of 3 m, these 3 m benches will be finally converted into 6 m during conceptual period.

(vi) The blast holes will be drilled by DTH drill machine of 80 mm dia for blasting. Thereafter, the oversized blasted mass will be reduced by hydraulic rock breaker to loadable size (about 8" to 10") which will be transported by excavator/dumper combination to crushing & screening plant for further sizing as required by the consumers.

(vii) The recovery of graded dolomite will be expected as 95% of the total ROM and the remaining 5% constituting of clay / laterite in the voids encountered within the dolomite bands will be separated manually and will form waste, which will be used for maintenance of haul road.

(viii) In the C & S plant, the marketable size fractions of 40mm, 20mm, 12mm, 6mm & minus 6mm will be produced as per market demand.

(ix) The total working days in a year will be about 300 days with one shift working.

(x) The proposed maximum annual production of dolomite will be 50,000 tonnes.

Table: Mining Method of mine lease area:

S. No.	Name of the Mine	Existing	Proposed
1	M/s Gupta Stone Mines		Open cast semi mechanized

Source: Approved Mining plan/Scheme by Indian Bureau of Mines

ES.6 LAND USE PATTERN

The description of the land-use for the buffer and core zone is given in the **Table below**. The 10.0 km land-use map is given in **Figure 0.9** with superimposed on FCC Imagery and shown as **Figure 0.10**. and pie-diagram of the study area is shown as **Figure 3.11**.

Table: Land-use Classification of the Project Area

Land-Use Classification	Area in Hectare	Area in %
Waterbody	774	2.37
Settlements	3849	11.80
Open Scrub	4370	13.39
Sandy Area	450	1.38
Mining Area	229	0.70
Agriculture Land	22956	70.36
Total	**32628**	**100.00**

Source: SOI Toposheet and Satellite Imagery of Project Area, Landsat LISS-III Satellite Imagery,Google earth Inc., USA

ES.7 ANALYSIS OF ALTERNATIVES

In the proposed project, an opencast mining will be carried out. For that, no other methodology is going to be changed, depending upon the geological set up, strata of the rock, boulders and its structural behaviour. So, all the parameters of EIA/ EMP will be implemented as per the open cast mining.

ES.8 DESCRIPTION OF ENVIRONMENT

Mining activities invariably affect the existing environmental status of the site. It has both adverse and beneficial effects. To maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components.

Baseline data collection/generation forms a part of the Environmental Impact Assessment (EIA) study and helps to evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted environmental impact assessment methodologies. Baseline data is also required in preparing an Environmental Management Plan (EMP) outlining the measures for improving the environment quality and scope of future expansions for environmentally sustainable development.

This section contains the description of baseline studies of the 10 km radius of the area surrounding "Pendrdih Mine". 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.

Baseline data was generated for various environmental parameters including air, water (surface and ground water), land and soil, ecology and socio-economic status to determine quality of the prevailing environmental settings. The study was conducted during Pre-monsoon (March-May, 2019) season.

The baseline data for environmental parameters were collected as per standard Terms of Reference for the relevant category of the project. The data was also authenticated or validated from the secondary data collected from regarding departments of agencies

ES.8.1 Meteorological Data

The data on meteorological parameters in the study area were monitored continuously for Summer season (March to May 2019). The data was monitored with an automatic weather-monitoring station placed at nearby Village. The details of the parameters considered for the study and the results computed are presented in **Table below** and on-site wind-rose pattern is shown as **Figure 3.17**. Hourly Meteorological data is enclosed as **Annex 7**.

Table: On-site Micro Meteorological Data for Pre-monsoon Season

Months	Temperature (°C)			Relative Humidity (%)			Average Wind Speed		Total Rainfall (mm)
	Max	Min	Average	Max	Min	Average	km/hrs	m/s	
March, 19	41.7	18.6	27.7	79.0	44.0	58.9	5.1	1.4	0.0
April, 19	43.7	23.0	32.1	73.0	46.0	59.9	5.7	1.6	0.0
May, 19	46.1	24.6	33.0	76.7	44.3	60.2	6.2	1.7	0.0
Average	**43.8**	**22.1**	**30.9**	**76.2**	**44.8**	**59.6**	**5.7**	**1.6**	**0.0**

Source: JP Test & Research Centre, NCR, Ghaziabad

The maximum temperature recorded during the study period was 46.1°C in the month of May and the minimum temperature was 18.6°C in the month of March. The highest RH found in the study area was 76.7% in the month of May, while minimum monthly average RH found 44.0 % in the month of March. The average wind speed recorded was 1.6 m/sec. Wind rose diagram from the monitored data shows that the predominant wind direction during the study period was mainly North followed by West.

ES.8.2 Air Environment

Eight Ambient Air Quality Monitoring (AAQM) Stations were selected. Criteria used for designing the network were principally governed by the wind rose pattern & coverage factor calculation of windblown for winter season and the accessibility of the selected sites. Attempts were made to locate most of the AAQ stations in predominant downwind direction with respect to the project site. Logistic considerations such as accessibility, security, and availability of reliable power supply etc. were also examined while finalizing the stations. Monitoring Locations are marked in **Figure** ..

Table: Consolidated 98th Percentile Values of AAQ

Location Code	Location Name	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/ m^3)	Silica as Quartz *
AAQ-1	Project Site	69.8	31.5	14.2	22.3	1.19	1.49
AAQ-2	Achanakpura	81.5	32.5	14.0	17.9	1.28	1.67
AAQ-3	Murhipar	60.5	25.0	15.3	20.3	1.27	1.21
AAQ-4	Muru	69.9	26.3	14.9	18.1	1.20	1.38
AAQ-5	Chakarbhata	61.0	28.8	16.7	22.9	1.17	1.14
AAQ-6	Chaunrabhatha	75.4	27.6	15.0	18.5	1.33	1.57
AAQ-7	Bilha	71.8	23.7	13.6	17.3	1.18	1.30
AAQ-8	Chirchida	64.9	22.3	13.0	16.9	1.30	1.39
Standards for 24 Hours Monitoring except CO for 1 Hour Monitoring							
NAAQS 2009		100	60	80	80	4	-

Source: JP Test & Research Centre, NCR, Ghaziabad, *Silica as (µg/m³), Gazette of India Notification, dated 18th Nov 2009 * Annual Arithmetic Means of minimum 104 measurements in a year at a site taken twice a week 24 hourly at uniform intervals, ** 24 hourly or 8 hourly or 1 hourly monitored value, as applicable shall be complied with 98% of the time in a year. 2% of the time they may exceed the limits but not on two consecutive days of monitoring, For CO 1 hourly standard is being considered.

Baseline Interpretation

S. No.	Parameters	Baseline Status
1.	Particulate Matter (PM_{10} & $PM_{2.5}$)	The particulate matters size not greater than 10 µm in diameter is collectively referred to as PM_{10}. Due to their small sizes, PM_{10} can be inhaled readily and can penetrate deep into the human body. In study area particulate matter 10 varying from 60.5 $\mu g/m^3$ to 81.5 $\mu g/m^3$. $PM_{2.5}$ was observed 22.3 $\mu g/m^3$ to 32.5 $\mu g/m^3$. Overall particulate matter was observed below to the NAAQS standards of 100 $\mu g/m^3$ 60 $\mu g/m^3$ respectively. Overall, the air condition is good in area and meeting to NAAQS 2009.
2.	Gaseous Pollutants (SO_2, NO_x & CO)	The source of SO_2 in the study area is mainly from burning fuels containing sulphur or emissions from biomass depending on the sulphur content in the material. Other anthropogenic sources are high vehicular moment. The primary sources of NO_2 in the study area are motor vehicles, electric utilities and residential sources that burn fuels. SO_2 was varying from 13.0 $\mu g/m^3$ to 16.7 $\mu g/m^3$ & NO_x was observed 16.9 $\mu g/m^3$ to 22.9 $\mu g/m^3$) in study area. CO was observed from 1.17 mg/m^3 to 1.33 mg/m^3 in study area. All the parameters are complying

S. No.	Parameters	Baseline Status
		to the standards as defined by CPCB.
Overall, air quality was good in the area and only vehicular and mining emission activities are the major source of the particulate matter and gaseous emission.		

ES.8.3 Noise Environment

Eight noise monitoring locations were selected. The Sound Pressure Level recorded during the daytime on all locations varies from 50.4 dB(A) to 56.0 dB(A) and during night-time varying from 32.6 dB(A) to 36.4 dB(A). The noise level was found well within prescribed standards due to absence of any major noise generating activities in the area.

ES.8.4 Water Environment

Ground water:

Five surface water samples were collected from the available identified water bodies during the Summer season (March 2019 to May 2019). Six ground water sources were examined for physico-chemical and heavy metals to access the effect of the already ongoing activities on surface and ground water. Water sampling locations are depicted in **Figure 0.2**.

The permanent hardness of water is typically given in one of three types of measurements: grains per gallon, milligrams per liter (mg/L), or parts per million (ppm) of "calcium carbonate" in the water. Since calcium carbonate has a mw of 100 g/mole the equivalents of calcium carbonate would be:

$$g\ CaCO_3 = 100\ g/\ mole \times ([Ca^{2+}] + [Mg^{2+}])$$

where [Ca2+] [Ca2+] is the molarity of calcium and [Mg2+] is the molarity of magnesium. So, in the sense of molarity, calcium and magnesium are equal. However, you could also measure calcium and magnesium as mass of the cation per volume in which case

$$\text{mass of } CaCO_3 = 2.5 \times (\text{mass of } Ca^{2+}) + 4.1 \times (\text{mass of } Mg^{2+})$$

So, in the sense of the mass of cations, then 1 g/l of magnesium is harder than 1 g/l of calcium. The physical parameters were meeting to the acceptable limits of drinking water as TDS was varying from 452 mg/l to 524 mg/l. Other physical parameters as pH, Na, K are also complying to acceptable limit of drinking water standard 10500:2012. Hardness in the water may be because of the presence of lime in the earth. The chemical parameters were analyzed as alkalinity, calcium, hardness, chloride, Sulphate, fluoride and nitrate etc. all the parameters were meeting to the acceptable limits of drinking water standards IS 10500:2012 at all locations. The heavy metals were also analyzed, only metals were detected as iron & zinc which was meeting to the acceptable limits of drinking water standard 10500:2012 and other metals were below to the detection limits of laboratory. Overall the ground water quality was good to drink.

Surface water:

The physical parameters were analyzed as turbidity, pH, TDS, Na and K. The chemical parameters were analyzed for Alkalinity, Total Hardness, Calcium, Magnesium, Chloride, Bicarbonate, Sulphate, Nitrate, Fluoride, DO and COD were analyzed. Dissolved oxygen was Drinking water source after conventional treatment and disinfection or suitable for outdoor bathing as per CPCB criteria. BOD was observed meeting to class B & below Class E as per CPCB water quality criteria. The heavy metals were also analyzed in the surface water. Only iron & zinc were detected. Other parameters were below to the detection limits. Total coliform was meeting to the Class B of water quality criteria as defined by CPCB.

ES.8.5 Soil Analysis Report

Soil samples has been collected from 6 locations. As per district brochure and area surveyed, Agriculture is practiced in the area during kharif and Rabi season every year. During the Kharif, cultivation is done through rainfall while during the Rabi season, it is done through ground water as well as partly through surface water like ponds and other sources. The groundwater abstraction structures are generally Dug wells, Bore wells /tube wells. The principal crops in the block are Paddy, Wheat and Gram. The soil quality is very good as are was mostly loamy which is good for cropping and root development.

The pH was ranges 7.1 to 8.6 which was neutral to strongly alkaline as per ICAR guideline. The conductivity was varying from 468 µmhos/cm to 821 µmhos/cm in the study area which is meeting to average soil quality. The organic carbon of the study area was an average sufficient to more than sufficient (0.57%) to (1.47 %). Nitrogen was observed varying from 116.2 kg/ha to 264.2 kg/ha which is good to better for crop growth. Phosphorous was variable in study area as the quality was very less in the soil. The potash content was very low to average in terms of fertility. Overall the soil quality was good having the good bulk density, porosity and infiltration rate.

ES.8.6 Water Requirement

The total water requirement in the project area of the dolomite Mine is about 6 KLD. The water is used in the following purpose and it will be met through Ground water.

- For dust suppression;
- For domestic consumption;
- For greenbelt development;

ES.8.7 Air Modelling

In order to predict the particulate emissions, Gaussian's mathematical expression was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of particulate matter, due to the various mining activities of the proposed mine.

Predicted GLC of PM_{10} after Implementation of Project on 24 hourly bases in $\mu g/m^3$

Sl. No.	Particular	Max. 98P Baseline GLCs of PM_{10} (Near to the project site)	Predicted Max. Predicted GLC s	Resultant GLC	Permissible Limit
1	PM_{10}	----	0.0328	---	100

Source: - EIA Study conducted by In Situ Enviro Care, Bhopal

Modelling was done for an infinite line source assuming unpaved road. For conservative calculation wind was assumed to blow at a velocity of 1.85 m/s perpendicular to the road. The result for 24 hourly concentration values is showing in **Figure 4.4 & 4.5**.

It is observed that the average ground level concentration (GLC) decreases from 92.05 $\mu g/m^3$ for PM_{10} at 50 m at the center line of the road to 12.03 $\mu g/m^3$ at 500 m from the center line of the road. These values have been predicted for a dry unpaved road in an uncontrolled scenario. However, GLC of PM_{10} at 50 m will further reduce to 23.93 $\mu g/m^3$ and 3.13 $\mu g/m^3$ at 500 m in a controlled scenario i.e. through water sprinkling.

The distance of unpaved road of the proposed dolomite mine within the mine lease area is approximately 200 m to 0.50 km (average). After that pucca road is available. Hence, no fugitive emission will take place after this point. Most of the fugitive dust will get settled at this distance due to specific settling velocity of the particles. Also, regular water sprinkling will reduce the dust drastically.

The dispersion of vehicular emissions is limited to 100 m, after that particle will get stabilized on the earth surface due to their specific settling velocity. The incremental GLCs due to vehicular movement have been calculated at 50 m from the road to present the worst-case scenario.

ES.9 IMPACT ASSESSMENT

ES.9.1 Air Environment

In opencast mining the different process of handling and transportation of minerals in the mining activities are prone to generation of high levels of fugitive dust that may increase the levels of particulate matters to high extent. Dusts are likely to generate due to the following mining processes:

- Blasting
- Generation of dust due to transportation of minerals
- Generation of dust due to movement of heavy vehicles

The effects of air pollutants upon receptors are influenced by concentrations of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for

prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards. It was found that after mines operation the resultant Ground Level Concentration for Particulate Matters will be below the stipulated standards. The efficient management of air quality requires the use of modelling techniques to analyse the patterns of pollutant concentrations from many individual sources of air pollutants operating simultaneously.

Mitigation measures:

- Controlled blasting techniques
- Drilling units to be equipped with water spraying system
- Drilling units to have in-built dust collector system
- Dense plantation
- Dust suppression systems

ES.9.2 Noise Environment

The impact due to blasting noise in the nearest habitation from the mine site not going to be significant, as the time duration for which the noise level is going to rise is very limited, i.e. up to a few seconds in the whole day.

Mitigation Measures:

- Proper maintenance of equipment
- Dense plantation to act as acoustic barriers
- Blasting parameters to be suitably set to reduce ground vibrations
- Equipment to be sealed with acoustic enclosure

ES.9.3 Water Environment

There is not toxic element in and around the applied area. Hence contamination of any nature is not expected for surface or any ground water source.

ES.9.4 Ecology

There are no Wildlife Sanctuaries or National Parks or Tiger Reserve within 15 km radius of the project site. The impact on terrestrial ecology would be due to emission of gaseous pollutant like NO_2 due to transportation activities. Adequate dust control measures would be taken to control dust emissions. Moreover, as described in air quality section above, the contribution of PM, NO_2 and SO_2 due to mine operation will result in the AAQ to remain within the AAQ standards. The existing mining lease area is government revenue land. Lease area does not have any habitation of rare or vulnerable species. To control emissions,

dense plantation will be carried out in the mine lease area as well as in the along the haul roads.

ES.9.5 Impact on Socio-economic

The mining activity will generate socio-economic benefits to the people. In mining activity number of skilled and unskilled workers are employed which generate direct or indirect employment. Additional facilities such as medical, educational, and infrastructural development will also take place under CSR activities. While assessing the socio-economic and sociological impact it has been noticed that economic level and living standard of people will generally increase.

ES.10 ENVIRONMENT MONITORING PLAN

Usually an impact assessment study is carried over short period of time and the data cannot bring out all variations induced by the natural or human activities. Therefore, regular monitoring program for environmental parameters is essential to take into account the changes in the environment. The objective of monitoring is:

- To verify the result of the impact assessment study in particular with regard to new developments;
- To follow the trend of parameters which have been identified as critical;
- To check or assess the efficiency of the controlling measures;
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new installations
- To check assumption made with regard to the development and to detect deviations in order to initiate necessary measures; and
- To establish a data base for future impact assessment studies for new projects.

ES.11 RISK ASSESSMENT & HAZARD

The components associated with risk and hazard in a mining case include blasting, overburden, heavy machinery and explosive storage. Measures to reduce and avoid any incidents occurring from the above mentioned components are already planned and will be implemented as soon as the mine starts commissioning. This includes measures to avoid accidents during blasting, due to storage of overburden and due to trucks and dumpers. The project does not involve storage of any chemicals or explosives and therefore risk associated with storage is not considered.

ES.12 PROJECT BENEFITS

- Improvement in physical infrastructure
- Improvement in Social Infrastructure
- Employment Potential
- Company will undertake awareness program and community activities like health, camps, medical aids, family welfare camps,

ES.13 ENVIRONMENT MANAGEMENT PLAN

The mining activities involve, dozing, excavation, loading, haulage and transportation of OB and ore. These activities lead to generation of air borne dust, which can cause air pollution in and around the mining lease area, if appropriate control measures are not taken. Similarly mining causes Land Degradation, Noise and Water Pollution etc. in the area.
The Environmental Management Plan (EMP) is a site specific plan developed based on the base line environmental status, mining methodology and environmental impact assessment. In order to minimize impacts of mining on different environmental parameters and to keep air and water quality within prescribed limits of CPCB, an Environmental Management Plan (EMP) is prepared to strictly follow it. The environmental management plan includes all measures and safety precautions necessary for safe mining along with rehabilitation measures for mined out areas.
It is necessary to include the environmental cost as a part of the budgetary cost component. The project authorities propose to undertake the following environmental works to achieve the environmental quality as desired.

The mine will be supervised and controlled by an independent Mines Manager supported by adequate team of technically and statutorily qualified personnel apart from the operating staff of skilled, semi-skilled, unskilled and other categories.

This Environment Cell is responsible for the management and implementation of the environmental control measures. Basically, this department shall supervise the monitoring of environmental pollution levels viz. ambient air quality, water and effluent quality, noise level either departmentally or by appointing external agencies wherever necessary.

The working conditions in the mines are governed by the enactments of the Director General of Mines Safety (DGMS). As per the guidelines of the Mines Act, the management will take all necessary precautions. Normal sanitary facilities will be provided within the lease area. The management will carry out periodic health check-up of workers.
A well-defined environmental monitoring program would be emphasized with trained and qualified staff that would monitor the ambient air to ensure that the pollutants level is maintained always within the permissible levels. The locations will be finalized in consultation with SPCB.

ES.13.1 Green belt Development Plan

Green belt is plantation of trees for reducing the pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. The greenbelt development plan aims to overall improvement in the environmental conditions of the region. The plan with a five-fold objective addresses issues such as providing sink for air pollutants likely to emitted from the project; enhancing the forest cover for increasing the biodiversity of the region; providing aesthetic value to the project area enhancing the ecological equilibrium of the area; and to a large proportion in combating soil erosion.

- Afforestation on degraded forest area, forest protection / conservation will be carried out every year by the mine owner
- This activity will promote the emergence of the primary succession species, hence it will be a silvicultural operation, extremely important for maintaining ecology and environmental health of the area
- This helps in regeneration & establishment of pioneer plant species saving expose land & land cutting

Conceptual plantation:
The plantation program will be taken up within the 7.5 m of non-mining zone @ of 1,500 saplings during the first year and thereafter only maintenance of this plantation will be carried out. Plantation will be as under:

Year	Sapling (no.)	Area (sq m)
Conceptual Period	2200	10,200

Afforestation will be of miscellaneous and mixed type. These plantations will be carried out around mining zone and both sides of the mine road.

ES.13.2 Social Environment

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings, places, monuments etc exist within the lease area or in the vicinity. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated.
The impact of mining activity in the area is positive on the socio-economic environment of the region. ***The negative impact will be limited to some sporadic health problems, which may occur due to increase in fugitive emission in the vicinity of the mines.*** The Project area of Dolomite mine is providing employment to local population and it will be give preference to the local people whenever there is requirement of man power.

ES.14. CONCLUSION

As discussed, it is safe to say that the proposed facilities are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the premises of "Pendridih Dolomite Mine".