

26<sup>th</sup> September, 2022

LQ/LJB/ENV/AES/351-2022

The Member Secretary,  
State Pollution Control Board, Odisha  
A/118, Paribesh Bhawan, Nilakantha Nagar, Unit-VIII  
BHUBANESWAR-751 012

Sub: Submission of Environmental statement for the financial year ending 31<sup>st</sup>  
March 2022.

Dear Sir,

It is submitted herewith the Environmental Statement in Form-V, as prescribed under Rule 14 of Environment Protection Act, 1986 for the financial year 2021-22 in respect to Lanjiberna Limestone & Dolomite Mines of M/s. Dalmia Cement (Bharat) Limited, At/Po- Rajgangpur, Dist. Sundergarh, Odisha.

This for your kind information.

Thanking you,

For Dalmia Cement (Bharat) Limited, Rajgangpur

  
Dr. Satish Mishra  
Sr. General Manager (Env.)/C

Encl: As above.

CC: (1) The Regional officer, State pollution Control Board, Regional Office, Near Hockey Chowk, Panposh, Rourkela-769004

(2) Regional Director, Ministry of Environment, Forest & Climate Change,  
Regional Office (Eastern Zone), A/3-Chandrasekharapur  
Bhubaneswar-751023.

"FORM - V"

(See Rule 14)  
(Environmental Protection Rules, 1986)

ENVIRONMENT STATEMENT FOR THE FINANCIAL YEAR ENDING THE 31<sup>st</sup> MARCH, 2022  
PART - A

- (i) Name and address of the owner/  
occupier of the industry operation  
or process. : Dalmia Cement (Bharat) Limited  
(Formerly known as OCL India Limited)  
Lanjiberna Limestone & Dolomite Mines,  
At/Po : Lanjiberna-770023  
Dist. Sundargarh (ODISHA)
- (ii) Industry category  
Primary - (STC Code) : Fully Mechanized (Category- A Mines)  
Secondary - (SIC Code)
- (iii) Production capacity - Units : Limestone: 9.50 MTPA  
Dolomite : 0.08 MTPA
- (iv) Year of Establishment : 01.03.1990
- (v) Date of the last environmental  
Statement submitted : 25.05.2021

PART - B

Water and Raw Materials Consumption

(1) Water consumption m<sup>3</sup>/d.

- Process : Consumption plantation and water sprinkling = 29,360 KL
- Cooling & Domestic : 9,089 KL

Nature of products	Process Water consumption per unit of product output	
	During the previous financial year	During the current financial year
Limestone & Dolomite Mining	NA	NA

(2) Raw Material Consumption – Not Applicable as it is a mining project.

* Nature of consumption	Process Raw Material Consumption per unit of product output		
	Quality of product	During the previous financial year	During the current financial year
NA	NA	NA	NA
NA	NA	NA	NA
NA	NA	NA	NA

\* Industry may use codes if disclosing details of raw materials would violate contractual obligations, otherwise all industries have to name the raw materials used.


PART - C

Pollution discharged to environment/unit of output.

(Parameter as specified in the consent issued)

Pollutants	Quantity of pollutants discharged (mass/day)	Concentration of pollutants in discharges (mass/volume)	Percentage of variation from prescribed standards with reasons
(a) Water	-	Please refer Annexure-1 & 2	Within prescribed standards
(b) Air	-	Please refer Annexure-1 & 2	Within prescribed standards

STACK EMISSION TEST

Date	Dust Concentration in mg / Nm <sup>3</sup>
-	Six Monthly Environment Monitoring Reports are attached herewith as Annexure-1&2

PART - D

HAZARDOUS WASTES

(As specified under Hazardous Wastes/Management and Handling Rules 1989)

Hazardous Wastes	Total Quantity (kg)	
	During the previous financial year	During the current financial year
(a) From process	1. Used Oil 18.91 Ton 2. Used Filters 0.07 Ton 3. Discarded 1.76 Ton Containers 4. Waste Residue 0.01 Ton Containing Oil	1. Used Oil 2.97 Ton 2. Used Filters 0.35 Ton 3. Discarded 1.92 Ton Containers 4. Waste Residue 0.00 Ton Containing Oil
(b) From pollution control facilities	Nil	Nil

PART - E  
SOLID WASTE

	Total Quantity	
	During the previous financial year	During the current financial year
a) From process	Not applicable	Not applicable
b) From pollution control facilities	Not applicable	Not applicable
c) Quantity recycled or reutilized within the Unit.	Not applicable	Not applicable
d) Sold	Not applicable	Not applicable
e) Disposed	Not applicable	Not applicable

PART - F

Please specify the characterizations (in terms of composition and quantum) of hazardous as well as solid wastes and indicate disposal practice adopted for both these categories of wastes.

*Handwritten signature*

*Handwritten signature*

*No solid waste. Used oil is collected in drum & sent to General Stores for onward sale to authorized re-processors.*

#### PART - G

Impact of the pollution abatement measures taken on conservation of natural resources and on the cost of production.

*Pollution free atmosphere resulted in better working environment for higher productivity.*

#### PART - H

Additional measures/investment proposed for environmental protection including abatement of pollution, prevention of pollution.

*Practices for pollution control are adopted.*

#### PART - I

Any other particulars for improving the quality of the environment.

Following initiatives taken by Dalmia Cement (Bharat) Limited to improve the Environment-

- Arresting air leakages in process circuits.
- Construction of retaining wall around the mine working pit.
- Covered shed for raw materials with Stacker & Reclaimer.
- The Mineral transportation from mines to plant are done through fully covered Cross Country Belt Conveyor (CCBC) system. Now we have installed Cold Fog Dust Suppression System (CFDS) all along the CCBC including the transfer towers & crushers.
- Installations of Bag filter for better control of stack emission.
- Installation of Weather monitoring system.
- Disposal of Hazardous waste through authorized recyclers for process.
- Eco friendly, Hydraulic drills attached with efficient dust collection system have been deployed.
- We are adopting controlled blasting system to minimize emission of dust and ground vibration.
- Drill bits are being timely sharpened regularly.
- Effluent Treatment Plant has been installed and working properly. The adequately treated waste water is being reused.
- Celebration of "World Environment Day" on 5<sup>th</sup> June every year to create greater awareness among the people of villagers, employee, students and organizing various type of competitions with plantations.
- We have procured eco-friendly machineries to avoid pollution.
- We have installed two numbers continuous real time ambient air quality monitoring stations (CAAQMS), with data transfer facility to SPCB server at mines.
- Conversion of Bag filter of Crusher-4 to auto mode which detect the emission percentage of stack.
- Conveyor Covered with canopy for arresting of dust emission in air at Crusher-4.

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# ENVIRONMENTAL MONITORING REPORT

BASED ON DATA GENERATED

FROM

**APRIL 2021 – SEPTEMBER 2021**

FOR

**OCL INDIA LIMITED**

At/Po: RAJGANGPUR, District: SUNDARGARH, ODISHA



AT

**LANJIBERNA LIMESTONE & DOLOMITE MINES PROJECT**

Prepared By:

**Cleenviron Private Limited**

D-124, KOELNAGAR, ROURKELA, ODISHA

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## 1. INTRODUCTION

Lanjiberna Lime stone & Dolomite Mines of M/s OCL India Ltd. is a captive mine for its Cement manufacturing works situated at Rajgangpur in the district of Sundargarh of Odisha State. The mining lease covering an area of 873.057 ha is located near the village Lanjiberna (**Figure No: 1.1**), under Sundargarh Sadar sub-division of Sundargarh district approximately 18 kms from the Cement Works by road and the aerial distance will be around 12 kms. A vicinity map up to 10 kms radius from the center of the lease is given in **Figure No: 1.2**. Presently the mine is producing 9.50 million tones of Lime Stone per annum and 80, 000 TPA of Dolomite as per Environmental Clearance from Ministry of Environment and Forest, Govt. India vide letter no: J-11015/202/2016-IA.II(M) dated: 4<sup>th</sup> March 2020. Consent to operate from State Pollution Control Board, Odisha is also valid up to 31<sup>st</sup> March 2022 vide Order No 162, vide letter No 55346/IND-I-CON-258, Dt 23.03.2021 for the production of 9.50 million tones of Limestone and 80, 000 TPA of Dolomite.

## 2. PRESENT STATUS OF THE PROJECT

At present from April 2021 to September 2021 the mine has produced Limestone of 27, 52, 855 MT and production of Dolomite was 3, 240 MT during the period mentioned, apart from this 27, 57, 286 MT of sized Limestone and 461.9 MT of Dolomite has been dispatched to the cement plant. Total plantation done is 2800 nos. during April 2021 to September 2021 and the cumulative plantation till date is 3, 36, 101 saplings covering an area of 102.39 ha and the survival rate is 70%. Along with that the mine authority had distributed 12000 saplings during the period in total 34 villages.

## 3. ASPECTS CONSIDERED FOR ENVIRONMENTAL MONITORING

This report is based on the monitoring results generated from April 2021 to September 2021 covering summer and monsoon seasons of the year. Micro-meteorological monitoring was carried out on continuous basis and Ambient Air monitoring was carried out on twice weekly basis at each location and Stack Emission from Limestone Crusher Plant was carried out on monthly once basis. However other aspects like, Water quality, Fugitive Dust Emission monitoring and Noise level studies are carried out on quarterly basis, i.e. during May and August months of the year. Environmental Monitoring data were generated at Lanjiberna Limestone & Dolomite Mines and its buffer zone covering the following aspects in detail.

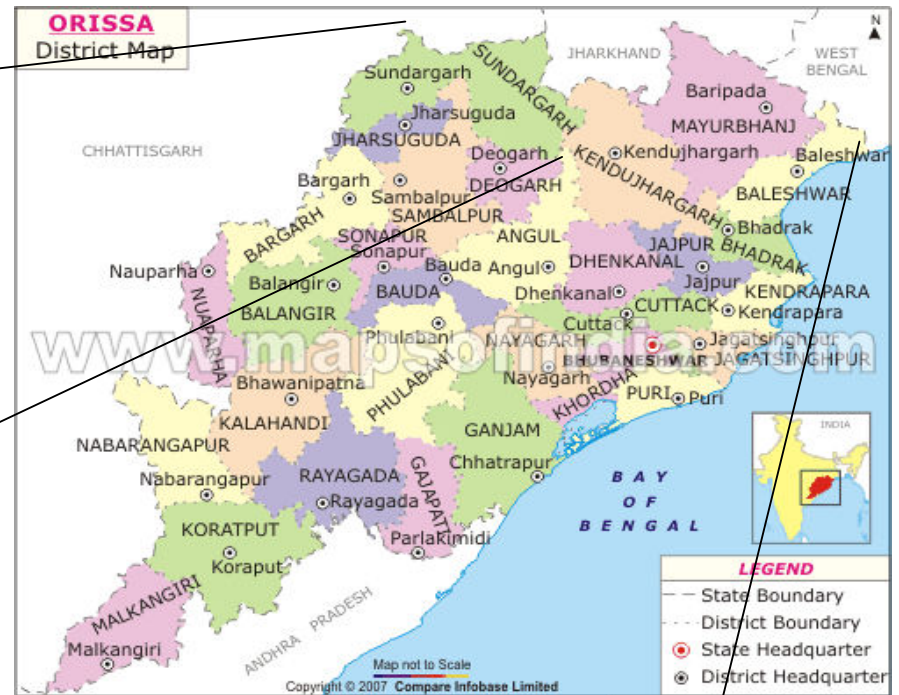
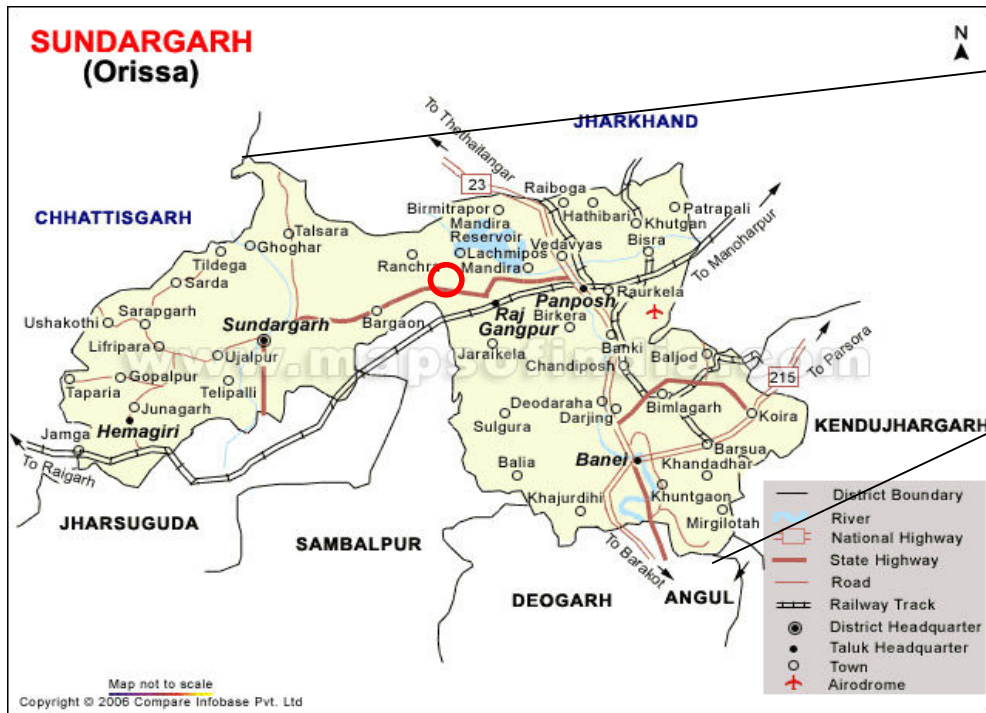
- i. Micro-meteorological Study
- ii. Ambient Air Quality Study
- iii. Fugitive Dust Emission Study
- iv. Stack Emission Monitoring from Crusher Plant
- v. Quarry Discharge Water Quality Study
- vi. Ground Water Level Study
- vii. Noise Level Study
- viii. Effluent Water Quality Study
- ix. Soil Quality Study

Monitoring of environmental parameters for collection of data involves field work, which is described below:

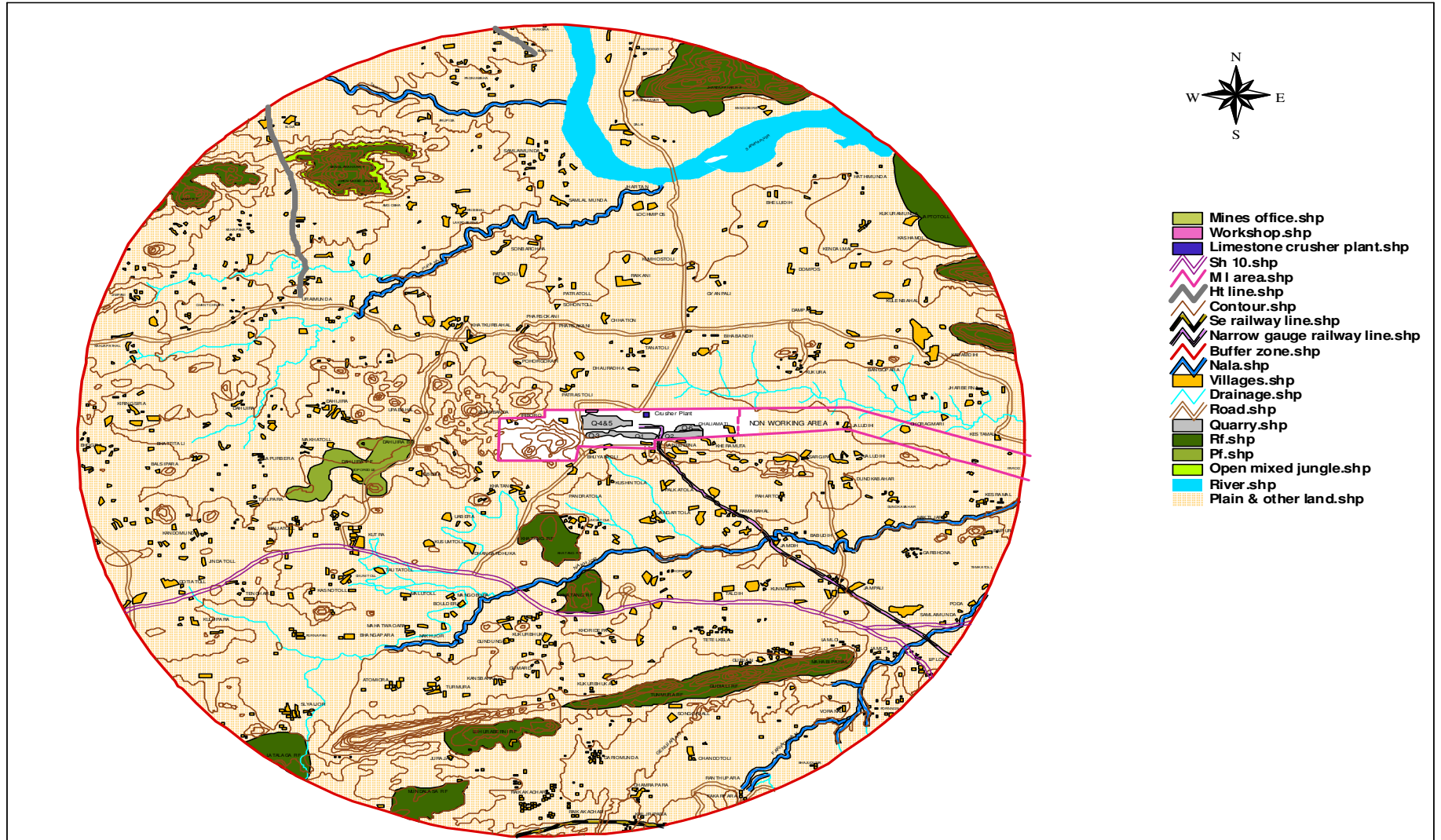
### 3.1 Micro-meteorological Study

For collection of micro-meteorological data like Temperature, Relative Humidity, Wind Speed, Wind Direction, & Rainfall, a weather monitoring station is fixed on the Magazine Hill Top of Lanjiberna Limestone and Dolomite Mines of M/s OCL India Ltd. Hourly data is being recorded continuously by putting up windows compatible data logging facility instrument, Make: Virtual Electronics Company, Roorkee.

Figure No: 1.1 Location Map of the Project



# Figure No:1.2 Vicinity Map of Lanjiberna Limestone & Dolomite Mines



Prepared by: Cleenviron Pvt. Ltd.

### **3.2 Ambient Air Monitoring**

To assess ambient air quality, total 6 (six) monitoring stations are fixed including 4 (four) in the Core zone and 2(two) in the buffer zone. The monitoring locations are fixed according to the micro-meteorological data and in consultation with State Pollution Control Board. The monitoring was carried out for parameters like PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub> & CO and monitoring was carried out on twice weekly from each location. For collection of samples Respirable Dust sampler and Fine Particulate Sampler was placed at each location, sampling and analytical techniques are followed as per the standard method of ambient air sampling and analysis. The other parameters like NH<sub>3</sub>, O<sub>3</sub>, As, Ni, Pb, Benzene & Benzo(a)pyrene are monitored once in a year from all the four buffer zone AAQ monitoring stations.

### **3.3 Fugitive Dust Emission Monitoring**

To find out the quantity of fugitive dust emission from the mining operation, two main dust generating locations are identified and those are within the quarry during operation of Excavators and Drill machines. The second location was set up on the haulage road of the mines leading to Crusher Plant. For collection of samples two high volume samplers are used and 8 hourly samples are collected for Particulate Matter only. Fugitive monitoring was carried out on quarterly basis, during month of June for summer and August for monsoon season.

### **3.4 Stack Emission Monitoring from Crusher Plant**

The crusher plant of Lanjiberna Limestone and Dolomite mines is equipped with a Dust Extraction and Bag House Filter system to control the emission of dust particles during crushing operation of Limestone lumps in to required size. To assess the emission level of Particulate Matter from the stack of bag filter system, monitoring of Stack emission levels was scheduled on monthly once basis. Particulate Matter emission was monitored following the BIS methods for Stack monitoring.

### **3.5 Quarry Discharge Water Quality Study**

Total three locations were fixed for sampling of the quarry discharge water from three different quarries operating. The sampling and analysis of quarry discharge water were carried out on monthly basis. The parameters analyzed are as per the Schedule – IV of EPA, G.S.R.422(E), 1993. Few parameters like pH, Temperature and DO are recorded at the site. For other parameters the samples were fixed and preserved as per the standard methods of sampling by APHA 23<sup>rd</sup> Edition.

### **3.6 Ground Water Quality Study**

To find out the ground water quality of the area, a net work of 5(five) existing dug wells are fixed and the sampling was carried out only during the month of June as per the environmental clearance conditions of MoEF. The parameters analyzed were as per the drinking water standards of IS10500. Few parameters like pH and Temperature are recorded at the site. For other parameters the samples were fixed and preserved as per the standard methods of sampling by APHA 23<sup>rd</sup> Edition.

### **3.7 Ground Water Level Study**

To assess the ground water availability and fluctuation, a net work of 5(Five) existing dug wells are fixed, from where the ground water quality study were carried out during the month of June and one extra location was considered in the village Katang for ground water level measurement. To measure the ground water level variation, water level is being studied on quarterly basis during the months of June for summer season and August for monsoon season manually.

### **3.8 Noise Level Study**

Noise monitoring were carried out at 4(four) different locations within the Core zone once in three months period during June and August months. The measurements were collected by Sound Level Meter, make: Envirotech Instruments Pvt. Ltd., New Delhi, in dB(A) at a height of 1.5 meter, above ground level and away from the sound reflecting sources like walls and buildings etc.

### **3.9 Soil Quality Study**

Soil samples were scheduled to be collected from three different sites, where the three quarry discharge water is discharged on to the land. The Soil samples are collected and analysed in the month of June.

### **3.10 Effluent Water Quality**

The waste water from Workshop/Garage of the Lanjiberna Limestone & Dolomite mines is directed to an Oil Separation Tank and after removal of Oil & TSS it is reused in HEMM washing. The outlet water from the Oil & Grease Separation tank was sampled and analysed for 5 (Five) parameters on quarterly basis during the months of June and August.

## **4. SAMPLING LOCATIONS**

### **4.1 Micro-Meteorological Study**

One meteorological station was set up on the Magazine Hill Top of the Lanjiberna Limestone & Dolomite Mines to monitor wind speed, wind direction, temperature, relative humidity and rainfall on hourly basis by data logging technique.

### **4.2 Ambient Air Quality Monitoring**

Four ambient air quality monitoring stations are fixed within the core zone and two stations are fixed in the buffer zone. General precautions were taken to position the Respirable Dust Samplers at all the locations. The descriptions of the Ambient Air Monitoring Stations are as follows:

#### **A-1 Brick Plant Area:**

The sampling station is located within the core zone and the station was selected to assess the present level of pollution due to excavation, drilling works being carried out in the quarry.

#### **A-2 Limestone Crusher Plant Area:**

This location is around the Crusher plant area of the Mines within the core zone. This was selected to assess the air quality in and around the crusher plant and the level of pollution due to crushing, screening and transfer of Limestone to conveyor belts.

#### **A-3 Lanjiberna Mines Office Area:**

The location was selected within the core zone and to assess the pollution load generated from the mining operations and movement of vehicles.

#### **A-4 Magazine Hill Top**

The location was selected within the core zone and to assess the effect of mining as well as crushing operations of the mine on the background air quality and sensitive receptors on the hill top which is at a higher elevation from the ground.

#### **A-5 Village Katang**

This location is situated in the buffer zone of the mine and selection of this location was done as to assess the effect of the mining operation on the local receptors, as this village is falling in the predominant wind direction towards south-west of the lease area.

#### **A-6 Village Bihabandh**

This location is situated in the buffer zone of the mine and selection of this location was done as to assess the effect of the mining operation on the local receptors, as this village is falling in the predominant wind direction towards north-east of the lease area.

The distances and directions of the Ambient Air Quality monitoring locations are summarized in **Table No 4.1**

**Table No 4.1: Ambient Air Quality Monitoring Stations**

SI No	Name of Location	Zone	Distance	Direction
1	Brick Plant Area	Core	-	-
2	Crusher Plant Area	Core	-	-
3	Lanjiberna Mines Office Area	Core	-	-
4	Magazine Hill Top	Core	-	-
5	Village Katang	Buffer	1 km from ML Area	SW
6	Village Bihabandh	Buffer	2 km from ML Area	NE

#### **4.3 Fugitive Dust Emission Study Locations:**

Two fugitive dust emission monitoring locations are established inside the core zone, to find out the amount of dust being generated from the source during the excavation, drilling & hauling of Limestone to crusher plant. The descriptions of fugitive emission monitoring locations are as follows:

##### **F-1 Downwind of Excavator/ Drill Machine within the Quarry**

This location was fixed within an operating quarry and while operation of mining equipments are on. Towards the down wind direction of any excavator or drill machine within a distance of 500 m, one high volume sampler was set for 8 hour operation and the parameter monitored is SPM general precautions are obeyed while collection of samples.

##### **F-2 Haulage Road Leading to Crusher Plant**

This location was fixed to evaluate the amount of pollution load on the ambient air due to moving of heavy earth moving equipments like 35T & 50T Dumpers on the haulage road which leads to the Limestone Crusher Plant. The samplers are being operated for continuous of 8 hours by the side of the haulage road and parameter like SPM was measured.

#### **4.4 Stack Emission Monitoring:**

The stack of the bag filter unit installed at the limestone crusher plant was monitored for Particulate Matter emission from the same during the crushing of Limestone lumps in to different sizes. There is a platform made at a height around 25m from the ground at the stack and sample has been collected on monthly basis to evaluate the performance of the bag filters and emission level from the stack.

#### **4.5 Quarry Discharge Water:**

In order to assess the present quality of water, which is being discharged on to the land after pumping out from the quarry. Three sampling locations were set at the discharge points of the pumped out water. The samples were being collected from each discharge point every month. The descriptions of the locations are given below:

##### **SW-1 Quarry 2&6 Discharge Water**

The water collected inside the quarry no-2&6 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the northern side of the lease and the water is used by the nearby villagers for irrigation purpose. The sample were collected from the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

### **SW-2 Quarry 1&3 Discharge Water**

The water collected inside the quarry no-1&3 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the southern side of the lease and the water is used by the nearby villagers for irrigation purpose. The sample were collected from the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

### **SW-3 Quarry 4&5 Discharge Water**

The water collected inside the quarry no-4&5 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the north-eastern side of the lease and the water is used by the nearby villagers for irrigation purpose. The sample were collected from the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

### **4.6 Ground Water Quality and Level:**

Ground Water quality were monitored by fixing a network of existing dug wells of 5(five) numbers and Water level was monitored by fixing a net work of 6(six) existing dug wells in the nearby villages as well as in the core zone. Samples were collected during the month of June only for evaluating the quality of the water and analyzed as per IS 10500. Ground water levels were measured during month of June and August to know the amount of seasonal fluctuation and availability of ground water during pre-monsoon and monsoon seasons of the area. The details of the water level measurement locations are described below:

#### **GW-1 Village Kheramuta Dug Well**

The water sample was collected from the dug well of Kheramuta village and was tested for drinking water quality as the villagers are using the dug well water for their drinking purpose.

#### **GW-2 Lanjiberna Colony Dug Well**

The water sample was collected from the dug well of Lanjiberna colony of M/s OCL India Ltd. and was tested for drinking water quality as the workers are using the dug well water for their drinking domestic purpose.

#### **GW-3 Village Dhauradah Dug Well**

The water sample was collected from the dug well of Dhauradah village and was tested for drinking water quality as the villagers are using the dug well water for their drinking purpose.

#### **GW-4 Lanjiberna Mines Workshop Dug Well**

The water sample was collected from the dug well of the HEMM workshop/garage of the Lanjiberna Mines and was tested for drinking water quality as the workers are using the dug well water for their drinking purpose.

#### **GW-5 Village Lanjiberna Dug Well**

The water sample was collected from the dug well of Lanjiberna village and was tested for drinking water quality as the villagers are using the dug well water for their drinking purpose.

#### **GW-6 Village Katang Dug Well**

The water level was measured from the dug well of Katang village for water availability as the villagers are using the dug well water for their domestic purpose.

### **4.7 Noise Level Monitoring**

Noise levels were measured at 4(four) different locations within the core zone only to assess the impact of the mining operation on the ambient noise level. A brief description of the monitoring location is given below:

#### **N-1 Quarry Area during Operation of HEMM**

This station was selected to assess the ambient noise level due to the operation of HEMM within the quarry area during ongoing mining works. The monitoring was carried out inside the quarry and at distance of 100 m from the operating machines.

#### **N-2 Limestone Crusher Plant area**

This station was selected to assess the ambient noise level due to the operation of Crusher Plant and crushing and screening operation of Limestone lumps. The monitoring was carried out at a distance of 100m from the Crusher building.

#### **N-3 Lanjiberna Colony Area**

This station was selected to assess the ambient noise level due to the mining activities and transportation of limestone to the Cement Plant by Railway wagons. The monitoring was carried out near the Lanjiberna Colony.

#### **N-4 Magazine Hill Top**

This station was selected to assess the ambient noise level due to the mining activities and crushing of limestone and its impact on the background and sensitive receptors. The monitoring was carried out on the Magazine Hill top near the security search light post.

#### **4.8 Effluent Water Quality Sampling Station**

The wash water of HEMM in workshop is directed to an Oil & Grease separation tank inside the garage premises and the treated water is reused in the washing process. The sample from the outlet of the Tank is collected on quarterly basis for analysis of 5 parameters and to find out the efficiency of the Oil & Grease separation process.

### **5. METHODOLOGY OF SAMPLING & ANALYTICAL PROCEDURES**

#### **5.1 Meteorological Study**

For recording various meteorological parameters like, Temperature, RH, Wind Speed, Wind Direction & Rainfall, a weather monitoring station, Make: Virtual Electronics Company, Roorkee was installed at the site. The instrument is equipped with windows based data logging software to store each data on hourly basis, which can be further down loaded to a PC and data can be interpreted as per the requirement of the report.

#### **5.2 Ambient Air Monitoring**

Air quality samples were monitored for all parameters as per NAAQS. For sampling and analysis, methods prescribed by CPCB were followed and Respirable Dust Samplers were used and for PM2.5 sampling Fine Particulate Samplers were used where ever necessary at the site.

#### **5.3 Fugitive Dust Emission Monitoring**

Fugitive dust samples were monitored for parameter like, SPM only. For sampling and analysis ambient air monitoring methods prescribed by CPCB were followed and High Volume Samplers (HVS) APM 415, Make: Envirotech Instruments Pvt. Ltd. were used at the site. 8 hours continuous samplings were carried out once in three months at each location.



#### 5.4 Stack Monitoring

Stack monitoring were carried out once in every month from the bag filter outlet stack of the Limestone Crusher plant and the CPCB standard for monitoring of Stack emission was followed for collecting the sample and the concentration of Particulate Matter were calculated by following the standard methods of CPCB. For collection of sample Ecotech Instruments make Stack sampler, Model: ESS 100 was used at the site.

#### 5.5 Water Quality Sampling

As per the standard practice, one sample from each station was collected once, during the month of August and November. Grab water samples were collected in plastic container by standard sampling technique. Necessary precautions were taken for sample preservation. The parameters like pH, Temp., Conductivity and DO were measured at the site by using portable water analysis kit from WTW, Germany. All other parameters were analysed as per the standard methods for Water and Waste Water analysis by APHA.

#### 5.6 Noise Level Monitoring

Ambient Noise level monitoring was carried out with an integrating Sound Level Meter, Model: SLM 100, Make: Envirotech Instruments Pvt. Ltd. in dB(A). The measurements were collected at a height of 1.5m from the ground level and away from any sound reflecting sources like walls and buildings etc.

The Ambient Noise monitoring was carried out on continuous basis by the data logging system of the instrument and data are logged on at every minute for 24 hours. The Sound Pressure Level were measured and Lmin, Lmax & Leq Day Time and Leq Night Time were calculated and interpreted for data analysis.

### 6. DATA ANALYSIS

#### 6.1 Micro-meteorological Study:

##### 6.1.1 Wind Speed & Wind Direction

During the entire period from 1<sup>st</sup> April to 30<sup>th</sup> September all total 4391 no. of data are recorded by the instrument and after interpretation of the collected data it was found that Calm condition prevailed over 20.75%, while considering the 24 hourly data. 14.75% calm condition prevailed from morning 6 hrs to 14hrs for the entire study period, 18.64% calm condition prevailed from 14hrs to 22hrs and 28.98% calm condition prevailed from 22hrs to 06hrs. The predominant wind directions were from South, SE & SW with average wind speed 2.64 m/sec. The wind rose diagram for the entire study period are depicted on the **Figure No: 6.1, 6.2, 6.3 & 6.4.**

##### 6.1.2 Temperature

The maximum & minimum temperature during the entire study period were divided in to two parts as the study period was covering summer as well as monsoon seasons. The Minimum temperature during the summer season was found to be 17.92°C and the Maximum temperature was found to be 41.76°C up to the end of 30<sup>th</sup> June.

The minimum and maximum temperature during the monsoon season i.e. from July to September was found to be 20.8°C and 33.68°C. **Table No 6.1** shows a summary of micro-meteorological data collected for the entire period.

##### 6.1.3 Rainfall

The total rain fall from 1<sup>st</sup> April to 30<sup>th</sup> September was observed to be 843.752 mm. during the study period. A month wise rainfall data recorded at the site is depicted in **Table No 6.1.**

**Table No: 6.1**  
**A Summary of the Micro-meteorological Data**

**Project Site** : Lanjiberna Limestone & Dolomite Mines  
**Location** : Magazine Hill Top

SI No	Parameters	From April – September 2021
1	Predominant Wind Direction	From South East
2	Calm Condition %	20.75%
3	Average Wind Speed m/sec	2.64
4	Temperature °C	
	<b>Summer Season</b>	
	Minimum	17.92
	Maximum	41.76
	<b>Monsoon Season</b>	
	Minimum	20.80
	Maximum	33.41
5	<b>Rain Fall in mm</b>	
	April	54.512
	May	108.64
	June	243.00
	July	150.80
	August	69.40
	September	217.40
	<b>Total</b>	<b>843.752</b>

**Figure No: 6.1**      **Wind Rose Diagram for 24 Hours**

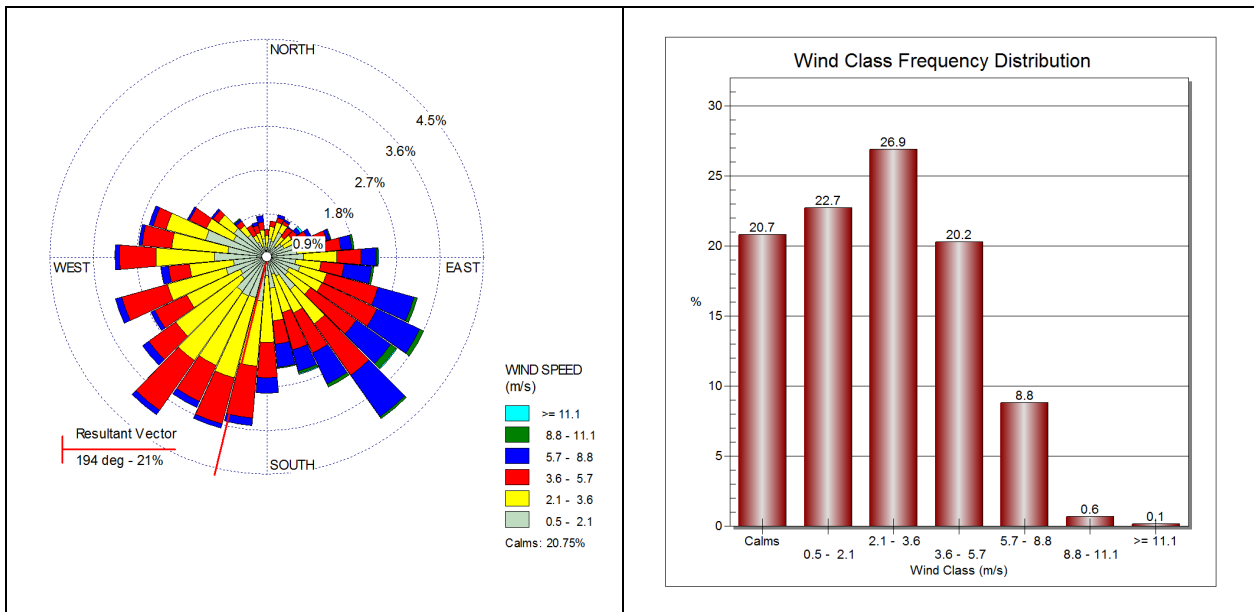


Figure No: 6.2

Wind Rose Diagram from 06 – 14 Hours

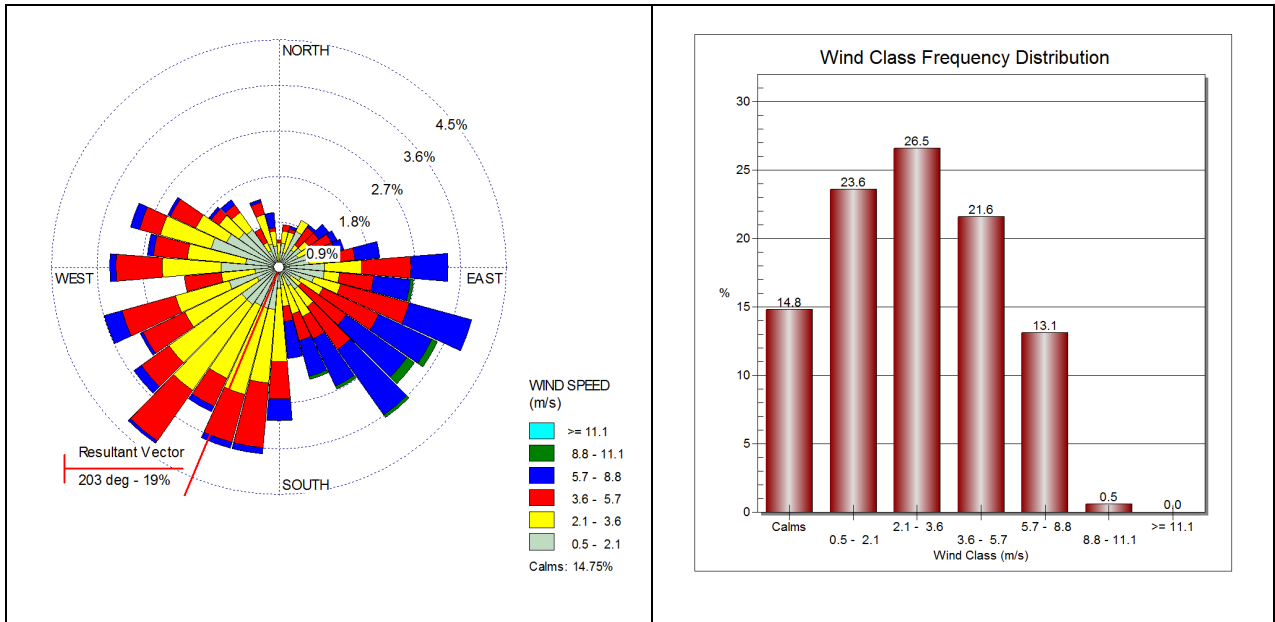
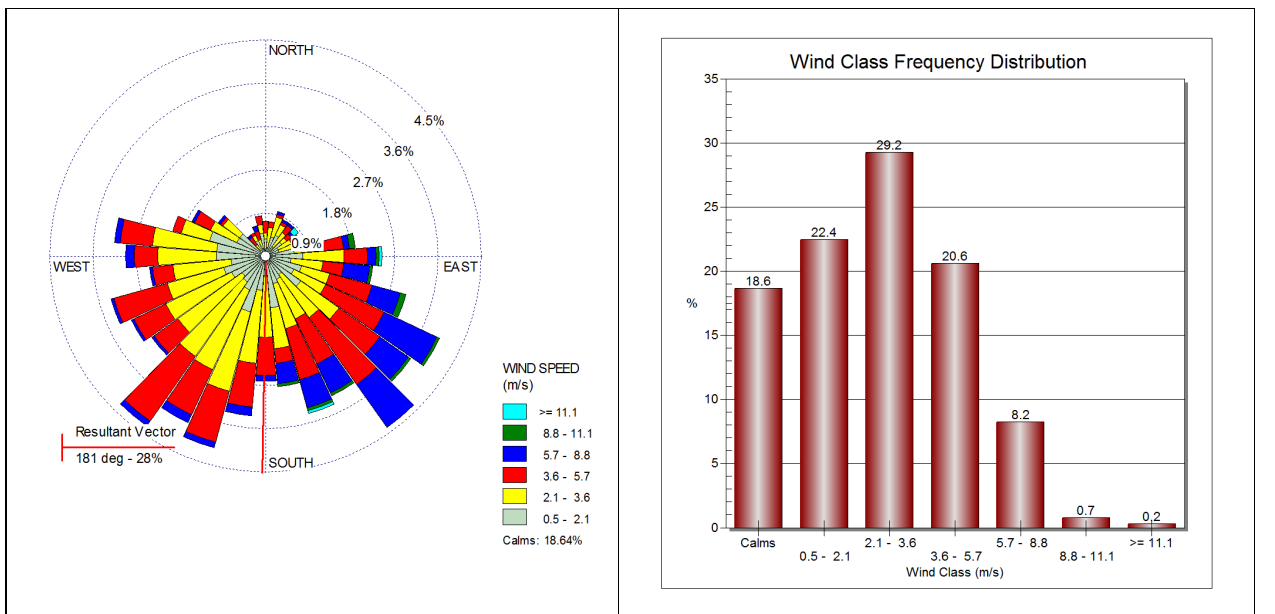
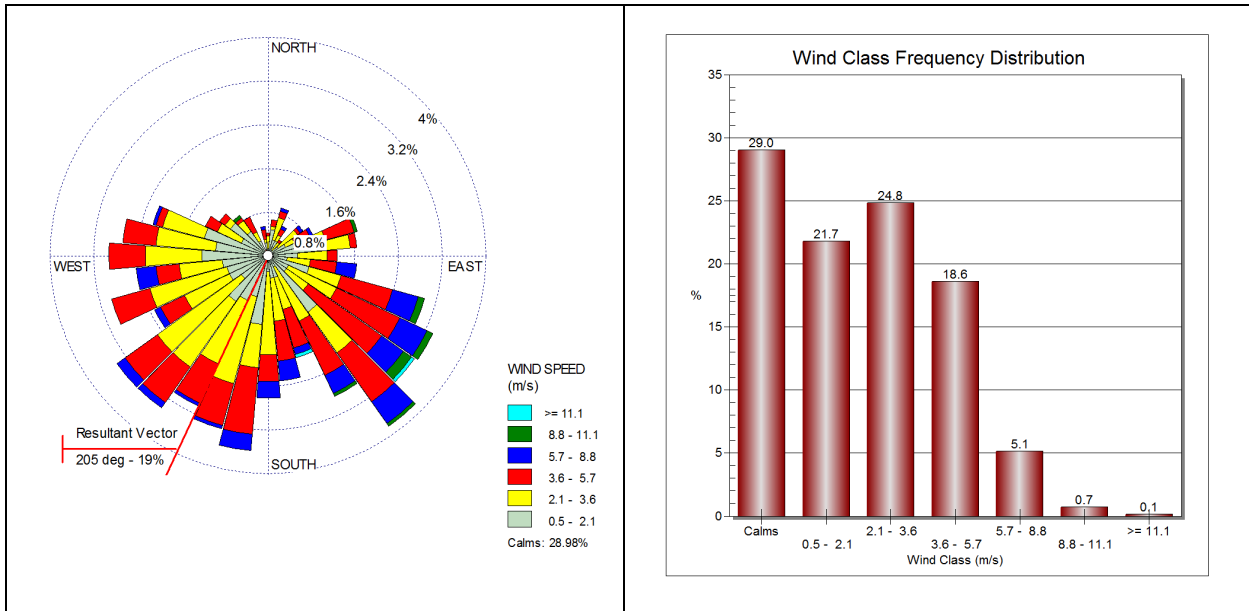


Figure No: 6.3

Wind Rose Diagram from 14 – 22 Hours



**Figure No: 6.4 Wind Rose Diagram from 22 – 06 Hours**



## 6.2 Ambient Air Quality Data

### 6.2.1 Near Brick Plant (A-1)

#### PM<sub>2.5</sub>

Data as given in the **Table No: 6.2** shows that the maximum value was 29 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 17.04 $\mu\text{g}/\text{m}^3$ , the lowest value was 16.0 $\mu\text{g}/\text{m}^3$  and the average value was 22.64 $\mu\text{g}/\text{m}^3$ .

#### PM<sub>10</sub>

Data as given in the **Table No: 6.2** shows that the maximum value was 79.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 47.08 $\mu\text{g}/\text{m}^3$ , the lowest value was 45.0 $\mu\text{g}/\text{m}^3$  and the average value was 64.28 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 60 & 100 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

#### SO<sub>2</sub>

The data given in the **Table No: 6.2** shows the maximum value was 12.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 3.04 $\mu\text{g}/\text{m}^3$ , the lowest value was 3.0 $\mu\text{g}/\text{m}^3$  and the average value was 6.62 $\mu\text{g}/\text{m}^3$ .

#### NO<sub>2</sub>

The data given in the **Table No: 6.2** shows the maximum value was 42.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 13.04 $\mu\text{g}/\text{m}^3$ , the lowest value was 12.0 $\mu\text{g}/\text{m}^3$  and the average value was 22.89 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 80 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.2****AMBIENT AIR QUALITY DATA**

From 01.04.2021 to 30.09.2021

Station: A-1 (Near Brick Plant)

<b>Date</b>	<b>PM2.5</b>	<b>PM10</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>2</sub></b>
03.04.2021	19	67	9	32
06.04.2021	24	66	12	36
21.04.2021	26	76	5	20
22.04.2021	27	74	6	21
23.04.2021	27	73	5	21
24.04.2021	27	77	6	25
26.04.2021	26	77	6	25
30.04.2021	27	77	6	19
03.05.2021	22	63	7	28
06.05.2021	23	65	10	30
10.05.2021	25	72	6	20
13.05.2021	21	64	4	25
17.05.2021	28	77	8	22
20.05.2021	23	64	3	28
24.05.2021	20	59	7	24
27.05.2021	29	79	8	19
31.05.2021	27	75	9	23
02.06.2021	20	55	8	21
05.06.2021	24	69	6	21
08.06.2021	18	55	4	15
11.06.2021	23	67	6	19
14.06.2021	21	61	9	31
17.06.2021	19	57	7	26
21.06.2021	27	71	6	19
23.06.2021	21	55	12	42
30.06.2021	24	70	12	37
02.07.2021	23	74	3	23
05.07.2021	17	52	5	18
08.07.2021	16	49	7	21
12.07.2021	18	66	9	29
17.07.2021	23	62	6	19
21.07.2021	25	70	4	20
24.07.2021	20	56	10	27
27.07.2021	19	56	6	20
30.07.2021	25	67	6	21

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
03.08.2021	22	47	9	26
06.08.2021	20	52	5	15
09.08.2021	21	72	8	34
12.08.2021	25	45	7	20
16.08.2021	25	68	5	15
19.08.2021	28	71	5	14
23.08.2021	19	55	8	26
26.08.2021	20	56	4	15
30.08.2021	26	71	4	12
02.09.2021	18	54	4	13
04.09.2021	24	66	8	23
07.09.2021	20	61	6	25
10.09.2021	21	62	8	21
13.09.2021	22	60	5	20
16.09.2021	20	60	6	24
20.09.2021	22	63	6	22
23.09.2021	23	68	5	21
24.09.2021	20	59	5	20
<b>Minimum</b>	<b>16</b>	<b>45</b>	<b>3</b>	<b>12</b>
<b>Maximum</b>	<b>29</b>	<b>79</b>	<b>12</b>	<b>42</b>
<b>Average</b>	<b>22.64</b>	<b>64.28</b>	<b>6.62</b>	<b>22.89</b>
<b>98%tile Value</b>	<b>17.04</b>	<b>47.08</b>	<b>3.04</b>	<b>13.04</b>

## 6.2.2 Limestone Crusher Plant (A-2)

### PM2.5

Data as given in the **Table No: 6.3** shows that the maximum value was 34.0µg/m<sup>3</sup>, 98 percentile values were 12.04µg/m<sup>3</sup>, the lowest value was 12.0µg/m<sup>3</sup> and the average value was 22.26µg/m<sup>3</sup>.

### PM10

Data as given in the **Table No: 6.3** shows that the maximum value was 88.0µg/m<sup>3</sup>, 98 percentile values were 39.04µg/m<sup>3</sup>, the lowest value was 38.0µg/m<sup>3</sup> and the average value was 64.38µg/m<sup>3</sup>.

All the readings are below the permissible limit of 60 & 100µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

### SO<sub>2</sub>

The data given in the **Table No: 6.3** shows the maximum value was 13.0µg/m<sup>3</sup>, 98 percentile values were 4.0µg/m<sup>3</sup>, the lowest value was 4.0µg/m<sup>3</sup> and the average value was 6.11µg/m<sup>3</sup>.

### NO<sub>2</sub>

The data given in the **Table No: 6.3** shows the maximum value was 33.0µg/m<sup>3</sup>, 98 percentile values were 14.0µg/m<sup>3</sup>, the lowest value was 13.0µg/m<sup>3</sup> and the average value was 20.72µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.3**

**AMBIENT AIR QUALITY DATA**  
From 01.04.2021 to 30.09.2021  
Station: A-2 (Limestone Crusher Plant)

<b>Date</b>	<b>PM2.5</b>	<b>PM10</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>2</sub></b>
03.04.2021	21	60	6	24
06.04.2021	24	68	13	33
21.04.2021	26	78	5	20
22.04.2021	25	72	6	26
23.04.2021	27	78	5	18
24.04.2021	28	79	6	19
26.04.2021	27	76	5	20
30.04.2021	27	75	4	17
03.05.2021	24	73	10	20
06.05.2021	27	80	8	26
10.05.2021	29	81	6	28
13.05.2021	22	65	8	21
17.05.2021	26	71	7	18
20.05.2021	30	82	8	20
24.05.2021	32	85	6	24
27.05.2021	34	88	5	16
31.05.2021	28	78	8	23
02.06.2021	23	64	4	14
05.06.2021	22	74	4	14
08.06.2021	22	61	6	17
11.06.2021	18	53	8	22
14.06.2021	20	70	5	19
17.06.2021	22	68	10	29
21.06.2021	20	57	5	18
23.06.2021	24	71	6	20
30.06.2021	22	59	4	20
02.07.2021	16	48	4	21
05.07.2021	22	63	8	22
08.07.2021	21	61	6	17
12.07.2021	17	53	6	21
17.07.2021	18	53	6	18
21.07.2021	17	42	8	23
24.07.2021	24	62	6	25

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
27.07.2021	20	60	5	18
30.07.2021	19	55	5	24
03.08.2021	24	61	4	24
06.08.2021	26	75	5	20
09.08.2021	18	51	5	15
12.08.2021	19	58	5	20
16.08.2021	22	61	5	25
19.08.2021	21	60	6	18
23.08.2021	17	71	9	23
26.08.2021	22	65	9	22
30.08.2021	29	81	4	13
02.09.2021	17	43	6	16
04.09.2021	29	84	5	15
07.09.2021	12	38	5	20
10.09.2021	12	39	4	18
13.09.2021	13	43	5	21
16.09.2021	15	40	6	22
20.09.2021	15	42	6	26
23.09.2021	21	68	5	23
24.09.2021	24	69	8	22
<b>Minimum</b>	<b>12</b>	<b>38</b>	<b>4</b>	<b>13</b>
<b>Maximum</b>	<b>34</b>	<b>88</b>	<b>13</b>	<b>33</b>
<b>Average</b>	<b>22.26</b>	<b>64.38</b>	<b>6.11</b>	<b>20.72</b>
<b>98%tile Value</b>	<b>12.04</b>	<b>39.04</b>	<b>4.00</b>	<b>14.00</b>

### 6.2.3 Lanjiberna Mines Office Area (A-3)

#### PM2.5

Data as given in the **Table No: 6.4** shows that the maximum value was 31.0µg/m<sup>3</sup>, 98 percentile values were 12.08µg/m<sup>3</sup>, the lowest value was 10.0µg/m<sup>3</sup> and the average value was 20.67µg/m<sup>3</sup>.

#### PM10

Data as given in the **Table No: 6.4** shows that the maximum value was 83.0µg/m<sup>3</sup>, 98 percentile values were 38.28µg/m<sup>3</sup>, the lowest value was 28.0µg/m<sup>3</sup> and the average value was 59.76µg/m<sup>3</sup>.

All the readings are below the permissible limit of 60 & 100µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

#### SO<sub>2</sub>

The data given in the **Table No: 6.4** shows the maximum value was 15.0µg/m<sup>3</sup>, 98 percentile values were 3.04µg/m<sup>3</sup>, the lowest value was 3.0µg/m<sup>3</sup> and the average value was 6.33µg/m<sup>3</sup>.



**NO<sub>2</sub>**

The data given in the **Table No: 6.4** shows the maximum value was 37.0µg/m<sup>3</sup>, 98 percentile values were 11.04µg/m<sup>3</sup>, the lowest value was 11.0µg/m<sup>3</sup> and the average value was 20.60µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.4****AMBIENT AIR QUALITY DATA**

From 01.04.2021 to 30.09.2021

Station: A-3 (Lanjiberna Mines Office Area)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
03.04.2021	20	58	15	37
06.04.2021	23	65	11	29
21.04.2021	25	71	5	23
22.04.2021	25	72	5	23
23.04.2021	25	77	6	18
24.04.2021	23	73	4	15
26.04.2021	23	64	4	17
30.04.2021	25	70	5	15
03.05.2021	28	68	8	22
06.05.2021	24	67	10	28
10.05.2021	27	73	7	20
13.05.2021	22	63	6	18
17.05.2021	29	80	8	22
20.05.2021	30	83	5	16
24.05.2021	31	80	9	19
27.05.2021	26	77	10	24
31.05.2021	25	73	6	14
02.06.2021	22	63	6	22
05.06.2021	23	68	3	12
08.06.2021	17	49	6	26
11.06.2021	17	48	5	22
14.06.2021	21	60	8	33
17.06.2021	27	77	7	25
21.06.2021	18	54	7	21
23.06.2021	16	50	8	29
30.06.2021	16	49	8	32
02.07.2021	22	63	8	28
05.07.2021	15	46	6	21
08.07.2021	16	46	3	22
12.07.2021	10	28	6	19

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
17.07.2021	16	47	6	20
21.07.2021	19	53	6	24
24.07.2021	16	53	5	15
27.07.2021	18	52	5	17
30.07.2021	16	47	4	11
03.08.2021	17	52	4	15
06.08.2021	16	48	6	19
09.08.2021	12	38	7	19
12.08.2021	21	66	9	27
16.08.2021	14	53	5	13
19.08.2021	18	45	4	11
23.08.2021	21	58	4	15
26.08.2021	21	55	5	16
30.08.2021	17	50	5	17
02.09.2021	17	57	5	16
04.09.2021	21	71	5	13
07.09.2021	23	63	5	18
10.09.2021	24	64	4	18
13.09.2021	24	66	5	22
16.09.2021	23	62	6	25
20.09.2021	24	65	6	23
23.09.2021	26	63	5	24
24.09.2021	22	69	5	16
<b>Minimum</b>	<b>10</b>	<b>28</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>31</b>	<b>83</b>	<b>15</b>	<b>37</b>
<b>Average</b>	<b>20.67</b>	<b>59.76</b>	<b>6.33</b>	<b>20.60</b>
<b>98%tile Value</b>	<b>12.08</b>	<b>38.28</b>	<b>3.04</b>	<b>11.04</b>

#### 6.2.4 Magazine Hill Top (A-4)

##### PM2.5

Data as given in the **Table No: 6.5** shows that the maximum value was 28.0µg/m<sup>3</sup>, 98 percentile values were 10.0µg/m<sup>3</sup>, the lowest value was 5.0µg/m<sup>3</sup> and the average value was 16.3µg/m<sup>3</sup>.

##### PM10

Data as given in the **Table No: 6.5** shows that the maximum value was 71.0µg/m<sup>3</sup>, 98 percentile values were 27.0µg/m<sup>3</sup>, the lowest value was 16.0µg/m<sup>3</sup> and the average value was 46.3µg/m<sup>3</sup>.

All the readings are below the permissible limit of 60 & 100µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.5** shows the maximum value was 15.0µg/m<sup>3</sup>, 98 percentile values were 5.0µg/m<sup>3</sup>, the lowest value was 4.0µg/m<sup>3</sup> and the average value was 7.94µg/m<sup>3</sup>.

**NO<sub>2</sub>**

The data given in the **Table No: 6.5** shows the maximum value was 38.0µg/m<sup>3</sup>, 98 percentile values were 16.08µg/m<sup>3</sup>, the lowest value was 14.0µg/m<sup>3</sup> and the average value was 25.98µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.5****AMBIENT AIR QUALITY DATA**

From 01.04.2021 to 30.09.2021

Station: A-4 (Magazine Hill Top)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
03.04.2021	18	51	7	27
06.04.2021	14	40	5	33
21.04.2021	16	46	10	29
22.04.2021	17	46	6	26
23.04.2021	18	47	6	22
24.04.2021	15	46	5	20
26.04.2021	17	48	6	25
30.04.2021	19	53	6	26
03.05.2021	16	50	9	30
06.05.2021	15	47	15	38
10.05.2021	19	53	12	33
13.05.2021	20	56	8	22
17.05.2021	14	45	7	25
20.05.2021	18	52	9	28
24.05.2021	21	55	10	32
27.05.2021	16	47	5	16
31.05.2021	20	55	11	34
02.06.2021	18	52	11	30
05.06.2021	17	49	8	25
08.06.2021	17	46	14	34
11.06.2021	18	47	7	29
14.06.2021	17	53	13	36
17.06.2021	15	43	11	33
21.06.2021	12	36	12	34
23.06.2021	15	39	12	24
30.06.2021	18	51	7	21
02.07.2021	14	39	7	20

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
05.07.2021	10	27	7	22
08.07.2021	10	32	6	24
12.07.2021	5	16	6	20
17.07.2021	19	46	6	18
21.07.2021	10	27	8	27
24.07.2021	11	34	6	21
27.07.2021	13	36	10	28
30.07.2021	17	48	9	24
06.08.2021	16	61	6	18
09.08.2021	11	35	4	14
12.08.2021	27	66	10	32
16.08.2021	14	41	8	33
19.08.2021	22	71	7	32
23.08.2021	24	69	8	20
26.08.2021	15	44	8	25
28.08.2021	13	45	9	26
30.08.2021	12	39	8	27
02.09.2021	27	60	11	34
04.09.2021	15	47	5	22
07.09.2021	14	40	5	23
10.09.2021	12	38	6	21
13.09.2021	14	41	6	25
16.09.2021	18	41	5	22
20.09.2021	13	41	6	24
23.09.2021	28	59	5	21
24.09.2021	20	58	7	22
<b>Minimum</b>	<b>5</b>	<b>16</b>	<b>4</b>	<b>14</b>
<b>Maximum</b>	<b>28</b>	<b>71</b>	<b>15</b>	<b>38</b>
<b>Average</b>	<b>16.30</b>	<b>46.30</b>	<b>7.94</b>	<b>25.98</b>
<b>98%tile</b>	<b>10</b>	<b>27</b>	<b>5.00</b>	<b>16.08</b>

Figure No: 6.5 Graphical Representations of PM2.5 Values in Core Zone

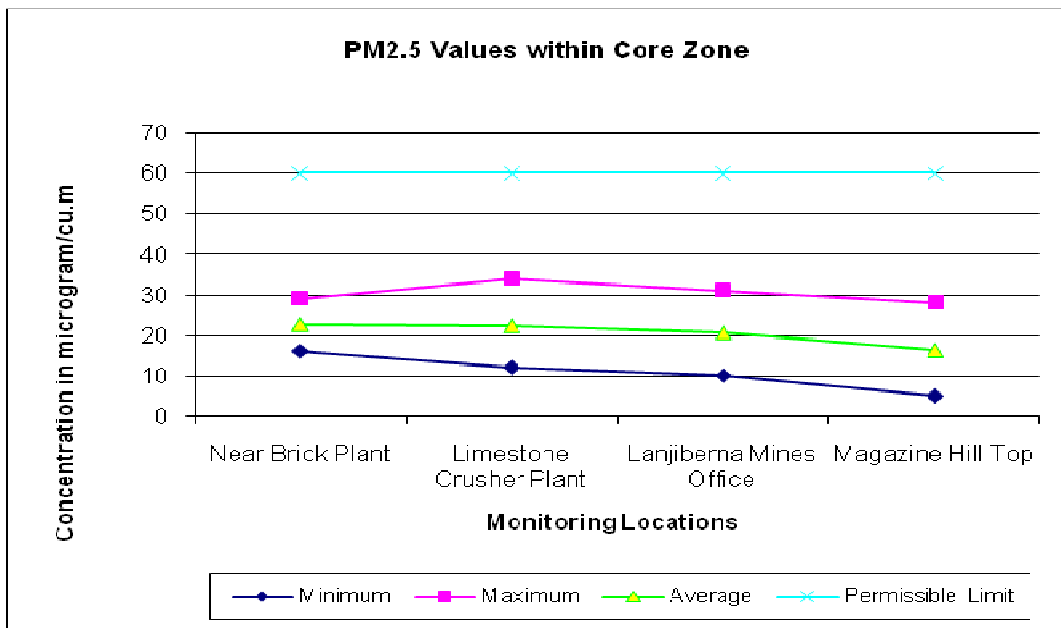


Figure No: 6.6 Graphical Representations of PM10 Values in Core Zone

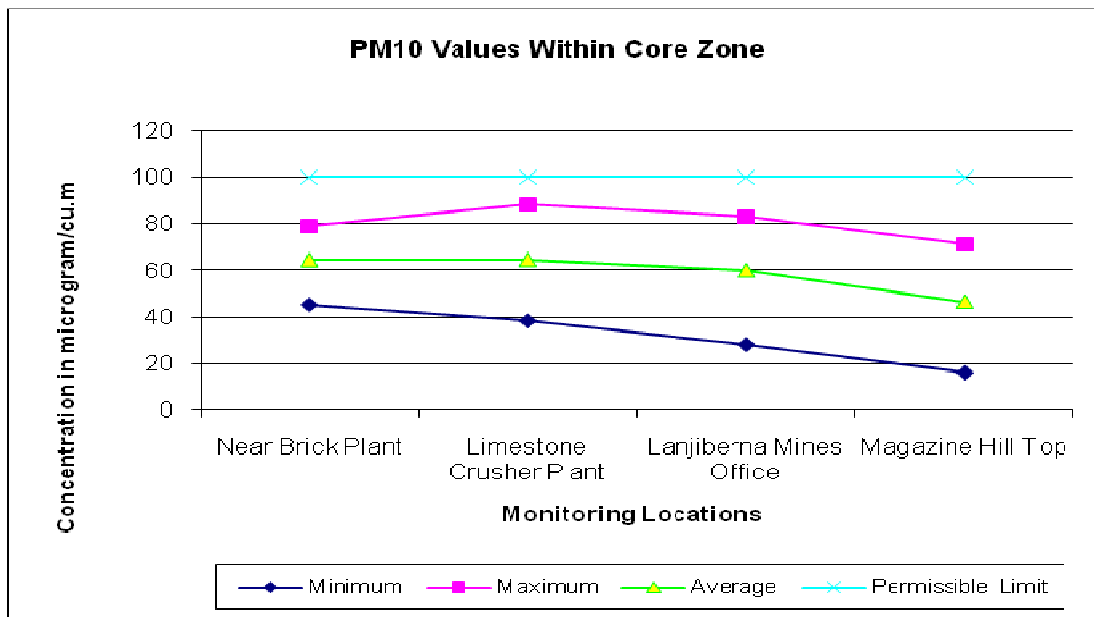


Figure No: 6.7 Graphical Representations of SO<sub>2</sub> Values in Core Zone

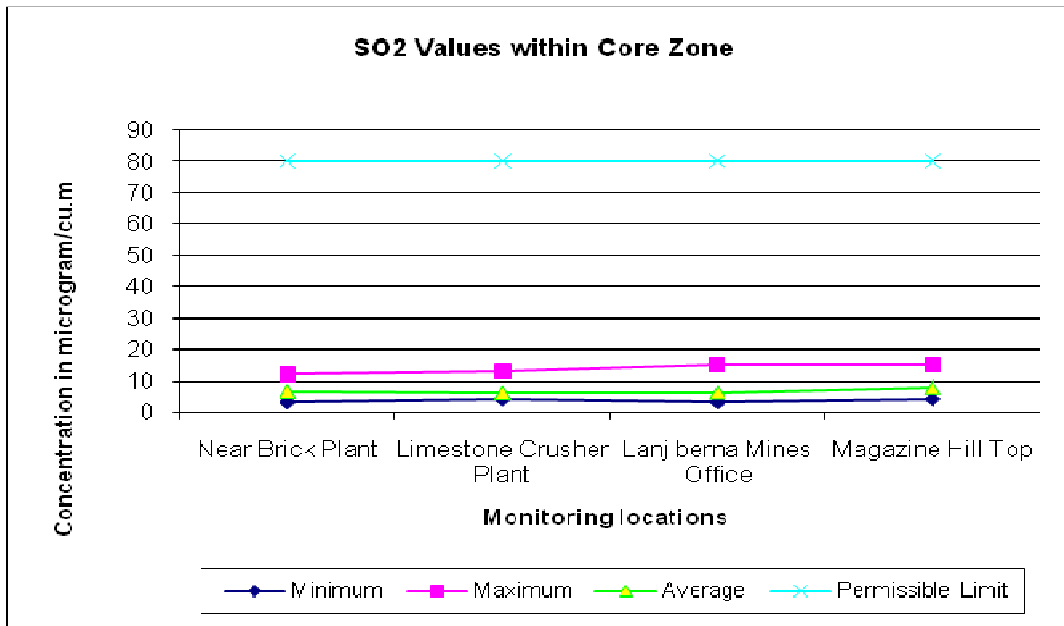
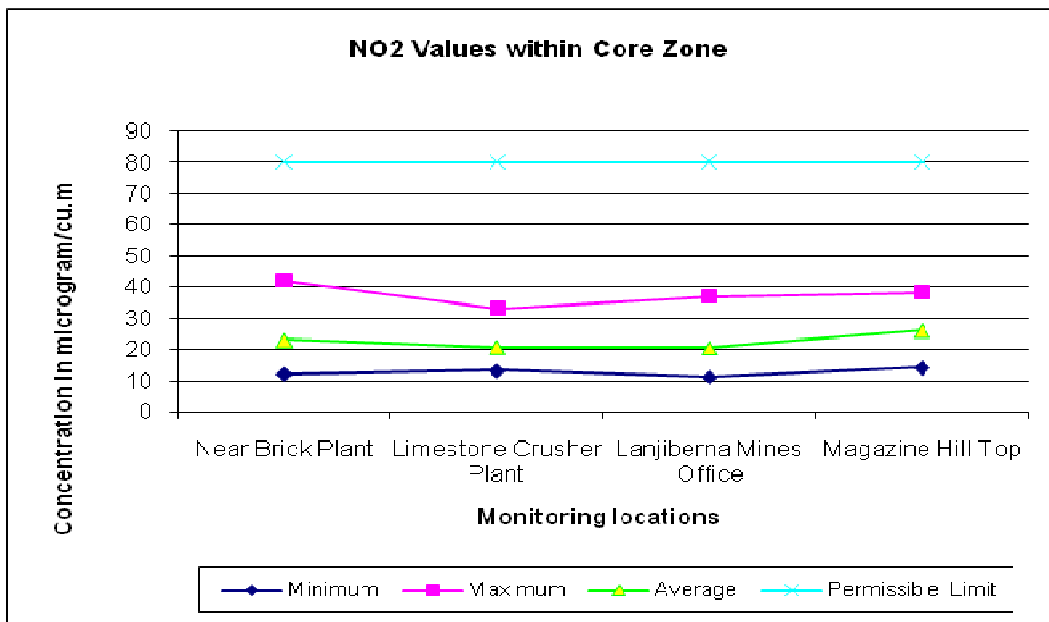


Figure No: 6.8 Graphical Representations of NO<sub>2</sub> Values in Core Zone



### 6.2.5 Village Katang (A-5)

#### PM<sub>2.5</sub>

Data as given in the **Table No: 6.6** shows that the maximum value was 26.0µg/m<sup>3</sup>, 98 percentile values were 7.84µg/m<sup>3</sup>, the lowest value was 6.0µg/m<sup>3</sup> and the average value was 17.28µg/m<sup>3</sup>.

**PM10**

Data as given in the **Table No: 6.6** shows that the maximum value was 74.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 27.2 $\mu\text{g}/\text{m}^3$ , the lowest value was 18.0 $\mu\text{g}/\text{m}^3$  and the average value was 49.21 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 60 & 100 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.6** shows the maximum value was 12.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 3.0 $\mu\text{g}/\text{m}^3$ , the lowest value was 3.0 $\mu\text{g}/\text{m}^3$  and the average value was 5.30 $\mu\text{g}/\text{m}^3$ .

**NO<sub>2</sub>**

The data given in the **Table No: 6.6** shows the maximum value was 29.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 9.92 $\mu\text{g}/\text{m}^3$ , the lowest value was 9.0 $\mu\text{g}/\text{m}^3$  and the average value was 18.49 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 80 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.6****AMBIENT AIR QUALITY DATA**

From 01.04.2021 to 30.09.2021

Station: A-5 (Village Katang)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
03.04.2021	15	47	< 3	14
06.04.2021	20	56	6	22
21.04.2021	17	48	3	11
22.04.2021	16	45	4	19
23.04.2021	16	45	4	16
26.04.2021	16	45	6	27
30.04.2021	17	47	5	18
03.05.2021	22	53	4	10
06.05.2021	21	55	5	14
10.05.2021	23	57	3	9
13.05.2021	19	51	3	10
17.05.2021	18	52	3	12
20.05.2021	23	56	4	16
24.05.2021	19	50	5	20
27.05.2021	20	53	4	12
02.06.2021	16	50	5	18
05.06.2021	19	61	7	27
08.06.2021	14	39	3	18
11.06.2021	15	41	4	20
14.06.2021	18	69	5	23
21.06.2021	20	68	7	29

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
23.06.2021	13	37	11	29
30.06.2021	17	49	4	14
02.07.2021	13	38	5	29
05.07.2021	19	58	3	12
08.07.2021	8	28	6	21
12.07.2021	6	18	4	13
17.07.2021	14	41	6	18
21.07.2021	15	45	5	14
27.07.2021	16	48	7	22
30.07.2021	16	50	7	24
03.08.2021	19	51	5	20
06.08.2021	12	41	5	16
09.08.2021	19	58	6	16
12.08.2021	14	44	4	14
16.08.2021	14	35	7	22
19.08.2021	26	74	5	16
23.08.2021	14	30	5	13
30.08.2021	18	45	12	28
02.09.2021	14	31	5	20
04.09.2021	16	45	7	18
07.09.2021	22	63	6	24
10.09.2021	23	64	8	23
13.09.2021	23	62	6	21
16.09.2021	21	61	6	22
20.09.2021	20	61	5	16
24.09.2021	16	48	4	19
<b>Minimum</b>	<b>6</b>	<b>18</b>	<b>3</b>	<b>9</b>
<b>Maximum</b>	<b>26</b>	<b>74</b>	<b>12</b>	<b>29</b>
<b>Average</b>	<b>17.28</b>	<b>49.21</b>	<b>5.30</b>	<b>18.49</b>
<b>98%tile</b>	<b>7.84</b>	<b>27.2</b>	<b>3.00</b>	<b>9.92</b>

### 6.2.6 Village Bihabandh (A-6)

#### PM2.5

Data as given in the **Table No: 6.7** shows that the maximum value was 25.0µg/m<sup>3</sup>, 98 percentile values were 8.0µg/m<sup>3</sup>, the lowest value was 8.0µg/m<sup>3</sup> and the average value was 17.93µg/m<sup>3</sup>.

#### PM10

Data as given in the **Table No: 6.7** shows that the maximum value was 72.0µg/m<sup>3</sup>, 98 percentile values were 26.3µg/m<sup>3</sup>, the lowest value was 20.0µg/m<sup>3</sup> and the average value was 50.87µg/m<sup>3</sup>.



All the readings are below the permissible limit of 60 & 100 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

#### SO<sub>2</sub>

The data given in the **Table No: 6.7** shows the maximum value was 10.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 3.0 $\mu\text{g}/\text{m}^3$ , the lowest value was 3.0 $\mu\text{g}/\text{m}^3$  and the average value was 6.00 $\mu\text{g}/\text{m}^3$ .

#### NO<sub>2</sub>

The data given in the **Table No: 6.7** shows the maximum value was 39.0 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 13.8 $\mu\text{g}/\text{m}^3$ , the lowest value was 12.0 $\mu\text{g}/\text{m}^3$  and the average value was 21.76 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 80 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.7**

#### AMBIENT AIR QUALITY DATA

From 01.04.2021 to 30.09.2021

Station: A-6 (Village Bihabandh)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
03.04.2021	8	38	6	18
06.04.2021	10	33	6	28
21.04.2021	15	47	6	23
23.04.2021	16	46	4	17
24.04.2021	17	46	6	22
26.04.2021	16	46	5	22
03.05.2021	20	56	5	16
06.05.2021	23	58	6	20
10.05.2021	25	61	4	22
13.05.2021	22	57	7	26
17.05.2021	24	60	3	12
20.05.2021	20	54	6	18
24.05.2021	21	56	5	24
27.05.2021	22	59	4	16
02.06.2021	16	47	4	17
05.06.2021	17	46	4	19
08.06.2021	8	20	10	31
11.06.2021	22	63	6	21
17.06.2021	21	56	10	31
21.06.2021	19	59	8	20
23.06.2021	23	62	5	22
30.06.2021	18	55	6	17
02.07.2021	11	37	5	16
05.07.2021	17	54	3	16

<b>Date</b>	<b>PM2.5</b>	<b>PM10</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>2</sub></b>
08.07.2021	21	38	9	23
12.07.2021	13	42	6	19
17.07.2021	11	29	5	33
24.07.2021	17	43	9	23
27.07.2021	15	38	7	21
30.07.2021	12	51	5	19
03.08.2021	15	51	5	14
06.08.2021	21	51	6	27
09.08.2021	14	38	6	17
12.08.2021	17	44	8	23
16.08.2021	16	46	8	25
19.08.2021	10	27	9	24
23.08.2021	21	50	7	24
30.08.2021	19	62	8	39
02.09.2021	22	72	6	24
04.09.2021	17	49	5	16
07.09.2021	24	68	6	26
10.09.2021	22	71	5	19
13.09.2021	23	65	5	27
16.09.2021	22	64	5	22
20.09.2021	24	67	5	23
23.09.2021	18	58	7	19
<b>Minimum</b>	<b>8</b>	<b>20</b>	<b>3</b>	<b>12</b>
<b>Maximum</b>	<b>25</b>	<b>72</b>	<b>10</b>	<b>39</b>
<b>Average</b>	<b>17.93</b>	<b>50.87</b>	<b>6.00</b>	<b>21.76</b>
<b>98%tile</b>	<b>8</b>	<b>26.3</b>	<b>3.00</b>	<b>13.80</b>

Figure No: 6.9 Graphical Representations of PM2.5 Values in Buffer Zone

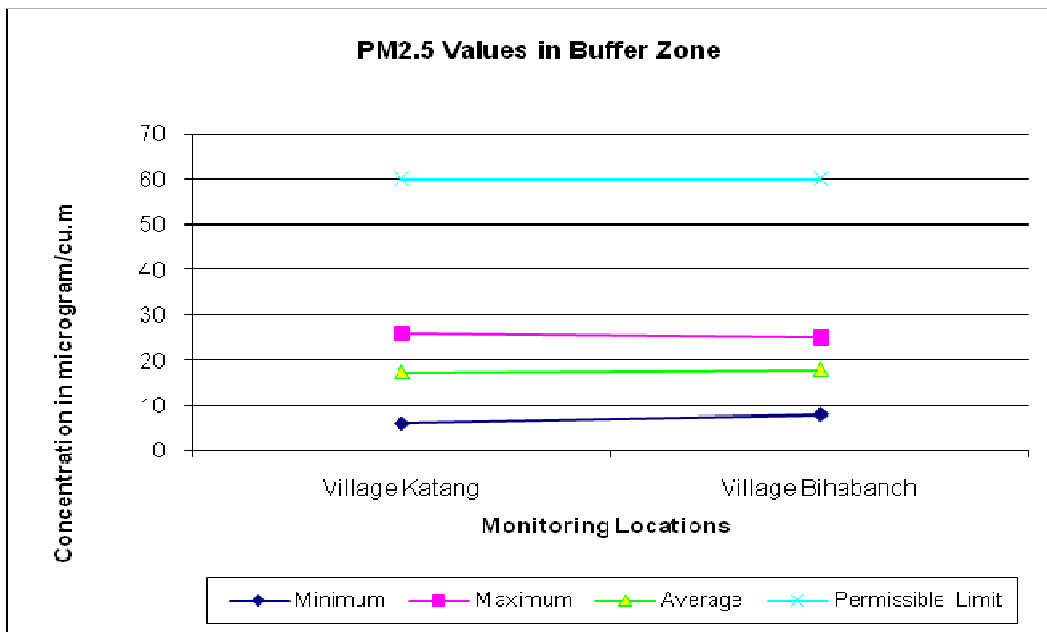


Figure No: 6.10 Graphical Representations of PM10 Values in Buffer Zone

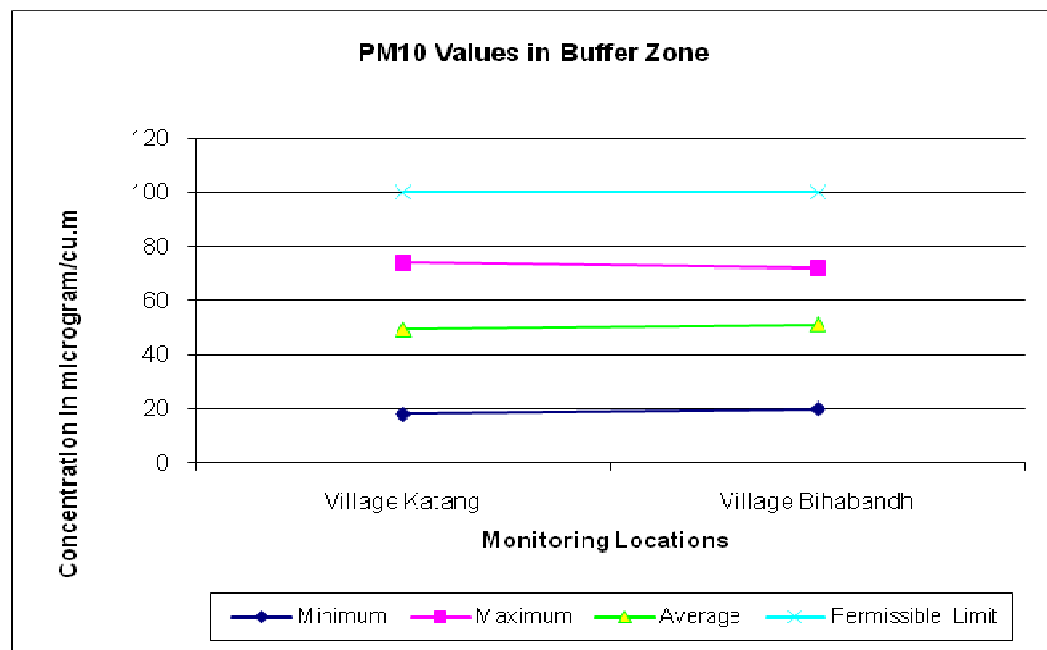


Figure No: 6.11 Graphical Representations of SO<sub>2</sub> Values in Buffer Zone

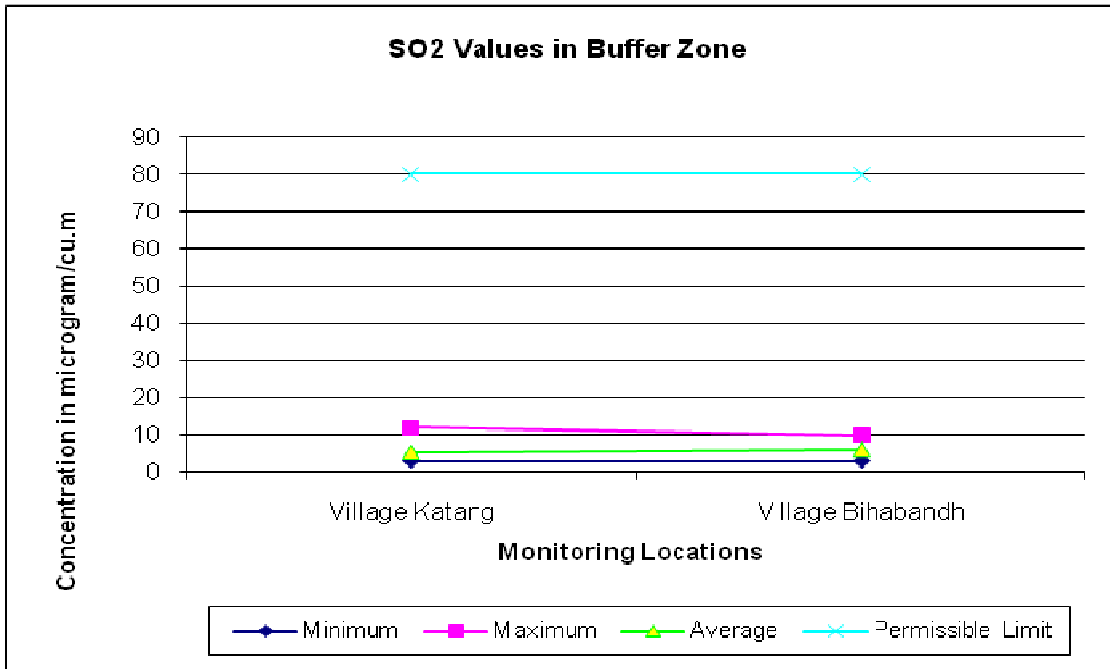
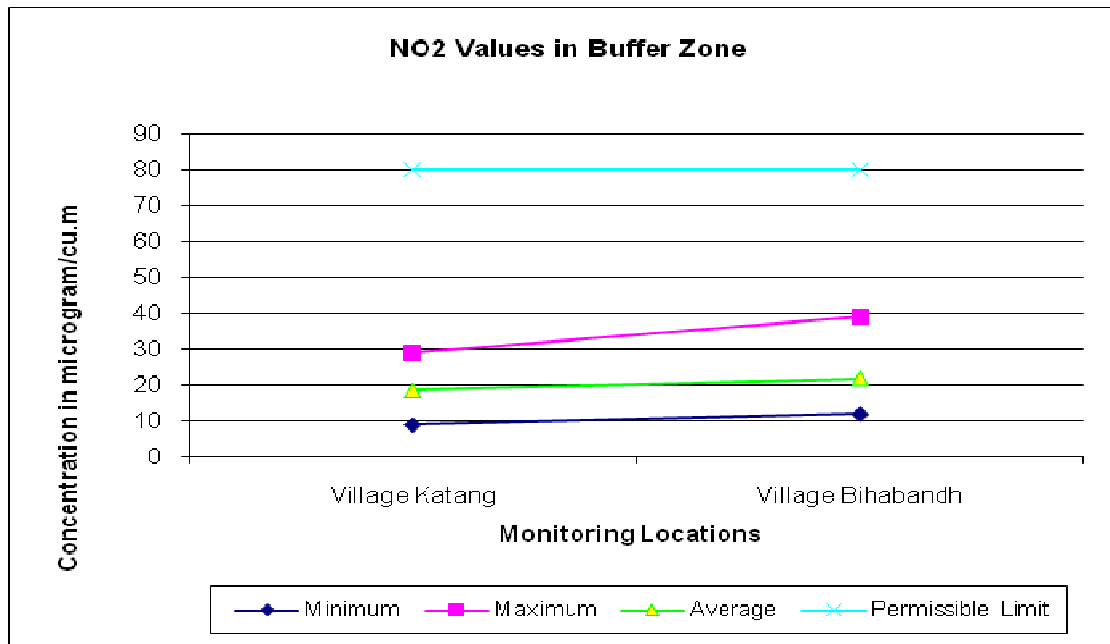


Figure No: 6.12 Graphical Representations of NO<sub>2</sub> Values in Buffer Zone



### 6.3 Fugitive Dust Emission

The fugitive dust samples collected from two locations during June and August is detailed below.

**Table No 6.8: Fugitive Dust Emission Results**

Month	Haulage Road from Quarry to Crusher Plant	Downwind of Drill Machine within the Quarry
	Particulate Matter	Particulate Matter
June	277 µg/m <sup>3</sup>	252 µg/m <sup>3</sup>
August	126 µg/m <sup>3</sup>	103 µg/m <sup>3</sup>

In the month of June the result of Drill area is higher from the August month's results due to ongoing dry summer months.

### 6.4 Stack Emission Monitoring

The monthly monitoring results of stack emission from the Limestone Crusher Plant Bag filter outlet given below shows that all the results from April to September are within the prescribed limits (150mg/Nm<sup>3</sup>) of State Pollution Control Board. The detail results are as follows:

**Table No 6.9: Stack Emission Monitoring Results**

SI No	Month	Particulate Matter Concentration in mg/Nm <sup>3</sup>
1	April	48
2	May	56
3	June	16
4	July	78
5	August	93
6	September	143

### 6.5 Water Quality

#### SW-1 Quarry 2&6 Discharge Water:

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in the month monitored. The results are detailed in **Table No. 6.10**.

#### SW-2 Quarry 1&3 Discharge Water

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in the month monitored. The results are detailed in **Table No. 6.11**.

#### SW-3 Quarry 4&5 Discharge Water

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in both the seasons monitored. The results are detailed in **Table No. 6.12**.

**Table No: 6.10**  
**Discharge Water Quality from Quarry No 2&6**

Sl No	Parameters	June	September	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour in hazen unit	< 5	< 5	-
2.	Odour	Odourless	Odourless	-
3.	Total Suspended Solids mg/l	< 2.5	3.0	200
4.	pH Value	7.95	7.38	5.5 – 9.0
5.	Temperature ° C	27.5	29.2	-
6.	Oil & Grease mg/l	< 2.0	< 2.0	10
7.	Total Residual Chlorine mg/l	0.14	0.052	-
8.	Ammoniacal Nitrogen (as N) mg/l	< 5	< 5	-
9.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> ) mg/l	< 10	< 10	-
10.	Free Ammonia (as NH <sub>3</sub> ) mg/l	< 0.012	< 0.012	-
11.	BOD (3 days at 27°C) mg/l	01	02	100
12.	COD mg/l	4.484	5.298	-
13.	Lead (as Pb) mg/l	< 0.10	< 2.0	-
14.	Cadmium (as Cd) mg/l	< 0.05	< 0.05	-
15.	Hex. Chromium (as Cr <sup>+6</sup> ) mg/l	< 0.01	< 0.03	-
16.	Total Chromium (as Cr) mg/l	< 0.10	< 0.10	-
17.	Copper (as Cu) mg/l	< 0.10	< 0.10	-
18.	Zinc (as Zn) mg/l	< 0.02	< 0.10	-
19.	Nickel (as Ni) mg/l	< 0.25	< 0.25	-
20.	Cyanide (as CN) mg/l	< 0.002	< 0.002	0.2
21.	Fluoride (as F) mg/l	< 0.10	< 0.10	-
22.	Dissolved Phosphate (as P) mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S) mg/l	< 0.02	< 0.50	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH) mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn) mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe) mg/l	< 0.01	< 0.10	-
27.	Nitrate Nitrogen mg/l	< 0.50	< 1.0	-

**Table No: 6.11**  
**Discharge Water Quality from Quarry No 1&3**

Sl No	Parameters	April	August	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour in hazen unit	< 5	< 5	-
2.	Odour	Odourless	Odourless	-
3.	Total Suspended Solids mg/l	< 2.5	5.9	200
4.	pH Value	7.65	7.71	5.5 – 9.0
5.	Temperature ° C	26.9	28.6	-
6.	Oil & Grease mg/l	< 2.0	1.80	10
7.	Total Residual Chlorine mg/l	0.10	< 0.01	-
8.	Ammoniacal Nitrogen (as N) mg/l	< 5	< 5	-
9.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> ) mg/l	< 10	< 10	-
10.	Free Ammonia (as NH <sub>3</sub> ) mg/l	< 0.012	< 0.012	-
11.	BOD (3 days at 27°C) mg/l	01	03	100
12.	COD mg/l	4.842	7.862	-
13.	Lead (as Pb) mg/l	< 0.10	< 2.0	-
14.	Cadmium (as Cd) mg/l	< 0.05	< 0.05	-
15.	Hex. Chromium (as Cr <sup>+6</sup> ) mg/l	< 0.01	< 0.03	-
16.	Total Chromium (as Cr) mg/l	< 0.10	< 0.10	-
17.	Copper (as Cu) mg/l	< 0.10	< 0.10	-

Sl No	Parameters	April	August	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
18.	Zinc (as Zn) mg/l	< 0.02	< 0.10	-
19.	Nickel (as Ni) mg/l	< 0.25	< 0.25	-
20.	Cyanide (as CN) mg/l	< 0.002	< 0.002	0.2
21.	Fluoride (as F) mg/l	< 0.10	< 0.10	-
22.	Dissolved Phosphate (as P) mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S) mg/l	< 0.02	< 0.50	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH) mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn) mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe) mg/l	< 0.01	< 0.10	-
27.	Nitrate Nitrogen mg/l	< 0.50	< 1.0	-

**Table No: 6.12**  
**Discharge Water Quality from Quarry No 4&5**

Sl No	Parameters	May	July	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour in hazen unit	< 5	< 5	-
2.	Odour	Odourless	Odourless	-
3.	Total Suspended Solids mg/l	< 2.5	< 2.5	200
4.	pH Value	7.72	7.85	5.5 – 9.0
5.	Temperature °C	28.2	28.1	-
6.	Oil & Grease mg/l	< 2.0	< 2.0	10
7.	Total Residual Chlorine mg/l	0.12	0.03	-
8.	Ammoniacal Nitrogen (as N) mg/l	< 5	< 5	-
9.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> ) mg/l	< 10	< 10	-
10.	Free Ammonia (as NH <sub>3</sub> ) mg/l	< 0.012	0.39	-
11.	BOD (3 days at 27°C) mg/l	01	01	100
12.	COD mg/l	4.564	4.238	-
13.	Lead (as Pb) mg/l	< 0.10	< 0.10	-
14.	Cadmium (as Cd) mg/l	< 0.05	< 0.05	-
15.	Hex. Chromium (as Cr <sup>+6</sup> ) mg/l	< 0.01	< 0.01	-
16.	Total Chromium (as Cr) mg/l	< 0.10	< 0.10	-
17.	Copper (as Cu) mg/l	< 0.10	< 0.10	-
18.	Zinc (as Zn) mg/l	< 0.02	< 0.02	-
19.	Nickel (as Ni) mg/l	< 0.25	< 0.25	-
20.	Cyanide (as CN) mg/l	< 0.002	< 0.002	0.2
21.	Fluoride (as F) mg/l	< 0.10	0.20	-
22.	Dissolved Phosphate (as P) mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S) mg/l	< 0.02	< 0.02	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH) mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn) mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe) mg/l	< 0.01	0.01	-
27.	Nitrate Nitrogen mg/l	0.5896	< 0.50	-

#### **GW-1 Village Kheramuta Dug Well**

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and all parameters are found to be within the prescribed limits. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

#### **GW-2 Lanjiberna Colony Dug Well**

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and all parameters are found to lie within the prescribed limit. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

### GW-3 Village Dhauradah Dug Well

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and all parameters within the prescribed limits. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

### GW-4 Brick Plant Dug Well

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and parameters are found to lie within the prescribed limits. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

### GW-5 Village Lanjiberna Dug Well

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and all parameters lie within the prescribed limits. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

### GW-6 Village Katang Dug Well

In comparison of the parameters with the prescribed limits of IS 10500:2012, it was found that the water quality is good and all parameters lie within the prescribed limits. All the Heavy metals are found to be below the detection limits. The detail results are given in the **Table No 6.13**.

**Table No: 6.13**  
**Ground Water Quality in the month of June**

Sl No	Parameters	Data Recorded from current Analysis						Max. Desirable Limit As per IS 10500:2012
		GW1	GW2	GW3	GW4	GW5	GW6	
1.	Colour in hazen unit	< 5	< 5	< 5	< 5	< 5	< 5	15
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity NTU	0.7	0.1	1.2	0.3	0.8	0.3	5.0
5.	pH Value	7.39	7.00	8.10	7.76	7.65	6.88	6.5 – 8.5
6.	Temperature °C	25.7	25.8	25.5	27.5	25.7	26.1	-
7.	Total Hardness (as CaCO <sub>3</sub> ) mg/l	257.92	293.63	305.54	416.64	353.15	305.05	600
8.	Iron (as Fe) mg/l	< 0.01	0.07	< 0.01	< 0.01	< 0.01	0.04	0.3
9.	Chlorides (as Cl) mg/l	93.30	21.84	22.83	20.84	36.73	65.51	1000
10.	Residual Free Chlorine mg/l	0.26	0.34	0.38	0.28	0.48	0.42	1.0 (min)
11.	Total Dissolved Solids mg/l	504	356	350	516	446	532	2000
12.	Electrical Conductivity, µS/cm	776	572	575	827	736	850	-
13.	Calcium (as Ca) mg/l	60.43	58.84	42.94	87.47	58.84	76.34	200
14.	Magnesium (as Mg) mg/l	26.04	35.67	48.21	48.21	50.13	27.85	100
15.	Copper (as Cu) mg/l	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.5
16.	Manganese (as Mn) mg/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.3
17.	Sulfate (as SO <sub>4</sub> ) mg/l	43.53	46.27	40.31	111.79	33.14	42.26	400
18.	Nitrate (as NO <sub>3</sub> ) mg/l	17.04	5.53	2.59	5.60	2.22	39.08	45
19.	Fluoride (as F) mg/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.3	1.5
20.	Cadmium (as Cd) mg/l	ND	ND	ND	ND	ND	ND	0.003
21.	Lead (as Pb) mg/l	ND	ND	ND	ND	ND	ND	0.01
22.	Arsenic (as As) mg/l	ND	ND	ND	ND	ND	ND	0.05
23.	Mercury (as Hg) mg/l	ND	ND	ND	ND	ND	ND	0.001
24.	Selenium (as Se) mg/l	ND	ND	ND	ND	ND	ND	0.01
25.	Nickel (as Ni) mg/l	ND	ND	ND	ND	ND	ND	0.02
26.	Zinc (as Zn) mg/l	ND	ND	ND	ND	ND	ND	15.0
27.	Total Chromium (as Cr) mg/l	ND	ND	ND	ND	ND	ND	0.05
28.	Total Alkalinity (as CaCO <sub>3</sub> ) mg/l	176	180	192	220	240	232	600
29.	Acidity mg/l	04	10	04	04	02	16	-



Sl No	Parameters	Data Recorded from current Analysis							Max. Desirable
30.	Sulphide (as H <sub>2</sub> S) mg/l	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05
31.	Sodium (as Na) mg/l	122.7	16.9	11.2	30.8	49.8	53.4	-	-
32.	Potassium (as K) mg/l	1.5	5.0	6.6	1.6	0.7	1.0	-	-
33.	Total Bacterial Count nos/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
34.	E coli nos/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

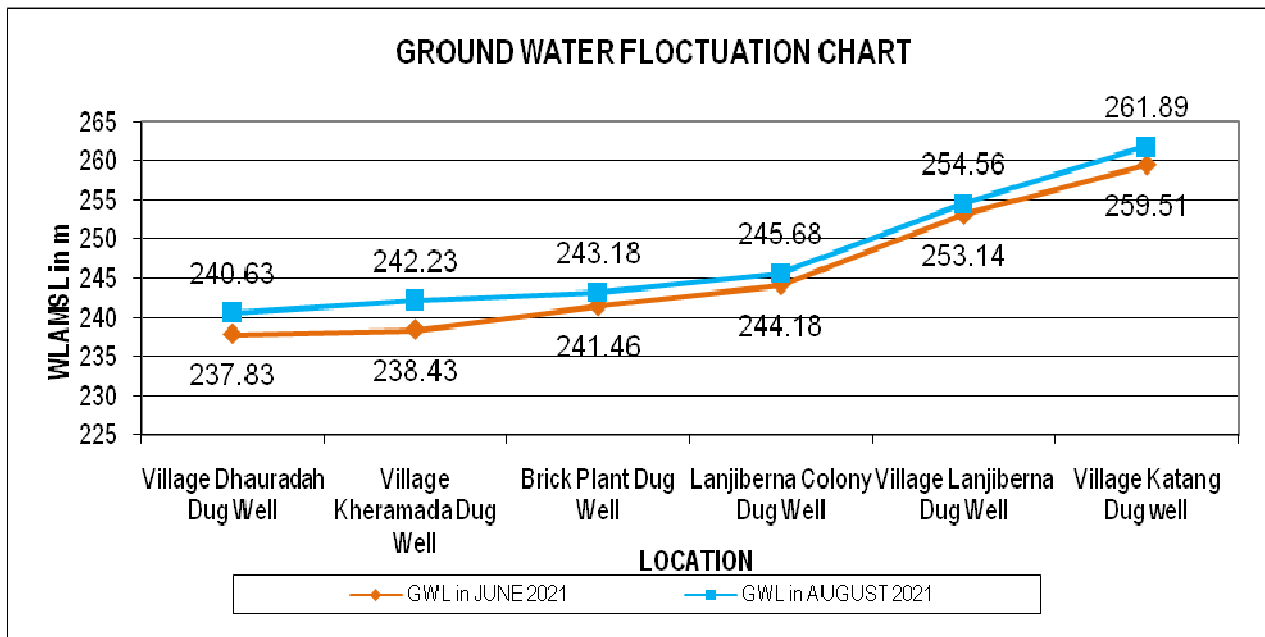
### 6.6 Ground Water Level Data

The ground water level measured from the existing dug wells mentioned above are found to be varying significantly at all the locations, during the month of June the water level was found to be very low, which has increased significantly during monsoon season. The detail data is given below in the **Table No 6.14**, with a graphical representation of the fluctuation in **Figure No: 6.13**.

**Table No 6.14: Ground Water Level Data**

SI No	Location	Ground Level in m AMSL	Ground Water Level in m AMSL		Height of Water Column in m	
			June	August	June	August
			1	Village Kheramada Dug Well	243.23	238.43
2	Lanjiberna Colony Dug Well	247.83	244.18	245.68	7.75	9.25
3	Village Dhauradah Dug Well	242.34	237.83	240.63	3.98	6.78
4	Brick Plant Dug Well	245.03	241.46	243.18	2.57	4.29
5	Village Lanjiberna Dug Well	255.14	253.14	254.56	3.00	4.42
6	Village Katang Dug well	264.89	259.51	261.89	2.57	4.95

**Figure No 6.13: Seasonal Fluctuation of Ground Water Level**



## 6.7 Noise Level Monitoring Data

Noise monitoring was carried out at four different locations of the mine during month of June and August for summer and monsoon seasons respectively. The Sound Pressure Level recorded was calculated for Lmin, Lmax, Leq Day Time & Leq Night Time. All the data are given in detail in the **Table No 6.15 & 6.16**.

### **N-1 Quarry Area during Operation of HEMM**

The noise level range between 65.9 and 37.5 dB(A) and the Leq values for Day time was 56.3 dB(A) and Leq values for Night time was 39.2 dB(A) during the month of June.

The noise level range between 75.4 and 35.8 dB(A) and the Leq values for Day time was 68.4 dB(A) and Leq values for Night time was 49.7 dB(A) during the month of August.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Industrial area for both day and night time.

### **N-2 Limestone Crusher Plant Area**

The noise level range between 71.3 and 38.6 dB(A) and the Leq values for Day time was 65.3 dB(A) and Leq values for Night time was 42.6 dB(A) during the month of June.

The noise level range between 84.6 and 47.2 dB(A) and the Leq values for Day time was 78.8 dB(A) and Leq values for Night time was 62.4 dB(A) during the month of August.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for both day and night time.

### **N-3 Lanjiberna Colony area**

The noise level range between 51.3 and 37.9 dB(A) and the Leq values for Day time was 44.2 dB(A) and Leq values for Night time was 39.4 dB(A) during the month of June.

The noise level range between 59.8 and 33.9 dB(A) and the Leq values for Day time was 52.4 dB(A) and Leq values for Night time was 38.2 dB(A) during the month of August.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Residential area for both day and night time.

### **N-4 Magazine Hill Top**

The noise level range between 49.5 and 37.2 dB(A) and the Leq values for Day time was 44.6 dB(A) and Leq values for Night time was 38.2 dB(A) during the month of June.

The noise level range between 45.9 and 34.6 dB(A) and the Leq values for Day time was 40.7 dB(A) and Leq values for Night time was 36.4 dB(A) during the month of August.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Silence Zone for both day and night time.

**Table No: 6.15**  
**Noise Level Data in Month of June**

SL NO	STATION NO	L <sub>eq</sub> dB(A) Day Time (0600 Hrs – 2200 Hrs)	L <sub>eq</sub> dB(A) Night Time (2200 Hrs – 0600 Hrs)	L <sub>max</sub> dB(A)	L <sub>min</sub> dB(A)
1.	N1	56.3	39.2	65.9	37.5
2.	N2	65.3	42.6	71.3	38.6
3.	N3	44.2	39.4	51.3	37.9
4.	N4	44.6	38.2	49.5	37.2

**Table No: 6.16**  
**Noise Level Data in Month of August**

SL NO	STATION NO	L <sub>eq</sub> dB(A) Day Time (0600 Hrs – 2200 Hrs)	L <sub>eq</sub> dB(A) Night Time (2200 Hrs – 0600 Hrs)	L <sub>max</sub> dB(A)	L <sub>min</sub> dB(A)
1.	N1	68.4	49.7	75.4	35.8
2.	N2	78.8	62.4	84.6	47.2
3.	N3	52.4	38.2	59.8	33.9
4.	N4	40.7	36.4	45.9	34.6

### 6.8 Effluent Water Quality Data

The water quality from the outlet of Oil & Grease Separation tank was monitored during month of June and August for five parameters. pH was in the range of 7.75 to 7.18 which is slightly alkaline, TSS was 19 & 4.9 mg/l in June & August months, Oil & Grease content was 8.4 and 12.6 mg/l, Iron was 0.12 mg/l in June and 0.10 mg/l in August and Nickel was < 0.25 mg/l in both the months. All the results are found to be well within the prescribed standards of State Pollution Control Board.

## 7. CONCLUSION

### 7.1 Ambient Air Quality

It is concluded from the above study that the overall ambient air quality of the Lanjiberna Limestone & Dolomite mines of OCL India Ltd. is good and the action taken by the mines authority were quite satisfactory.

### 7.2 Fugitive Dust Emission

The results of fugitive dust emission monitoring shows that the mining authority has taken up highly effective sprinkling systems inside the mines to control the emission of dust from the drilling, excavation and hauling operations.

### 7.3 Stack Emission Monitoring

The stack emission monitoring results of all the six months shows that the bag filter installed in the limestone crusher plant is very much effective and results are all within the prescribed standards by the State Pollution Control Board, Odisha.

### 7.4 Water Quality

The discharge water quality of all the quarries are found to be well within the prescribed standards as per EPA, G.S.R.422(E), 1993 and the ground water quality of the entire area was also good.

### **7.5 Ground Water Level**

There is no problem in the availability of ground water in the area and all the locations have adequate water. The ground water level is found to be low in the month of June due to ongoing dry summer months but is found to be rising sufficiently during the monsoon season as found in the month of August.

### **7.6 Noise level**

Noise monitoring results show that noise levels are well within the limits at all the stations, and there is no problem in the area due noise from the mining activity.

### **7.7 Effluent Water Quality**

The treatment facility available for Oil & Grease separation in the workshop waste water of the mines is found to be good and the system is operating quite well.

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# ENVIRONMENTAL MONITORING REPORT

BASED ON DATA GENERATED

FROM

**OCTOBER 2021 – MARCH 2022**

FOR

**DALMIA CEMENT (BHARAT) LIMITED**

At/Po: RAJGANGPUR, District: SUNDARGARH, ODISHA



AT

**LANJIBERNA LIMESTONE & DOLOMITE MINES PROJECT**

Prepared By:

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## 1. INTRODUCTION

Lanjiberna Limestone & Dolomite Mines of M/s DALMIA CEMENT (BHARAT) LIMITED is a captive mine for its Cement manufacturing works situated at Rajgangpur in the district of Sundargarh of Odisha State. The mining lease covering an area of 893.55 ha has been reduced to 873.057 ha and is located near the village Lanjiberna (**Figure No: 1.1**), under Sundargarh Sadar sub-division of Sundargarh district approximately 18 kms from the Cement Works by road and the aerial distance will be around 12 kms. A vicinity map up to 10 kms radius from the center of the lease is given in **Figure No: 1.2**. Presently the mine is producing 9.50 million tones of Lime Stone per annum and 80, 000 TPA of Dolomite as per Environmental Clearance from Ministry of Environment and Forest, Govt. India vide letter no: J-11015/202/2016-IA.II(M) dated: 4<sup>th</sup> March 2020. Consent to operate from State Pollution Control Board, Odisha is also valid up to 31<sup>st</sup> March 2022 vide Order No 162,vide letter No 55346/IND-I-CON-258, Dt 23.03.2021 for the production of 9.50 million tones of Limestone and 80, 000 TPA of Dolomite.

## 2. PRESENT STATUS OF THE PROJECT

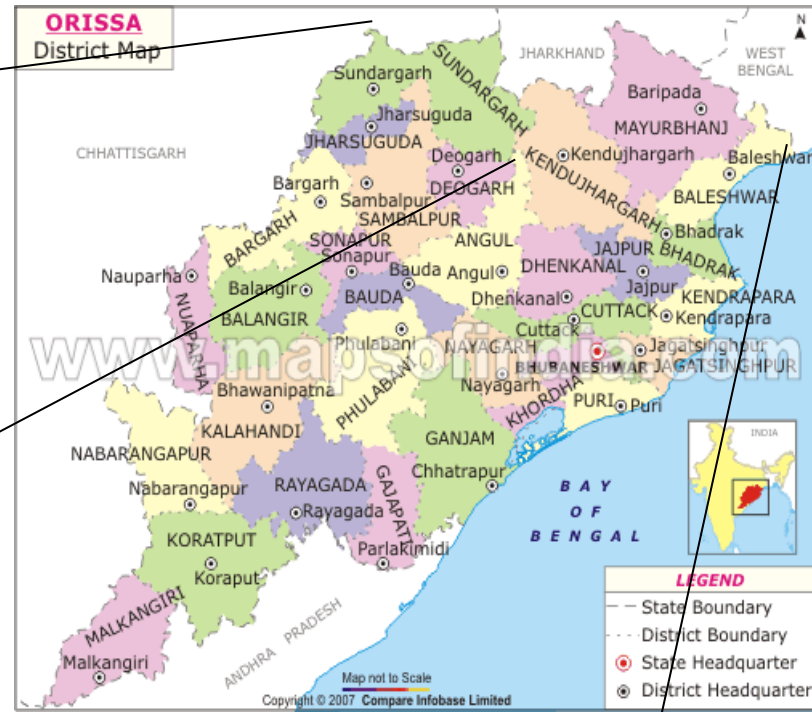
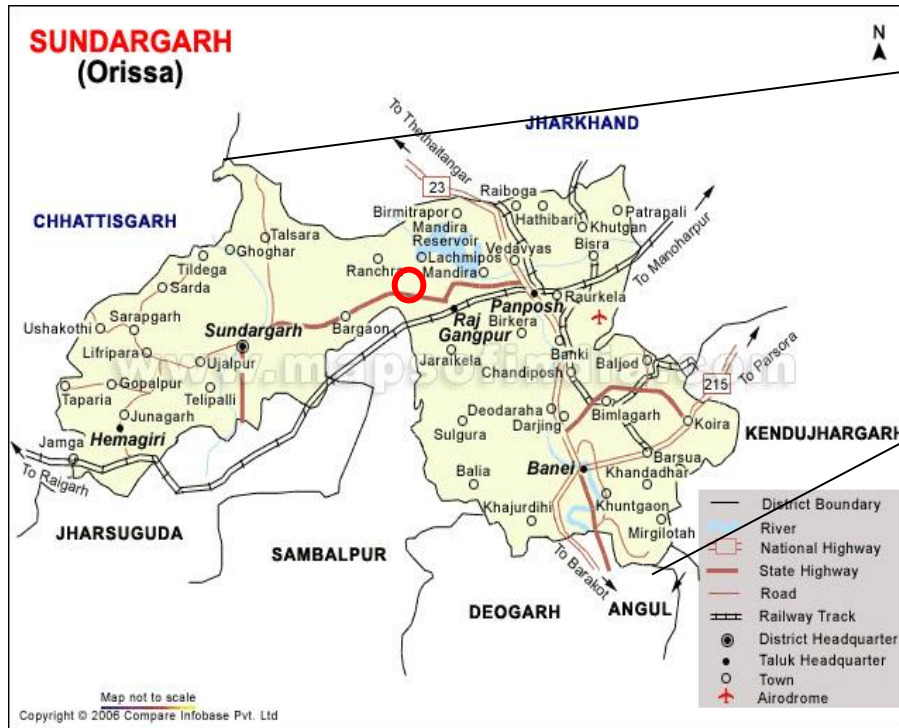
At present from October 2021 to March 2022 the mine has produced Limestone of 30, 02, 650.00 MT and there was production of Dolomite to the tune of 4, 240.00 MT during the period mentioned, during the period 29, 78, 408.00 MT of sized Limestone has been dispatched to the cement plant and dispatch of Dolomite was 13, 647.58 MT during the period.

The operation of the mines is being carried out in all total three no. of quarries, those are Quarry no. 2 & 6, Quarry no.1 & 3 and Quarry no. 4 & 5.

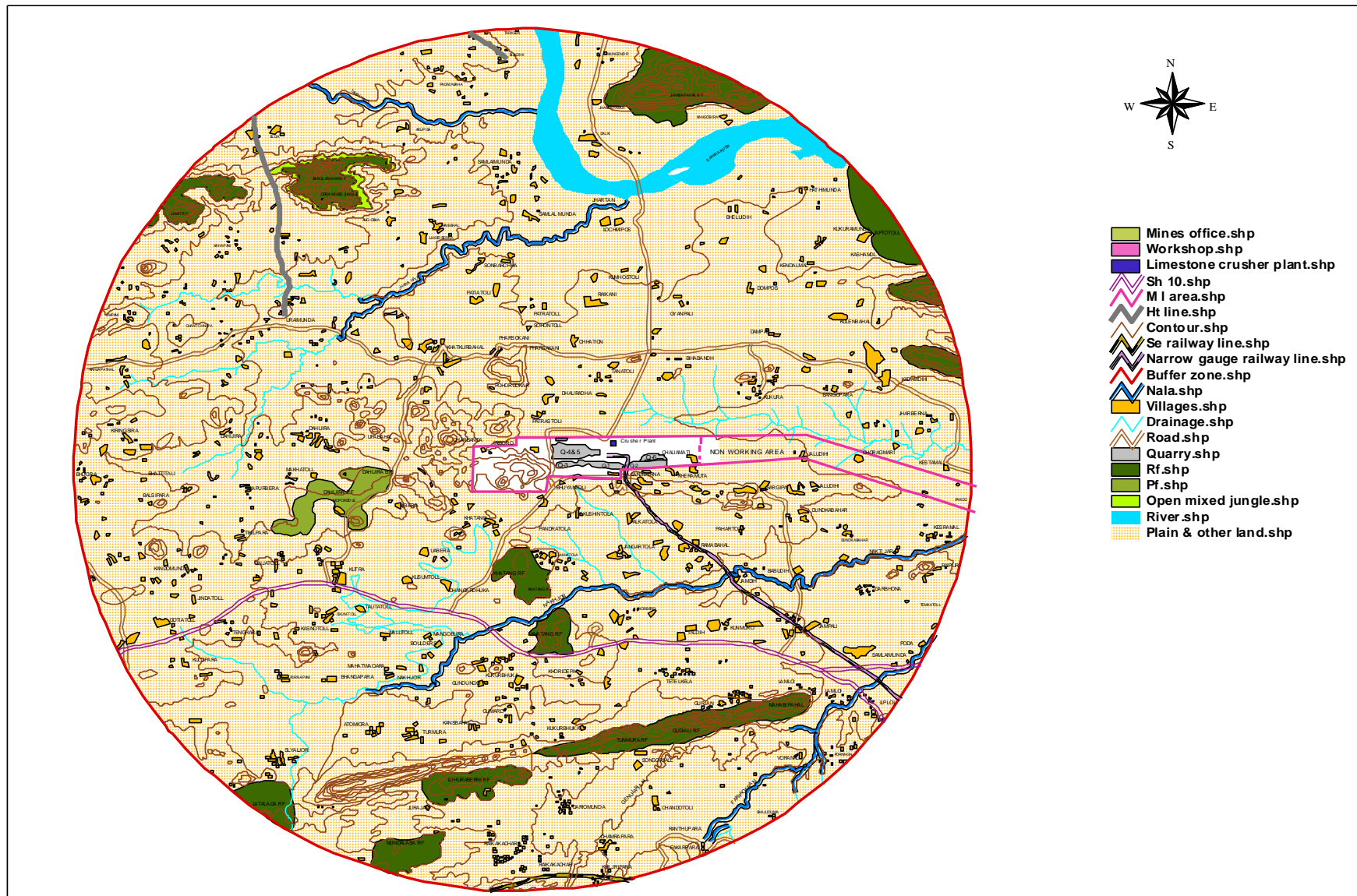
Status of Compliances as on 31<sup>st</sup> March 2022.

1. Forest Clearance has been obtained from the MoEF vide letter No.8-56/1994-FC(pt) Dated 30.09.2013.
2. As on date, 102.39 Ha. area has been covered with plantation. Total 3, 36, 101 nos. of trees have been planted including species like Teak, Shisham, Chakunda, Debdaru & Mango etc. till March 2022. Survival rate is approximately is 70.0%. Total distribution of saplings around the mine area during 2021 – 22 is around 12000 nos. in 34 villages.
3. Four ambient air quality monitoring stations in core zone and two in the buffer zone are fixed in consultation with SPCB and considering the meteorological data. Monitoring is being carried out on twice weekly basis at each location as per NAAQS, 18<sup>th</sup> November 2009.
4. Fugitive dust emission monitoring is carried out on quarterly basis and data thus collected are mentioned in this report. Hydraulic drills attached with efficient dust collection system have been deployed. Latest blasting technology is being adopted. Water sprinkling is being done on haul roads, quarry faces, limestone receiving hopper, conveyor belt etc. Limestone crushing plant has been provided with bag filter. Filter bags are periodically cleaned/ changed. Permanent water sprinkling systems along the haul roads have been installed along the main haul road.
5. To control noise levels below 85 dB(A), latest blasting technology is being adopted. Drill bits are being timely sharpened. Preventive maintenance of diesel driven quarry equipment is being done as per OEM's recommendations. Workers engaged in blasting & drilling operations and in operating HEMM have been provided with ear plugs/ muffs.

Figure No: 1.1 Location Map of the Project



# Figure No:1.2 Vicinity Map of Lanjiberna Limestone & Dolomite Mines



Prepared by: Cleenviron Pvt. Ltd.

6. Waste water from garage and workshop are carried to oil separation system (oil & grease trap) and the water is recycled. There is no discharge from the workshop. Water discharged from the quarry pits passes through long drainage and discharge to settling tanks. Thereafter, the water is allowed to discharge to the nearby agricultural land for ultimate usage by the tenants for cultivation purpose as per advice of District Administration. The quality of water is regularly monitored from approved laboratories and is found well within the prescribed norms. The discharge water from quarry pits is monitored on quarterly basis and the data collected is mentioned in this report.
7. Environmental management Cell has been set up and functioning.

### **3. ASPECTS CONSIDERED FOR ENVIRONMENTAL MONITORING**

This report is based on the monitoring results generated from October 2021 to March 2022 covering post-monsoon and winter seasons of the year. Micro-meteorological monitoring was carried out on continuous basis and Ambient Air monitoring was carried out on twice weekly basis at each location and Stack Emission from Limestone Crusher Plant was carried out on monthly once basis. However other aspects like, Water quality, Fugitive Dust Emission monitoring and Noise level studies are carried out on quarterly basis, i.e. during November and February months of the year. Environmental Monitoring data were generated at Lanjiberna Limestone & Dolomite Mines and its buffer zone covering the following aspects in detail.

- i. Micro-meteorological Study
- ii. Ambient Air Quality Study
- iii. Fugitive Dust Emission Study
- iv. Stack Emission Monitoring from Crusher Plant
- v. Quarry Discharge Water Quality Study
- vi. Ground Water Level Study
- vii. Noise Level Study
- viii. Effluent Water Quality Study

Monitoring of environmental parameters for collection of data involves field work, which is described below:

#### **3.1 Micro-meteorological Study**

For collection of micro-meteorological data like Temperature, Relative Humidity, Wind Speed, Wind Direction, & Rainfall, a weather monitoring station is fixed on the Magazine Hill Top of Lanjiberna Limestone and Dolomite Mines of M/s DALMIA CEMENT (BHARAT) LIMITED Hourly data is being recorded continuously by putting up windows compatible data logging facility instrument, Make: Virtual Electronics Company, Roorkee.

#### **3.2 Ambient Air Monitoring**

To assess ambient air quality, total 6 (six) monitoring stations are fixed including 4 (four) in the Core zone and 2 (two) in the buffer zone. The monitoring locations are fixed according to the micro-meteorological data and in consultation with State Pollution Control Board. The monitoring was carried out for parameters like PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> and monitoring was carried out on twice weekly from each location. For collection of samples Respirable Dust sampler and Fine Particulate samplers were placed at each location, sampling and analytical techniques are followed as per the standard method of ambient air sampling and analysis. The other parameters like NH<sub>3</sub>, O<sub>3</sub>, CO, As, Ni, Pb, Benzene & Benzo(a)pyrene are monitored once in a year from four core zone AAQ monitoring stations only.

### **3.3 Fugitive Dust Emission Monitoring**

To find out the quantity of fugitive dust emission from the mining operation, two main dust generating locations are identified and those are within the quarry during operation of Excavators and Drill machines. The second location was set up on the haulage road of the mines leading to Crusher Plant. For collection of samples two high volume samplers are used and 8 hourly samples are collected for Particulate Matter only. Fugitive monitoring was carried out on quarterly basis, during month of November for post-monsoon and February for winter season.

### **3.4 Stack Emission Monitoring from Crusher Plant**

The crusher plant of Lanjiberna Limestone and Dolomite mines is equipped with a Dust Extraction and Bag House Filter system to control the emission of dust particles during crushing operation of Limestone lumps in to required size. To assess the emission level of Particulate Matter from the stack of bag filter system, monitoring of Stack emission was scheduled on monthly once basis. Particulate Matter emission was monitored following the IS methods for Stack monitoring.

### **3.5 Quarry Discharge Water Quality Study**

Total three locations were fixed for sampling of the quarry discharge water from three different quarries operating. The sampling and analysis of quarry discharge water were carried out on monthly basis. The parameters analyzed are as per the Schedule – IV of EPA, G.S.R.422(E), 1993. Few parameters like pH, Temperature and DO are recorded at the site. For other parameters the samples were fixed and preserved as per the standard methods of sampling by APHA 23<sup>rd</sup> Edition.

### **3.6 Ground Water Level Study**

To assess the ground water availability and fluctuation, a net work of 5(Five) existing dug wells are fixed, from where the ground water quality study were carried out during the month of May or June and one extra location was considered in the village Katang for ground water level measurement. The variation of ground water level is being studied on quarterly basis during the months of November for post-monsoon season and February for winter season.

### **3.7 Noise Level Study**

Noise monitoring were carried out at 4(four) different locations within the Core zone once in three months period during November and February months. The measurements were collected by Sound Level Meter, make: Envirotech Instruments Pvt. Ltd., New Delhi, in dB(A) at a height of 1.5 meter, above ground level and away from the sound reflecting sources like walls and buildings etc.

### **3.8 Effluent Water Quality**

The waste water from Workshop/Garage of the Lanjiberna Limestone & Dolomite mines is directed to an Oil Separation Tank and after removal of Oil & TSS it is reused in HEMM washing. The outlet water from the Oil & Grease Separation tank was sampled and analysed for 5 (Five) parameters on quarterly basis during the months of November and February.

## 4. SAMPLING LOCATIONS

### 4.1 Micro-Meteorological Study

One meteorological station was set up on the Magazine Hill Top of the Lanjiberna Limestone & Dolomite Mines to monitor wind speed, wind direction, temperature, relative humidity and rainfall on hourly basis by data logging technique.

### 4.2 Ambient Air Quality Monitoring

Four ambient air quality monitoring stations are fixed within the core zone and two stations are fixed in the buffer zone. General precautions were taken to position the Respirable Dust Samplers at all the locations. The descriptions of the Ambient Air Monitoring Stations are as follows:

#### A-1 Near Brick Plant

The sampling station is located within the core zone and the station was selected to assess the present level of pollution due to excavation, drilling works being carried out in the quarry no 2&6 and also the movement of crushed limestone from the crusher plant to the Cement Works at Rajgangpur, by belt conveyors systems.

#### A-2 Limestone Crusher Plant Area

This location is around the Crusher plant area of the Mines within the core zone. This was selected to assess the air quality in and around the crusher plant and the level of pollution due to crushing, screening and transfer of Limestone to conveyor belts.

#### A-3 Lanjiberna Mines Office Area

The location was selected within the core zone and to assess the pollution load generated from the mini crusher plants situated near the northern boundary of the lease and near Quarry no 4&5.

#### A-4 Magazine Hill Top

The location was selected within the core zone and to assess the effect of mining as well as crushing operations of the mine on the background air quality and sensitive receptors on the hill top which is at a higher elevation from the ground.

#### A-5 Village Katang

This location is situated in the buffer zone of the mine and selection of this location was done as to assess the effect of the mining operation on the local receptors, as this village is falling in the predominant wind direction towards south-west of the lease area.

#### A-6 Village Bihabandh

This location is situated in the buffer zone of the mine and selection of this location was done as to assess the effect of the mining operation on the local receptors, as this village is falling in the predominant wind direction towards north-east of the lease area.

The distances and directions of the Ambient Air Quality monitoring locations are summarized in **Table No 4.1**

**Table No 4.1: Ambient Air Quality Monitoring Stations**

SI No	Name of Location	Zone	Distance	Direction
1	Near Brick Plant	Core	-	-
2	Crusher Plant Area	Core	-	-
3	Lanjiberna Mines Office Area	Core	-	-
4	Magazine Hill Top	Core	-	-

SI No	Name of Location	Zone	Distance	Direction
5	Village Katang	Buffer	1 km from ML Area	SW
6	Village Bihabandh	Buffer	2 km from ML Area	NE

#### 4.3 Fugitive Dust Emission Study Locations:

Two fugitive dust emission monitoring locations are established inside the core zone, to find out the amount of dust being generated from the source during the excavation, drilling & hauling of Limestone to crusher plant. The descriptions of fugitive emission monitoring locations are as follows:

##### F-1 Downwind of Excavator/ Drill Machine within the Quarry

This location was fixed within an operating quarry and while operation of mining equipments are on. Towards the down wind direction of any excavator or drill machine within a distance of 500 m, one high volume sampler was set for 8 hour operation and the parameter monitored is SPM general precautions are obeyed while collection of samples.

##### F-2 Haulage Road Leading to Crusher Plant

This location was fixed to evaluate the amount of pollution load on the ambient air due to moving of heavy earth moving equipments like 35T & 50T Dumpers on the haulage road which leads to the Limestone Crusher Plant. The samplers are being operated for continuous of 8 hours by the side of the haulage road and parameter like SPM was measured.

#### 4.4 Stack Emission Monitoring:

The stack of the bag filter unit installed at the limestone crusher plant was monitored for Particulate Matter emission from the same during the crushing of Limestone lumps in to different sizes. There is a platform made at a height around 25m from the ground at the stack and sample has been collected on monthly basis to evaluate the performance of the bag filters and emission level from the stack.

#### 4.5 Quarry Discharge Water:

In order to assess the present quality of water, which is being discharged on to the land after pumping out from the quarry. Three sampling locations were set at the discharge points of the pumped out water. The samples were being collected from each discharge point every month. The descriptions of the locations are given below:

##### SW-1 Quarry 2&6 Discharge Water

The water collected inside the quarry no-2&6 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the northern side of the lease and the water is used by the near by villagers for irrigation purpose. The sample were collected from the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

##### SW-2 Quarry 1&3 Discharge Water

The water collected inside the quarry no-1&3 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the southern side of the lease and the water is used by the near by villagers for irrigation purpose. The sample were collected from the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

##### SW-3 Quarry 4&5 Discharge Water

The water collected inside the quarry no-4&5 is pumped out continuously and is stored in a RCC tank before allowing it to flow out of the ML area by a guided channel towards the north-eastern side of the lease and the water is used by the near by villagers for irrigation purpose. The sample were collected from

the out let of the RCC tank and analyzed for 27 parameters as per the Schedule – VI of EPA, G.S.R.422(E) 1993 for any contaminants in it.

#### **4.6 Ground Water Level:**

Ground water levels were measured during month of November and February to know the amount of seasonal fluctuation and availability of ground water during post-monsoon and winter seasons of the area. The details of the water level measurement locations are described below:

##### **GW-1 Village Kheramuta Dug Well**

The water level was measured from the dug well of Kheramuta village for water availability as the villagers are using the dug well water for their domestic purpose.

##### **GW-2 Lanjiberna Colony Dug Well**

The water level was measured from the dug well of Lanjiberna Colony for water availability as the workers are using the dug well water for their domestic purpose.

##### **GW-3 Village Dhauradah Dug Well**

The water level was measured from the dug well of Dhauradah village for water availability as the villagers are using the dug well water for their domestic purpose.

##### **GW-4 Lanjiberna Mines Workshop Dug Well**

The water level was measured from the dug well of Lanjiberna Mines Workshop for water availability as the dug well is being used for domestic purpose.

##### **GW-5 Village Lanjiberna Dug Well**

The water level was measured from the dug well of Lanjiberna village for water availability as the villagers are using the dug well water for their domestic purpose.

##### **GW-6 Village Katang Dug Well**

The water level was measured from the dug well of Katang village for water availability as the villagers are using the dug well water for their domestic purpose.

#### **4.7 Noise Level Monitoring**

Noise levels were measured at 4(four) different locations within the core zone only to assess the impact of the mining operation on the ambient noise level. A brief description of the monitoring location is given below:

##### **N-1 Quarry Area during Operation of HEMM**

This station was selected to assess the ambient noise level due to the operation of HEMM within the quarry area during ongoing mining works. The monitoring was carried out inside the quarry and at distance of 100 m from the operating machines.

##### **N-2 Limestone Crusher Plant area**

This station was selected to assess the ambient noise level due to the operation of Crusher Plant and crushing and screening operation of Limestone lumps. The monitoring was carried out at a distance of 100m from the Crusher building.

##### **N-3 Lanjiberna Colony Area**

This station was selected to assess the ambient noise level due to the mining activities and transportation of limestone to the Cement Plant by Railway wagons. The monitoring was carried out near the Lanjiberna Colony.



#### **N-4 Magazine Hill Top**

This station was selected to assess the ambient noise level due to the mining activities and crushing of limestone and its impact on the background and sensitive receptors. The monitoring was carried out on the Magazine Hill top near the security search light post.

#### **4.8 Effluent Water Quality Sampling Station**

The wash water of HEMM in workshop is directed to an Oil & Grease separation tank inside the garage premises and the treated water is reused in the washing process. The sample from the outlet of the Tank is collected on quarterly basis for analysis of 5 parameters and to find out the efficiency of the Oil & Grease separation process.

### **5. METHODOLOGY OF SAMPLING & ANALYTICAL PROCEDURES**

#### **5.1 Meteorological Study**

For recording various meteorological parameters like, Temperature, RH, Wind Speed, Wind Direction & Rainfall, a weather monitoring station, Make: Virtual Electronics Company, Roorkee was installed at the site. The instrument is equipped with windows based data logging software to store each data on hourly basis, which can be further down loaded to a PC and data can be interpreted as per the requirement of the report.

#### **5.2 Ambient Air Monitoring**

Air quality samples were monitored for all parameters as per NAAQS. For sampling and analysis, methods prescribed by CPCB were followed and Respirable Dust Samplers (RDS) were used and for PM2.5 sampling Fine Particulate Samplers were used at the site.

#### **5.3 Fugitive Dust Emission Monitoring**

Fugitive dust samples were monitored for parameter like, SPM only. For sampling and analysis ambient air monitoring methods prescribed by CPCB were followed and High Volume Samplers/ Respirable Dust Samplers were used at the site. 8 hours continuous samplings were carried out once in three months at each location.

#### **5.4 Stack Monitoring**

Stack monitoring were carried out once in every month from the bag filter outlet stack of the Limestone Crusher plant and the CPCB standard for monitoring of Stack emission was followed for collecting the sample and the concentration of Particulate Matter were calculated by following the standard methods of CPCB. For collection of sample Ecotech Instruments make Stack sampler Model: ESS -100 was used at the site.

#### **5.5 Water Quality Sampling**

As per the standard practice, one sample from each station was collected once, during the month of August and November. Grab water samples were collected in plastic container by standard sampling technique. Necessary precautions were taken for sample preservation. The parameters like pH, Temp., Conductivity and DO were measured at the site by using portable water analysis kit from WTW, Germany. All other parameters were analysed as per the standard methods for Water and Waste Water analysis by APHA.

#### **5.6 Noise Level Monitoring**

Ambient Noise level monitoring was carried out with an integrating Sound Level Meter, Model: SLM 100, Make: Envirotech Instruments Pvt. Ltd. in dB(A). The measurements were collected at a height of 1.5m from the ground level and away from any sound reflecting sources like walls and buildings etc.

The Ambient Noise monitoring was carried out on continuous basis by the data logging system of the instrument and data are logged on at every minute for 24 hours. The Sound Pressure Level were measured and Lmin, Lmax & Leq Day Time and Leq Night Time were calculated and interpreted for data analysis.

## 6. DATA ANALYSIS

### 6.1 Micro-meteorological Study:

#### 6.1.1 Wind Speed & Wind Direction

During the entire period from 1<sup>st</sup> October to 31<sup>st</sup> March all total 4378 no. of data are recorded by the instrument and after interpretation of the collected data it was found that Calm condition prevailed over 59.32%, while considering the 24 hourly data. 65.18% calm condition prevailed from morning 6 hrs to 14hrs for the entire study period, 42.17% calm condition prevailed from 14hrs to 22hrs and 69.34% calm condition prevailed from 22hrs to 06hrs. The predominant wind directions were from SSW with average wind speed 0.77 m/sec. The wind rose diagrams for the entire study period are depicted on the **Figure No: 6.1, 6.2, 6.3 & 6.4.**

#### 6.1.2 Temperature

The maximum & minimum temperature during the entire study period were divided in to three parts as the study period was covering post-monsoon, winter seasons and early summer season also. The Minimum temperature during the post-monsoon season was found to be 13.71°C and the Maximum temperature was found to be 32.08°C up to the end of 30<sup>th</sup> November.

The minimum and maximum temperature during the winter season i.e. from December to February was found to be 8.06°C and 33.39°C. During the month of March the minimum and maximum temperature was found to be 17.25°C and 40.37°C. **Table No 6.1** shows a summary of micro-meteorological data collected for the entire period.

#### 6.1.3 Rainfall

The total rain fall from 1<sup>st</sup> October to 31<sup>st</sup> March was observed to be 436.9 mm. during the study period. A month wise rainfall data recorded at the site is depicted in **Table No 6.1.**

**Table No: 6.1**  
**A Summary of the Micro-meteorological Data**

**Project Site :** Lanjiberna Limestone & Dolomite Mines  
**Location :** Magazine Hill Top

SI No	Parameters	From October' 21 – March' 22
1	Predominant Wind Direction	From SSW
2	Calm Condition %	59.32
3	Average Wind Speed m/sec	0.77
4	Temperature °C	
	<b>Post-monsoon Season</b>	
	Minimum	13.71
	Maximum	32.08
	<b>Winter Season</b>	
	Minimum	8.06
	Maximum	33.39
	<b>Early Summer Season</b>	
	Minimum	17.25

SI No	Parameters	From October' 21 – March' 22
	Maximum	40.37
5	<b>Rain Fall in mm</b>	
	October	159.4
	November	61.10
	December	60.80
	January	104.00
	February	51.60
	March	0.00
	<b>Total</b>	<b>436.90</b>

Figure No: 6.1 Wind Rose Diagram for 24 Hours

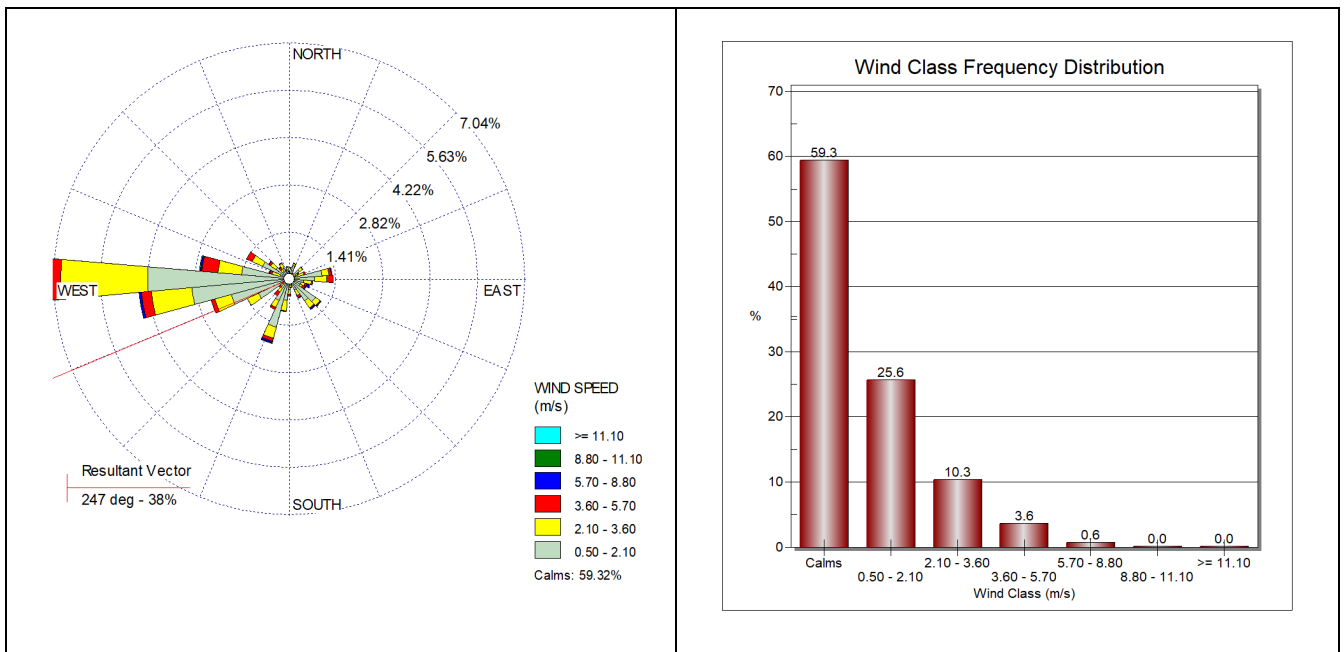
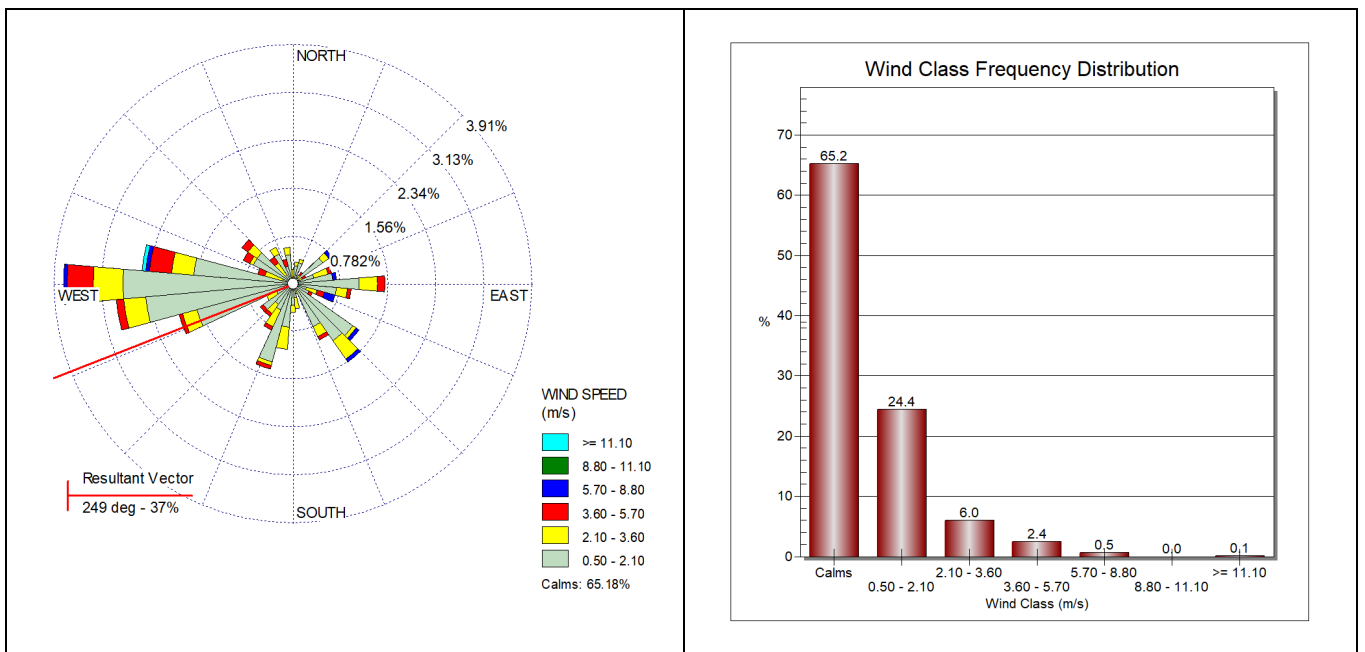
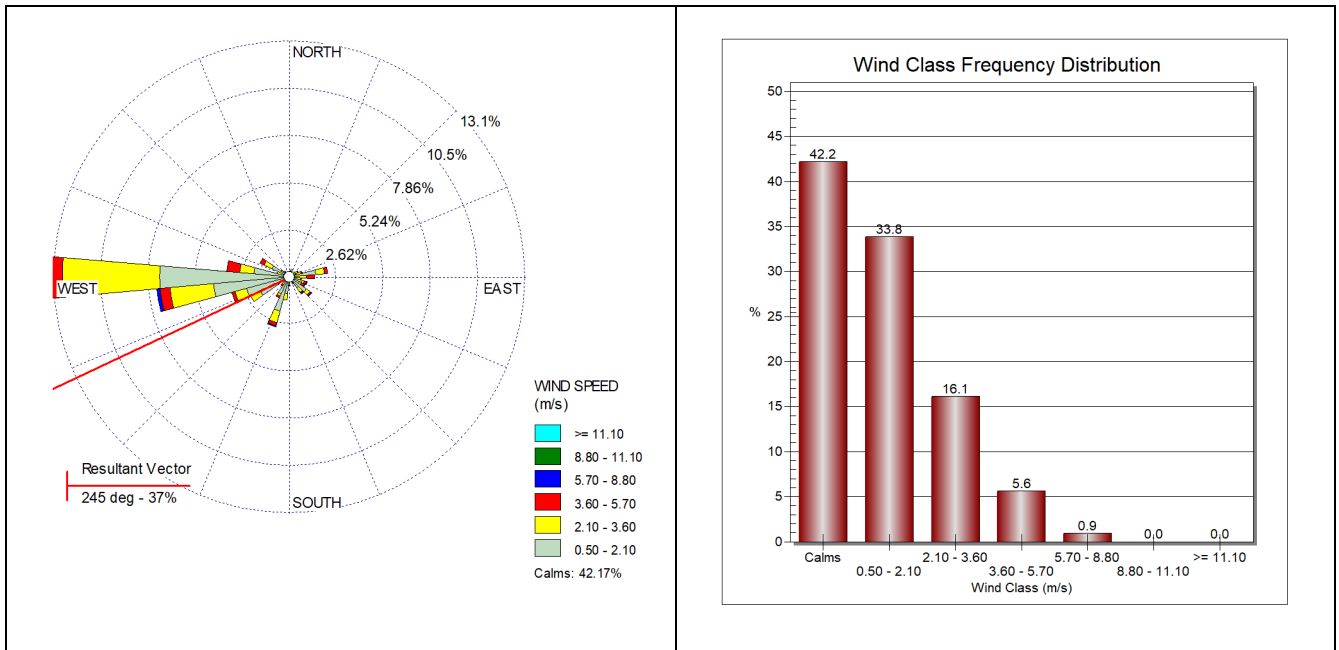


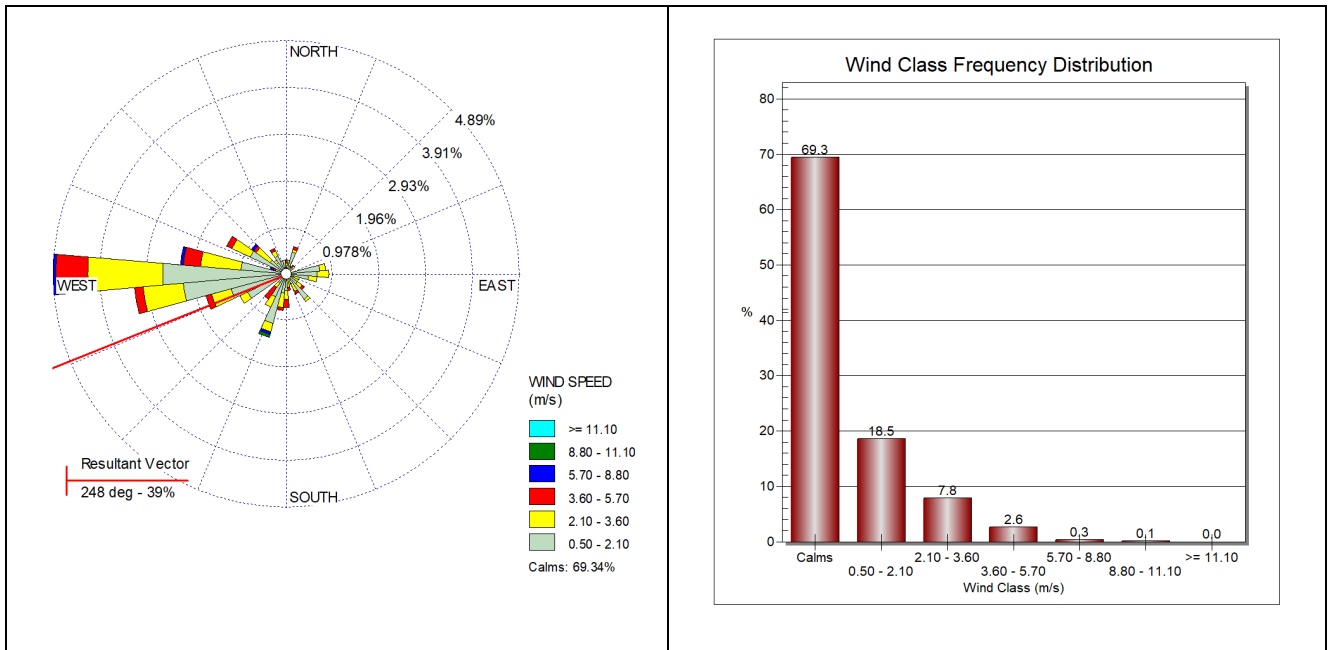
Figure No: 6.2 Wind Rose Diagram from 06 – 14 Hours



**Figure No: 6.3 Wind Rose Diagram from 14 – 22 Hours**



**Figure No: 6.4 Wind Rose Diagram from 22 – 06 Hours**



## 6.2 Ambient Air Quality Data

### 6.2.1 Near Brick Plant (A-1)

#### PM2.5

Data as given in the **Table No: 6.2** shows that the maximum value was  $29\mu\text{g}/\text{m}^3$ , 98 percentile values were  $27\mu\text{g}/\text{m}^3$ , the lowest value was  $13\mu\text{g}/\text{m}^3$  and the average value was  $22.24\mu\text{g}/\text{m}^3$ .

**PM10**

Data as given in the **Table No: 6.2** shows that the maximum value was 81µg/m<sup>3</sup>, 98 percentile values were 76µg/m<sup>3</sup>, the lowest value was 36µg/m<sup>3</sup> and the average value was 62.53µg/m<sup>3</sup>.

All the readings are below the permissible limit of 60 & 100µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.2** shows the maximum value was 11µg/m<sup>3</sup>, 98 percentile values were 9.00µg/m<sup>3</sup>, the lowest value was 3.0µg/m<sup>3</sup> and the average value was 5.76µg/m<sup>3</sup>.

**NO<sub>2</sub>**

The data given in the **Table No: 6.2** shows the maximum value was 45µg/m<sup>3</sup>, 98 percentile values were 33µg/m<sup>3</sup>, the lowest value was 11.0µg/m<sup>3</sup> and the average value was 20.69µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.2**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-1 (Near Brick Plant)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
01.10.2021	18	66	6	21
04.10.2021	17	49	7	19
07.10.2021	20	58	4	17
11.10.2021	21	62	4	13
14.10.2021	26	70	6	19
18.10.2021	21	70	5	18
21.10.2021	27	71	5	18
25.10.2021	26	66	7	25
28.10.2021	21	75	5	25
03.11.2021	21	76	11	45
09.11.2021	20	69	6	26
12.11.2021	21	60	7	28
16.11.2021	23	62	9	29
20.11.2021	23	63	8	24
23.11.2021	22	65	6	23
27.11.2021	14	47	6	20
30.11.2021	20	53	4	12
02.12.2021	26	68	5	17
07.12.2021	20	53	4	15
11.12.2021	20	53	6	22
15.12.2021	22	58	8	27
18.12.2021	24	60	8	33

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
21.12.2021	18	47	5	19
24.12.2021	22	58	7	24
28.12.2021	13	36	4	14
31.12.2021	25	67	6	18
03.01.2022	19	50	5	19
07.01.2022	23	66	5	19
10.01.2022	25	74	5	22
14.01.2022	24	53	9	29
18.01.2022	25	73	4	19
22.01.2022	24	72	6	16
24.01.2022	27	76	5	23
27.01.2022	21	55	5	15
31.01.2022	27	69	3	19
02.02.2022	23	62	5	18
04.02.2022	25	73	6	19
09.02.2022	26	74	6	19
12.02.2022	23	63	8	24
16.02.2022	24	66	8	24
19.02.2022	23	59	6	23
22.02.2022	24	68	4	14
26.02.2022	25	66	4	11
01.03.2022	15	49	5	17
04.03.2022	22	59	5	19
08.03.2022	24	64	4	11
15.03.2022	23	61	7	28
18.03.2022	22	59	7	18
23.03.2022	18	52	5	13
26.03.2022	29	81	5	24
31.03.2022	22	63	3	21
<b>Minimum</b>	<b>13</b>	<b>36</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>29</b>	<b>81</b>	<b>11</b>	<b>45</b>
<b>Average</b>	<b>22.24</b>	<b>62.53</b>	<b>5.76</b>	<b>20.69</b>
<b>98%tile Value</b>	<b>27</b>	<b>76</b>	<b>9</b>	<b>33</b>

## 6.2.2 Limestone Crusher Plant (A-2)

### PM2.5

Data as given in the **Table No: 6.3** shows that the maximum value was 28 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 27 $\mu\text{g}/\text{m}^3$ , the lowest value was 15 $\mu\text{g}/\text{m}^3$  and the average value was 22.57 $\mu\text{g}/\text{m}^3$ .

**PM10**

Data as given in the **Table No: 6.3** shows that the maximum value was  $79\mu\text{g}/\text{m}^3$ , 98 percentile values were  $77.96\mu\text{g}/\text{m}^3$ , the lowest value was  $40\mu\text{g}/\text{m}^3$  and the average value was  $62.55\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of  $60$  &  $100\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.3** shows the maximum value was  $11\mu\text{g}/\text{m}^3$ , 98 percentile values were  $9.00\mu\text{g}/\text{m}^3$ , the lowest value was  $3.0\mu\text{g}/\text{m}^3$  and the average value was  $5.77\mu\text{g}/\text{m}^3$ .

**NO<sub>2</sub>**

The data given in the **Table No: 6.3** shows the maximum value was  $35\mu\text{g}/\text{m}^3$ , 98 percentile values were  $30\mu\text{g}/\text{m}^3$ , the lowest value was  $11.0\mu\text{g}/\text{m}^3$  and the average value was  $19.81\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of  $80\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.3**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-2 (Limestone Crusher Plant)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
01.10.2021	25	77	4	15
04.10.2021	26	73	8	27
07.10.2021	23	68	7	25
11.10.2021	19	71	6	18
14.10.2021	27	68	5	27
18.10.2021	23	60	7	21
21.10.2021	26	68	5	17
25.10.2021	23	60	8	28
28.10.2021	21	56	6	18
03.11.2021	19	63	5	15
06.11.2021	24	79	7	26
09.11.2021	22	70	6	22
12.11.2021	25	59	5	18
16.11.2021	24	68	6	21
20.11.2021	23	64	9	30
23.11.2021	23	66	5	23
27.11.2021	19	50	9	35
30.11.2021	22	59	6	20
02.12.2021	19	49	6	21
04.12.2021	24	69	5	19
07.12.2021	19	49	11	30
11.12.2021	22	58	5	15

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
15.12.2021	23	61	8	23
18.12.2021	22	58	3	17
21.12.2021	15	40	8	22
24.12.2021	27	70	8	21
28.12.2021	19	52	5	19
03.01.2022	21	59	5	14
07.01.2022	23	69	4	20
10.01.2022	24	70	6	19
14.01.2022	24	64	5	17
18.01.2022	28	78	6	19
22.01.2022	27	77	5	15
24.01.2022	27	73	6	18
27.01.2022	25	67	6	17
31.01.2022	24	64	8	23
02.02.2022	26	68	6	25
04.02.2022	26	72	5	19
09.02.2022	26	72	6	19
12.02.2022	20	52	5	15
16.02.2022	18	47	5	14
19.02.2022	17	43	7	23
22.02.2022	18	48	4	15
26.02.2022	22	56	4	15
01.03.2022	19	49	5	15
04.03.2022	26	69	6	17
08.03.2022	21	55	4	11
11.03.2022	18	47	4	19
15.03.2022	27	70	4	24
18.03.2022	20	58	3	12
23.03.2022	23	67	5	16
26.03.2022	21	69	4	20
31.03.2022	21	67	5	16
<b>Minimum</b>	<b>15</b>	<b>40</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>28</b>	<b>79</b>	<b>11</b>	<b>35</b>
<b>Average</b>	<b>22.57</b>	<b>62.55</b>	<b>5.77</b>	<b>19.81</b>
<b>98%tile Value</b>	<b>27</b>	<b>77.96</b>	<b>9</b>	<b>30</b>

### 6.2.3 Lanjiberna Mines Office Area (A-3)

#### PM2.5

Data as given in the **Table No: 6.4** shows that the maximum value was 27 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 26.96 $\mu\text{g}/\text{m}^3$ , the lowest value was 14 $\mu\text{g}/\text{m}^3$  and the average value was 21.94 $\mu\text{g}/\text{m}^3$ .



**PM10**

Data as given in the **Table No: 6.4** shows that the maximum value was 75µg/m<sup>3</sup>, 98 percentile values were 75µg/m<sup>3</sup>, the lowest value was 38µg/m<sup>3</sup> and the average value was 60.71µg/m<sup>3</sup>.

All the readings are below the permissible limit of 60 & 100µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.4** shows the maximum value was 9µg/m<sup>3</sup>, 98 percentile values were 8µg/m<sup>3</sup>, the lowest value was 3.0µg/m<sup>3</sup> and the average value was 5.69µg/m<sup>3</sup>.

**NO<sub>2</sub>**

The data given in the **Table No: 6.4** shows the maximum value was 33µg/m<sup>3</sup>, 98 percentile values were 27.96µg/m<sup>3</sup>, the lowest value was 11.0µg/m<sup>3</sup> and the average value was 19.67µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.4**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-3 (Lanjiberna Mines Office Area)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
01.10.2021	20	70	6	21
04.10.2021	24	67	5	25
07.10.2021	20	75	6	19
11.10.2021	21	70	7	20
14.10.2021	25	67	5	16
18.10.2021	21	66	6	22
21.10.2021	26	75	4	12
25.10.2021	21	62	7	18
28.10.2021	25	63	4	14
03.11.2021	22	65	6	15
06.11.2021	21	59	8	25
09.11.2021	27	69	6	27
12.11.2021	15	38	6	20
16.11.2021	21	57	6	20
20.11.2021	21	52	7	27
23.11.2021	19	55	7	26
27.11.2021	25	65	7	33
30.11.2021	25	66	5	19
02.12.2021	21	59	6	21
04.12.2021	21	56	6	18
07.12.2021	21	58	7	20
11.12.2021	19	52	9	25

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
15.12.2021	26	69	8	26
18.12.2021	25	68	8	28
21.12.2021	24	61	4	14
24.12.2021	20	58	6	20
28.12.2021	24	62	7	22
03.01.2022	22	56	4	13
07.01.2022	23	62	3	16
10.01.2022	24	68	6	19
14.01.2022	18	48	7	21
18.01.2022	24	70	6	21
22.01.2022	25	71	6	21
24.01.2022	23	68	5	20
27.01.2022	18	49	5	15
31.01.2022	19	51	5	21
02.02.2022	23	60	7	19
04.02.2022	27	75	5	19
09.02.2022	23	66	5	16
12.02.2022	23	60	4	20
16.02.2022	14	39	5	21
19.02.2022	25	65	6	25
22.02.2022	22	57	6	15
26.02.2022	23	64	5	15
01.03.2022	23	62	5	20
04.03.2022	23	61	8	24
08.03.2022	19	49	4	11
11.03.2022	19	50	5	15
15.03.2022	18	48	3	15
18.03.2022	23	62	4	13
23.03.2022	21	59	4	16
26.03.2022	19	53	4	19
31.03.2022	23	65	5	16
<b>Minimum</b>	<b>14</b>	<b>38</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>27</b>	<b>75</b>	<b>9</b>	<b>33</b>
<b>Average</b>	<b>21.94</b>	<b>60.71</b>	<b>5.69</b>	<b>19.67</b>
<b>98%tile Value</b>	<b>26.96</b>	<b>75</b>	<b>8</b>	<b>27.96</b>

#### 6.2.4 Magazine Hill Top (A-4)

##### PM2.5

Data as given in the **Table No: 6.5** shows that the maximum value was 25 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 24.98 $\mu\text{g}/\text{m}^3$ , the lowest value was 9 $\mu\text{g}/\text{m}^3$  and the average value was 17.44 $\mu\text{g}/\text{m}^3$ .

**PM10**

Data as given in the **Table No: 6.5** shows that the maximum value was 71 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 70.98 $\mu\text{g}/\text{m}^3$ , the lowest value was 22 $\mu\text{g}/\text{m}^3$  and the average value was 48.9 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 60 & 100 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.5** shows the maximum value was 12 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 9.96 $\mu\text{g}/\text{m}^3$ , the lowest value was 3.0 $\mu\text{g}/\text{m}^3$  and the average value was 5.92 $\mu\text{g}/\text{m}^3$ .

**NO<sub>2</sub>**

The data given in the **Table No: 6.5** shows the maximum value was 33 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 32 $\mu\text{g}/\text{m}^3$ , the lowest value was 11.0 $\mu\text{g}/\text{m}^3$  and the average value was 20.4 $\mu\text{g}/\text{m}^3$ .

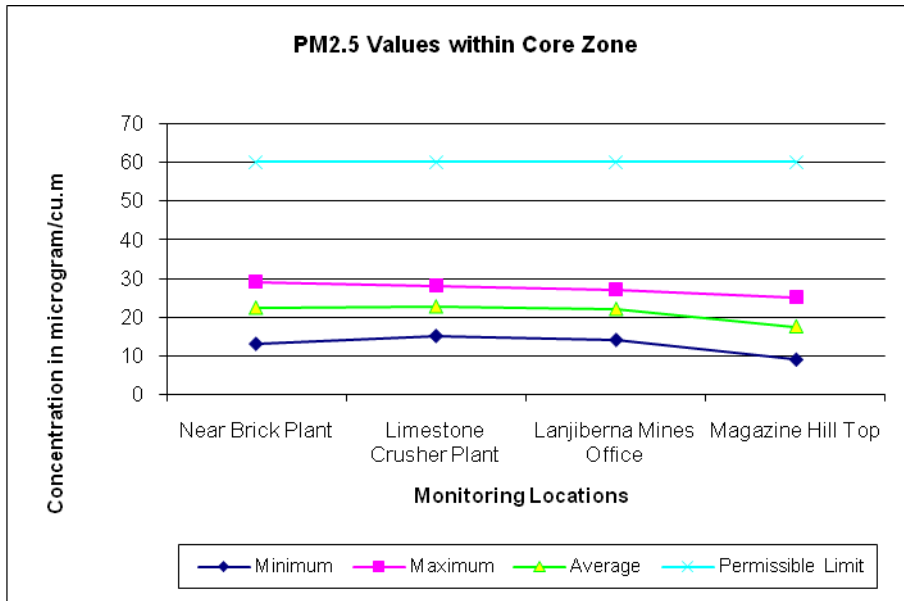
All the readings are below the permissible limit of 80 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.5**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-4 (Magazine Hill Top)

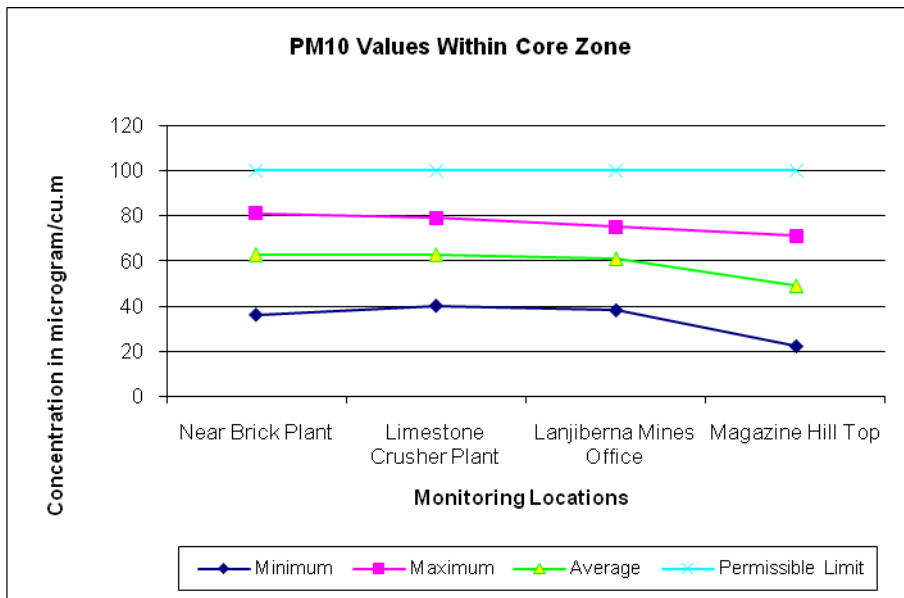
Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
01.10.2021	19	51	7	19
04.10.2021	13	40	10	28
07.10.2021	19	61	5	18
11.10.2021	20	56	8	25
14.10.2021	19	67	5	16
18.10.2021	15	48	8	32
21.10.2021	22	57	6	16
28.10.2021	19	69	12	32
03.11.2021	17	42	5	19
06.11.2021	19	49	5	19
09.11.2021	19	52	8	28
12.11.2021	21	54	6	21
16.11.2021	19	52	5	19
20.11.2021	21	54	6	20
23.11.2021	18	53	6	24
27.11.2021	12	39	7	33
30.11.2021	17	45	8	22
02.12.2021	17	43	5	17
04.12.2021	16	44	6	18
07.12.2021	12	36	7	24
11.12.2021	16	51	7	19
15.12.2021	18	47	5	21

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
18.12.2021	13	36	8	29
21.12.2021	16	43	3	14
24.12.2021	16	42	8	21
28.12.2021	16	43	5	15
03.01.2022	14	39	5	17
07.01.2022	21	61	5	23
10.01.2022	22	64	6	24
14.01.2022	17	45	5	20
18.01.2022	23	66	6	22
22.01.2022	25	70	7	22
24.01.2022	24	71	6	24
27.01.2022	15	39	4	19
31.01.2022	12	31	5	20
02.02.2022	16	43	5	15
04.02.2022	25	69	5	19
09.02.2022	24	71	6	21
12.02.2022	16	42	5	22
16.02.2022	23	60	6	20
19.02.2022	9	22	6	18
22.02.2022	12	31	5	18
26.02.2022	14	38	6	17
01.03.2022	14	36	5	17
04.03.2022	19	52	6	18
08.03.2022	13	34	5	11
11.03.2022	20	60	4	13
15.03.2022	16	43	5	18
18.03.2022	11	29	5	16
23.03.2022	18	54	5	18
26.03.2022	16	45	5	17
31.03.2022	19	54	4	23
<b>Minimum</b>	<b>9</b>	<b>22</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>25</b>	<b>71</b>	<b>12</b>	<b>33</b>
<b>Average</b>	<b>17.44</b>	<b>48.90</b>	<b>5.92</b>	<b>20.40</b>
<b>98%tile Value</b>	<b>24.98</b>	<b>70.98</b>	<b>9.96</b>	<b>32</b>

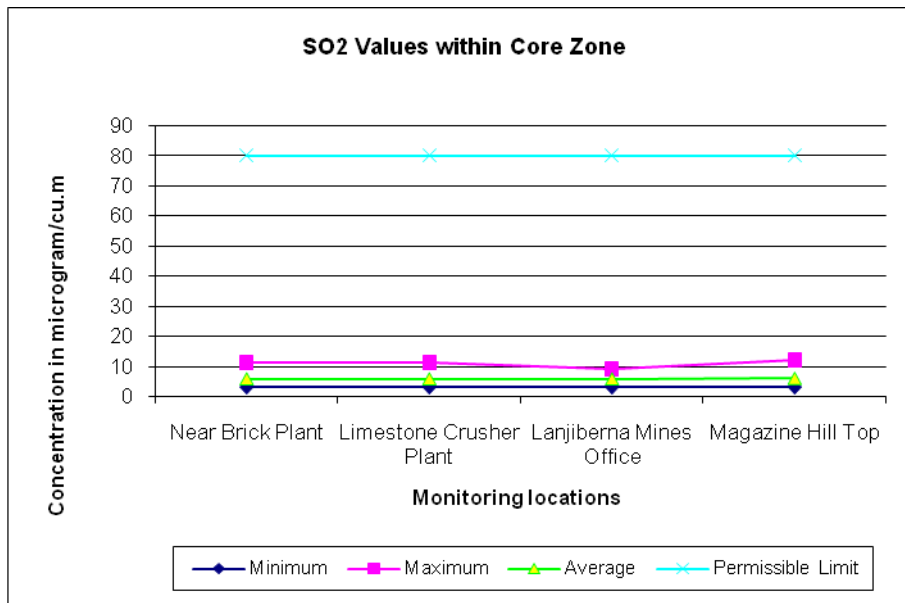
**Figure No: 6.5 Graphical Representations of PM2.5 Values in Core Zone**



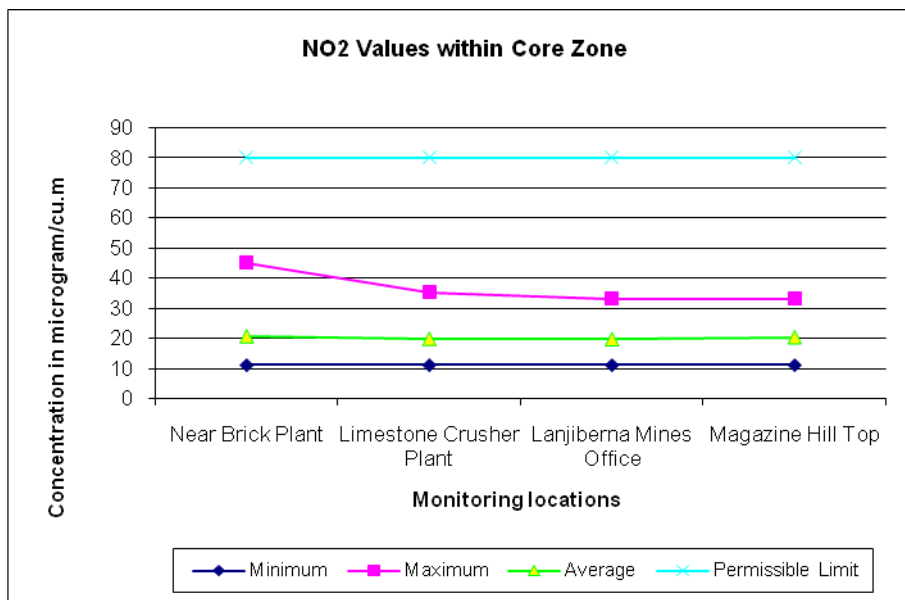
**Figure No: 6.6 Graphical Representations of PM10 Values in Core Zone**



**Figure No: 6.7 Graphical Representations of SO<sub>2</sub> Values in Core Zone**



**Figure No: 6.8 Graphical Representations of NO<sub>2</sub> Values in Core Zone**



**6.2.5 Village Katang (A-5)**

**PM<sub>2.5</sub>**

Data as given in the **Table No: 6.6** shows that the maximum value was 24.0µg/m<sup>3</sup>, 98 percentile values were 24.0µg/m<sup>3</sup>, the lowest value was 10.0µg/m<sup>3</sup> and the average value was 17.64µg/m<sup>3</sup>.

**PM10**

Data as given in the **Table No: 6.6** shows that the maximum value was  $69\mu\text{g}/\text{m}^3$ , 98 percentile values were  $66.24\mu\text{g}/\text{m}^3$ , the lowest value was  $29\mu\text{g}/\text{m}^3$  and the average value was  $48.68\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of  $60$  &  $100\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**SO<sub>2</sub>**

The data given in the **Table No: 6.6** shows the maximum value was  $10.0\mu\text{g}/\text{m}^3$ , 98 percentile values were  $9.1\mu\text{g}/\text{m}^3$ , the lowest value was  $3.0\mu\text{g}/\text{m}^3$  and the average value was  $5.57\mu\text{g}/\text{m}^3$ .

**NO<sub>2</sub>**

The data given in the **Table No: 6.6** shows the maximum value was  $40\mu\text{g}/\text{m}^3$ , 98 percentile values were  $32.64\mu\text{g}/\text{m}^3$ , the lowest value was  $11.0\mu\text{g}/\text{m}^3$  and the average value was  $19.83\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of  $80\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.6**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-5 (Village Katang)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
04.10.2021	19	54	6	18
07.10.2021	16	44	5	17
11.10.2021	21	55	3	12
14.10.2021	16	43	5	13
18.10.2021	21	69	4	15
21.10.2021	22	57	5	20
25.10.2021	24	65	8	23
28.10.2021	22	66	6	19
06.11.2021	17	45	6	20
09.11.2021	24	66	9	32
12.11.2021	17	46	8	26
16.11.2021	17	42	5	18
20.11.2021	16	46	6	21
23.11.2021	18	51	6	22
27.11.2021	16	40	4	27
30.11.2021	13	37	6	20
02.12.2021	15	40	6	18
04.12.2021	15	40	5	17
07.12.2021	10	30	< 3	28
15.12.2021	16	42	4	18
21.12.2021	17	43	5	18
24.12.2021	14	38	8	23

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
28.12.2021	11	29	5	24
31.12.2021	18	50	10	40
03.01.2022	12	31	4	17
07.01.2022	19	55	5	20
10.01.2022	20	54	5	20
18.01.2022	20	54	5	25
22.01.2022	24	66	6	18
24.01.2022	21	62	6	21
27.01.2022	17	48	5	15
31.01.2022	22	62	5	19
02.02.2022	17	48	7	23
04.02.2022	22	65	5	18
09.02.2022	22	59	4	14
12.02.2022	15	41	5	19
16.02.2022	20	58	6	15
19.02.2022	14	35	4	12
22.02.2022	22	58	5	21
26.02.2022	17	44	8	27
01.03.2022	17	42	7	27
04.03.2022	11	29	6	17
08.03.2022	14	36	4	12
15.03.2022	16	42	4	12
18.03.2022	20	53	3	11
23.03.2022	15	58	5	17
26.03.2022	17	50	7	23
<b>Minimum</b>	<b>10</b>	<b>29</b>	<b>3</b>	<b>11</b>
<b>Maximum</b>	<b>24</b>	<b>69</b>	<b>10</b>	<b>40</b>
<b>Average</b>	<b>17.64</b>	<b>48.68</b>	<b>5.49</b>	<b>19.83</b>
<b>98%tile Value</b>	<b>24</b>	<b>66.24</b>	<b>9.08</b>	<b>32.64</b>

#### 6.2.6 Village Bihabandh (A-6)

##### PM2.5

Data as given in the **Table No: 6.7** shows that the maximum value was 25 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 24.1 $\mu\text{g}/\text{m}^3$ , the lowest value was 12.0 $\mu\text{g}/\text{m}^3$  and the average value was 17.78 $\mu\text{g}/\text{m}^3$ .

##### PM10

Data as given in the **Table No: 6.7** shows that the maximum value was 72 $\mu\text{g}/\text{m}^3$ , 98 percentile values were 68.4 $\mu\text{g}/\text{m}^3$ , the lowest value was 30 $\mu\text{g}/\text{m}^3$  and the average value was 49.8 $\mu\text{g}/\text{m}^3$ .

All the readings are below the permissible limit of 60 & 100 $\mu\text{g}/\text{m}^3$  as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.



**SO<sub>2</sub>**

The data given in the **Table No: 6.7** shows the maximum value was 10µg/m<sup>3</sup>, 98 percentile values were 10.00µg/m<sup>3</sup>, the lowest value was 4.0µg/m<sup>3</sup> and the average value was 5.87µg/m<sup>3</sup>.

**NO<sub>2</sub>**

The data given in the **Table No: 6.7** shows the maximum value was 33µg/m<sup>3</sup>, 98 percentile values were 33.00µg/m<sup>3</sup>, the lowest value was 9.0µg/m<sup>3</sup> and the average value was 20.58µg/m<sup>3</sup>.

All the readings are below the permissible limit of 80µg/m<sup>3</sup> as specified in the National Ambient Air Quality Standards, CPCB Notification 18<sup>th</sup> November 2009.

**Table No: 6.7**  
**AMBIENT AIR QUALITY DATA**  
From 01.10.2021 to 31.03.2022  
Station: A-6 (Village Bihabandh)

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
04.10.2021	19	53	8	27
07.10.2021	24	68	5	17
11.10.2021	14	41	10	28
14.10.2021	21	67	6	21
18.10.2021	16	45	6	21
21.10.2021	19	50	5	20
28.10.2021	25	66	5	15
03.11.2021	17	50	6	20
06.11.2021	18	56	7	22
09.11.2021	22	58	7	22
12.11.2021	19	50	6	23
16.11.2021	12	48	7	24
20.11.2021	19	52	6	27
27.11.2021	16	44	7	33
30.11.2021	17	44	4	15]
02.12.2021	24	62	8	28
04.12.2021	16	42	5	17
07.12.2021	17	45	10	33
15.12.2021	15	42	6	24
21.12.2021	19	50	5	17
24.12.2021	14	41	5	15
28.12.2021	22	72	5	19
31.12.2021	12	30	5	18
03.01.2022	21	59	5	19
07.01.2022	18	50	7	22
10.01.2022	17	52	6	30
14.01.2022	14	41	8	22

Date	PM2.5	PM10	SO <sub>2</sub>	NO <sub>2</sub>
22.01.2022	18	52	5	17
24.01.2022	21	59	5	18
27.01.2022	14	37	6	26
31.01.2022	15	43	5	19
02.02.2022	15	42	4	15
04.02.2022	23	60	4	16
09.02.2022	20	56	5	20
12.02.2022	21	55	6	17
16.02.2022	17	44	5	20
19.02.2022	22	59	6	22
22.02.2022	14	43	5	18
26.02.2022	22	59	6	19
01.03.2022	15	41	4	18
04.03.2022	14	38	6	17
08.03.2022	19	50	7	20
15.03.2022	14	40	7	26
18.03.2022	19	51	4	13
23.03.2022	12	33	< 3	9
26.03.2022	16	51	4	12
<b>Minimum</b>	<b>12</b>	<b>30</b>	<b>4</b>	<b>9</b>
<b>Maximum</b>	<b>25</b>	<b>72</b>	<b>10</b>	<b>33</b>
<b>Average</b>	<b>17.78</b>	<b>49.80</b>	<b>5.87</b>	<b>20.58</b>
<b>98%tile Value</b>	<b>24.1</b>	<b>68.4</b>	<b>10</b>	<b>33</b>

Figure No: 6.9 Graphical Representations of PM2.5 Values in Buffer Zone

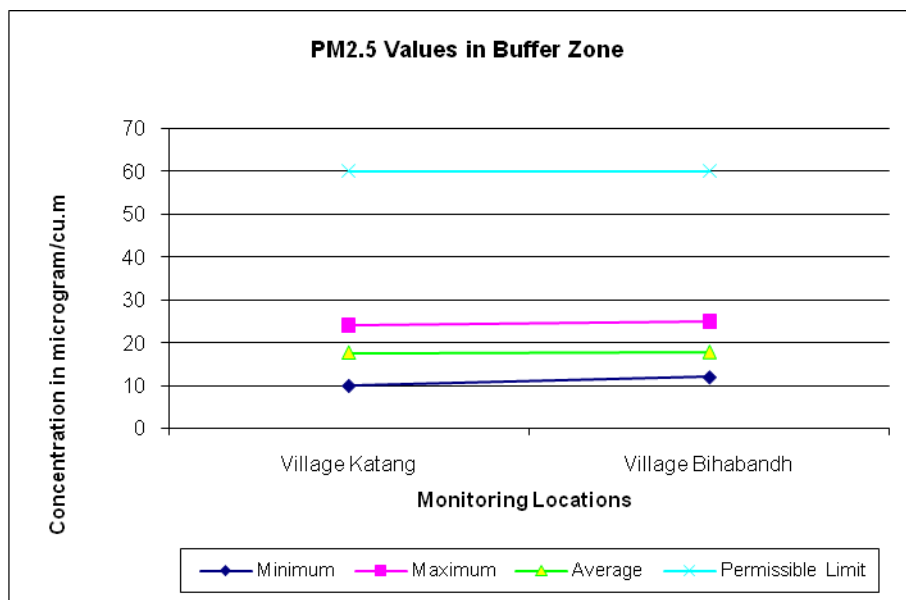


Figure No: 6.10 Graphical Representations of PM10 Values in Buffer Zone

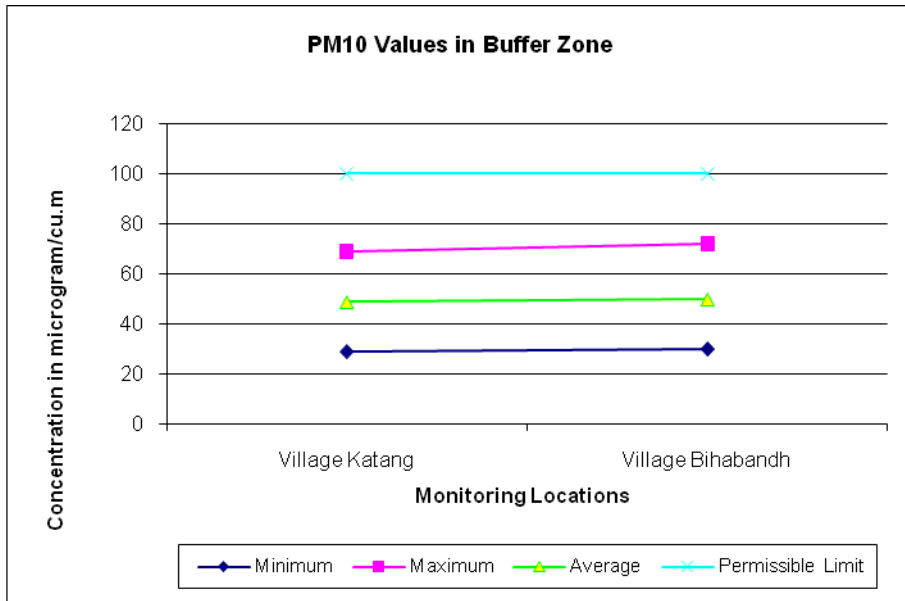
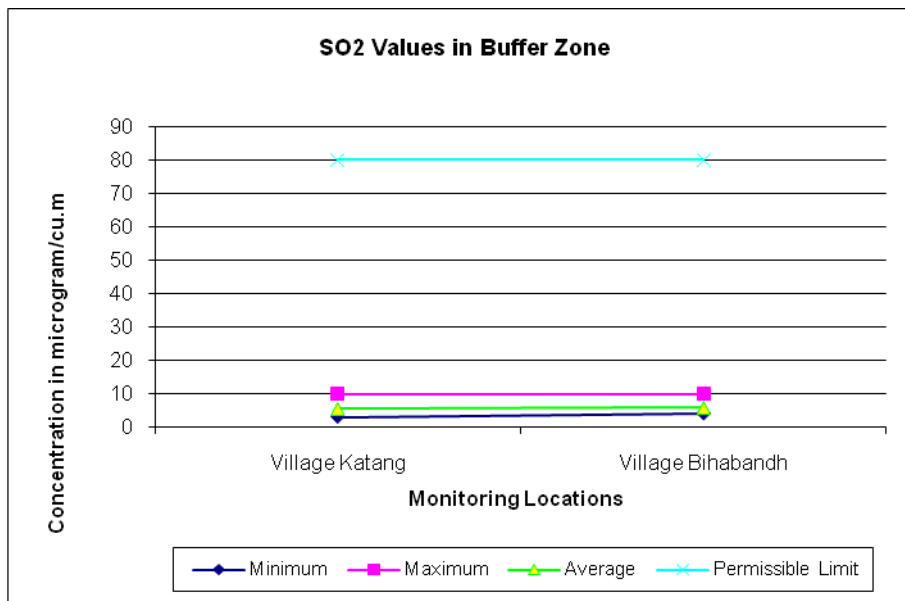
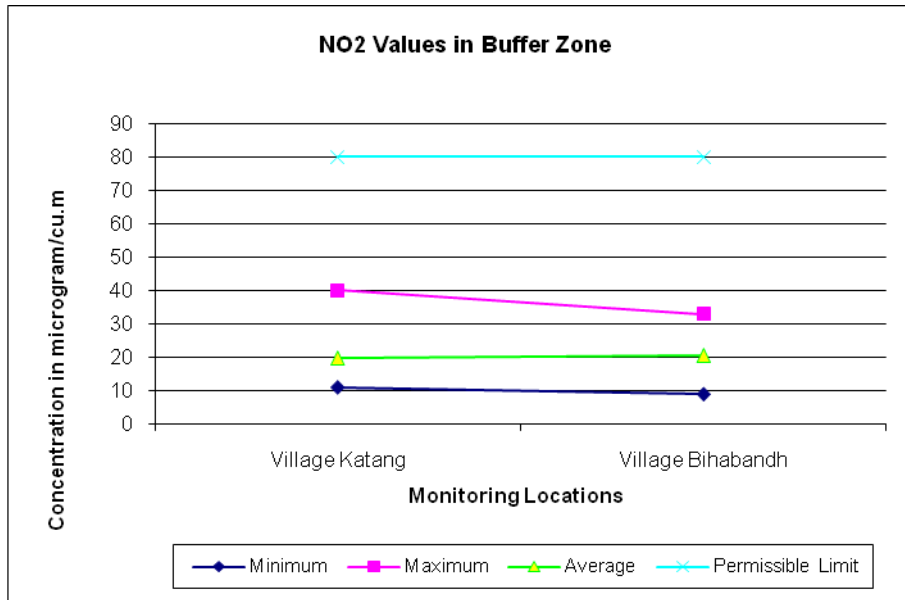


Figure No: 6.11 Graphical Representations of SO<sub>2</sub> Values in Buffer Zone



**Figure No: 6.12 Graphical Representations of NO<sub>2</sub> Values in Buffer Zone**



### 6.3 Fugitive Dust Emission

The fugitive dust samples collected from two locations during November and February is detailed below.

**Table No 6.8: Fugitive Dust Emission Results**

Month	Haulage Road from Quarry to Crusher Plant	Downwind of Drill Machine within the Quarry
	Particulate Matter	Particulate Matter
November	721 µg/m <sup>3</sup>	647 µg/m <sup>3</sup>
February	1094 µg/m <sup>3</sup>	645 µg/m <sup>3</sup>

In the month of February the results are higher than the results for the month of November.

### 6.4 Stack Emission Monitoring

The monthly monitoring results of stack emission from the Limestone Crusher Plant Bag filter outlet given below shows that all the results from October to March are within the prescribed limits (150 mg/Nm<sup>3</sup>) of State Pollution Control Board. The detail results are as follows:

**Table No 6.9: Stack Emission Monitoring Results**

SI No	Month	Particulate Matter Concentration in mg/Nm <sup>3</sup>
1	October	90
2	November	40
3	December	59
4	January	47
5	February	44
6	March	141

## 6.5 Water Quality

### SW-1 Quarry 2&6 Discharge Water:

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in both the seasons monitored. The results are detailed in **Table No. 6.10**.

### SW-2 Quarry 1&3 Discharge Water

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in both the seasons monitored. The results are detailed in **Table No. 6.11**.

### SW-3 Quarry 4&5 Discharge Water

The sample after analysis and in comparison with the Standards prescribed in the Schedule – VI of the EPA, G.S.R. 422(E), 1993 for discharge of water on land for irrigation is found to be well within the prescribed limits in both the seasons monitored. The results are detailed in **Table No. 6.12**.

**Table No: 6.10**  
**Discharge Water Quality from Quarry No 2&6**

Sl No	Parameters	Unit	November	January	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour	Hazen	< 5	< 5	-
2.	Odour	-	Odourless	Odourless	-
3.	Temperature	°C	25.7	23.9	-
4.	Total Residual Chlorine	mg/l	0.064	0.12	-
5.	Free Ammonia (as NH <sub>3</sub> )	mg/l	< 0.012	< 0.012	-
6.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	0.2
7.	Total Suspended Solids	mg/l	5.9	6.2	200
8.	pH Value	-	7.83	7.24	5.5 – 9.0
9.	Oil & Grease	mg/l	< 2.0	< 2.0	10
10.	Ammoniacal Nitrogen (as N)	mg/l	< 5.0	< 5.0	-
11.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> )	mg/l	< 10	< 10	-
12.	BOD (5 days at 20°C)	mg/l	04	02	100
13.	COD	mg/l	10.884	7.628	-
14.	Lead (as Pb)	mg/l	< 2.0	< 2.0	-
15.	Cadmium (as Cd)	mg/l	< 0.05	< 0.05	-
16.	Hex. Chromium (as Cr <sup>+6</sup> )	mg/l	< 0.03	< 0.03	-
17.	Total Chromium (as Cr)	mg/l	< 0.10	< 0.10	-
18.	Copper (as Cu)	mg/l	< 0.10	< 0.10	-
19.	Zinc (as Zn)	mg/l	< 0.10	< 0.10	-
20.	Nickel (as Ni)	mg/l	< 0.25	< 0.25	-
21.	Fluoride (as F)	mg/l	< 0.10	< 0.10	-
22.	Dissolved Phosphate (as P)	mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S)	mg/l	< 0.50	< 0.50	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe)	mg/l	< 0.10	< 0.10	-
27.	Nitrate Nitrogen (as NO <sub>3</sub> – N)	mg/l	< 1.0	< 1.0	-

**Table No: 6.11**  
**Discharge Water Quality from Quarry No 1&3**

Sl No	Parameters	Unit	December	March	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour	Hazen	< 5	< 5	-
2.	Odour	-	Odourless	Odourless	-
3.	Temperature	°C	23.8	24.1	-
4.	Total Residual Chlorine	mg/l	0.124	0.071	-
5.	Free Ammonia (as NH <sub>3</sub> )	mg/l	< 0.012	< 0.012	-
6.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	0.2
7.	Total Suspended Solids	mg/l	2.3	5.9	200
8.	pH Value	-	7.67	7.83	5.5 – 9.0
9.	Oil & Grease	mg/l	< 2.0	< 2.0	10
10.	Ammoniacal Nitrogen (as N)	mg/l	< 05	< 5.0	-
11.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> )	mg/l	< 10	< 10	-
12.	BOD (5 days at 20°C)	mg/l	04	04	100
13.	COD	mg/l	15.128	10.884	-
14.	Lead (as Pb)	mg/l	< 2.0	< 2.0	-
15.	Cadmium (as Cd)	mg/l	< 0.05	< 0.05	-
16.	Hex. Chromium (as Cr <sup>+6</sup> )	mg/l	< 0.03	< 0.03	-
17.	Total Chromium (as Cr)	mg/l	< 0.10	< 0.10	-
18.	Copper (as Cu)	mg/l	< 0.10	< 0.10	-
19.	Zinc (as Zn)	mg/l	< 0.10	< 0.10	-
20.	Nickel (as Ni)	mg/l	< 0.25	< 0.25	-
21.	Fluoride (as F)	mg/l	< 0.10	< 0.10	-
22.	Dissolved Phosphate (as P)	mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S)	mg/l	< 0.50	< 0.50	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe)	mg/l	< 0.10	< 0.10	-
27.	Nitrate Nitrogen (as NO <sub>3</sub> – N)	mg/l	< 1.0	< 1.0	-

**Table No: 6.12**  
**Discharge Water Quality from Quarry No 4&5**

Sl No	Parameters	Unit	October	February	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
1.	Colour	Hazen	< 5	< 5	-
2.	Odour	-	Odourless	Odourless	-
3.	Temperature	°C	22.3	20.8	-
4.	Total Residual Chlorine	mg/l	0.16	0.19	-
5.	Free Ammonia (as NH <sub>3</sub> )	mg/l	< 0.012	< 0.012	-
6.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	0.2
7.	Total Suspended Solids	mg/l	3.0	4.1	200
8.	pH Value	-	7.36	7.54	5.5 – 9.0
9.	Oil & Grease	mg/l	< 2.0	< 2.0	10
10.	Ammoniacal Nitrogen (as N)	mg/l	< 5.0	< 5.0	-
11.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> )	mg/l	< 10	< 10	-
12.	BOD (5 days at 20°C)	mg/l	01	01	100
13.	COD	mg/l	4.884	3.849	-
14.	Lead (as Pb)	mg/l	< 2.0	< 2.0	-
15.	Cadmium (as Cd)	mg/l	< 0.05	< 0.05	-
16.	Hex. Chromium (as Cr <sup>+6</sup> )	mg/l	< 0.03	< 0.03	-
17.	Total Chromium (as Cr)	mg/l	< 0.10	< 0.10	-
18.	Copper (as Cu)	mg/l	< 0.10	< 0.10	-

Sl No	Parameters	Unit	October	February	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
19.	Zinc (as Zn)	mg/l	< 0.10	< 0.10	-
20.	Nickel (as Ni)	mg/l	< 0.25	< 0.25	-
21.	Fluoride (as F)	mg/l	< 0.10	< 0.10	-
22.	Dissolved Phosphate (as P)	mg/l	< 0.01	< 0.01	-
23.	Sulphide (as S)	mg/l	< 0.50	< 0.50	-
24.	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe)	mg/l	< 0.10	< 0.10	-
27.	Nitrate Nitrogen (as NO <sub>3</sub> – N)	mg/l	< 1.0	< 1.0	-

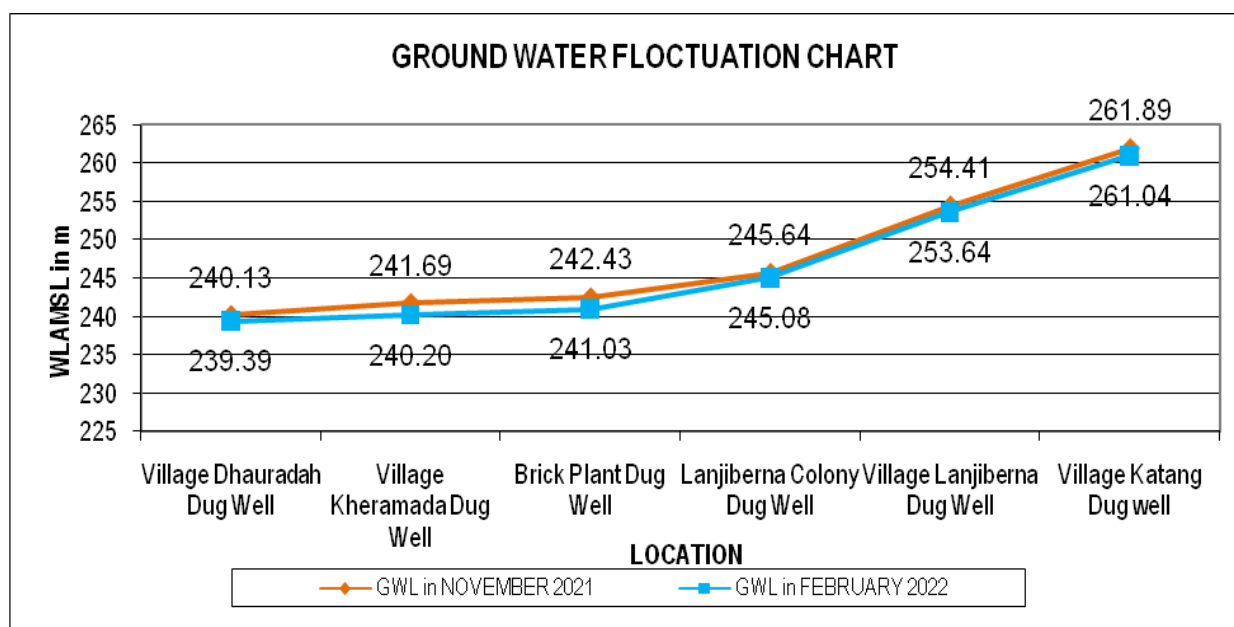
## 6.6 Ground Water Level Data

The ground water level measured from the existing dug wells mentioned above are found to be varying significantly at all the locations, during the month of November the water level was found to be higher, which has decreased slightly during the month of February due to start of Dry summer months. The detail data is given below in the **Table No 6.13**, with a graphical representation of the fluctuation in **Figure No: 6.13**.

**Table No 6.13: Ground Water Level Data**

Sl No	Location	Ground Level in m AMSL	Ground Water Level in m AMSL		Height of Water Column in m	
			November	February	November	February
1	Village Kheramada Dug Well	243.23	241.69	240.20	6.47	4.98
2	Lanjiberna Colony Dug Well	247.83	245.64	245.08	9.21	8.65
3	Village Dhauradah Dug Well	242.34	240.13	239.39	6.28	5.54
4	Brick Plant Dug Well	245.03	242.43	241.03	3.54	2.14
5	Village Lanjiberna Dug Well	255.14	254.41	253.64	4.27	3.50
6	Village Katang Dug well	264.89	261.89	261.04	4.95	4.10

**Figure No 6.13: Seasonal Fluctuation of Ground Water Level**



## **6.7 Noise Level Monitoring Data**

Noise monitoring was carried out at four different locations of the mine during month of November and February for post-monsoon and winter seasons respectively. The Sound Pressure Level recorded was calculated for Lmin, Lmax, Leq Day Time & Leq Night Time. All the data are given in detail in the **Table No 6.14 & 6.15**.

### **N-1 Quarry Area during Operation of HEMM**

The noise level range between 75.6 and 35.8 dB(A) and the Leq values for Day time was 66.8 dB(A) and Leq values for Night time was 48.0 dB(A) during the month of November.

The noise level range between 75.3 and 35.8 dB(A) and the Leq values for Day time was 67.9 dB(A) and Leq values for Night time was 39.1 dB(A) during the month of February.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Industrial area for both day and night time.

### **N-2 Limestone Crusher Plant Area**

The noise level range between 79.9 and 42.3 dB(A) and the Leq values for Day time was 72.6 dB(A) and Leq values for Night time was 53.6 dB(A) during the month of November.

The noise level range between 82.4 and 38.5 dB(A) and the Leq values for Day time was 77.1 dB(A) and Leq values for Night time was 47.9 dB(A) during the month of February.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for both day and night time.

### **N-3 Lanjiberna Colony area**

The noise level range between 58.1 and 34.5 dB(A) and the Leq values for Day time was 52.6 dB(A) and Leq values for Night time was 36.4 dB(A) during the month of November.

The noise level range between 60.6 and 40.4 dB(A) and the Leq values for Day time was 52.8 dB(A) and Leq values for Night time was 44.5 dB(A) during the month of February.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Residential area for both day and night time.

### **N-4 Magazine Hill Top**

The noise level range between 41.2 and 33.2 dB(A) and the Leq values for Day time was 37.2 dB(A) and Leq values for Night time was 34.2 dB(A) during the month of November.

The noise level range between 46.2 and 33.1 dB(A) and the Leq values for Day time was 41.1 dB(A) and Leq values for Night time was 34.4 dB(A) during the month of February.

On comparison of the results with ambient air quality standards in respect of noise by CPCB, it was found that the ambient noise levels from this location was well within the standards for Silence Zone for both day and night time.



**Table No: 6.14**  
**Noise Level Data in Month of November**

SL NO	STATION NO	L <sub>eq</sub> dB(A) Day Time (600 Hrs – 2200 Hrs)	L <sub>eq</sub> dB(A) Night Time (2200 Hrs – 600 Hrs)	L <sub>max</sub> dB(A)	L <sub>min</sub> dB(A)
1.	N1	66.8	48.0	75.6	35.8
2.	N2	72.6	53.6	79.9	42.3
3.	N3	52.6	36.4	58.1	34.5
4.	N4	37.2	34.2	41.2	33.2

**Table No: 6.15**  
**Noise Level Data in Month of February**

SL NO	STATION NO	L <sub>eq</sub> dB(A) Day Time (600 Hrs – 2200 Hrs)	L <sub>eq</sub> dB(A) Night Time (2200 Hrs – 600 Hrs)	L <sub>max</sub> dB(A)	L <sub>min</sub> dB(A)
1.	N1	67.9	39.1	75.3	35.8
2.	N2	77.1	47.9	82.4	38.5
3.	N3	52.8	44.5	60.6	40.4
4.	N4	41.1	34.4	46.2	33.1

## 6.8 Effluent Water Quality Data

The water quality from the outlet of Oil & Grease Separation tank was monitored during month of November and February for five parameters. pH was in the range of 7.58 to 7.46 which is slightly alkaline, TSS was 4.2 & < 2.5 mg/l in November & February months, Oil & Grease content was < 2.0 & < 2.0 mg/l in November and February months, Iron was 0.14 & 0.137 mg/l in the month of November & February and Nickel was < 0.25 mg/l in both the months. All the results are found to be well within the prescribed standards of State Pollution Control Board.

## 7. CONCLUSION

### 7.1 Ambient Air Quality

It is concluded from the above study that the overall ambient air quality of the Lanjiberna Limestone & Dolomite mines of DALMIA CEMENT (BHARAT) LIMITED is good and the action taken by the mines authority were quite satisfactory.

### 7.2 Fugitive Dust Emission

The results of fugitive dust emission monitoring shows that the mining authority has taken up highly effective sprinkling systems inside the mines to control the emission of dust from the drilling, excavation and hauling operations.

### 7.3 Stack Emission Monitoring

The stack emission monitoring results of all the six months shows that the bag filter installed in the limestone crusher plant is very much effective and results are all within the prescribed standards by the State Pollution Control Board, Odisha.

### 7.4 Water Quality

The discharge water quality of all the quarries are found to be well within the prescribed standards as per EPA, G.S.R.422(E), 1993.

### **7.5 Ground Water Level**

There is no problem in the availability of ground water in the area and all the locations have adequate water. The ground water level is found to be slightly decreasing in the month of February due to start of dry summer months.

### **7.6 Noise level**

Noise monitoring results show that noise levels are well within the limits at all the stations, and there is no problem in the area due noise from the mining activity.

### **7.7 Effluent Water Quality**

The treatment facility available for Oil & Grease separation in the workshop waste water of the mines is found to be good and the system is operating quite well.

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