ENVIRONMENTAL MONITORING REPORT

BASED ON DATA GENERATED

FROM

OCTOBER 2018 – MARCH 2019

FOR

OCL INDIA LIMITED

At/Po: RAJGANGPUR, District: SUNDARGARH, ODISHA

AT

LANJIBERNA LIMESTONE & DOLOMITE MINES PROJECT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INDRODUCTION

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 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 4.20 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-11015/372/2007-IA.II(M) dated: 28th April 2010. Consent to operate from State Pollution Control Board, Odisha is also valid up to 31st March 2019 vide Order No 162,vide letter No 4449/IND-I-CON-258, Dt 22.03.2017 for the production of 4.20 million tones of Limestone and 80, 000 TPA of Dolomite.

2. PRESENT STATUS OF THE PROJECT

At present from October 2018 to March 2019 the mine has produced Limestone of 21, 38, 039.00 MT and there was production of Dolomite to the tune of 43, 664.00 MT during the period mentioned, during the period 20, 62, 573.00 MT of sized Limestone has been dispatched to the cement plant and dispatch of Dolomite has not been done at all.

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.

The present working depth of quarry 2&6 is 198m AMSL, quarry 1&3 is 228m AMSL and quarry 4&5 is 203m AMSL. The working has gone down to 198m AMSL, but it has not encountered the ground water table so far.

Status of Compliances as on 31st March 2019.

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, 26, 734 nos. of trees have been planted including species like Teak, Shisham, Chakunda, Debdaru & Mango etc. till March 2019. Survival rate is approximately is 67.3%.
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, 18th 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.

Figure No: 1.1 Location Map of the Project

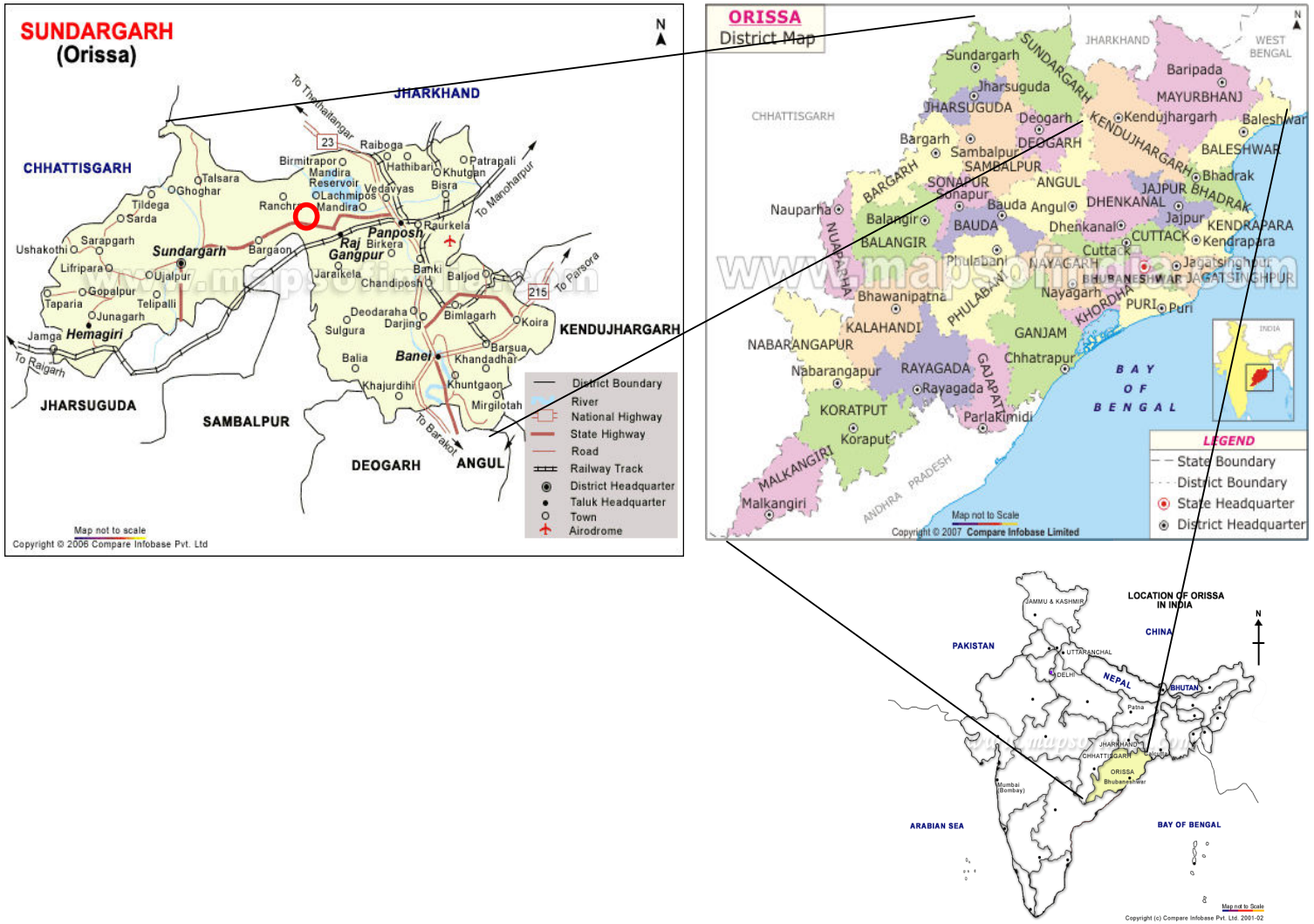
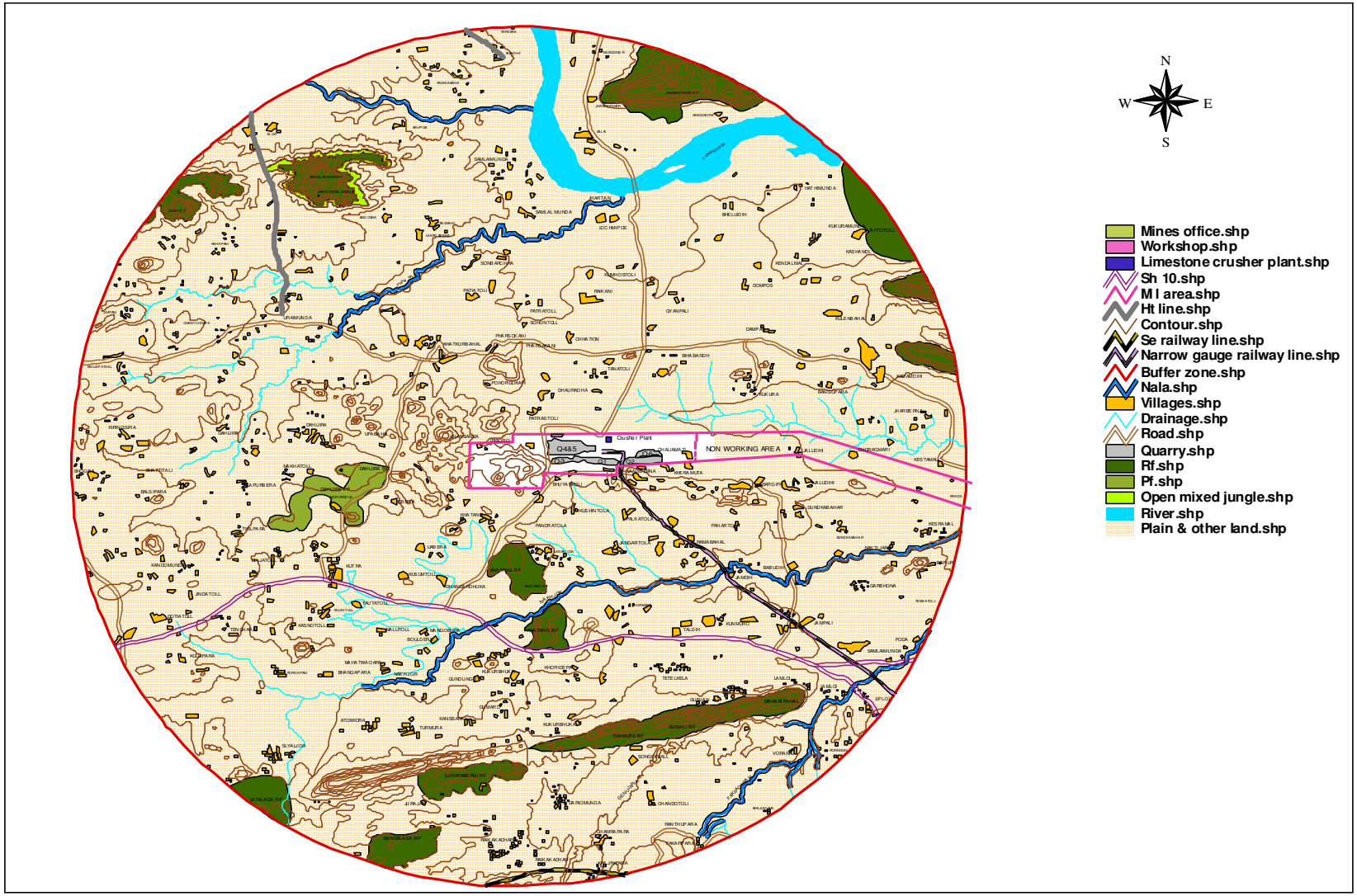


Figure No:1.2 Vicinity Map of Lanjiberna Limestone & Dolomite Mines



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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.
6. Wastewater 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 2018 to March 2019 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 OCL India Ltd. 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 PM2.5, PM10, SO_2, NO_x & CO and monitoring was carried out on twice weekly from each location. For collection of samples Respirable Dust sampler with PM2.5 attachment 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_3, O_3, As, Ni, Pb, Benzene & Benzo(a)pyrene are monitored once in six months from all the six 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 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 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 23rd 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 and one extra location was considered in the village Katang for ground water level measurement. To measure the ground water level piezometers are fixed at each dug wells and the variation of ground water level are 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 Quarry No – 2 Site Office:

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 Stone Crusher Plant

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

Sl No	Name of Location	Zone	Distance	Direction
1	Quarry No-2 Site Office	Core	-	-
2	Crusher Plant Area	Core	-	-
3	Mini Crusher Plant	Core	-	-
4	Magazine Hill Top	Core	-	-

Sl 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) APM 460BL – 411TE, Make: Envirotech Instruments Pvt. Ltd. were used and for PM2.5 sampling AAS 190 attachment for fine particulate sampling along with RDS was 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 1st October to 31st March all total 4360 no. of data are recorded by the instrument and after interpretation of the collected data it was found that Calm condition prevailed over 51.08%, while considering the 24 hourly data. 33.33% calm condition prevailed from morning 6 hrs to 14hrs for the entire study period, 55.67% calm condition prevailed from 14hrs to 22hrs and 62.96% calm condition prevailed from 22hrs to 06hrs. The predominant wind directions were from NE with average wind speed 1.23 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 13.07^{o}C and the Maximum temperature was found to be 34.87^{o}C up to the end of 30th November.

The minimum and maximum temperature during the winter season i.e. from December to February was found to be 8.55^{o}C and 34.41^{o}C. During the month of March the minimum and maximum temperature was found to be 16.47^{o}C and 39.18^{o}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 1st October to 31st March was observed to be 658.7 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

Sl No	Parameters	From October' 18 – March' 19
1	Predominant Wind Direction	From NE
2	Calm Condition %	51.08
3	Average Wind Speed m/sec	1.23
4	Temperature ^{o}C **Post-monsoon Season** Minimum	 13.07

Sl No	Parameters	From October' 18 – March' 19
	Maximum	34.87
	Winter Season	
	Minimum	8.55
	Maximum	34.41
	Early Summer Season	
	Minimum	16.47
	Maximum	39.18
5	**Rain Fall in mm**	
	October	296.4
	November	0.00
	December	13.80
	January	152.00
	February	169.20
	March	27.30
	Total	**658.7**

Figure No: 6.1 Wind Rose Diagram for 24 Hours

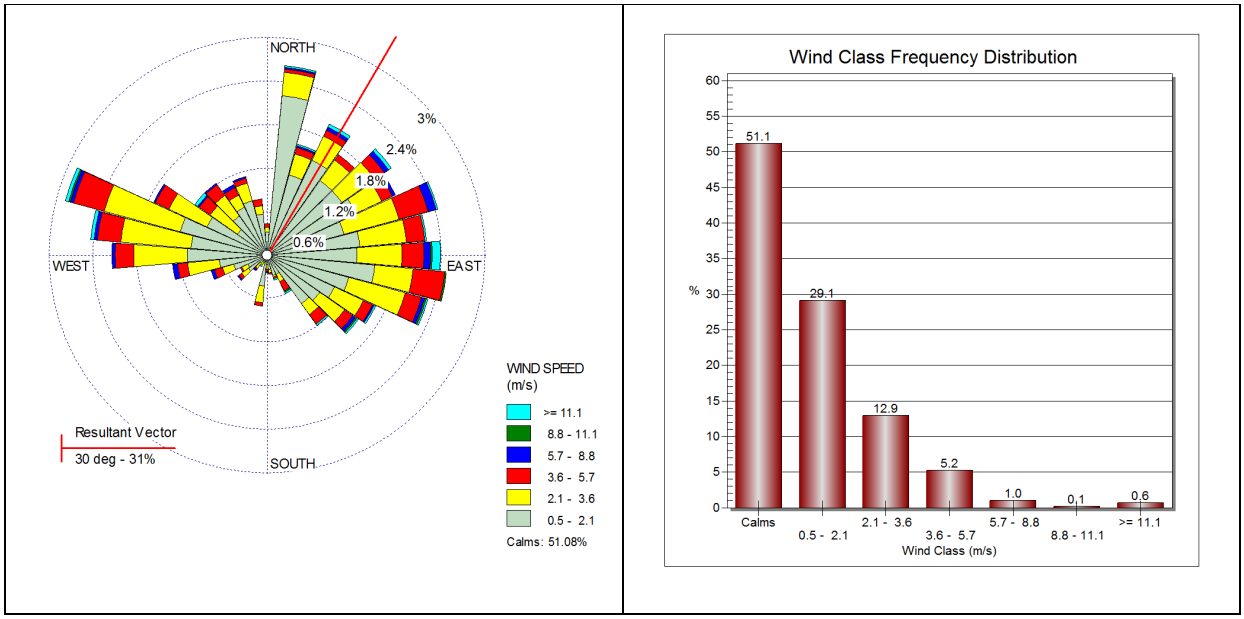


Figure No: 6.2 **Wind Rose Diagram from 06 – 14 Hours**

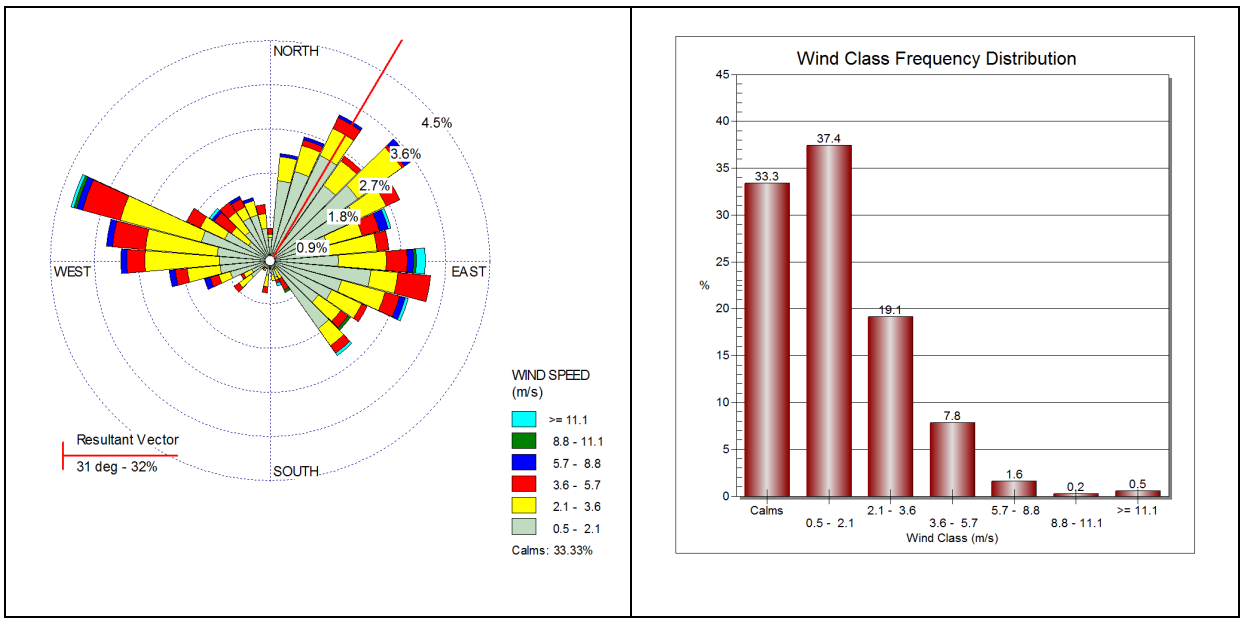


Figure No: 6.3 **Wind Rose Diagram from 14 – 22 Hours**

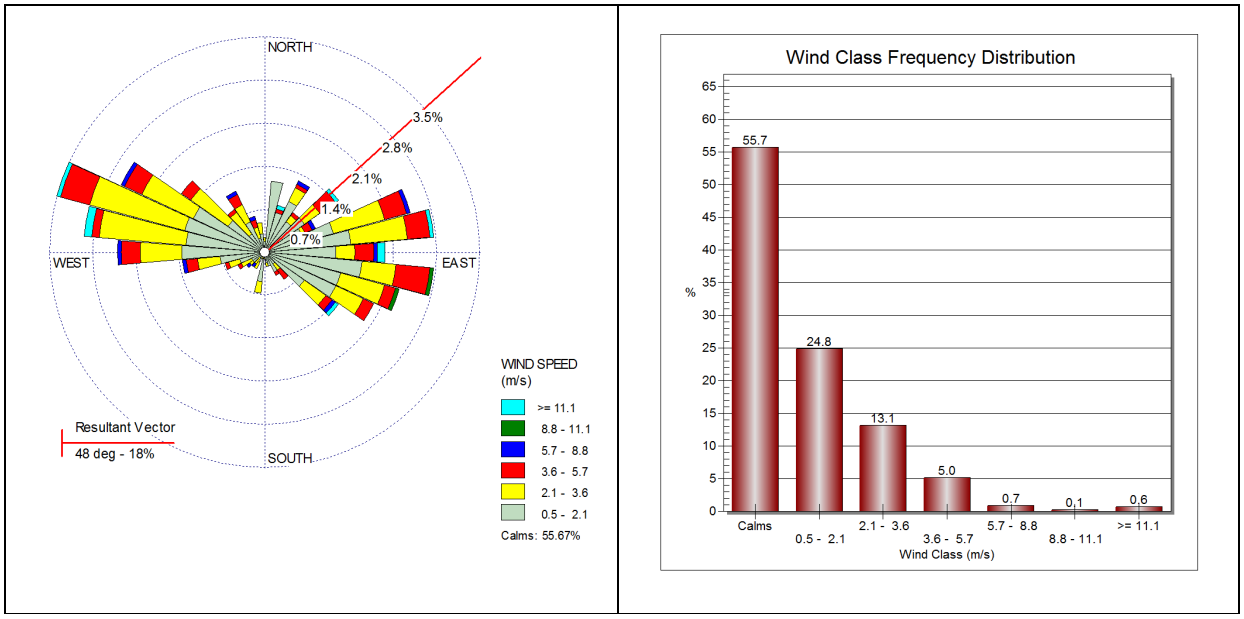
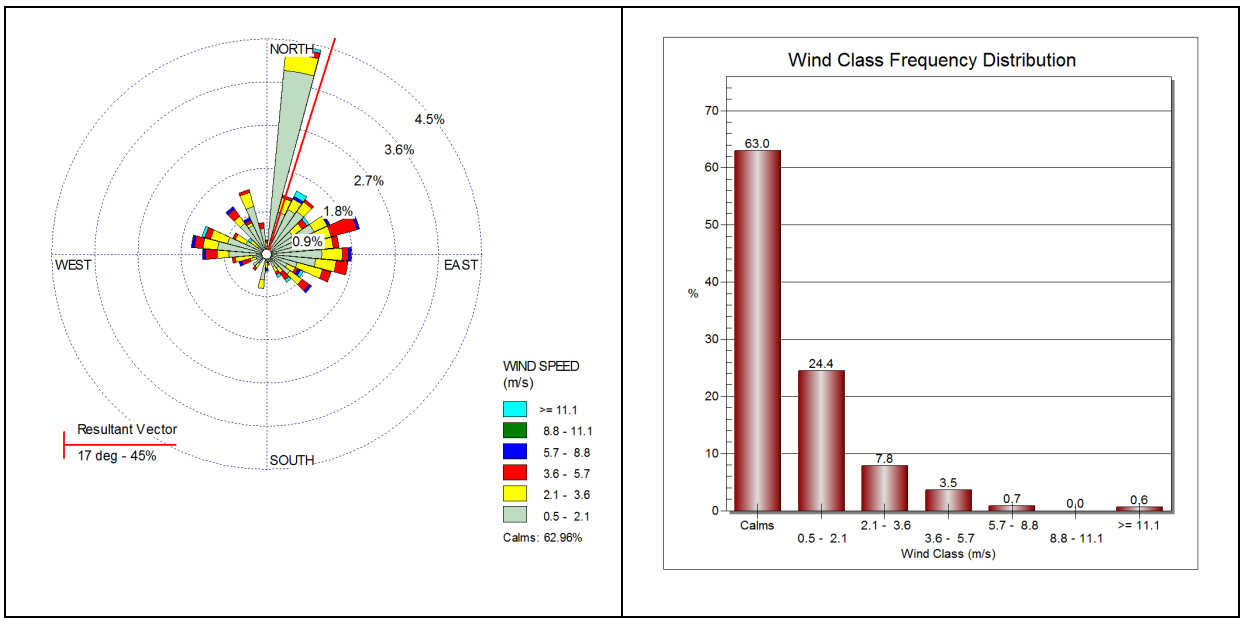


Figure No: 6.4 Wind Rose Diagram from 22 – 06 Hours



6.2 Ambient Air Quality Data

6.2.1 Quarry 2 Site Office (A-1)

PM2.5

Data as given in the **Table No: 6.2** shows that the maximum value was 35µg/m^3, 98 percentile values were 34.96µg/m^3, the lowest value was 12µg/m^3 and the average value was 23.57µg/m^3.

PM10

Data as given in the **Table No: 6.2** shows that the maximum value was 95µg/m^3, 98 percentile values were 93.92µg/m^3, the lowest value was 36µg/m^3 and the average value was 66.72µg/m^3.

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

SO_2

The data given in the **Table No: 6.2** shows the maximum value was 5µg/m^3, 98 percentile values were 5.00µg/m^3, the lowest value was 3.0µg/m^3 and the average value was 3.70µg/m^3.

NO_2

The data given in the **Table No: 6.2** shows the maximum value was 31µg/m^3, 98 percentile values were 24.92µg/m^3, the lowest value was 5.0µg/m^3 and the average value was 14.38µg/m^3.

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

Table No: 6.2
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-1 (Quarry 2 Site Office)

Date	PM2.5	PM10	SO_2	NO_2
01.10.2018	14	50	< 3	10
05.10.2018	27	72	< 3	25
09.10.2018	16	62	3	10
12.10.2018	29	73	< 3	15
16.10.2018	31	94	< 3	11
19.10.2018	22	73	4	11
23.10.2018	15	55	3	15
26.10.2018	19	58	4	16
30.10.2018	22	64	5	18
01.11.2018	15	56	< 3	12
05.11.2018	35	86	< 3	5
08.11.2018	34	86	< 3	23
12.11.2018	30	82	3	15
15.11.2018	22	57	4	13
19.11.2018	21	53	< 3	14
22.11.2018	25	71	< 3	7
26.11.2018	28	80	4	10
30.11.2018	26	73	4	18
01.12.2018	30	87	< 3	13
05.12.2018	23	62	< 3	8
08.12.2018	27	63	< 3	18
12.12.2018	25	69	< 3	7
15.12.2018	18	50	< 3	18
19.12.2018	19	69	3	22
22.12.2018	16	36	< 3	8
26.12.2018	22	56	4	21
29.12.2018	24	62	4	17
01.01.2019	34	95	< 3	11
04.01.2019	23	63	< 3	14
08.01.2019	28	85	3	15
11.01.2019	16	61	< 3	8
15.01.2019	26	73	< 3	31
18.01.2019	32	92	< 3	15
22.01.2019	12	44	3	18
25.01.2019	23	64	4	19
30.01.2019	26	69	4	22

Date	PM2.5	PM10	SO_2	NO_2
01.02.2019	25	73	< 3	11
05.02.2019	24	62	3	14
08.02.2019	27	74	< 3	14
12.02.2019	20	54	< 3	12
15.02.2019	17	47	5	15
19.02.2019	29	81	< 3	7
22.02.2019	35	80	< 3	12
26.02.2019	28	73	4	16
01.03.2019	22	51	< 3	10
05.03.2019	24	60	< 3	10
08.03.2019	22	59	3	14
12.03.2019	21	66	< 3	10
15.03.2019	17	54	< 3	18
19.03.2019	21	62	< 3	18
22.03.2019	14	59	3	12
26.03.2019	23	64	4	16
29.03.2019	25	72	4	20
Minimum	**12**	**36**	**3**	**5**
Maximum	**35**	**95**	**5**	**31**
Average	**23.57**	**66.72**	**3.70**	**14.38**
98%tile Value	**34.96**	**93.92**	**5**	**24.92**

The other parameters monitored during the month of November is described below in the **Table No: 6.2A**

Table No: 6.2A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method – 804	APWA 3rd Ed. Method – 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	08.11.2018	28	< 19.6	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

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 36µg/m³, 98 percentile values were 35.0µg/m³, the lowest value was 12µg/m³ and the average value was 26.38µg/m³.

PM10

Data as given in the **Table No: 6.3** shows that the maximum value was 96µg/m³, 98 percentile values were 95.92µg/m³, the lowest value was 39µg/m³ and the average value was 72.79µg/m³.

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

SO_2

The data given in the **Table No: 6.3** shows the maximum value was 05µg/m^3, 98 percentile values were 5.00µg/m^3, the lowest value was 3.0µg/m^3 and the average value was 3.64µg/m^3.

NO_2

The data given in the **Table No: 6.3** shows the maximum value was 26µg/m^3, 98 percentile values were 24.96µg/m^3, the lowest value was 6.0µg/m^3 and the average value was 12.96µg/m^3.

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

Table No: 6.3
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-2 (Limestone Crusher Plant)

Date	PM2.5	PM10	SO_2	NO_2
01.10.2018	29	68	< 3	11
05.10.2018	31	93	3	7
09.10.2018	12	60	< 3	18
12.10.2018	34	82	< 3	10
16.10.2018	35	94	< 3	12
19.10.2018	32	91	< 3	16
23.10.2018	22	79	3	10
26.10.2018	24	77	4	12
30.10.2018	30	84	3	16
01.11.2018	33	76	< 3	9
05.11.2018	27	81	< 3	19
08.11.2018	36	94	< 3	15
12.11.2018	35	83	< 3	26
15.11.2018	32	89	< 3	6
19.11.2018	26	50	< 3	8
22.11.2018	17	49	< 3	7
26.11.2018	30	80	3	10
30.11.2018	28	76	4	16
01.12.2018	25	59	< 3	11
05.12.2018	16	57	< 3	6
08.12.2018	21	53	< 3	8
12.12.2018	24	67	4	16
15.12.2018	26	84	< 3	7
19.12.2018	21	64	3	14
22.12.2018	21	63	< 3	7

Date	PM2.5	PM10	SO_2	NO_2
26.12.2018	23	66	4	12
29.12.2018	27	72	5	18
01.01.2019	24	64	< 3	7
04.01.2019	34	96	3	17
08.01.2019	31	96	4	16
11.01.2019	34	92	< 3	22
15.01.2019	17	52	5	16
18.01.2019	25	85	3	13
22.01.2019	31	87	< 3	25
25.01.2019	29	78	4	22
30.01.2019	30	82	3	24
01.02.2019	25	85	< 3	9
05.02.2019	31	79	3	12
08.02.2019	15	39	< 3	14
12.02.2019	15	57	< 3	10
15.02.2019	26	74	< 3	9
19.02.2019	20	46	3	12
22.02.2019	28	70	< 3	7
26.02.2019	27	68	3	12
01.03.2019	35	85	< 3	17
05.03.2019	34	80	< 3	10
08.03.2019	30	79	< 3	9
12.03.2019	26	71	< 3	13
15.03.2019	20	49	4	11
19.03.2019	19	45	< 3	7
22.03.2019	18	56	< 3	6
26.03.2019	27	74	4	18
29.03.2019	30	78	5	22
Minimum	**12**	**39**	**3**	**6**
Maximum	**36**	**96**	**5**	**26**
Average	**26.38**	**72.79**	**3.64**	**12.96**
98%tile Value	**35**	**95.92**	**5**	**24.96**

The other parameters monitored during the month of November is described below in the **Table No: 6.3A**

Table No: 6.3A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method - 804	APWA 3rd Ed. Method - 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	08.11.2018	32	27	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

6.2.3 Stone Crusher Plant (A-3)

PM2.5

Data as given in the **Table No: 6.4** shows that the maximum value was 40µg/m³, 98 percentile values were 37.92µg/m³, the lowest value was 7µg/m³ and the average value was 22.10µg/m³.

PM10

Data as given in the **Table No: 6.4** shows that the maximum value was 98µg/m³, 98 percentile values were 95.76µg/m³, the lowest value was 12µg/m³ and the average value was 62.06µg/m³.

All the readings are below the permissible limit of 60 & 100µg/m³ as specified in the National Ambient Air Quality Standards, CPCB Notification 18th November 2009.

SO_2

The data given in the **Table No: 6.4** shows the maximum value was 05µg/m³, 98 percentile values were 5.00µg/m³, the lowest value was 3.0µg/m³ and the average value was 3.74µg/m³.

NO_2

The data given in the **Table No: 6.4** shows the maximum value was 22µg/m³, 98 percentile values were 20.96µg/m³, the lowest value was 6.0µg/m³ and the average value was 12.62µg/m³.

All the readings are below the permissible limit of 80µg/m³ as specified in the National Ambient Air Quality Standards, CPCB Notification 18th November 2009.

Table No: 6.4
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-3 (Stone Crusher Plant Area)

Date	PM2.5	PM10	SO_2	NO_2
03.10.2018	15	44	< 3	11
06.10.2018	17	66	4	16
10.10.2018	16	77	< 3	10
13.10.2018	25	63	< 3	11
17.10.2018	23	67	< 3	8
20.10.2018	10	45	< 3	7
24.10.2018	17	51	< 3	18
27.10.2018	22	55	4	19

Date	PM2.5	PM10	SO_2	NO_2
31.10.2018	18	53	4	11
02.11.2018	14	49	< 3	16
06.11.2018	30	70	< 3	10
09.11.2018	30	90	< 3	11
13.11.2018	23	62	< 3	19
16.11.2018	36	98	3	15
20.11.2018	38	89	< 3	6
23.11.2018	33	85	3	18
27.11.2018	35	88	4	22
30.11.2018	29	82	5	18
03.12.2018	20	57	< 3	6
06.12.2018	16	50	< 3	21
10.12.2018	25	75	5	15
13.12.2018	12	36	4	15
17.12.2018	7	12	< 3	10
20.12.2018	15	57	< 3	14
24.12.2018	27	62	< 3	11
27.12.2018	25	73	3	15
31.12.2018	21	63	4	17
02.01.2019	17	46	< 3	6
05.01.2019	32	81	< 3	6
09.01.2019	40	96	< 3	17
12.01.2019	20	59	< 3	20
16.01.2019	32	72	4	19
19.01.2019	14	50	< 3	12
23.01.2019	22	53	< 3	10
28.01.2019	24	58	3	12
31.01.2019	26	64	4	16
02.02.2019	33	86	< 3	11
06.02.2019	36	74	< 3	10
09.02.2019	19	65	3	9
13.02.2019	15	42	< 3	13
16.02.2019	12	45	< 3	15
20.02.2019	26	67	< 3	11
23.02.2019	10	51	< 3	6
27.02.2019	24	68	4	12
02.03.2019	19	56	< 3	11
06.03.2019	14	47	< 3	7
09.03.2019	22	62	3	14
13.03.2019	24	48	< 3	6

Date	PM2.5	PM10	SO_2	NO_2
16.03.2019	15	52	< 3	10
20.03.2019	17	66	< 3	9
23.03.2019	15	42	3	9
27.03.2019	22	58	4	15
30.03.2019	24	63	4	18
Minimum	**7**	**12**	**3**	**6**
Maximum	**40**	**98**	**5**	**22**
Average	**22.10**	**62.06**	**3.74**	**12.62**
98%tile Value	**37.92**	**95.76**	**5**	**20.96**

The other parameters monitored during the month of November is described below in the **Table No: 6.4A**

Table No: 6.4A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method - 804	APWA 3rd Ed. Method - 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	09.11.2018	30	23	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

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 24µg/m³, 98 percentile values were 23.92µg/m³, the lowest value was 5µg/m³ and the average value was 17.23µg/m³.

PM10

Data as given in the **Table No: 6.5** shows that the maximum value was 61µg/m³, 98 percentile values were 59.92µg/m³, the lowest value was 17µg/m³ and the average value was 48.47µg/m³.

All the readings are below the permissible limit of 60 & 100µg/m³ as specified in the National Ambient Air Quality Standards, CPCB Notification 18th November 2009.

SO_2

The data given in the **Table No: 6.5** shows the maximum value was 06µg/m³, 98 percentile values were 5.40µg/m³, the lowest value was 3.0µg/m³ and the average value was 3.48µg/m³.

NO_2

The data given in the **Table No: 6.5** shows the maximum value was 22µg/m³, 98 percentile values were 20.0µg/m³, the lowest value was 6.0µg/m³ and the average value was 12.66µg/m³.

All the readings are below the permissible limit of 80µg/m³ as specified in the National Ambient Air Quality Standards, CPCB Notification 18th November 2009.

Table No: 6.5
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-4 (Magazine Hill Top)

Date	PM2.5	PM10	SO_2	NO_2
03.10.2018	15	55	< 3	13
06.10.2018	5	27	< 3	19
10.10.2018	14	50	< 3	12
13.10.2018	22	45	< 3	9
17.10.2018	17	41	3	10
20.10.2018	9	39	4	16
24.10.2018	17	43	< 3	11
27.10.2018	16	47	4	12
31.10.2018	19	52	3	16
02.11.2018	21	55	< 3	9
06.11.2018	16	56	< 3	13
09.11.2018	13	32	3	9
13.11.2018	21	47	3	20
16.11.2018	18	57	< 3	18
20.11.2018	24	54	< 3	11
23.11.2018	20	52	4	12
27.11.2018	22	55	3	14
30.11.2018	24	58	4	15
03.12.2018	21	57	3	9
06.12.2018	19	55	< 3	7
10.12.2018	18	55	< 3	8
13.12.2018	6	26	3	13
17.12.2018	13	38	3	11
20.12.2018	16	55	< 3	13
24.12.2018	17	47	< 3	6
27.12.2018	14	43	3	11
31.12.2018	16	49	3	14
02.01.2019	17	33	3	9
05.01.2019	18	54	6	19
09.01.2019	18	53	4	13
12.01.2019	15	55	3	14
16.01.2019	22	60	4	16
19.01.2019	17	55	< 3	9
23.01.2019	9	36	3	12
28.01.2019	14	46	3	17
31.01.2019	16	52	4	15

Date	PM2.5	PM10	SO_2	NO_2
02.02.2019	21	54	3	8
06.02.2019	12	45	< 3	9
09.02.2019	15	35	< 3	7
13.02.2019	21	46	4	18
16.02.2019	17	42	5	18
20.02.2019	22	57	3	14
23.02.2019	21	55	3	11
27.02.2019	20	52	3	10
02.03.2019	18	49	< 3	11
06.03.2019	20	53	< 3	10
09.03.2019	8	17	< 3	9
13.03.2019	17	55	4	14
16.03.2019	21	52	< 3	10
20.03.2019	18	61	< 3	22
23.03.2019	20	52	< 3	7
27.03.2019	21	54	3	18
30.03.2019	22	56	4	20
Minimum	**5**	**17**	**3**	**6**
Maximum	**24**	**61**	**6**	**22**
Average	**17.23**	**48.47**	**3.48**	**12.66**
98%tile Value	**23.92**	**59.92**	**5.4**	**20**

The other parameters monitored during the month of November is described below in the **Table No: 6.5A**

Table No: 6.5A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method - 804	APWA 3rd Ed. Method - 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	16.11.2018	< 20	< 19.6	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

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

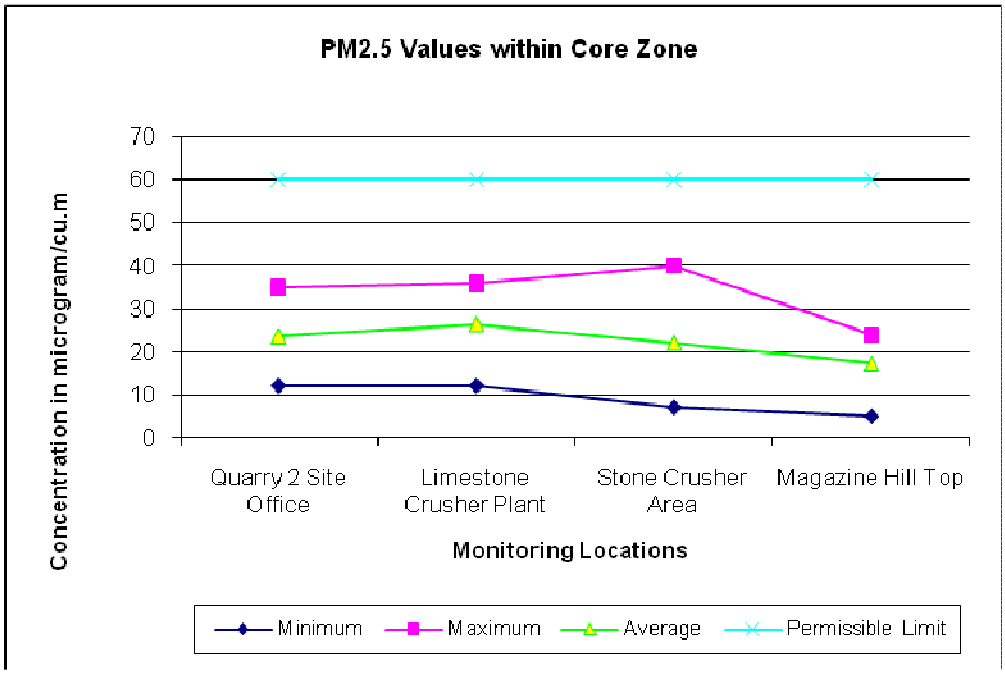


Figure No: 6.6 Graphical Representations of PM10 Values in Core Zone

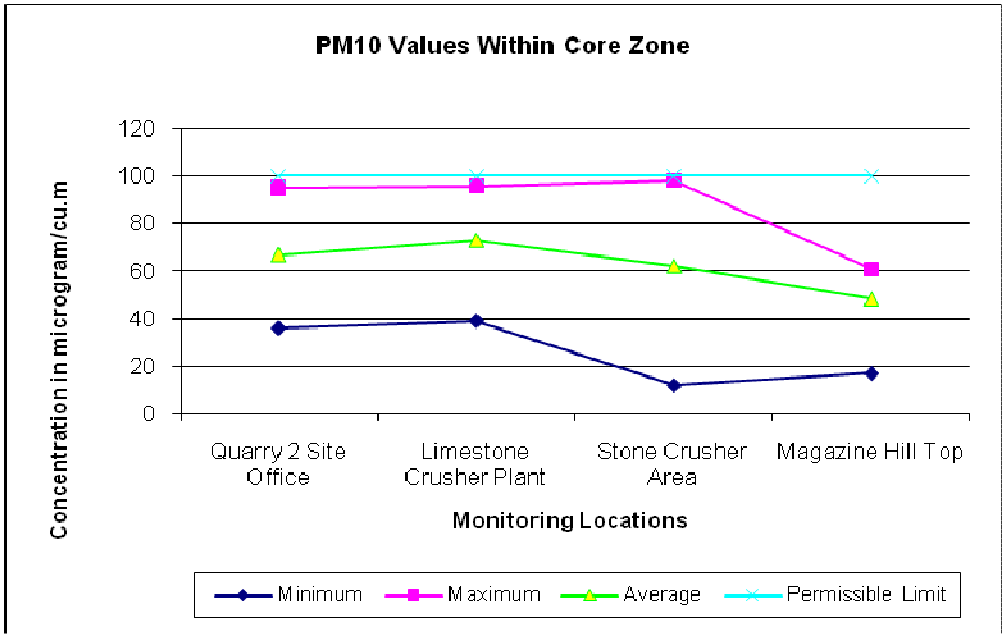


Figure No: 6.7 Graphical Representations of SO_2 Values in Core Zone

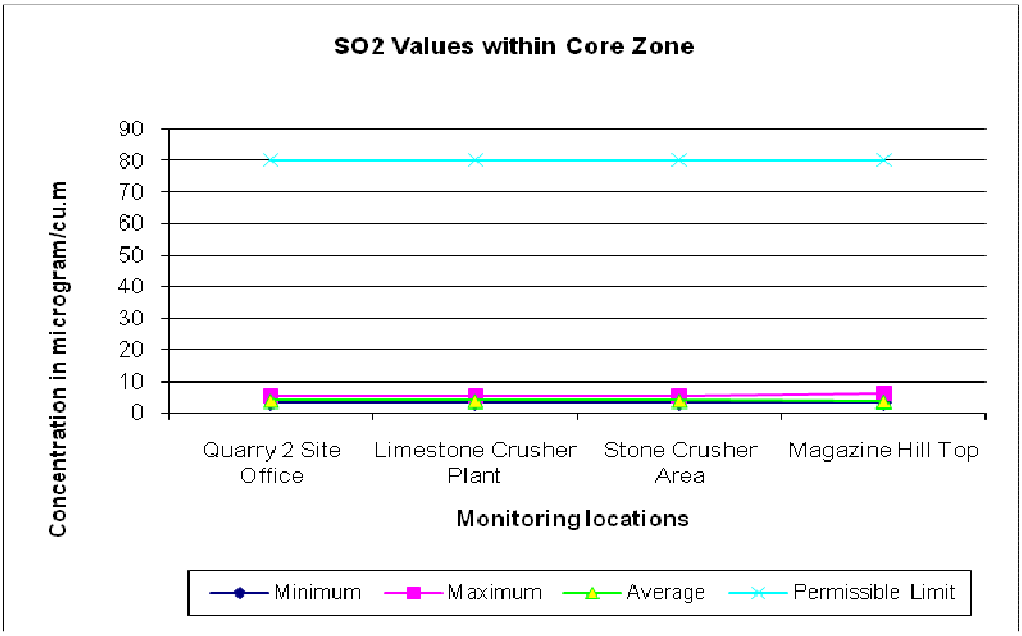
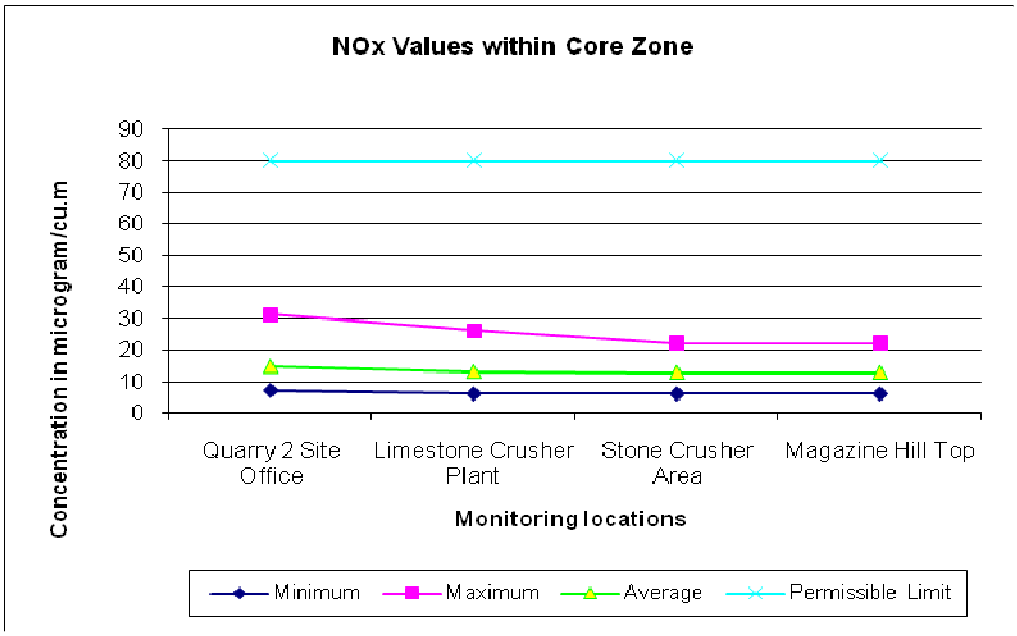


Figure No: 6.8 Graphical Representations of NOx Values in Core Zone



6.2.5 Village Katang (A-5)

PM2.5

Data as given in the **Table No: 6.6** shows that the maximum value was 31µg/m^3, 98 percentile values were 28.18µg/m^3, the lowest value was 6.0µg/m^3 and the average value was 19.48µg/m^3.

PM10

Data as given in the **Table No: 6.6** shows that the maximum value was 65µg/m^3, 98 percentile values were 64.06µg/m^3, the lowest value was 15µg/m^3 and the average value was 51.44µg/m^3.

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

SO_2

The data given in the **Table No: 6.6** shows the maximum value was 04µg/m^3, 98 percentile values were 4.00µg/m^3, the lowest value was 3.0µg/m^3 and the average value was 3.40µg/m^3.

NO_2

The data given in the **Table No: 6.6** shows the maximum value was 35µg/m^3, 98 percentile values were 24.20µg/m^3, the lowest value was 7.0µg/m^3 and the average value was 13.43µg/m^3.

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

Table No: 6.6
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-5 (Village Katang)

Date	PM2.5	PM10	SO_2	NO_2
04.10.2018	12	29	< 3	< 6
08.10.2018	16	43	< 3	7
11.10.2018	18	44	4	12
15.10.2018	15	51	3	19
18.10.2018	25	62	< 3	7
22.10.2018	21	54	< 3	15
25.10.2018	20	50	3	12
29.10.2018	22	52	4	16
03.11.2018	20	49	3	14
07.11.2018	21	55	< 3	14
10.11.2018	16	55	4	16
14.11.2018	23	59	3	35
17.11.2018	28	59	3	18
21.11.2018	19	55	3	14
24.11.2018	31	60	3	9
28.11.2018	23	55	4	12
04.12.2018	23	64	< 3	23
07.12.2018	17	57	< 3	9
11.12.2018	19	54	< 3	22
14.12.2018	16	57	3	12
18.12.2018	19	49	< 3	7

Date	PM2.5	PM10	SO_2	NO_2
21.12.2018	11	32	< 3	7
25.12.2018	16	50	3	10
28.12.2018	18	54	4	12
03.01.2019	24	58	< 3	< 6
07.01.2019	26	58	3	13
10.01.2019	17	33	4	16
14.01.2019	6	15	3	16
17.01.2019	20	55	3	9
21.01.2019	16	45	< 3	11
24.01.2019	20	54	3	12
29.01.2019	23	58	4	14
04.02.2019	9	29	< 3	20
07.02.2019	24	56	4	16
11.02.2019	22	57	< 3	8
14.02.2019	22	57	< 3	17
18.02.2019	21	58	< 3	14
21.02.2019	24	65	< 3	8
25.02.2019	20	54	3	10
28.02.2019	17	49	4	16
04.03.2019	18	59	< 3	13
07.03.2019	19	40	< 3	16
11.03.2019	20	52	< 3	13
14.03.2019	20	50	< 3	8
18.03.2019	18	52	< 3	8
21.03.2019	19	55	< 3	10
25.03.2019	20	54	3	12
28.03.2019	21	57	4	16
Minimum	**6**	**15**	**3**	**7**
Maximum	**31**	**65**	**4**	**35**
Average	**19.48**	**51.44**	**3.40**	**13.43**
98%tile Value	**28.18**	**64.06**	**4**	**24.2**

The other parameters monitored during the month of November is described below in the **Table No: 6.6A**

Table No: 6.6A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method - 804	APWA 3rd Ed. Method - 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	14.11.2018	28	23	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

6.2.6 Village Bihabandh (A-6)

PM2.5

Data as given in the **Table No: 6.7** shows that the maximum value was 27µg/m^3, 98 percentile values were 27.0µg/m^3, the lowest value was 09µg/m^3 and the average value was 19.27µg/m^3.

PM10

Data as given in the **Table No: 6.7** shows that the maximum value was 67µg/m^3, 98 percentile values were 63.24µg/m^3, the lowest value was 35µg/m^3 and the average value was 51.42µg/m^3.

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

SO_2

The data given in the **Table No: 6.7** shows the maximum value was 04µg/m^3, 98 percentile values were 4.00µg/m^3, the lowest value was 3.0µg/m^3 and the average value was 3.44µg/m^3.

NO_2

The data given in the **Table No: 6.7** shows the maximum value was 27µg/m^3, 98 percentile values were 23.24µg/m^3, the lowest value was 6.0µg/m^3 and the average value was 12.02µg/m^3.

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

Table No: 6.7
AMBIENT AIR QUALITY DATA
From 01.10.2018 to 31.03.2019
Station: A-6 (Village Bihabandh)

Date	PM2.5	PM10	SO_2	NO_2
04.10.2018	11	38	< 3	6
08.10.2018	22	58	< 3	15
11.10.2018	21	54	< 3	10
15.10.2018	20	57	< 3	12
18.10.2018	21	67	< 3	6
22.10.2018	15	36	4	21
25.10.2018	18	38	4	22
29.10.2018	22	49	3	18
03.11.2018	27	63	< 3	8
07.11.2018	19	39	< 3	9
10.11.2018	17	43	< 3	8
14.11.2018	23	55	< 3	10
17.11.2018	9	39	< 3	8
21.11.2018	22	52	< 3	11
24.11.2018	9	37	< 3	8
28.11.2018	19	51	3	12
04.12.2018	11	48	< 3	11

Date	PM2.5	PM10	SO_2	NO_2
07.12.2018	16	58	< 3	17
11.12.2018	20	60	< 3	10
14.12.2018	14	52	< 3	16
18.12.2018	11	35	4	12
21.12.2018	22	55	3	11
25.12.2018	20	52	4	12
28.12.2018	22	54	4	13
03.01.2019	15	46	< 3	10
07.01.2019	24	57	< 3	7
10.01.2019	26	61	< 3	27
14.01.2019	16	44	3	12
17.01.2019	16	52	< 3	8
21.01.2019	21	43	< 3	7
24.01.2019	22	53	3	19
29.01.2019	24	57	4	16
04.02.2019	16	47	< 3	17
07.02.2019	22	54	< 3	11
11.02.2019	21	57	< 3	6
14.02.2019	17	59	< 3	13
18.02.2019	20	48	3	12
21.02.2019	27	57	< 3	10
25.02.2019	23	56	4	12
28.02.2019	22	53	3	10
04.03.2019	21	56	3	17
07.03.2019	21	54	< 3	8
11.03.2019	21	51	< 3	23
14.03.2019	17	51	< 3	10
18.03.2019	22	57	3	13
21.03.2019	14	50	< 3	6
25.03.2019	22	56	4	9
28.03.2019	24	59	3	8
Minimum	**9**	**35**	**3**	**6**
Maximum	**27**	**67**	**4**	**27**
Average	**19.27**	**51.42**	**3.44**	**12.02**
98%tile Value	**27**	**63.24**	**4**	**23.24**

The other parameters monitored during the month of November is described below in the **Table No: 6.7A**

Table No: 6.7A

Sl No	Date of Sampling	Parameters							
		NH_3	O_3	Lead (Pb)	Arsenic (As)	Nickel (Ni)	Benzene (C_6H_6)	Carbon Monoxide (CO)	Benzo(a)pyrene (BaP) – Particulate Phase
Units →		µg/m³	µg/m³	µg/m³	ng/m³	ng/m³	µg/m³	mg/m³	ng/m³
Method of Analysis →		APWA 3rd Ed. Method - 401	APWA 3rd Ed. Method – 411	APWA 3rd Ed. Method – 822	APWA 3rd Ed. Method - 804	APWA 3rd Ed. Method - 822	IS 5182 (Part – 11)	Electro-chemical Sensor	IS 5182 (Part – 12)
1.	21.11.2018	22	21	< 0.4	< 1.0	< 5.0	< 0.1	< 0.1	< 0.1

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

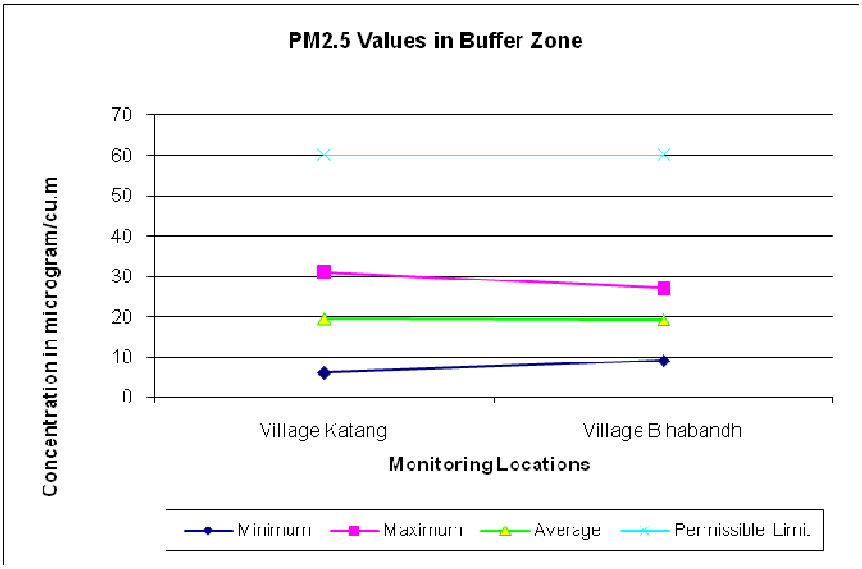


Figure No: 6.10 Graphical Representations of PM10 Values in Buffer Zone

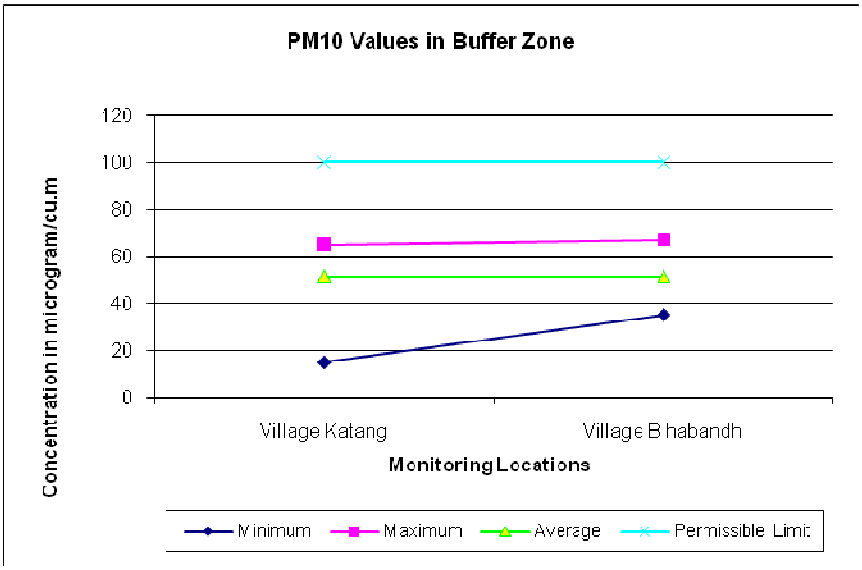


Figure No: 6.11 Graphical Representations of SO_2 Values in Buffer Zone

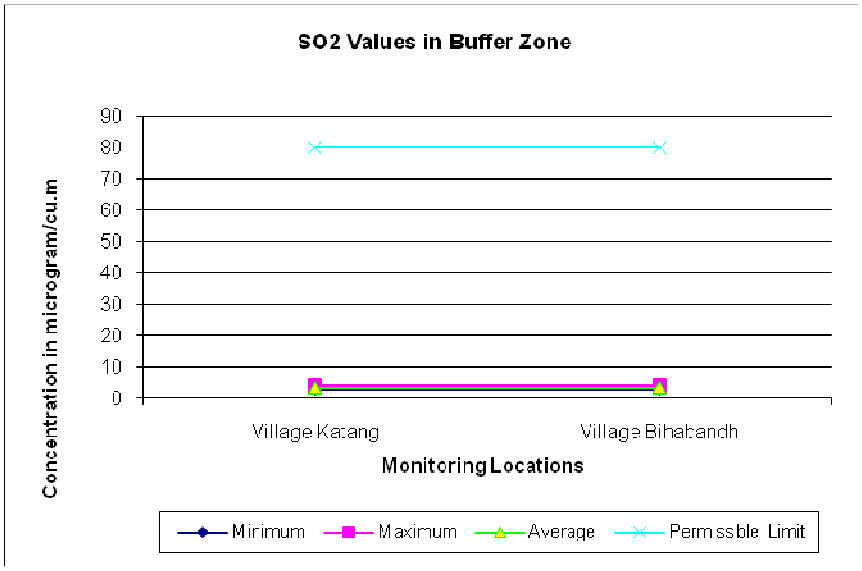
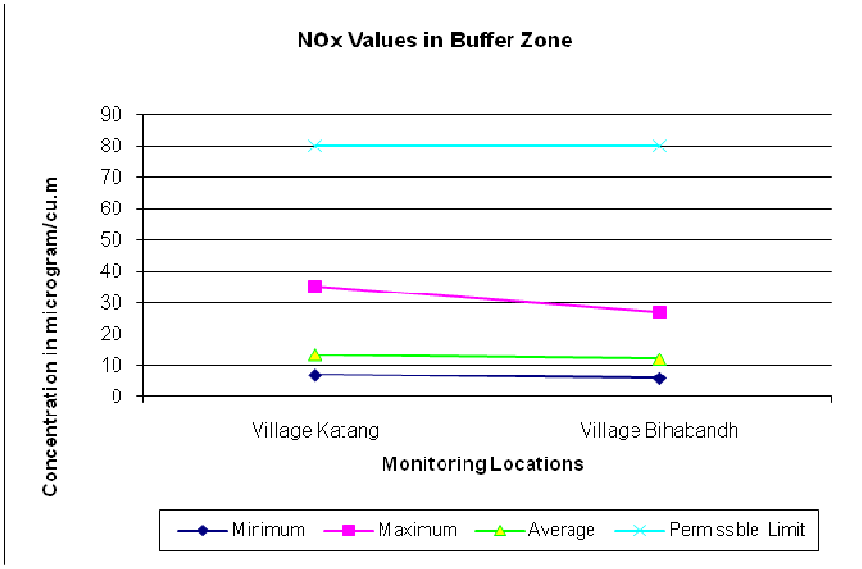


Figure No: 6.12 Graphical Representations of NOx Values in Buffer Zone



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	132 µg/m^3	86 µg/m^3
February	480 µg/m^3	174 µg/m^3

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^3) of State Pollution Control Board. The detail results are as follows:

Table No 6.9: Stack Emission Monitoring Results

Sl No	Month	Particulate Matter Concentration in mg/Nm^3
1	October	21
2	November	132
3	December	67
4	January	12
5	February	72
6	March	61

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		October	January	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		8.04	6.90	5.5 – 9.0
5.	Temperature	° C	26.4	19.9	-
6.	Oil & Grease	mg/l	< 0.10	< 0.10	10
7.	Total Residual Chlorine	mg/l	0.42	0.18	-
8.	Ammoniacal Nitrogen (as N)	mg/l	< 0.10	< 0.01	-
9.	Total Kjeldahl Nitrogen (as NH_3)	mg/l	< 0.10	< 0.01	-
10.	Free Ammonia (as NH_3)	mg/l	< 0.01	< 0.012	-
11.	BOD (3 days at 27°C)	mg/l	01	< 01	100
12.	COD	mg/l	< 04	< 04	-

Sl No	Parameters		October	January	General Standards As per Schedule - VI of EPA, G.S.R.422(E), 1993
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^{+6})	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	0.4696	0.5432	-
22.	Dissolved Phosphate (as P)	mg/l	< 0.10	< 0.10	-
23.	Sulphide (as S)	mg/l	< 0.02	< 0.02	-
24.	Phenolic Compounds (as C_6H_5OH)	mg/l	< 0.10	< 0.10	-
25.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe)	mg/l	< 0.01	0.06	-
27.	Nitrate Nitrogen	mg/l	0.94	< 0.50	-

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

Sl No	Parameters		November	February	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	5.2	200
4.	pH Value		8.01	8.02	5.5 – 9.0
5.	Temperature	^{o} C	25.7	23.4	-
6.	Oil & Grease	mg/l	< 0.10	< 0.10	10
7.	Total Residual Chlorine	mg/l	0.16	0.24	-
8.	Ammoniacal Nitrogen (as N)	mg/l	< 0.01	< 0.10	-
9.	Total Kjeldahl Nitrogen (as NH_3)	mg/l	< 0.01	< 0.10	-
10.	Free Ammonia (as NH_3)	mg/l	< 0.012	< 0.01	-
11.	BOD (3 days at 27^{o}C)	mg/l	01	< 01	100
12.	COD	mg/l	< 04	< 04	-
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^{+6})	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	1.3756	0.4268	-
22.	Dissolved Phosphate (as P)	mg/l	< 0.10	< 0.10	-
23.	Sulphide (as S)	mg/l	< 0.02	< 0.02	-
24.	Phenolic Compounds (as C_6H_5OH)	mg/l	0.06	< 0.10	-
25.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
26.	Iron (as Fe)	mg/l	0.05	4.23	-
27.	Nitrate Nitrogen	mg/l	3.49	< 0.50	-

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

Sl No	Parameters		December	March	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		7.93	6.72	5.5 – 9.0
5.	Temperature	° C	19.5	27.7	-
6.	Oil & Grease	mg/l	< 0.10	< 0.10	10
7.	Total Residual Chlorine	mg/l	0.17	0.20	-
8.	Ammoniacal Nitrogen (as N)	mg/l	< 0.01	< 0.10	-
9.	Total Kjeldahl Nitrogen (as NH_3)	mg/l	< 0.01	< 0.10	-
10.	Free Ammonia (as NH_3)	mg/l	< 0.012	< 0.01	-
11.	BOD (3 days at 27°C)	mg/l	01	< 01	100
12.	COD	mg/l	< 4	< 04	-
15.	Lead (as Pb)	mg/l	< 0.10	< 0.10	-
16.	Cadmium (as Cd)	mg/l	< 0.05	< 0.05	-
17.	Hex. Chromium (as Cr^{+6})	mg/l	< 0.01	< 0.01	-
18.	Total Chromium (as Cr)	mg/l	< 0.10	< 0.10	-
19.	Copper (as Cu)	mg/l	< 0.10	< 0.10	-
20.	Zinc (as Zn)	mg/l	< 0.02	< 0.02	-
22.	Nickel (as Ni)	mg/l	< 0.25	< 0.25	-
23.	Cyanide (as CN)	mg/l	< 0.002	< 0.002	0.2
24.	Fluoride (as F)	mg/l	0.7432	0.4010	-
25.	Dissolved Phosphate (as P)	mg/l	< 0.10	< 0.10	-
26.	Sulphide (as S)	mg/l	< 0.02	< 0.02	-
27.	Phenolic Compounds (as C_6H_5OH)	mg/l	< 0.025	< 0.10	-
28.	Manganese (as Mn)	mg/l	< 0.05	< 0.05	-
29.	Iron (as Fe)	mg/l	0.05	0.08	-
31.	Nitrate Nitrogen	mg/l	< 0.50	< 0.50	-

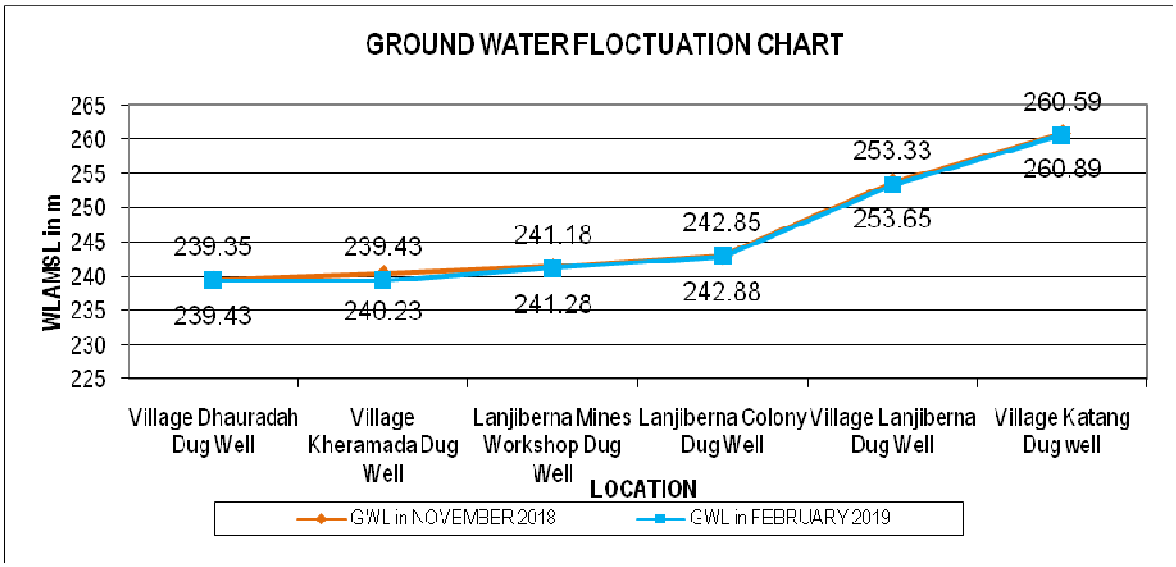
6.6 Ground Water Level Data

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	240.23	239.43	5.01	4.21
2	Lanjiberna Colony Dug Well	247.83	242.88	242.85	6.45	6.42
3	Village Dhauradah Dug Well	242.34	239.43	239.35	5.58	5.50
4	Lanjiberna Mines Workshop Dug Well	245.03	241.28	241.18	2.39	2.29
5	Village Lanjiberna Dug Well	255.14	253.65	253.33	3.51	3.19
6	Village Katang Dug well	264.89	260.89	260.59	3.95	3.65

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 67.4 and 40.3 dB(A) and the Leq values for Day time was 60.8 dB(A) and Leq values for Night time was 52.8 dB(A) during the month of November.

The noise level range between 67.5 and 39.4 dB(A) and the Leq values for Day time was 60.6 dB(A) and Leq values for Night time was 46.9 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 Industrial area for both day and night time.

N-2 Limestone Crusher Plant Area

The noise level range between 73.1 and 39.4 dB(A) and the Leq values for Day time was 67.6 dB(A) and Leq values for Night time was 52.8 dB(A) during the month of November.

The noise level range between 73.6 and 40.7 dB(A) and the Leq values for Day time was 68.3 dB(A) and Leq values for Night time was 51.6 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 61.7 and 36.2 dB(A) and the Leq values for Day time was 55.4 dB(A) and Leq values for Night time was 39.3 dB(A) during the month of November.

The noise level range between 59.7 and 37.6 dB(A) and the Leq values for Day time was 52.1 dB(A) and Leq values for Night time was 41.7 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 57.9 and 36.8 dB(A) and the Leq values for Day time was 49.4 dB(A) and Leq values for Night time was 40.0 dB(A) during the month of November.

The noise level range between 54.1 and 36.1 dB(A) and the Leq values for Day time was 48.6 dB(A) and Leq values for Night time was 42.8 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_{eq} dB(A) Day Time (600 Hrs – 2200 Hrs)	L_{eq} dB(A) Night Time (2200 Hrs – 600 Hrs)	L_{max} dB(A)	L_{min} dB(A)
1.	N1	60.8	52.8	67.4	40.3
2.	N2	67.6	52.8	73.1	39.4
3.	N3	55.4	39.3	61.7	36.2
4.	N4	49.4	40.0	57.9	36.8

Table No: 6.15
Noise Level Data in Month of February

SL NO	STATION NO	L_{eq} dB(A) Day Time (600 Hrs – 2200 Hrs)	L_{eq} dB(A) Night Time (2200 Hrs – 600 Hrs)	L_{max} dB(A)	L_{min} dB(A)
1.	N1	60.6	46.9	67.5	39.4
2.	N2	68.3	51.6	73.6	40.7
3.	N3	52.1	41.7	59.7	37.6
4.	N4	48.6	42.8	54.1	36.1

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 7.64 to 8.09 which is slightly alkaline, TSS was 21.6 & 11.8 mg/l in November & February months, Oil & Grease content was 2.4 & 1.4 mg/l in

November and February months, Iron was < 0.01 mg/l in both the months 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.

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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