

Environmental Status Report
For
Tatijharia Bauxite Mine
at
Post & Teh.: Samri,(Kusmi)
Dist: Balrampur–Ramanujganj(C.G.)

Duration: April-May-June-2015

Sponsor:-



M/s. Hindalco Industries Limited.,

Prepared By :-



Recognized by MoEF (GOI) as per EPA and valid up to Jan'2019
Accredited by NABL for Chemical, Biological & Mechanical), valid up to 03.10.2016
Accredited under the QCI-NABET Scheme for EIA Consultant
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Foreword

The protection of environment plays a crucial role in maintaining the local environment quality for any mining industry. Hence compliance of the statutory requirements becomes very important to conserve the ecological balance within and surrounding the mine area. Therefore, environment protection is becoming a prerequisite for sustainable development. In line with this requirement, the management of **M/s Hindalco Industries Ltd.** has adopted a corporate responsibility of environment protection.

In order to comply with the Environment protection act, to fulfill statutory requirement and to be in tune with Environmental Preservation and sustainable development, **M/s Hindalco Industries Ltd.** has retained **ANACON LABORATORIES PVT. LTD.**, Nagpur as Environment Consultants and for various Environmental issues related to their mines.

This report presents the Environmental Status for the period **April-2015 to June-2015**

as compliance to the statutory requirements.

The co-operation extended by the Staff and Management of **M/s Hindalco Industries Ltd.**

during the work execution period is gratefully acknowledged.

Place : Nagpur

Date : June, 2015

for ANACON LABORATORIES PVT. LTD.



Authorized Signatory





1.1 Introduction

Hindalco Industries Limited (Hindalco) is one among the flagship companies of the Aditya Birla Group of Industries and is one of the largest corporate groups in India. This group is a leading manufacturer of Aluminum in India, having integrated facilities encompassing bauxite, mining, refining and smelting to achieve Aluminum.

Various processing units of Hindalco are strategically located in different parts of the nation to achieve optimum benefits. Over the past few decades the group has grown multifold in its production capacities, product mix and diversification in mining. The Chhattisgarh Environment Conservation Board (CECB) granted permission for establishing the Bauxite mine to Hindalco at block Tatijharia, Kudag and Samri mines in Balrampur District of Chhattisgarh State.

HINDALCO INDUSTRIES LTD. awarded the work to M/s ANACON LABORATORIES PVT. LTD. NAGPUR (ALPL) for carrying out monitoring of parameters for assessing pollution levels and preparation of monthly report (April-May-June-2015) as per the requirement of Chhattisgarh Environment Conservation Board (CECB) and Ministry of Environment and Forest (MoEF) for Tatijharia mining lease in Balrampur District, Chhattisgarh State.

1.2 Background Information of Tatijharia Mine

Hindalco was granted Tatijharia Bauxite mining lease over an area of 1218.762hec. in Tatijharia, Post Jamira, Tehsil Samri of Balrampur district, Chhattisgarh on 25/06/1998 for a period of 20 years. The mining operations were started on 01/04/2004. The production capacity of bauxite is 4.0 Lakh Tonnes Per Annum (LTPA).

1.3 Salient Features of Tatijharia Bauxite Mine

The deposits occur in Tatijharia block, Post Jamira Tehsil Samri of Balrampur district. This deposit has been identified as one of the resources to cater the raw material requirements of the Hindalco Alumina refinery at Renukoot, Uttar Pradesh. The salient features of the project are presented below: (**Table 1**)



Table 1
Salient Features of Tatijharia Bauxite Mines

S.No.	Particulars	Details
1.	Survey of India Toposheet No.	64 M /15
2.	Latitude	23 ^o 21' 02"N to 23 ^o 24' 15"N
3.	Longitude	83 ^o 54' 50"E to 83 ^o 56' 30"E
4.	Elevation	1282-m above Mean Sea Level
5.	Climatic Conditions (as per IMD, Ambikapur)	Annual maximum temperature : 30.3 ^o C Annual minimum temperature : 17.7 ^o C Average annual rainfall : 1401.1 mm
6.	Mining lease area	1218.762hec.
7.	Method of mining	Open cast (Semi-Mechanized)
8.	Mode of transportation	Trucks
9.	Land use	Agricultural and Barren land
10.	Nearest Road	Samri to Kusmi (17 km)
11.	Nearest Airport	Ranchi (143.56 km, E)
12.	Nearest Town	Ambikapur (127 km, SW)

1.4 Environmental Monitoring

Regular monitoring of environmental parameters is of immense importance to assess the status of environment during mining operation. With the knowledge of baseline conditions, the monitoring program will serve as an indicator for any deterioration in environment conditions due to mining operation of the project. Suitable mitigation steps will be taken in time to safeguard the environment, based on monitoring reports. Monitoring is important in the control of pollution since the efficiency of control measures can only be determined by monitoring.

In order to find out impact of mining activity on sensitive receptors, it is necessary to monitor Environmental Quality to know ground level concentrations of pollutants within and around the mining lease area, accordingly Hindalco Industries through ALPL has been monitoring at the following locations air, water and Noise quality on monthly basis during these months(**Table 2**).

1.5 Air Environment

1.5.1 Ambient Air Quality Monitoring

Ambient Air Quality monitored at 8 locations in the core zone and buffer zone with reference to Tatijharia mine lease area shown in (**Fig. 1**).



Table 2
Locations of Ambient Air Quality Monitoring (AAQM) & Fugitive Emission
(1218.762 hec.)

S. No.	Fugitive Emission (Core Zone)	S. No.	Buffer Zone
1	Piprapat/Nr. Mining Area	5	Kutku Village/Nr.V.T.Center
2	Betpani	6	Sairaidh Campus
3	Virhorepat	7	Rajendrapur/Nr.Mining Area
4	Tatijharia Village/Nr.Weigh Bridge	8	Dumerkholi/Nr.Mining Area

The sampling stations are selected at the above mentioned locations, in downwind and upwind directions of the mining site in the core zone and buffer zone. ALPL is carrying out regular monitoring for PM_{2.5}, RPM(PM₁₀), SO₂, NO_x and SPM, RSPM, SO₂, NO_x, Pb, Hg, As and Cr at above Ambient Air Quality Monitoring (AAQM) locations. The dust fall rate was measured in the mining area (BKB campus) and Tatijharia village during April-May-June-2015. The AAQM sampling sites are selected considering seasonal variation in wind speed and wind direction.

Sampling Duration and Frequency

Ambient air quality monitoring was carried out for the parameters PM_{2.5}, RPM(PM₁₀), SO₂, NO_x and SPM, RSPM, SO₂, NO_x, Pb, Hg, As and Cr from April-May-June- 2015 as per CPCB norms. Sampling Frequency is given in **Table-3**.

Data is compared with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB) (August-20, 1994), and as per consent conditions mentioned in consent letter.

MONITORED PARAMETERS AND FREQUENCY OF SAMPLING

Methods and Instruments used for Sampling

The air samples were analyzed as per methods specified by Central Pollution Control Board (CPCB).

The levels of Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Pb, Hg, As and Cr were monitored for establishing the



baseline status. SPM and RPM was collected with the help of respirable particulate sampler operating 24 hours by drawing air which passes through the cyclone at the rate of 1.0 -1.3 m³/min which collects the particles less than 10 µm diameter over glass fiber filter paper and the bigger particulates from 10 to 100 µm are collected into the cup provided at the bottom of the cyclone.. The dust deposited over the filter paper is measured as RPM, PM_{2.5} collected with the help of Fine Dust sampler operating 24 hours Due to the high flow rate of air. The dust fall rate was measured using dust fall jar. The jar was exposed for one month in the mining area and (BKB campus) Tatijharia village during April-May-June- 2015. The jar was filled with 2 lit of distilled water. The water in the jar is mixed with copper sulphate solution (0.02 N solution) to prevent any growth of algae. The water level in the jar is constantly maintained in such a way that 2 lit of water is always retained. The measurement techniques used for various pollutants and other details are given in (Table 4).

Table 3
Monitored Parameters and Frequency of Sampling

Parameters	Sampling frequency
Suspended Particulate Matter	24 hourly sample twice a week for Three months
Respirable Particulate Matter	24 hourly sample twice a week for Three months
Particulate Matter 2.5	24 hourly sample twice a week for Three months
Sulphur dioxide (So ₂)	24 hourly sample twice a week for Three months
Oxides of Nitrogen (NO _x)	24 hourly sample twice a week for Three months
Pb,Hg,As,Cr	8 hourly samples for 24 hour twice a week for three months

Table 4
Measurement Techniques for various pollutants

S.No.	Parameter	Technique	Technical Protocol	Minimum Reportable Value (µg/ m ³)
1.	Suspended Particulate Matter	Respirable Dust Sampler (Gravimetric Method)	IS-5182 (Part – 23)	5
2.	Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric Method)	IS-5182 (Part-23)	5
3.	Particulate Matter 2.5	Respirable Dust Sampler (Gravimetric Method)	Gravimetric Method	5
4.	Sulphur Dioxide	Modified West and Gaeke	IS-5182 (Part – II)	4
5.	Oxide of Nitrogen	Jacob & Hochheiser Method	IS-5182 (Part – VI)	4
6.	Pb, As,Hg, Cr	Acid Digestion Method	EPA Method	0.1
7.	Dust Fall	Gravimetric	IS-5182 (Part-I)	–

1.6 Fugitive Emission Monitoring

The summary of Fugitive Emission monitoring results for the month of April-May-June -2015 are presented in detail in **Table 3.0**. 98th percentile; maximum and minimum values etc have been computed from the collected raw data for all the Fugitive monitoring station. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/NAAQ for residential and rural zone.

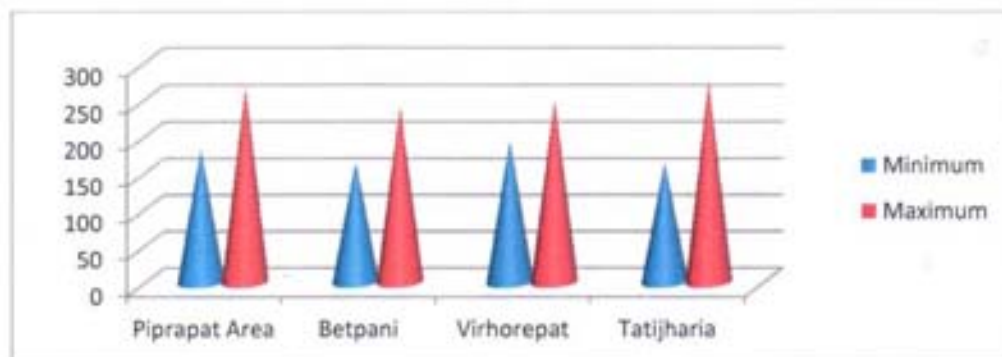
1.6.1 Presentation of Results

Suspended Particulate Matter-SPM

The minimum and maximum concentrations for Suspended Particulate Matter-SPM were recorded as 164 $\mu\text{g}/\text{m}^3$ and 273 $\mu\text{g}/\text{m}^3$ respectively. The average concentrations were ranged between 169 to 255 $\mu\text{g}/\text{m}^3$. and 98th percentile values ranged between 173 to 272 $\mu\text{g}/\text{m}^3$ in the study area (**Table 6**).

Graphical Presentation Of Fugitive Emission Monitoring

SPM

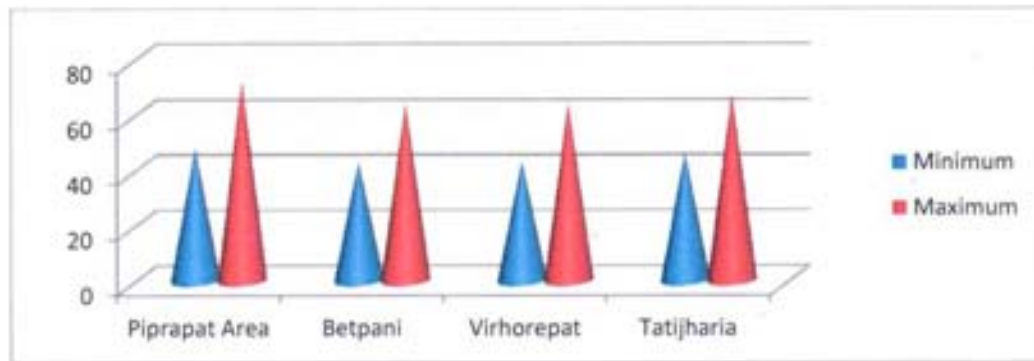


Respirable Suspended Particulate Matter –RSPM

The minimum and maximum concentrations for RSPM were recorded as 43 $\mu\text{g}/\text{m}^3$ and 72 $\mu\text{g}/\text{m}^3$ respectively. The average values were observed to be in the range of 46 to 65 $\mu\text{g}/\text{m}^3$ and 98th percentile values ranged between 48 to 72 $\mu\text{g}/\text{m}^3$ in the study area (**Table 7**).

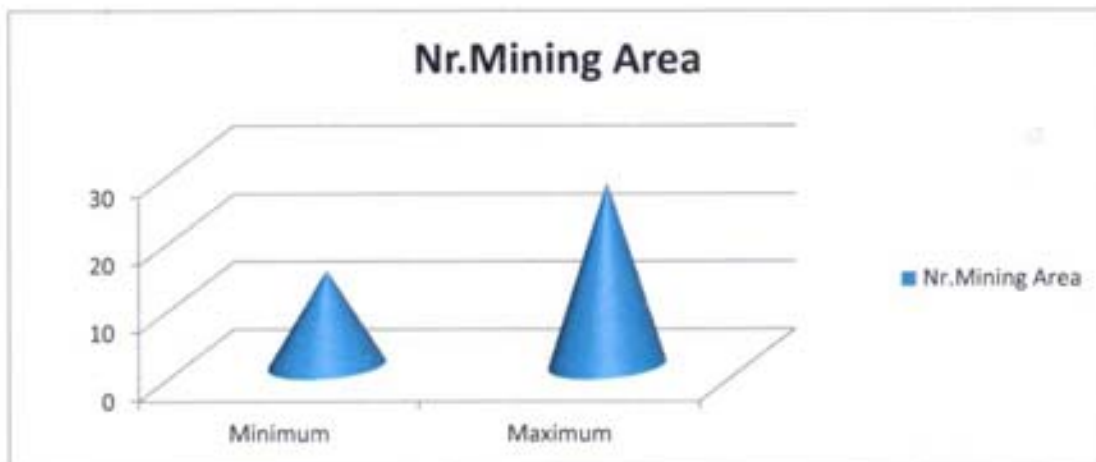
Graphical Presentation Of Fugitive Emission Monitoring

RSPM



Particulate Matter -PM_{2.5}

The minimum and maximum values of PM_{2.5} concentrations varied between 14 to 27 $\mu\text{g}/\text{m}^3$ respectively. The average values range between 16 to 23 $\mu\text{g}/\text{m}^3$ and 98th percentile values varied between 18 to 27 $\mu\text{g}/\text{m}^3$ (Table 8).

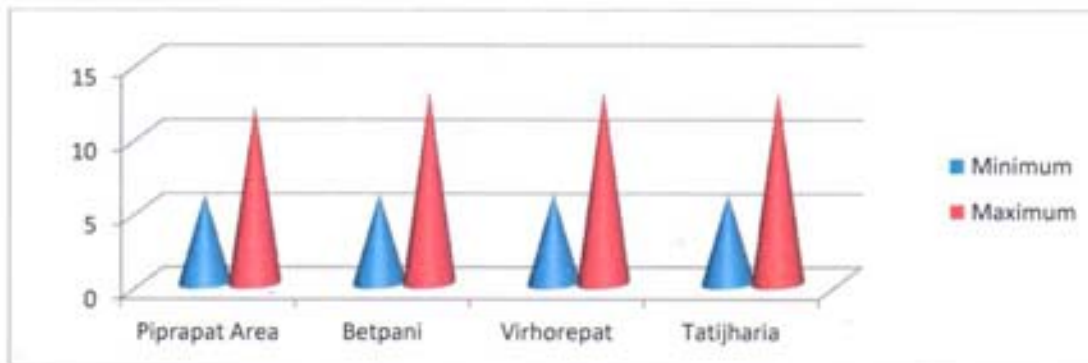


Sulphur Dioxide (SO₂)

The minimum and maximum SO₂ concentrations were recorded as 6 $\mu\text{g}/\text{m}^3$ and 13 $\mu\text{g}/\text{m}^3$ respectively. The average values were observed to be in the range of 7 to 11 $\mu\text{g}/\text{m}^3$ and 98th percentile values varied between 8 to 13 $\mu\text{g}/\text{m}^3$ (Table 9).

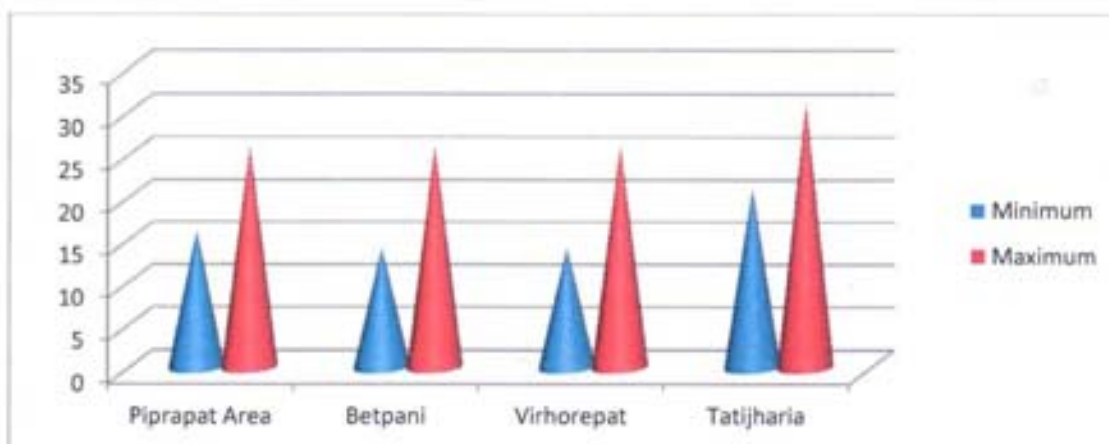
Graphical Presentation Of Fugitive Emission Monitoring

SO₂



Nitrogen Oxide (NO_x)

The minimum and maximum NO_x concentrations were recorded as 14 µg/m³ and 31 µg/m³. The average concentrations were ranged between 16 to 29 µg/m³ and 98th percentile values varied between 18 to 31 µg/m³ (Table 10).



Lead (Pb)

The minimum and maximum Lead detected between 0.018 to 0.057 µg/m³ respectively. The average Lead detected between 0.020 to 0.046 µg/m³ & 98th percentile values varied between 0.021 to 0.057 µg/m³ in the study region. (Table 11).



Mercury (Hg)

The maximum concentrations of Hg varied $0.043 \mu\text{g}/\text{m}^3$ respectively. The average concentration varied $0.036 \mu\text{g}/\text{m}^3$ 98th percentiles values varied $0.043 \mu\text{g}/\text{m}^3$ in the study region. (Table 12).

Arsenic (As)

The maximum concentrations of As varied $0.43 \mu\text{g}/\text{m}^3$ respectively. The average concentration varied $0.35 \mu\text{g}/\text{m}^3$ and 98th percentiles values varied $0.43 \mu\text{g}/\text{m}^3$ in the study region (Table 13).

Chromium (Cr)

Chromium was not detected at any of the locations in SPM samples as well as RSPM Samples.

1.7 Ambient Air Quality (Buffer Zone)

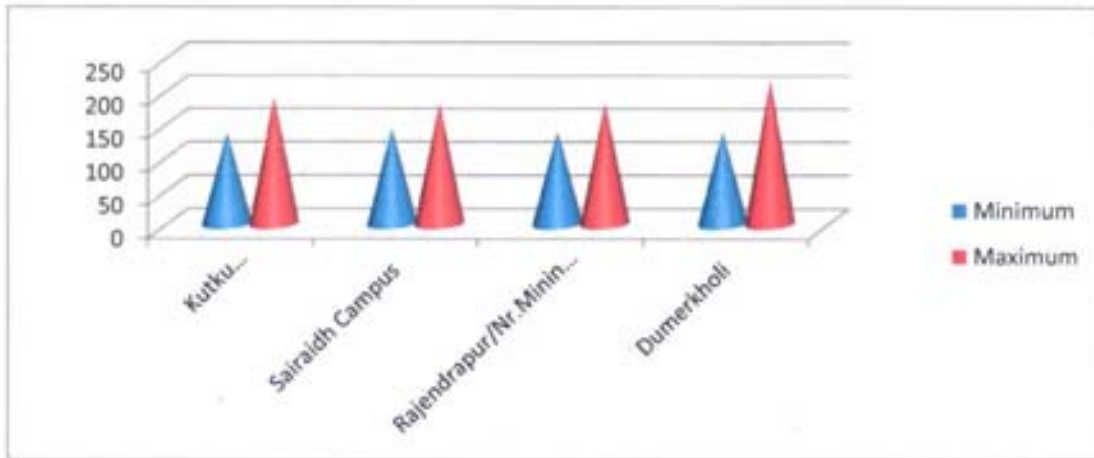
The background levels of SPM, RPM(PM_{10}), $\text{PM}_{2.5}$, SO_2 , NO_x , Pb, Hg, As and Cr measured are required to compute Ambient Air Quality. The sampling locations are selected at the above mentioned locations in downwind and upwind directions of the mine. The Minimum, Maximum concentration, Arithmetic mean (AM), Geometric mean (GM) and 98 Percentile are presented in tabular form (Table 6).

1.7.1 Presentation of Results

The summary of Ambient Air Quality monitoring results for the month of April-2015 to June-2015 are presented in detail in Table 3. 98th percentile; maximum and minimum values etc have been computed from the collected raw data for all the AAQ monitoring station. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/NAAQ for residential and rural zone.

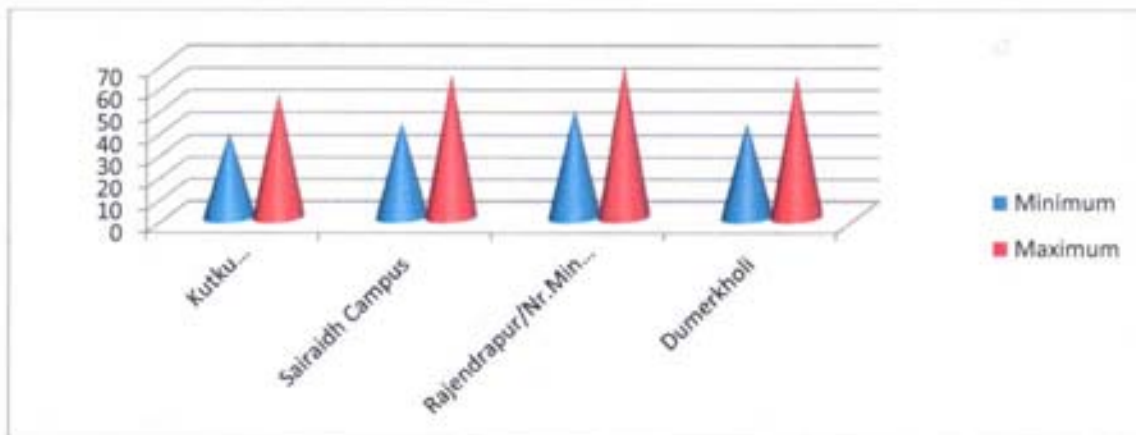
Suspended Particulate Matter-SPM

The statistical analysis of SPM is presented in Table 6 for the mining area. The minimum and maximum values varied between 137 to $217 \mu\text{g}/\text{m}^3$ respectively during study period at all the 4 locations. The average values ranged between 146 to $194 \mu\text{g}/\text{m}^3$ and 98th percentile values ranged between 154 to $216 \mu\text{g}/\text{m}^3$ in the study area.



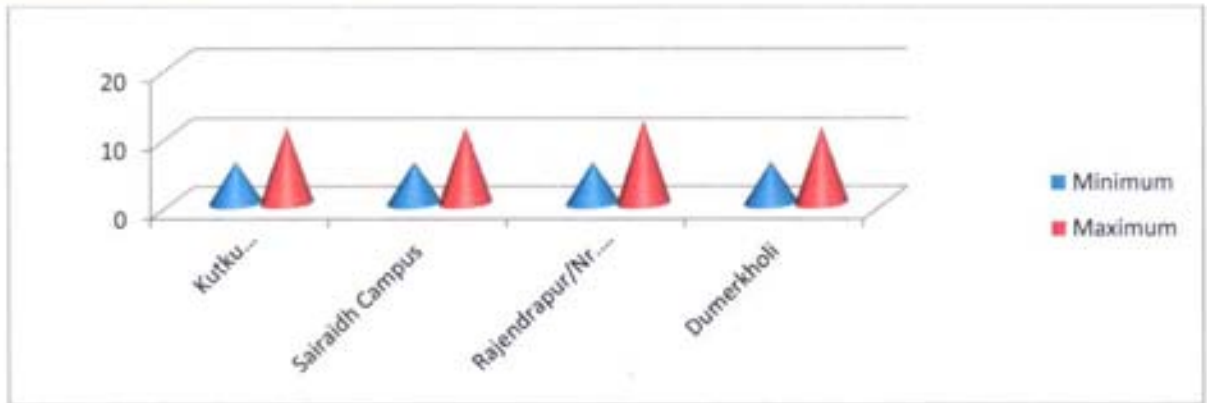
Particulate Matter-RSPM

The minimum and maximum values of RSPM varied between 38 to 68 $\mu\text{g}/\text{m}^3$ respectively (Table 7). The average values varied between 50 to 67 $\mu\text{g}/\text{m}^3$. The 98th percentile values varied between 43 to 62 $\mu\text{g}/\text{m}^3$ in the mining area. The overall values of SPM and RSPM were well within the CPCB limits prescribe for industrial and residential area in the study area during the study period.



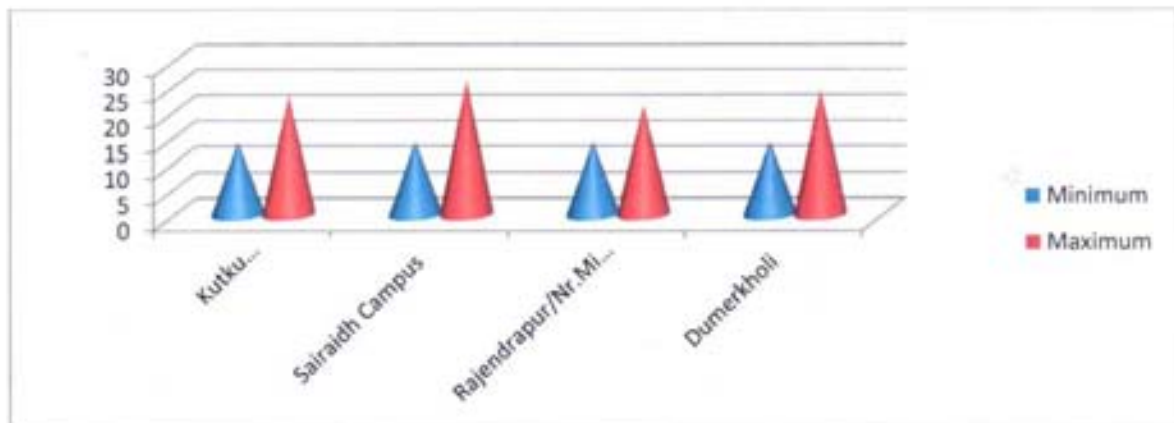
Sulphur Dioxide (SO₂)

The minimum and maximum values of SO₂ concentrations varied between 6 to 12 $\mu\text{g}/\text{m}^3$ respectively. The average values range between 7 to 10 $\mu\text{g}/\text{m}^3$ and 98th percentile values varied between 8 to 12 $\mu\text{g}/\text{m}^3$ (Table 9).



Nitrogen Oxide (NO_x)

The minimum and maximum values of NO_x concentrations varied between 14 to 26 $\mu\text{g}/\text{m}^3$ respectively. The average values range between 16 to 23 $\mu\text{g}/\text{m}^3$ and 98th percentile values varied between 18 to 26 $\mu\text{g}/\text{m}^3$ (Table 10).



Lead (Pb)

Lead (Pb) was not detected at any of the locations in SPM samples as well as RSPM Samples. (Table 11).

Mercury (Hg)

Mercury (Hg) was not detected at any of the locations in SPM samples as well as RSPM Samples. (Table 12).

Arsenic (As)

Arsenic (As) was not detected at any of the locations in SPM samples as well as RSPM Samples. (Table 13).



Chromium (Cr)

Chromium was not detected at any of the locations in SPM samples as well as RSPM Samples. The Dust fall rate during the month of April-May-June -2015 was observed 24.3 and 18.6 month MT/km²/month in the Piprapat/Near Mining Area and Tatijharia Village respectively. (Table 14).

Overall the ambient air concentrations of SPM, PM 10(RPM), PM2.5, SO₂, NO_x, Pb, Hg, and As were well within the limits of concentrations promulgated by CPCB, New Delhi in the study area.

1.8 Meteorology: Wind Pattern

The data of wind pattern collected during the study period (Apr-May-June, 2015) indicates that the wind was blowing predominantly from (W and NE) directions, during study period, for 22.80 % wind was found to be calm. The details of wind pattern in the form of wind frequency distribution are presented in table 1. The wind rose diagram and graphical illustration is presented in Figures 1 & 2 respectively.

Table.5
Wind Frequency Distribution Data

Wind Directions	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	>= 11.1	Total (%)
348.75 - 11.25	0.55021	0	0	0	0	0	0.54945
11.25 - 33.75	0	0	0	0	0	0.2751	0.27473
33.75 - 56.25	16.3686	1.37552	0	0	0	0	17.7198
56.25 - 78.75	0.13755	0	0	0	0	0	0.13736
78.75 - 101.25	8.8033	0.96286	0	0	0	0	9.75275
101.25 - 123.75	0	0	0	0	0	0	0
123.75 - 146.25	3.57634	0.2751	0	0	0	0.41265	4.25824
146.25 - 168.75	0	0	0	0	0	0	0
168.75 - 191.25	0.2751	0	0	0	0	0	0.27473
191.25 - 213.75	0.13755	0	0	0	0	0	0.13736
213.75 - 236.25	5.77717	1.65062	0	0	0	0	7.41758
236.25 - 258.75	0	0	0	0	0	0	0
258.75 - 281.25	26.9601	2.06327	0.96286	0	0	0	29.9451
281.25 - 303.75	1.23796	0	0	0	0	0	1.23626
303.75 - 326.25	3.30124	1.78817	0	0	0	0.13755	5.21978
326.25 - 348.75	0.13755	0	0	0	0	0	0.13736
Sub-Total	67.1703	8.1044	0.96154	0	0	0.82418	77.0604
Calms							22.8022
Missing/Incomplete							0.13736
Total							100

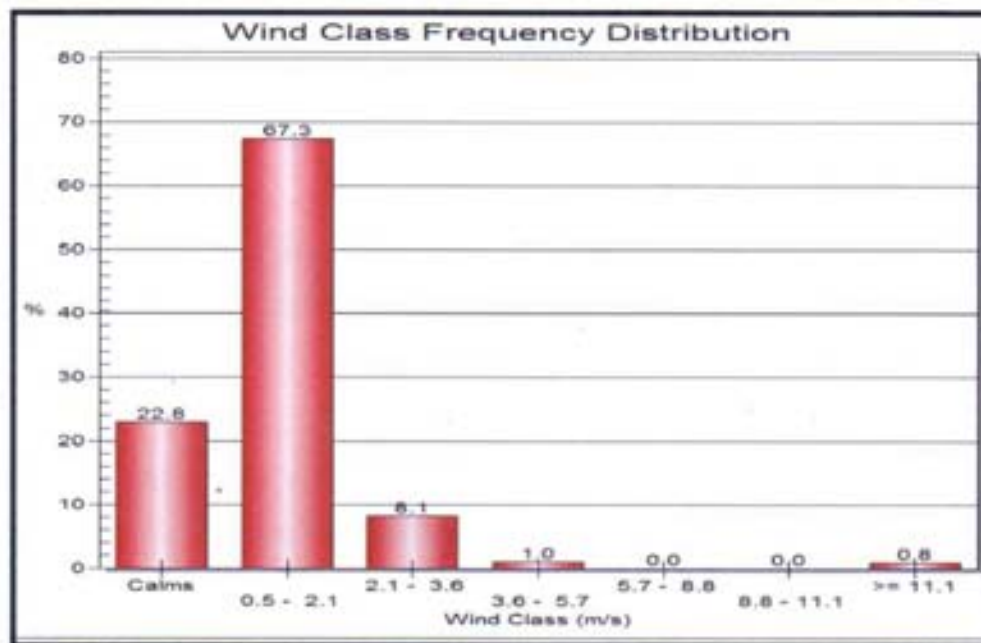


Figure 1: Wind Class Frequency Distribution

SUMMARY OF WIND PATTERN

Season	First Predominant Wind Direction	Second Predominant Wind Direction	Calm Condition
April-May-June, 2015	W (29.9%)	NE (17.7%)	22.80%

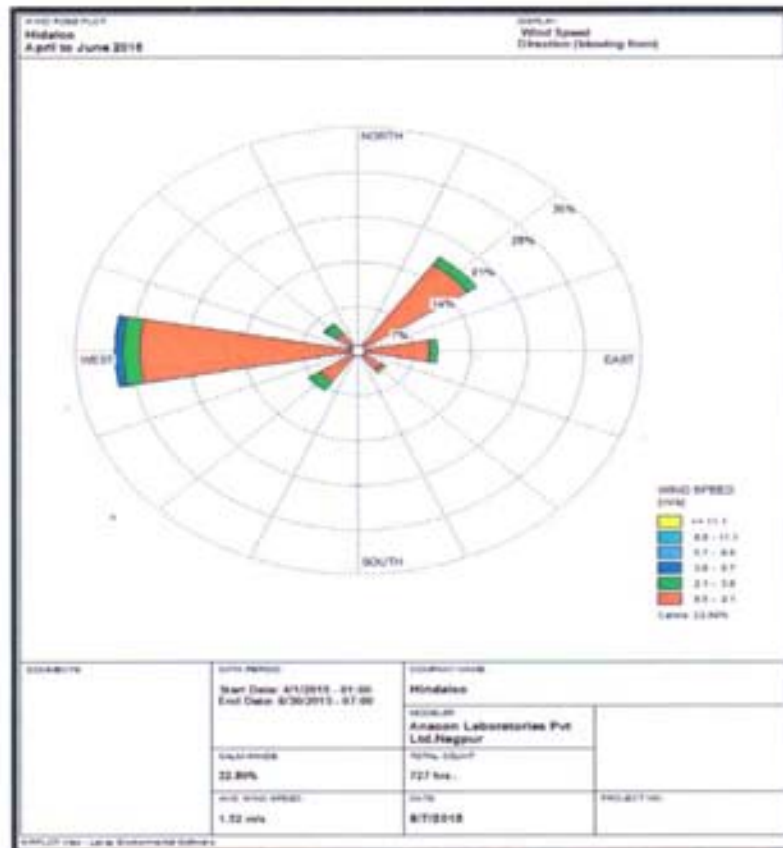


Figure 2: Wind Rose Diagram (April-May-June, 2015)

1.9 Noise Environment

The Director General of Mines Safety in its circular No. DG (Tech)/18 of 1975, has prescribed the noise level in mining occupations (TLV) for workers, in an 8 hour shift period with unprotected ear as 90 dB(A) or less. There will be some noise sources in mines, which produce noise levels above 90 dB(A), however, the workers are not expected to be exposed continuously for 8 hours. In order to maintain this statutory requirement Noise monitoring has been carried out in and around the mining lease area.

Work zone noise level in the mining area shall increase due to blasting excavation and transportation. The impacts due to the mining activities on the noise levels shall be negligible if all the precautions for the elimination of the noise are taken. The mining activities will be undertaken during daytime only. The daytime equivalent noise levels, when all the machineries are in operation, shall be minimized as the machineries have been provided with noise control equipment. Noise monitoring carried out on monthly basis at eight locations namely core and buffer zone is shown in (Fig. 3).



Identification of sampling locations

Noise at different noise generating sources has been identified based on the activities in the village area and ambient noise due to traffic.

The noise monitoring has been conducted for determination of ambient noise levels in the mining area and villages. The noise levels at each location were recorded for 24 hours.

Method of Monitoring

Sound Pressure Level (SPL) measurements were monitored at eight locations. The readings were taken for every hour for 24 hours. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at eight locations within 10-km radius of the study area.

Noise level monitoring was carried out continuously for 24 hours with one hour interval starting at 06.00 hrs to 06.00 hrs next day.

Noise levels monitored during day and night at 8 locations are found to be below the stipulated standard of CPCB as for Industrial area as 75dB(A) and 70dB(A) for day and night respectively as given in **(Table 15)**.

Instrument used for monitoring

Noise levels were measured using integrated sound level meter manufactured by Envirotech made in India (Model no. SLM-100). This instrument is capable of measuring the Sound Pressure Level (SPL), Leq.

1.10 Water Quality

The existing status of water quality for ground water and surface water was assessed by collecting the water samples from underground wells from the pipapat/Nr. mining area and surface water sample from nallahs nearby mining area. The physico-chemical analysis of ground and surface water samples collected during study period reported as average of three month given in **(Table 16 & 17)**. The overall water quality found to be below the stipulated standards of IS 10500-2012 for ground water and found to be fit for drinking purpose for tested parameters. Surface water quality is satisfactory as per IS 10500-2012 for surface water. Thus the impacts due to mining activities in each month have been found to be insignificant.



Table 6
Statistical analysis of SPM

Unit : $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat /Nr.Mining Area	April-2015	212	247	230	230	246
	May-2015	241	268	255	255	267
	June-2015	182	191	187	187	191
Betpani	April-2015	201	239	220	220	238
	May-2015	194	218	206	206	218
	June-2015	164	173	169	169	173
Virhorepat	April-2015	207	238	223	223	237
	May-2015	217	249	233	233	248
	June-2015	194	218	206	206	218
Tatijharia Village/Nr.Weigh Bridge	April-2015	227	261	244	244	260
	May-2015	231	273	252	252	272
	June-2015	164	179	172	172	179
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	154	173	164	164	173
	May-2015	163	191	177	177	190
	June-2015	137	154	146	146	154
Sairaidh Campus	April-2015	161	173	167	167	173
	May-2015	168	181	175	175	181
	June-2015	143	163	153	153	163
Rajendrapur/ Nr.Mining Area	April-2015	139	161	150	150	161
	May-2015	147	173	160	160	172
	June-2015	152	181	167	167	180
Dumerkholi/ Nr.Mining Area	April-2015	167	201	184	184	200
	May-2015	171	217	194	194	216
	June-2015	139	154	147	147	154

Fugitive Emission (Core Zone):- (Average of SPM April-May-June-2015)

Piprapat /Nr.Mining Area: For the Months of April-May-June-2015 Average of SPM is $224 \mu\text{g}/\text{m}^3$.


Betpani:- For the Months of April-May-June-2015 Average of SPM is $198 \mu\text{g}/\text{m}^3$.

Virhorepat:- For the Months of April-May-June-2015 Average of SPM is $221 \mu\text{g}/\text{m}^3$.

Tatijharia Village/Nr.Weigh Bridge:- For the Months of April-May-June-2015 Average of SPM is $223 \mu\text{g}/\text{m}^3$.

Buffer Zone :-

Kutku Village/ Nr.V.T.Center:- For the Months of April-May-June-2015 Average of SPM is $162 \mu\text{g}/\text{m}^3$.

	<p style="text-align: center;"><i>Hindalco Industries Limited</i> <i>Tatijharia Mining Environmental Status Report for</i> <i>April-2015 to June-2015</i></p>	<p style="text-align: center;"><i>Introduction</i></p>
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Sairaidh Campus:- For the Months of April-May-June-2015 Average of SPM is 165 $\mu\text{g}/\text{m}^3$.

Rajendrapur/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of SPM is 159 $\mu\text{g}/\text{m}^3$.

Dumerkholi/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of SPM is 175 $\mu\text{g}/\text{m}^3$.

Monthwise Summary of Statistical Analysis of SPM

1.11 Fugitive Emission (Core Zone)

1.11.1 Presentation of Results

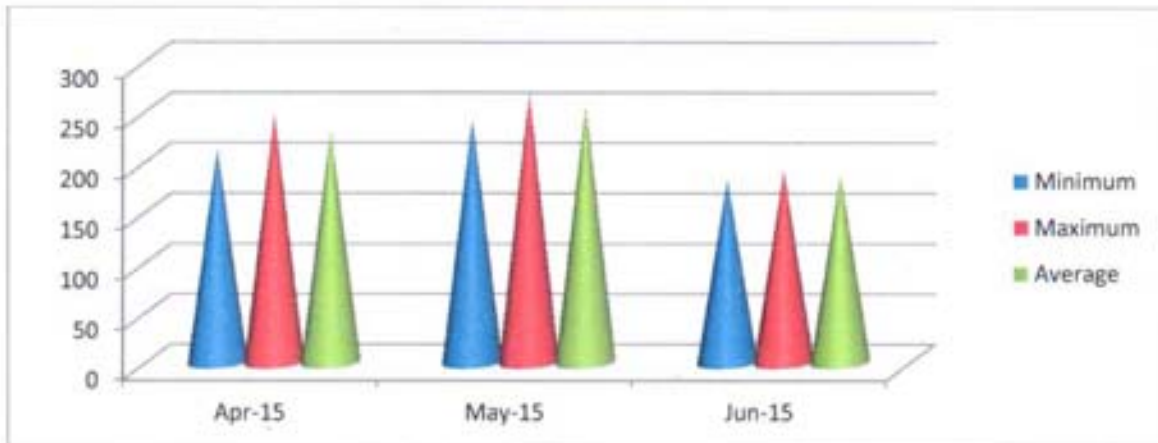
The summary of Statistical Analysis of SPM results for the month of April 2015 to June 2015 are presented in detail in **Table 6**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as 212 $\mu\text{g}/\text{m}^3$ and 247 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 230 $\mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as 241 $\mu\text{g}/\text{m}^3$ and 268 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 255 $\mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as 182 $\mu\text{g}/\text{m}^3$ and 191 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 187 $\mu\text{g}/\text{m}^3$.



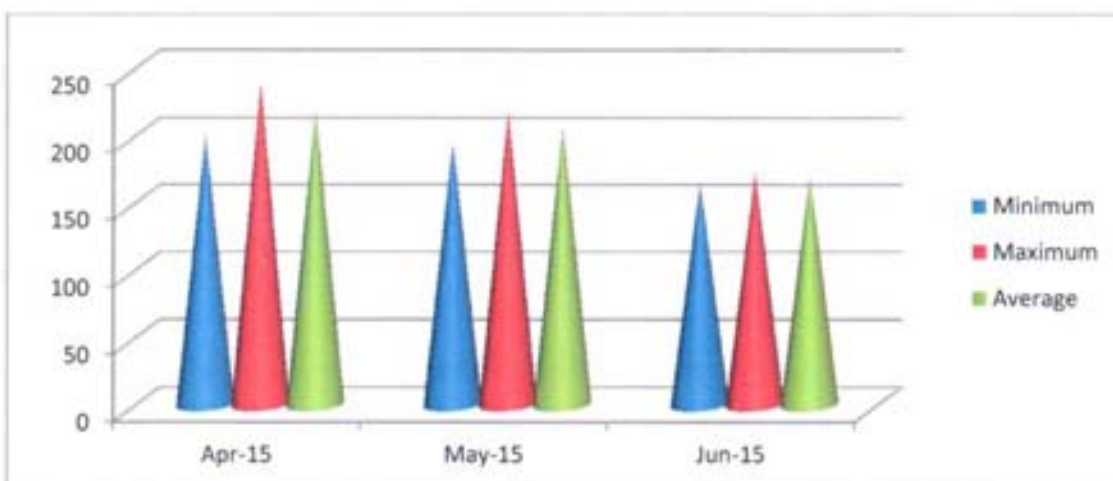
Graph :- Piprapat / Nr.Mining Area

Betpani

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $201 \mu\text{g}/\text{m}^3$ and $239 \mu\text{g}/\text{m}^3$ respectively and average concentration of $220 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $194 \mu\text{g}/\text{m}^3$ and $218 \mu\text{g}/\text{m}^3$ respectively and average concentration of $206 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $164 \mu\text{g}/\text{m}^3$ and $173 \mu\text{g}/\text{m}^3$ respectively and average concentration of $169 \mu\text{g}/\text{m}^3$.



Graph:- Betpani

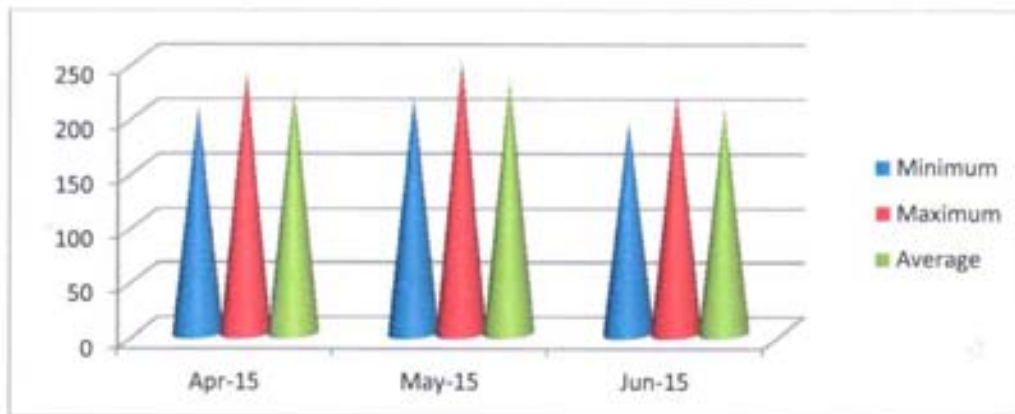


Virhorepat

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $207 \mu\text{g}/\text{m}^3$ and $238 \mu\text{g}/\text{m}^3$ respectively and average concentration of $223 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $217 \mu\text{g}/\text{m}^3$ and $249 \mu\text{g}/\text{m}^3$ respectively and average concentration of $233 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $194 \mu\text{g}/\text{m}^3$ and $218 \mu\text{g}/\text{m}^3$ respectively and average concentration of $206 \mu\text{g}/\text{m}^3$.



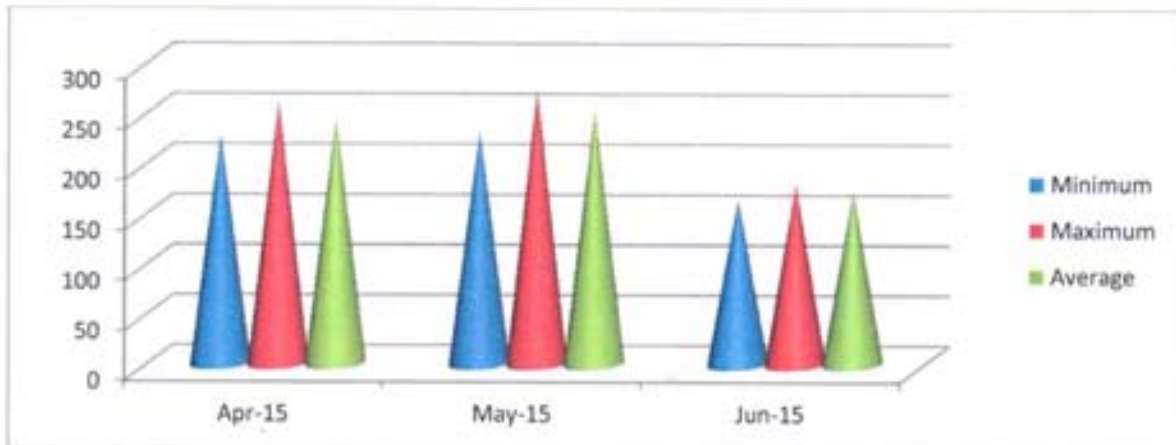
Graph:- Virhorepat

Tatijharia Village/Nr.Weigh Bridge

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $227 \mu\text{g}/\text{m}^3$ and $261 \mu\text{g}/\text{m}^3$ respectively and average concentration of $244 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $231 \mu\text{g}/\text{m}^3$ and $273 \mu\text{g}/\text{m}^3$ respectively and average concentration of $252 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $164 \mu\text{g}/\text{m}^3$ and $179 \mu\text{g}/\text{m}^3$ respectively and average concentration of $172 \mu\text{g}/\text{m}^3$.



Graph:- Tatijharia Village/Nr.Weigh Bridge

1.12 Fugitive Emission (Buffer Zone)

1.12.1 Presentation of Results

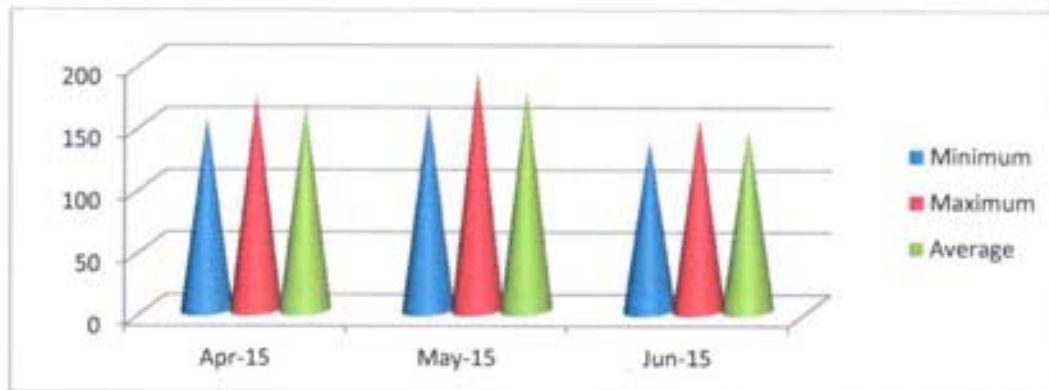
The summary of Statistical Analysis of SPM results for the month of April- 2015 to June- 2015 are presented in detail in **Table 6**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr. V.T.Center

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $154 \mu\text{g}/\text{m}^3$ and $173 \mu\text{g}/\text{m}^3$ respectively and average concentration of $164 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $163 \mu\text{g}/\text{m}^3$ and $191 \mu\text{g}/\text{m}^3$ respectively and average concentration of $177 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $137 \mu\text{g}/\text{m}^3$ and $154 \mu\text{g}/\text{m}^3$ respectively and average concentration of $146 \mu\text{g}/\text{m}^3$.



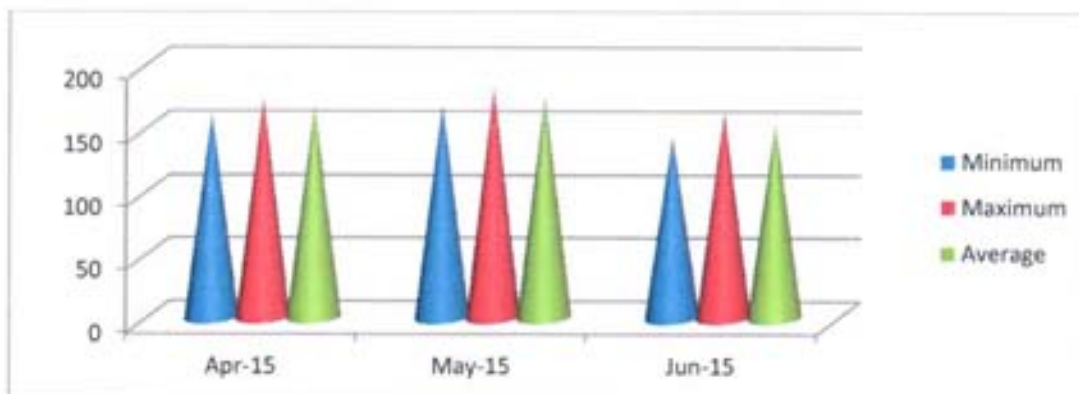
Graph:- Kutku Village / Nr. V.T.Center

Sairaidh Campus

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $161 \mu\text{g}/\text{m}^3$ and $173 \mu\text{g}/\text{m}^3$ respectively and average concentration of $167 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $168 \mu\text{g}/\text{m}^3$ and $181 \mu\text{g}/\text{m}^3$ respectively and average concentration of $175 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $143 \mu\text{g}/\text{m}^3$ and $163 \mu\text{g}/\text{m}^3$ respectively and average concentration of $153 \mu\text{g}/\text{m}^3$.



Graph:- Sairaidh Campus

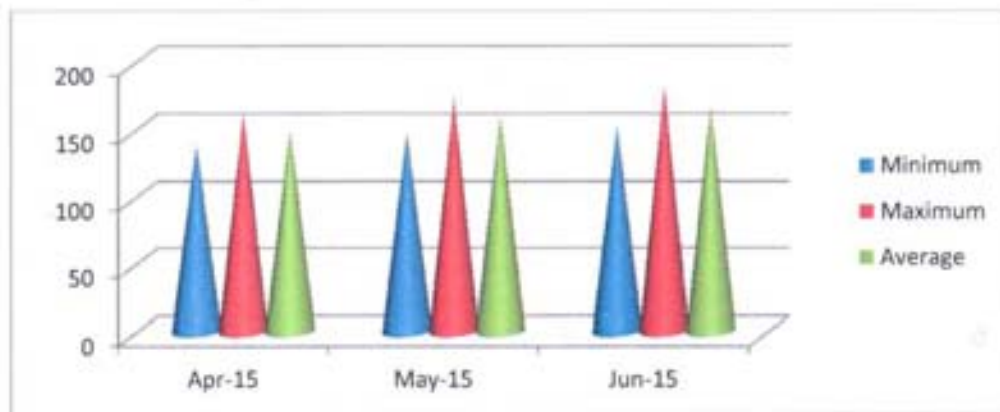


Rajendrapur / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $139 \mu\text{g}/\text{m}^3$ and $161 \mu\text{g}/\text{m}^3$ respectively and average concentration of $150 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $147 \mu\text{g}/\text{m}^3$ and $173 \mu\text{g}/\text{m}^3$ respectively and average concentration of $160 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $152 \mu\text{g}/\text{m}^3$ and $181 \mu\text{g}/\text{m}^3$ respectively and average concentration of $167 \mu\text{g}/\text{m}^3$.



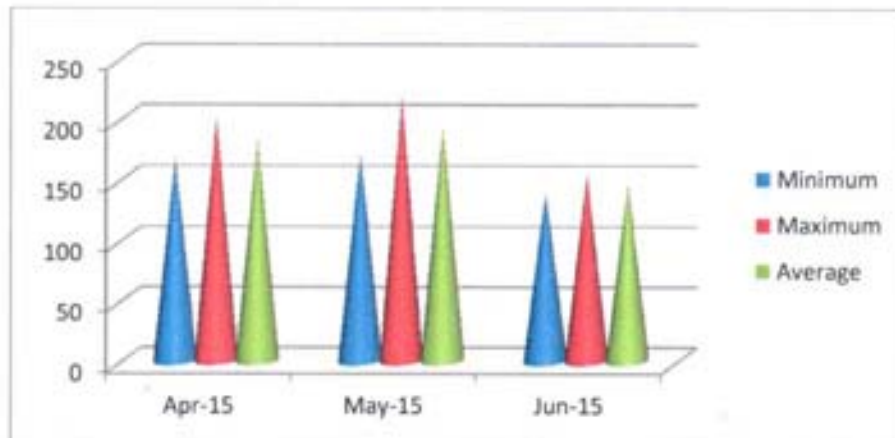
Graph:- Rajendrapur / Nr.Mining Area

Dumerkholi / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SPM were recorded as $167 \mu\text{g}/\text{m}^3$ and $201 \mu\text{g}/\text{m}^3$ respectively and average concentration of $184 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SPM were recorded as $171 \mu\text{g}/\text{m}^3$ and $217 \mu\text{g}/\text{m}^3$ respectively and average concentration of $194 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SPM were recorded as $139 \mu\text{g}/\text{m}^3$ and $154 \mu\text{g}/\text{m}^3$ respectively and average concentration of $147 \mu\text{g}/\text{m}^3$.



Graph:- Dumerkholi / Nr.Mining Area

Table 7
Statistical analysis of RSPM

Unit : $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat /Nr.Mining Area	April-2015	53	67	60	60	67
	May-2015	57	72	65	65	72
	June-2015	48	56	52	52	56
Betpani	April-2015	52	64	58	58	64
	May-2015	48	59	54	54	59
	June-2015	43	48	46	46	48
Virhorepat	April-2015	57	64	61	61	64
	May-2015	54	61	58	58	61
	June-2015	43	59	51	51	59
Tatijharia Village/Nr.Weigh Bridge	April-2015	58	67	63	63	67
	May-2015	52	64	58	58	64
	June-2015	46	57	52	52	57
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	43	48	46	46	48
	May-2015	47	56	52	52	56
	June-2015	38	47	43	43	47
Sairaidh Campus	April-2015	46	53	50	50	53
	May-2015	49	64	57	57	64
	June-2015	43	52	48	48	52
Rajendrapur/ Nr.Mining Area	April-2015	52	63	58	58	63
	May-2015	56	68	62	62	68
	June-2015	49	57	53	53	57
Dumerkholi/ Nr.Mining Area	April-2015	46	51	49	49	51
	May-2015	53	64	59	59	64
	June-2015	43	49	46	46	49
CPCB Standard	100 $\mu\text{g}/\text{m}^3$ (24 hrs)					

Note :- All the Values are in CPCB Limit



Fugitive Emission (Core Zone):- (Average of RSPM April-May-June-2015)

Piprapat /Nr.Mining Area: For the Months of April-May-June-2015 Average of RSPM is $59 \mu\text{g}/\text{m}^3$.

Betpani:- For the Months of April-May-June-2015 Average of RSPM is $53 \mu\text{g}/\text{m}^3$.

Virhorepat:- For the Months of April-May-June-2015 Average of RSPM is $57 \mu\text{g}/\text{m}^3$.

Tatijharia Village/Nr.Weigh Bridge:- For the Months of April-May-June-2015 Average of RSPM is $58 \mu\text{g}/\text{m}^3$.

Buffer Zone :-

Kutku Village/ Nr.V.T.Center:- For the Months of April-May-June-2015 Average of RSPM is $47 \mu\text{g}/\text{m}^3$.

Sairaidh Campus:- For the Months of April-May-June-2015 Average of RSPM is $52 \mu\text{g}/\text{m}^3$.

Rajendrapur/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of RSPM is $58 \mu\text{g}/\text{m}^3$.

Dumerkholi/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of RSPM is $51 \mu\text{g}/\text{m}^3$.

Monthwise Summary of Statistical Analysis of RSPM

2.0 Fugitive Emission (Core Zone)

2.1 Presentation of Results

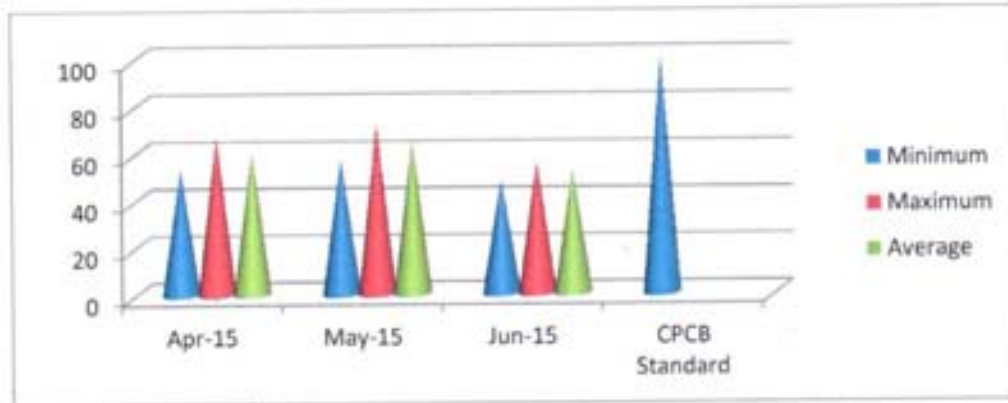
The summary of Statistical Analysis of RSPM results for the month of April-2015 to June 2015 are presented in detail in **Table 7**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as $53 \mu\text{g}/\text{m}^3$ and $67 \mu\text{g}/\text{m}^3$ respectively and average concentration of $60 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as $57 \mu\text{g}/\text{m}^3$ and $72 \mu\text{g}/\text{m}^3$ respectively and average concentration of $65 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as $48 \mu\text{g}/\text{m}^3$ and $56 \mu\text{g}/\text{m}^3$ respectively and average concentration of $52 \mu\text{g}/\text{m}^3$.



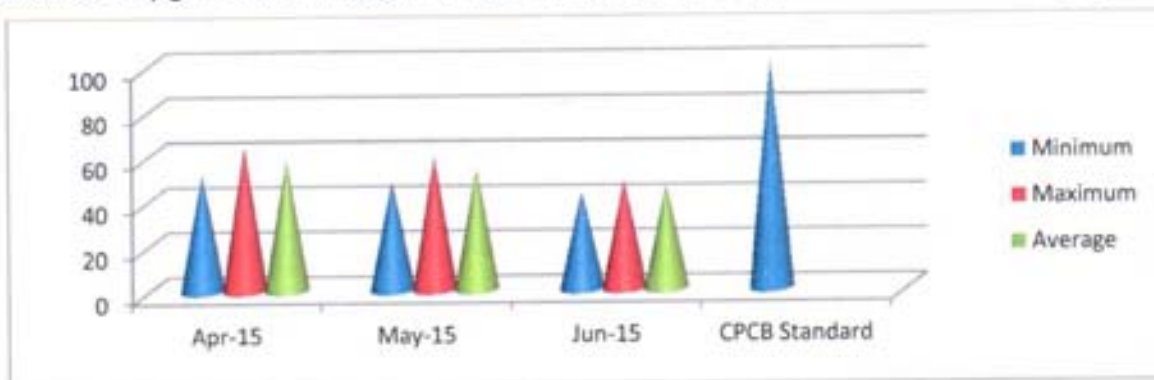
Graph :- Piprapat / Nr. Mining Area

Betpani

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as $52 \mu\text{g}/\text{m}^3$ and $64 \mu\text{g}/\text{m}^3$ respectively and average concentration of $58 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as $48 \mu\text{g}/\text{m}^3$ and $59 \mu\text{g}/\text{m}^3$ respectively and average concentration of $54 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as $43 \mu\text{g}/\text{m}^3$ and $48 \mu\text{g}/\text{m}^3$ respectively and average concentration of $46 \mu\text{g}/\text{m}^3$.



Graph:- Betpani

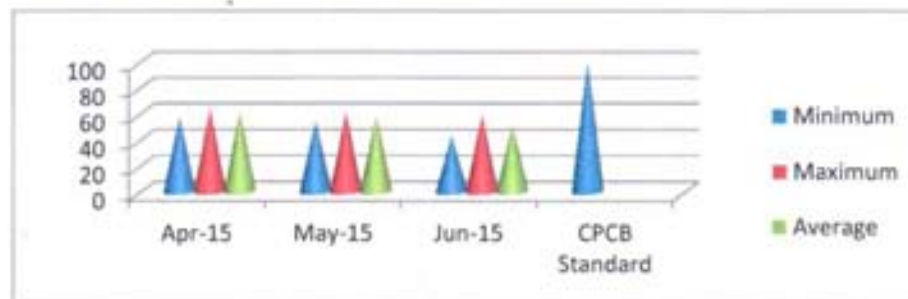


Virhorepat

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as $57 \mu\text{g}/\text{m}^3$ and $64 \mu\text{g}/\text{m}^3$ respectively and average concentration of $61 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as $54 \mu\text{g}/\text{m}^3$ and $61 \mu\text{g}/\text{m}^3$ respectively and average concentration of $58 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as $43 \mu\text{g}/\text{m}^3$ and $59 \mu\text{g}/\text{m}^3$ respectively and average concentration of $51 \mu\text{g}/\text{m}^3$.



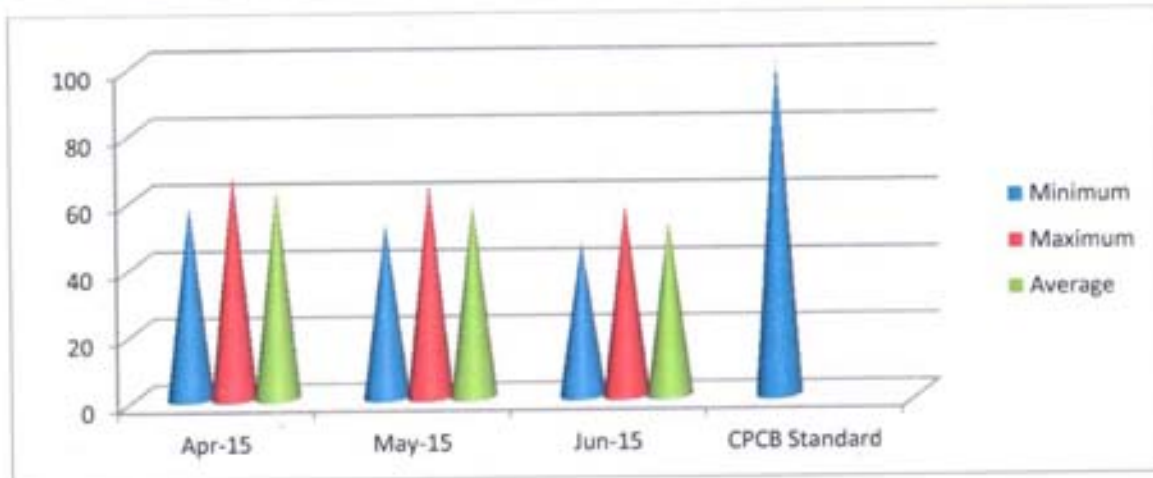
Graph:- Virhorepat

Tatijharia Village/Nr.Weigh Bridge

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as $58 \mu\text{g}/\text{m}^3$ and $67 \mu\text{g}/\text{m}^3$ respectively and average concentration of $63 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as $52 \mu\text{g}/\text{m}^3$ and $64 \mu\text{g}/\text{m}^3$ respectively and average concentration of $58 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as $46 \mu\text{g}/\text{m}^3$ and $57 \mu\text{g}/\text{m}^3$ respectively and average concentration of $52 \mu\text{g}/\text{m}^3$.



Graph:- Tatijharia Village/Nr. Weigh Bridge

2.2 Fugitive Emission (Buffer Zone)

2.2.1 Presentation of Results

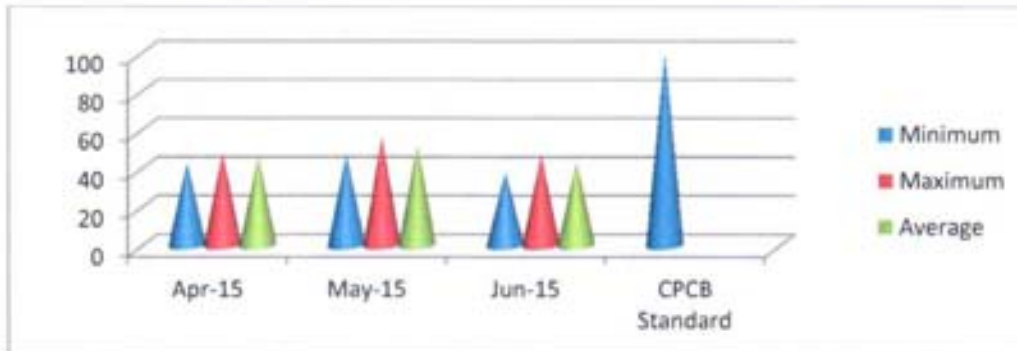
The summary of Statistical Analysis of RSPM results for the month of April 2015 to June 2015 are presented in detail in **Table 7**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr. V.T.Center

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as 43 µg/m³ and 48 µg/m³ respectively and average concentration of 46 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as 47 µg/m³ and 56 µg/m³ respectively and average concentration of 52 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as 38 µg/m³ and 47 µg/m³ respectively and average concentration of 43 µg/m³.



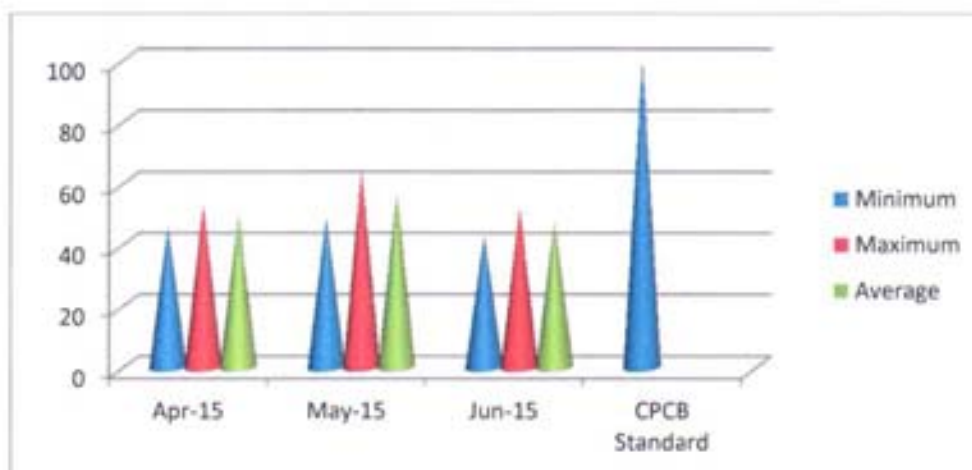
Graph:- Kutku Village / Nr. V.T.Center

Sairaidh Campus

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as $46 \mu\text{g}/\text{m}^3$ and $53 \mu\text{g}/\text{m}^3$ respectively and average concentration of $50 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as $49 \mu\text{g}/\text{m}^3$ and $64 \mu\text{g}/\text{m}^3$ respectively and average concentration of $57 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as $43 \mu\text{g}/\text{m}^3$ and $52 \mu\text{g}/\text{m}^3$ respectively and average concentration of $48 \mu\text{g}/\text{m}^3$.



Graph:- Sairaidh Campus

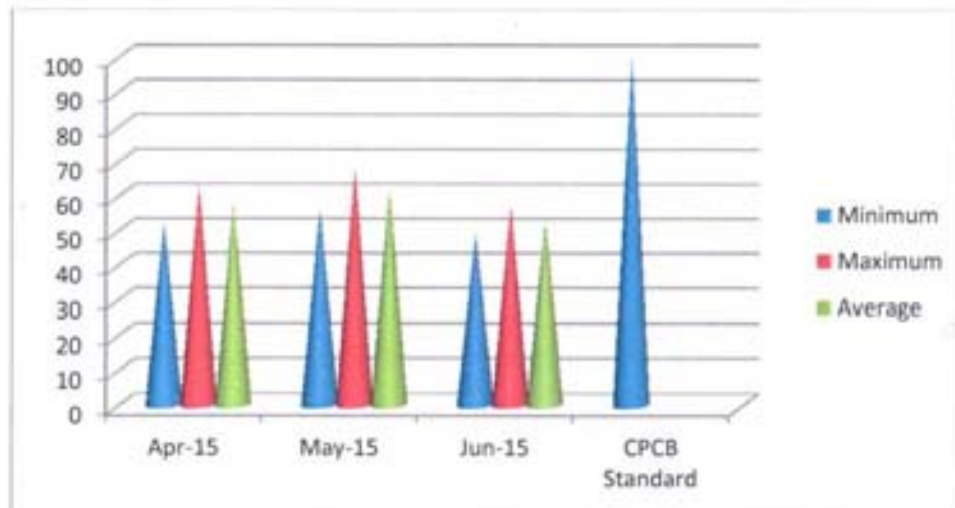


Rajendrapur / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as 52 $\mu\text{g}/\text{m}^3$ and 63 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 58 $\mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as 56 $\mu\text{g}/\text{m}^3$ and 68 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 62 $\mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as 49 $\mu\text{g}/\text{m}^3$ and 57 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 53 $\mu\text{g}/\text{m}^3$.



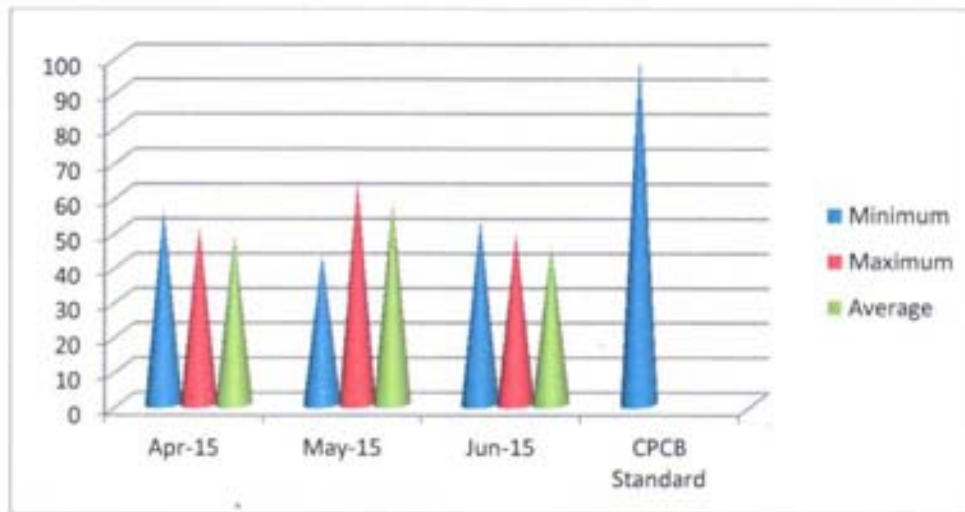
Graph:- Rajendrapur / Nr.Mining Area

Dumerkholi / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for RSPM were recorded as 46 $\mu\text{g}/\text{m}^3$ and 51 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 49 $\mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for RSPM were recorded as 53 $\mu\text{g}/\text{m}^3$ and 64 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 59 $\mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for RSPM were recorded as 43 $\mu\text{g}/\text{m}^3$ and 49 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 46 $\mu\text{g}/\text{m}^3$.



Graph:- Dumerkholi / Nr.Mining Area

Table 8
Statistical analysis of PM 2.5

Location	Month & Year	Min.	Max.	Unit : $\mu\text{g}/\text{m}^3$		
				A.M.	G.M.	98%
Nr.Mining Area	April-2015	16	23	20	20	23
	May-2015	18	27	23	23	27
	June-2015	14	18	16	16	18
CPCB Standard		60 $\mu\text{g}/\text{m}^3$ (24 hrs)				

Note :- All the Values are in CPCB Limit

Nr.Mining Area: For the Months of April-May- June- 2015 Average of $\text{PM}_{2.5}$ is $20 \mu\text{g}/\text{m}^3$.

Monthwise Summary of Statistical Analysis of $\text{PM}_{2.5}$

2.3 Presentation of Results

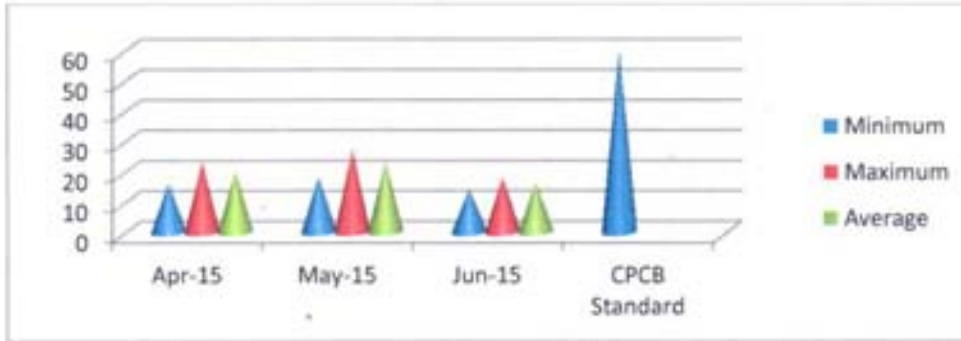
The summary of Statistical Analysis of $\text{PM}_{2.5}$ results for the month of April 2015 to June 2015 are presented in detail in **Table 8**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data.

Nr.Mining Area

For the month of April-2015 the minimum and maximum concentrations for $\text{PM}_{2.5}$ were recorded as $16 \mu\text{g}/\text{m}^3$ and $23 \mu\text{g}/\text{m}^3$ respectively and average concentration of $20 \mu\text{g}/\text{m}^3$.



For the month of May-2015 the minimum and maximum concentrations for $PM_{2.5}$ were recorded as $18 \mu g/m^3$ and $27 \mu g/m^3$ respectively and average concentration of $23 \mu g/m^3$. For the month of June-2015 the minimum and maximum concentrations for $PM_{2.5}$ were recorded as $14 \mu g/m^3$ and $18 \mu g/m^3$ respectively and average concentration of $16 \mu g/m^3$



Graph :- Nr.Mining Area



Table 9
Statistical Analysis of SO₂

Unit: µg/m³

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat/ Nr.Mining Area	April-2015	8	11	10	10	11
	May-2015	7	12	10	10	12
	June-2015	6	9	8	8	9
Betpani	April-2015	8	12	10	10	12
	May-2015	8	13	11	11	13
	June-2015	6	9	8	8	9
Virhorepat	April-2015	7	12	10	10	12
	May-2015	9	13	11	11	13
	June-2015	6	8	7	7	8
Tatijharia Village/Nr.Weigh Bridge	April-2015	7	13	10	10	13
	May-2015	6	11	9	9	11
	June-2015	7	9	8	8	9
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	7	11	9	9	11
	May-2015	6	9	8	8	9
	June-2015	7	9	8	8	9
Sairaidh Campus	April-2015	6	8	7	7	8
	May-2015	7	11	9	9	11
	June-2015	7	9	8	8	9
Rajendrapur/ Nr.Mining Area	April-2015	8	12	10	10	12
	May-2015	6	9	8	8	9
	June-2015	6	8	7	7	8
Dumerkholi/ Nr.Mining Area	April-2015	7	11	9	9	11
	May-2015	6	8	7	7	8
	June-2015	6	9	8	8	9
CPCB Standard		80 µg/m³ (24 hrs)				

Note :- All the Values are in CPCB Limit

Fugitive Emission (Core Zone):- (Average of SO₂ April-May-June-2015)

Piprapat /Nr.Mining Area: For the Months of April-May-June-2015 Average of SO₂ is 9 µg/m³.

Betpani:- For the Months of April-May-June-2015 Average of SO₂ is 10 µg/m³.

Virhorepat:- For the Months of April-May-June-2015 Average of SO₂ is 9 µg/m³.

Tatijharia Village/Nr.Weigh Bridge:- For the Months of April-May-June-2015 Average of SO₂ is 9 µg/m³.

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Buffer Zone :-

Kutku Village/ Nr.V.T.Center:- For the Months of April-May-June-2015 Average of SO₂ is 8 µg/m³.

Sairaidh Campus:- For the Months of April-May-June-2015 Average of SO₂ is 8 µg/m³.

Rajendrapur/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of SO₂ is 8 µg/m³..

Dumerkholi/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of SO₂ is 8 µg/m³.

Monthwise Summary of Statistical Analysis of SO₂

2.4 Fugitive Emission (Core Zone)

2.4.1 Presentation of Results

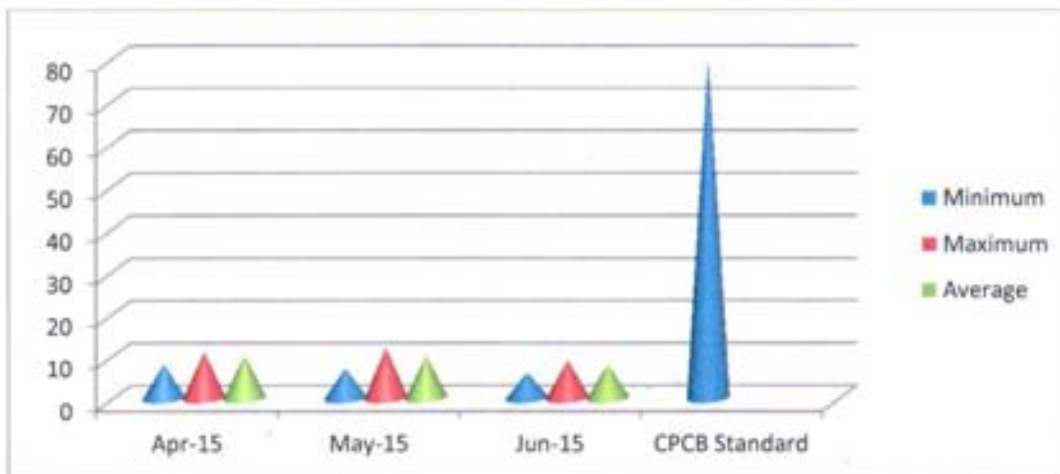
The summary of Statistical Analysis of SO₂ results for the month of April 2015 to June 2015 are presented in detail in **Table 9**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 8 µg/m³ and 11 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 12 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.



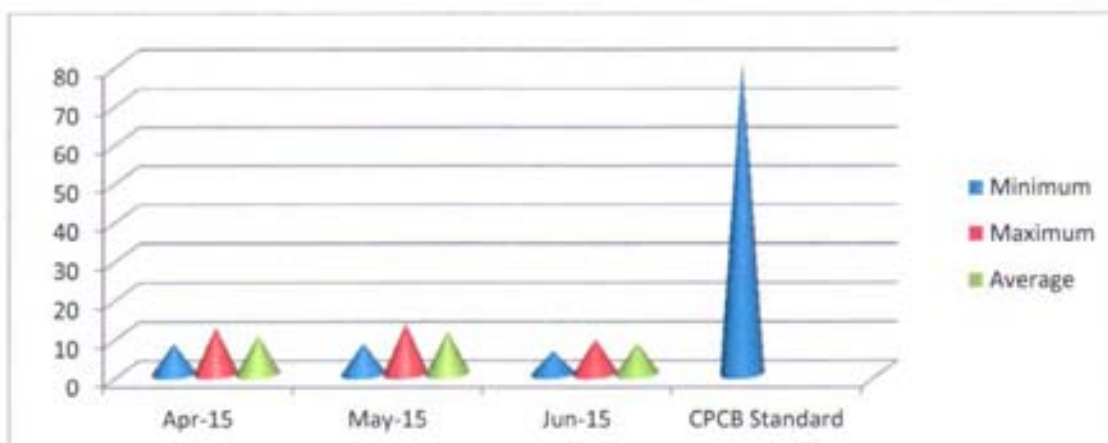
Graph :- Piprapat / Nr. Mining Area

Betpani

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 8 µg/m³ and 12 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 8 µg/m³ and 13 µg/m³ respectively and average concentration of 11 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.



Graph:- Betpani

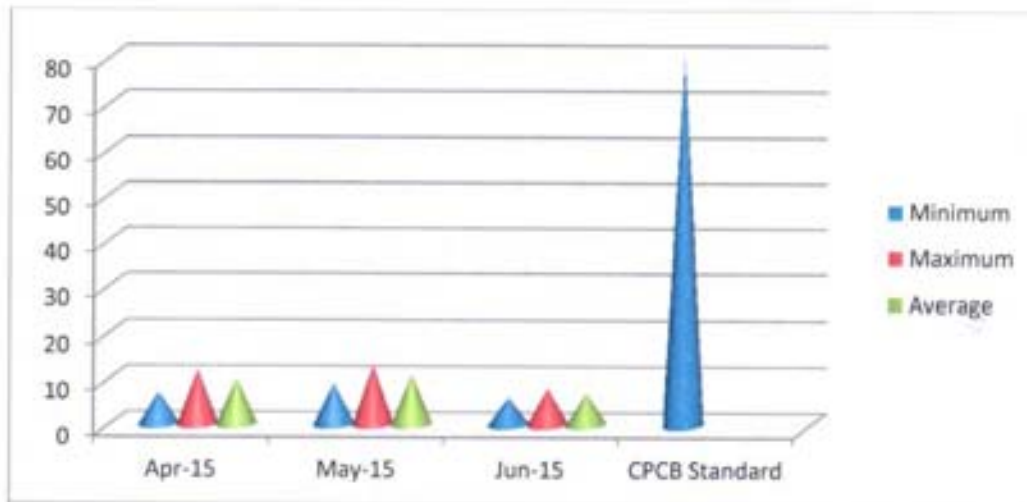


Virhorepat

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 12 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 9 µg/m³ and 13 µg/m³ respectively and average concentration of 11 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 8 µg/m³ respectively and average concentration of 7 µg/m³.



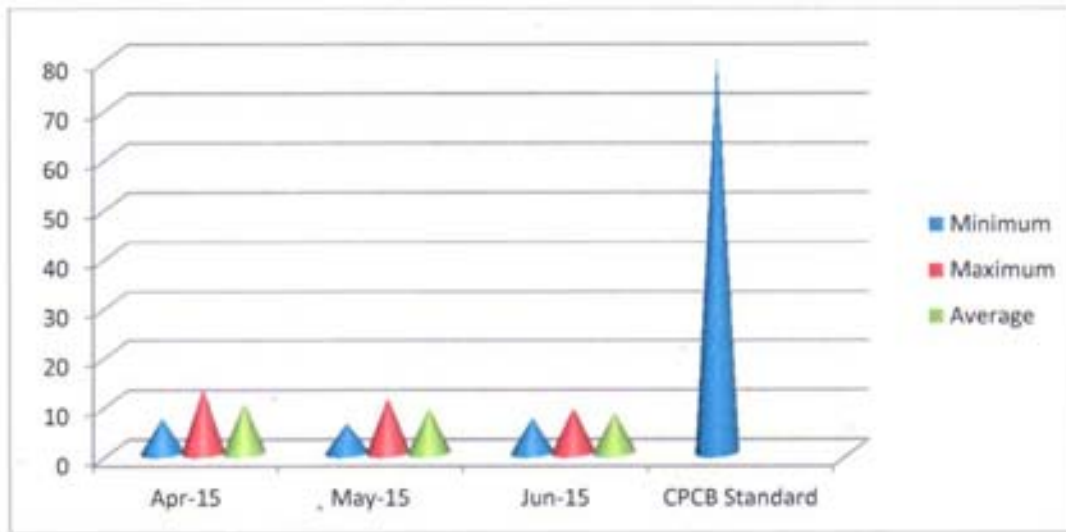
Graph:- Virhorepat

Tatijharia Village/Nr.Weigh Bridge

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 13 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 11 µg/m³ respectively and average concentration of 9 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.



Graph:- Tatijharia Village/Nr.Weigh Bridge

2.5 Fugitive Emission (Buffer Zone)

2.5.1 Presentation of Results

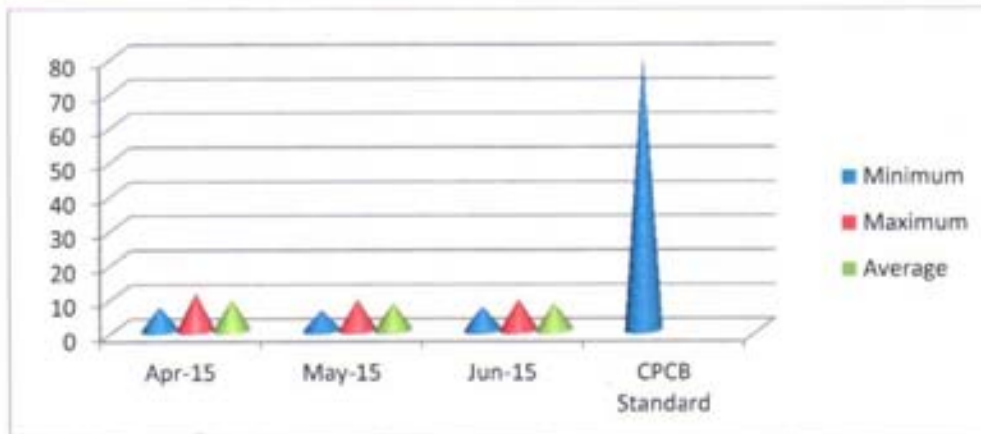
The summary of Statistical Analysis of SO₂ results for the month of April 2015 to June 2015 are presented in detail in **Table 9**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr. V.T.Center

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 11 µg/m³ respectively and average concentration of 9 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.



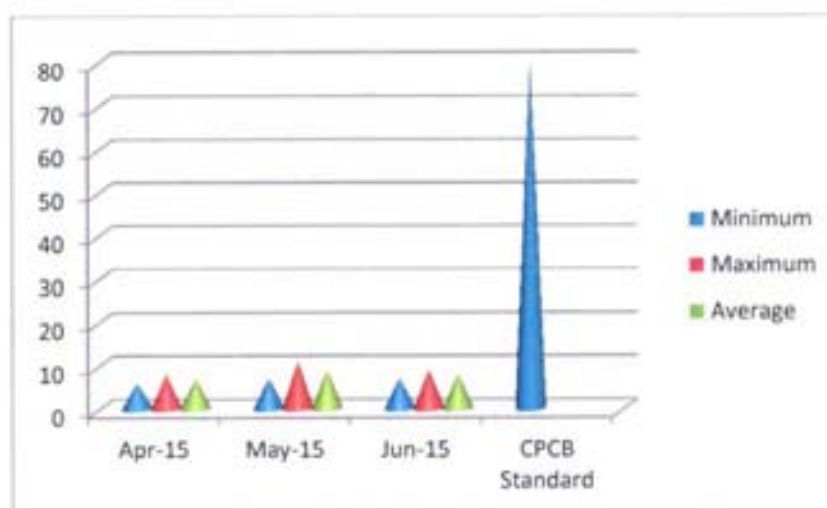
Graph:- Kutku Village / Nr. V.T.Center

Sairaidh Campus

For the Month of April-2015 the minimum and maximum concentrations for SO_2 were recorded as $6 \mu\text{g}/\text{m}^3$ and $8 \mu\text{g}/\text{m}^3$ respectively and average concentration of $7 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for SO_2 were recorded as $7 \mu\text{g}/\text{m}^3$ and $11 \mu\text{g}/\text{m}^3$ respectively and average concentration of $9 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for SO_2 were recorded as $7 \mu\text{g}/\text{m}^3$ and $9 \mu\text{g}/\text{m}^3$ respectively and average concentration of $8 \mu\text{g}/\text{m}^3$.



Graph:- Sairaidh Campus

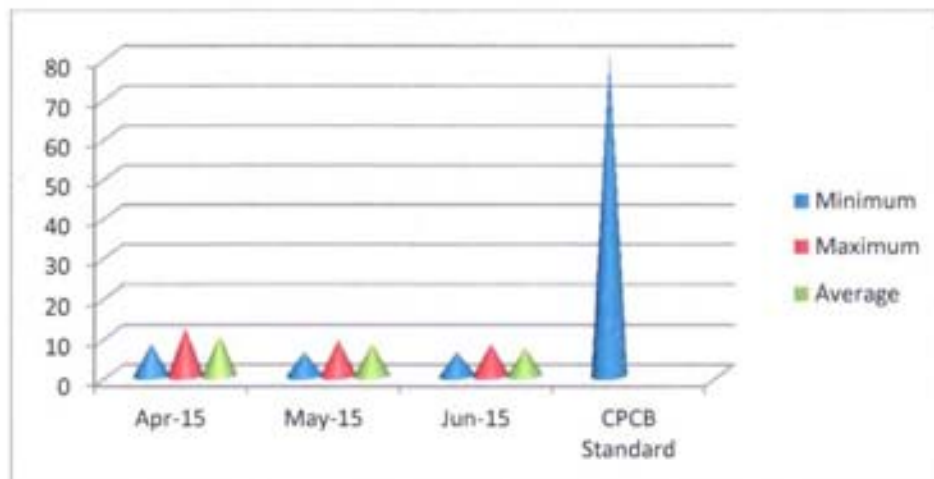


Rajendrapur / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 8 µg/m³ and 12 µg/m³ respectively and average concentration of 10 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 8 µg/m³ respectively and average concentration of 7 µg/m³.



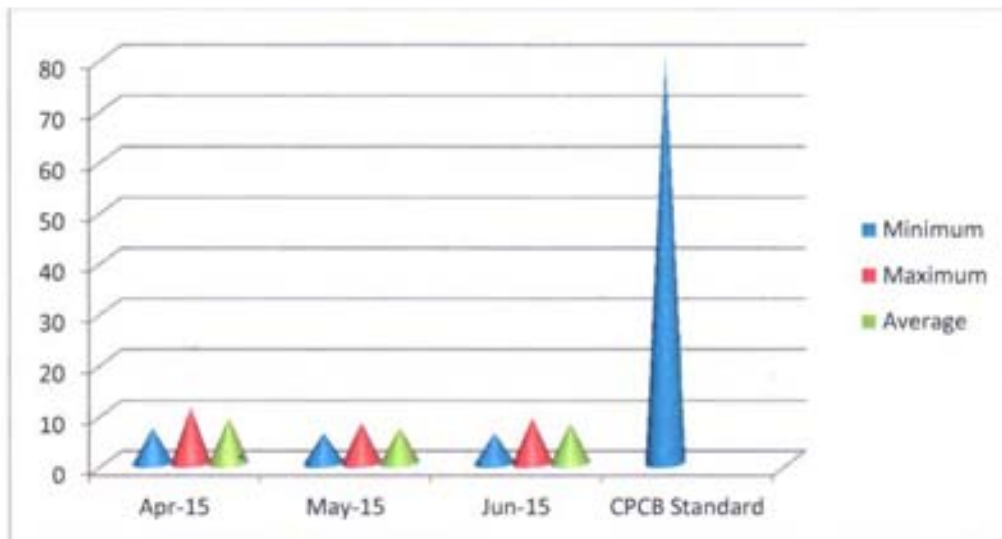
Graph:- Rajendrapur / Nr.Mining Area

Dumerkholi / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for SO₂ were recorded as 7 µg/m³ and 11 µg/m³ respectively and average concentration of 9 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 8 µg/m³ respectively and average concentration of 7 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for SO₂ were recorded as 6 µg/m³ and 9 µg/m³ respectively and average concentration of 8 µg/m³.



Graph:- Dumerkholi / Nr.Mining Area



Table 10
Statistical Analysis of NO_x

Unit : $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat/ Nr.Mining Area	April-2015	18	24	21	21	24
	May-2015	18	26	22	22	26
	June-2015	16	19	18	18	19
Betpani	April-2015	17	23	20	20	23
	May-2015	19	26	23	23	26
	June-2015	14	18	16	16	18
Virhorepat	April-2015	17	23	20	20	23
	May-2015	18	26	22	22	26
	June-2015	14	19	17	17	19
Tatijharia Village/Nr.Weigh Bridge	April-2015	23	29	26	26	29
	May-2015	26	31	29	29	31
	June-2015	21	24	23	23	24
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	16	19	18	18	19
	May-2015	18	23	21	21	23
	June-2015	14	18	16	16	18
Sairaidh Campus	April-2015	17	23	20	20	23
	May-2015	19	26	23	23	26
	June-2015	14	18	16	16	18
Rajendrapur/ Nr.Mining Area	April-2015	16	19	18	18	19
	May-2015	17	21	19	19	21
	June-2015	14	18	16	16	18
Dumerkholi/ Nr.Mining Area	April-2015	16	24	20	20	24
	May-2015	14	19	17	17	19
	June-2015	17	21	19	19	21
CPCB Standard				80 $\mu\text{g}/\text{m}^3$ (24 hrs)		

Note :- All the Values are in CPCB Limit

Fugitive Emission (Core Zone):- (Average of NO_x April-May-June-2015)

Piprapat /Nr.Mining Area: For the Months of April-May-June-2015 Average of NO_x is 20 $\mu\text{g}/\text{m}^3$.

Betpani:- For the Months of April-May-June-2015 Average of NO_x is 20 $\mu\text{g}/\text{m}^3$.

Virhorepat:- For the Months of April-May-June-2015 Average of NO_x is 20 $\mu\text{g}/\text{m}^3$.

Tatijharia Village/Nr.Weigh Bridge:- For the Months of April-May-June-2015 Average of NO_x is 26 $\mu\text{g}/\text{m}^3$.



Buffer Zone :-

Kutku Village/ Nr.V.T.Center:- For the Months of April-May-June-2015 Average of NO_x is 18 µg/m³.

Sairaidh Campus:- For the Months of April-May-June-2015 Average of NO_x is 20 µg/m³.

Rajendrapur/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of NO_x is 18 µg/m³.

Dumerkholi/ Nr.Mining Area:- For the Months of April-May-June-2015 Average of NO_x is 19 µg/m³.

Monthwise Summary of Statistical Analysis of NO_x

2.6 Fugitive Emission (Core Zone)

2.6.1 Presentation of Results

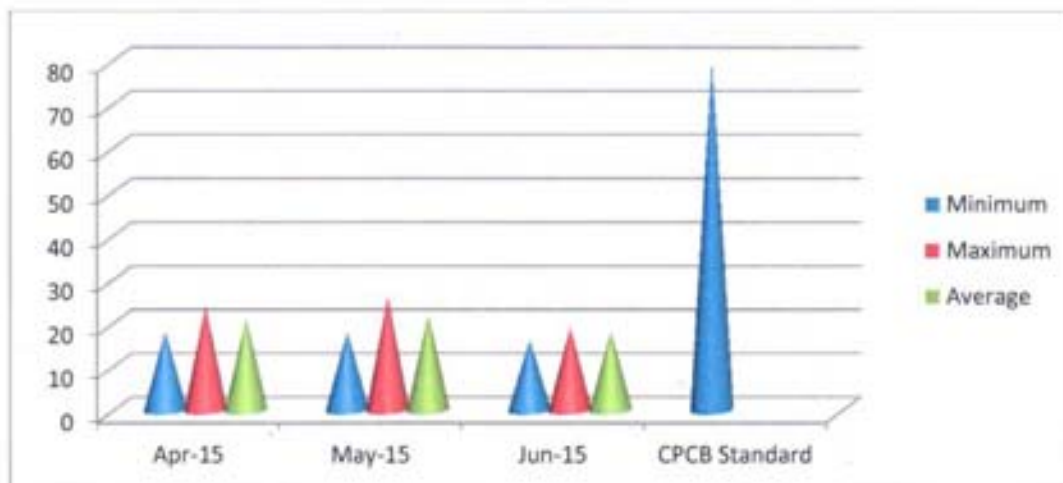
The summary of Statistical Analysis of NO_x results for the month of April 2015 to June 2015 are presented in detail in **Table 10**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 18 µg/m³ and 24 µg/m³ respectively and average concentration of 21 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 18 µg/m³ and 26 µg/m³ respectively and average concentration of 22 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 16 µg/m³ and 19 µg/m³ respectively and average concentration of 18 µg/m³.



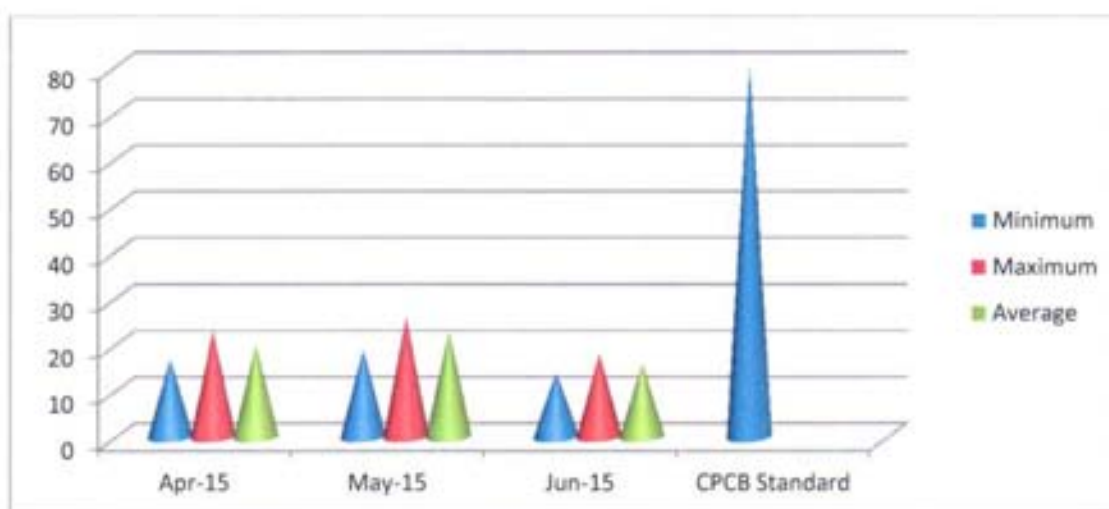
Graph :- Piprapat / Nr. Mining Area

Betpani

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as $17 \mu\text{g}/\text{m}^3$ and $23 \mu\text{g}/\text{m}^3$ respectively and average concentration of $20 \mu\text{g}/\text{m}^3$.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as $19 \mu\text{g}/\text{m}^3$ and $26 \mu\text{g}/\text{m}^3$ respectively and average concentration of $23 \mu\text{g}/\text{m}^3$.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as $14 \mu\text{g}/\text{m}^3$ and $18 \mu\text{g}/\text{m}^3$ respectively and average concentration of $16 \mu\text{g}/\text{m}^3$.



Graph:- Betpani

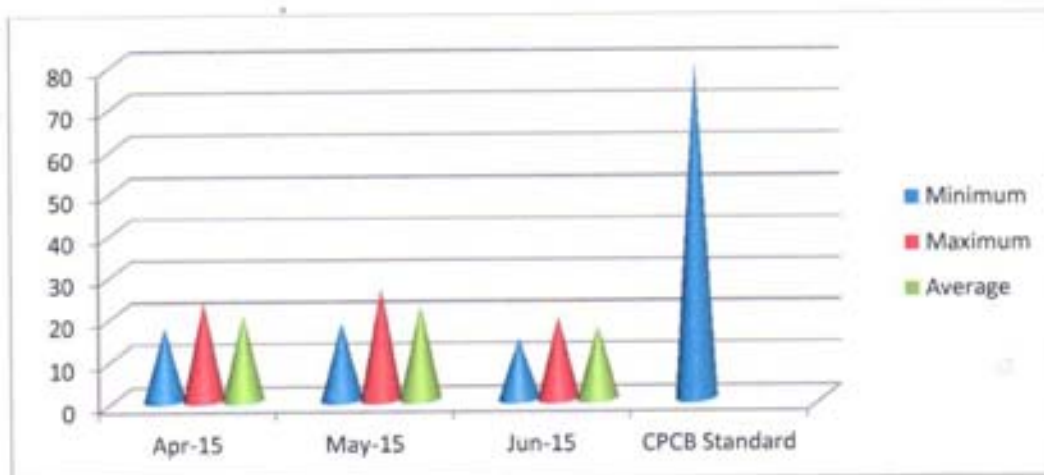


Virhorepat

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 17 µg/m³ and 23 µg/m³ respectively and average concentration of 20 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 18 µg/m³ and 26 µg/m³ respectively and average concentration of 22 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 14 µg/m³ and 19 µg/m³ respectively and average concentration of 17 µg/m³.



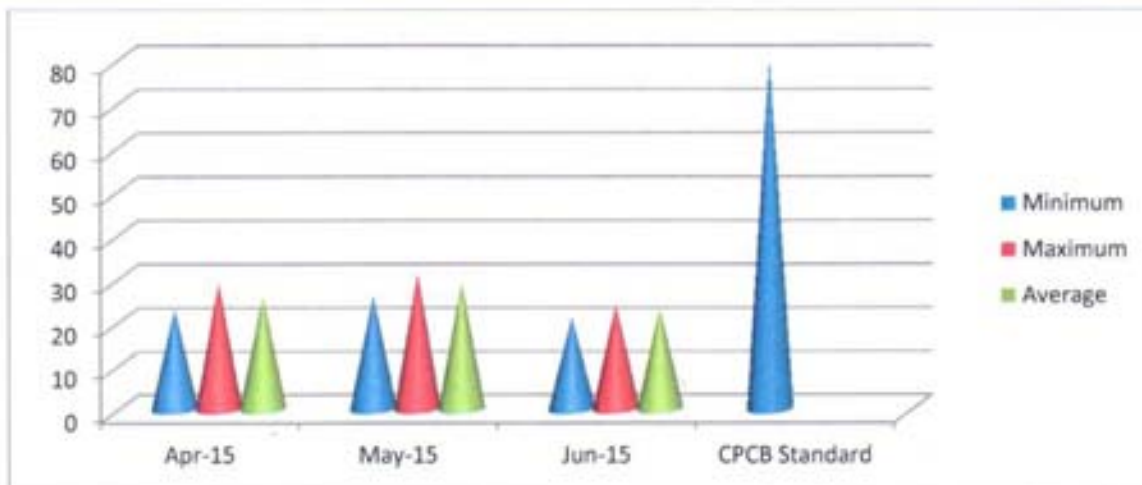
Graph:- Virhorepat

Tatijharia Village/Nr.Weigh Bridge

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 23 µg/m³ and 29 µg/m³ respectively and average concentration of 26 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 26 µg/m³ and 31 µg/m³ respectively and average concentration of 29 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 21 µg/m³ and 24 µg/m³ respectively and average concentration of 23 µg/m³.



Graph:- Tatijharia Village/Nr. Weigh Bridge

2.7 Fugitive Emission (Buffer Zone)

2.7.1 Presentation of Results

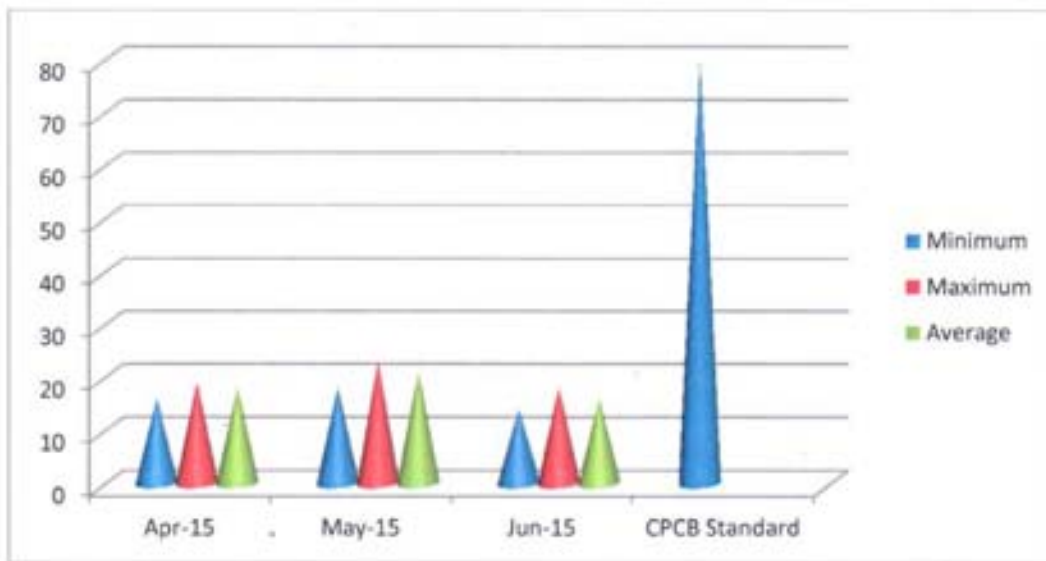
The summary of Statistical Analysis of NO_x results for the month of April 2015 to June 2015 are presented in detail in **Table 10**. 98th percentile; maximum, minimum and average values etc have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr. V.T.Center

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 16 µg/m³ and 19 µg/m³ respectively and average concentration of 18 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 18 µg/m³ and 23 µg/m³ respectively and average concentration of 21 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 14 µg/m³ and 18 µg/m³ respectively and average concentration of 16 µg/m³.



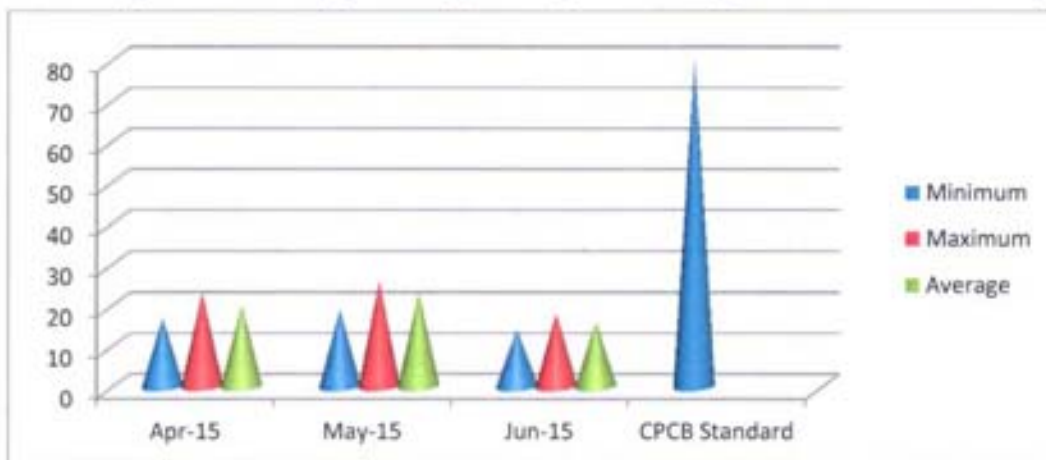
Graph:- Kutku Village / Nr. V.T.Center

Sairaidh Campus

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 17 µg/m³ and 23 µg/m³ respectively and average concentration of 20 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 19 µg/m³ and 26 µg/m³ respectively and average concentration of 23 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 14 µg/m³ and 18 µg/m³ respectively and average concentration of 16 µg/m³.



Graph:- Sairaidh Campus

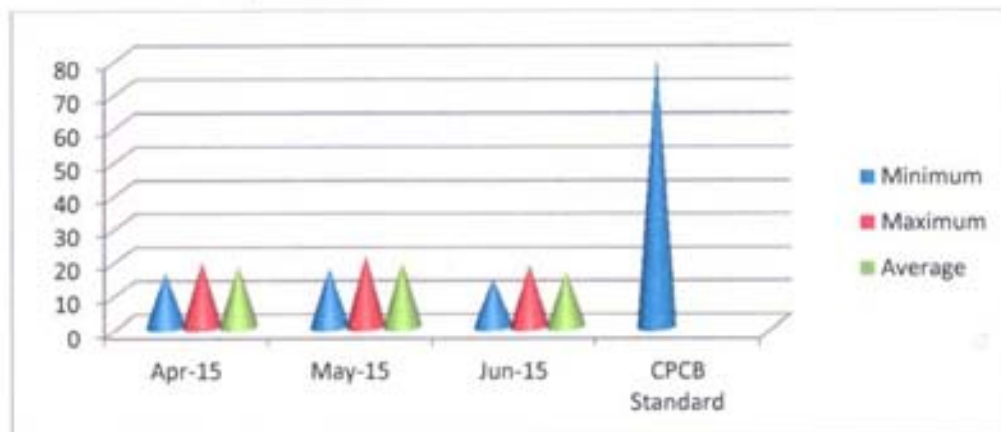


Rajendrapur / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 16 µg/m³ and 19 µg/m³ respectively and average concentration of 18 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 17 µg/m³ and 21 µg/m³ respectively and average concentration of 19 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 14 µg/m³ and 18 µg/m³ respectively and average concentration of 16 µg/m³.



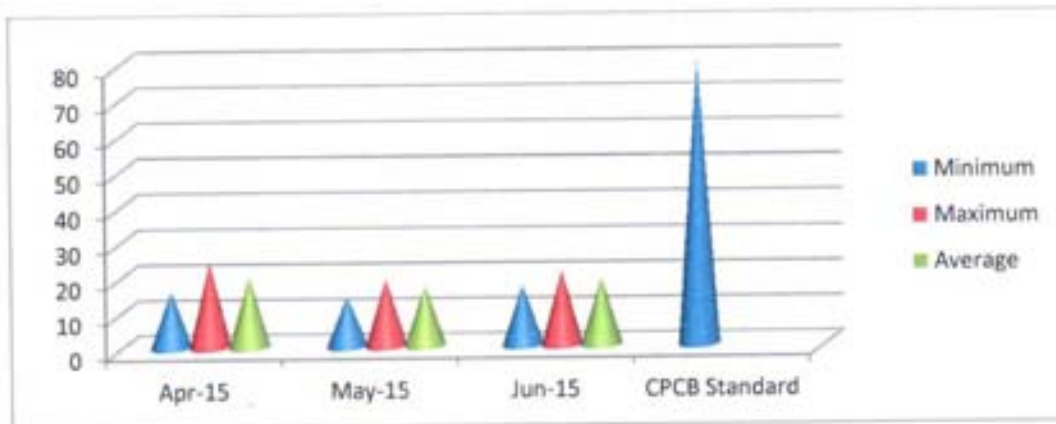
Graph:- Rajendrapur / Nr.Mining Area

Dumerkholi / Nr.Mining Area

For the Month of April-2015 the minimum and maximum concentrations for NO_x were recorded as 16 µg/m³ and 24 µg/m³ respectively and average concentration of 20 µg/m³.

For the Month of May-2015 the minimum and maximum concentrations for NO_x were recorded as 14 µg/m³ and 19 µg/m³ respectively and average concentration of 17 µg/m³.

For the Month of June-2015 the minimum and maximum concentrations for NO_x were recorded as 17 µg/m³ and 21 µg/m³ respectively and average concentration of 19 µg/m³.



Graph:- Dumerkholi / Nr.Mining Area



Table 11
Statistical Analysis of Pb

Unit: $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%ile
Fugitive Emission (Core Zone):-						
Piprapat/ Nr.Mining Area	April-2015	0.026	0.041	0.034	0.034	0.041
	May-2015	0.031	0.052	0.042	0.042	0.052
	June-2015	0.021	0.037	0.029	0.029	0.037
Betpani	April-2015	0.027	0.032	0.030	0.030	0.032
	May-2015	0.023	0.029	0.026	0.026	0.029
	June-2015	0.024	0.026	0.025	0.025	0.026
Virhorepat	April-2015	0.018	0.024	0.021	0.021	0.024
	May-2015	0.021	0.037	0.029	0.029	0.037
	June-2015	0.019	0.021	0.020	0.020	0.021
Tatijharia Village/Nr.Weigh Bridge	April-2015	0.031	0.051	0.041	0.041	0.051
	May-2015	0.034	0.057	0.046	0.046	0.057
	June-2015	0.019	0.043	0.031	0.031	0.043
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	May-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	June-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sairaidh Campus	April-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	May-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	June-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Rajendrapur/ Nr.Mining Area	April-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	May-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	June-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dumerkholi/ Nr.Mining Area	April-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	May-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	June-2015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
CPCB Standard				1.0 $\mu\text{g}/\text{m}^3$ (24 hrs)		

Note :- All the Values are in CPCB Limit



Table 12
Statistical Analysis of Hg

Unit: $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat/ Nr.Mining Area	April-2015	0.014	0.021	0.018	0.018	0.021
	May-2015	0.016	0.029	0.023	0.023	0.029
	June-2015	0.012	0.018	0.015	0.015	0.018
Betpani	April-2015	0.017	0.024	0.021	0.021	0.024
	May-2015	0.023	0.037	0.030	0.030	0.037
	June-2015	0.016	0.021	0.019	0.019	0.021
Virhorepat	April-2015	0.024	0.038	0.031	0.031	0.038
	May-2015	0.028	0.043	0.036	0.036	0.043
	June-2015	0.017	0.028	0.023	0.023	0.028
Tatijharia Village/Nr.Weigh Bridge	April-2015	0.018	0.031	0.025	0.025	0.031
	May-2015	0.021	0.029	0.025	0.025	0.029
	June-2015	0.016	0.024	0.020	0.020	0.024
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	May-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	June-2015	<0.01	<0.01	<0.01	<0.01	<0.01
Sairaidh Campus	April-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	May-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	June-2015	<0.01	<0.01	<0.01	<0.01	<0.01
Rajendrapur/ Nr.Mining Area	April-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	May-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	June-2015	<0.01	<0.01	<0.01	<0.01	<0.01
Dumerkholi/ Nr.Mining Area	April-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	May-2015	<0.01	<0.01	<0.01	<0.01	<0.01
	June-2015	<0.01	<0.01	<0.01	<0.01	<0.01



Table 13
Statistical Analysis of As

Unit: $\mu\text{g}/\text{m}^3$

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Fugitive Emission (Core Zone):-						
Piprapat/ Nr.Mining Area	April-2015	0.16	0.34	0.25	0.25	0.34
	May-2015	0.18	0.41	0.30	0.30	0.41
	June-2015	0.14	0.26	0.20	0.20	0.26
Betpani	April-2015	0.21	0.32	0.27	0.27	0.32
	May-2015	0.26	0.43	0.35	0.35	0.43
	June-2015	0.18	0.24	0.21	0.21	0.24
Virhorepat	April-2015	0.16	0.21	0.19	0.19	0.21
	May-2015	0.19	0.26	0.23	0.23	0.26
	June-2015	0.14	0.19	0.17	0.17	0.19
Tatijharia Village/Nr.Weigh Bridge	April-2015	0.21	0.36	0.29	0.29	0.36
	May-2015	0.24	0.43	0.34	0.34	0.43
	June-2015	0.16	0.22	0.19	0.19	0.22
Buffer Zone :-						
Kutku Village/ Nr.V.T.Center	April-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	May-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	June-2015	<0.1	<0.1	<0.1	<0.1	<0.1
Sairaidh Campus	April-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	May-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	June-2015	<0.1	<0.1	<0.1	<0.1	<0.1
Rajendrapur/ Nr.Mining Area	April-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	May-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	June-2015	<0.1	<0.1	<0.1	<0.1	<0.1
Dumerkholi/ Nr.Mining Area	April-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	May-2015	<0.1	<0.1	<0.1	<0.1	<0.1
	June-2015	<0.1	<0.1	<0.1	<0.1	<0.1
CPCB Standard		06 $\mu\text{g}/\text{m}^3$ (Annual)				

Note :- All the Values are in CPCB Limit



Free Silica :-

Sr. No.	Location	Measurement Unit	April-2015		May-2015		June-2015	
			SPM	RSPM	SPM	RSPM	SPM	RSPM
1.	Piprapat/ Near Mining Area	g/100gm	0.24	0.16	0.28	0.19	0.16	0.08

Table 14
Dust fall Rate

Sl.No.	Location	April-2015	May-2015	June-2015	Average
Rate (MT/km ² /month)					
1	Piprapat/Near Mining Area	24.9	28.7	19.3	24.3
2	Tatijharia Village	19.4	21.6	14.8	18.6

Table 15
Noise Level Monitoring

Unit: dB(A)

Sl. No.	Location	April-2015		May-2015		June-2015	
		Day	Night	Day	Night	Day	Night
Core Zone							
1.	Piprapat/Nr.Mining Area	67.1	52.8	64.9	53.7	57.3	48.2
2.	Betpani	63.4	51.6	58.2	52.4	53.8	46.1
3.	Virhorepat	58.3	46.1	61.8	56.2	49.3	42.8
4.	Tatijharia Village/ Nr.Weigh Bridge	64.1	58.2	62.7	52.8	59.2	51.6
Buffer Zone							
5.	Kutku Village/Nr.V.T.Center	48.7	39.2	51.6	42.1	46.7	37.1
6.	Sairaidh Campus	51.2	41.7	46.9	38.2	47.4	39.6
7.	Rajendrapur/Nr.Mining Area	52.8	43.4	48.7	41.6	46.3	41.2
8.	Dumerkholi/Nr.Mining Area	46.1	38.2	52.4	42.7	51.8	42.7

CPCB Standards for Residential Area: 55 (Day time) 45 (Night time)
Industrial Area: 75 (Day time) 70 (Night time)



Table 15-A

HEMM Spot Noise Level Monitoring

Unit: dB(A)

Sl. No.	Location	April-2015			May-2015			June-2015		
		Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
1	Piprapat/Nr.Mining Area	74.1	81.6	77.9	76.2	84.9	80.6	64.3	73.8	69.1

2.8 Ground Water Quality:-Most of the villages in the nearby plant area have hand pumps and wells, as most of the residents of these villages make use of this water for drinking and other domestic uses for TABLE NO.16



Table 16
Report on Chemical Examination of Ground Water
Location: GW1: Piprapat/Near Mining Area

(Average of April-May-June-2015)

TEST RESULTS

Sr. No.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)		Test Result
				Acceptable Limit	*Permissible Limit	
1.	pH value	-	IS 3025 (Part 11)	6.5 to 8.5	No relaxation	7.38 at 24°C
2.	Turbidity	NTU	IS 3025 (Part 10)	1	5	0.7
3.	Colour	Hazen units	IS 3025 (Part 4)	5	15	3
4.	Odour	-	IS 3025 (Part 5)	Agreeable	Agreeable	Agreeable
5.	Taste	-	IS 3025 (Part 8)	Agreeable	Agreeable	Agreeable
6.	Iron (as Fe)	mg/l	IS 3025 (Part 2)	0.3	No relaxation	0.14
7.	Free residual chlorine	mg/l	IS 3025 (Part 26)	Min. 0.2	Min. 1	< 0.1
8.	Total dissolved solids	mg/l	IS 3025 (Part 16)	500	2000	217
9.	Fluoride (as F)	mg/l	IS 3025 (Part 60)	1.0	1.5	0.16
10.	Cyanide (as CN)	mg/l	IS 3025 (Part 27)	0.05	No relaxation	< 0.005
11.	Chloride (as Cl)	mg/l	IS 3025 (Part 32)	250	1000	81.29
12.	Total Alkalinity (as CaCO ₃)	mg/l	IS 3025 (Part 23)	200	600	112.54
13.	Total hardness (as CaCO ₃)	mg/l	IS 3025 (Part 21)	200	600	165.51
14.	Calcium (as Ca)	mg/l	IS 3025 (Part 40)	75	200	58.27
15.	Magnesium (as Mg)	mg/l	IS 3025 (Part 46)	30	100	4.83
16.	Sulphate (as SO ₄)	mg/l	IS 3025 (Part 24)	200	400	43.71
17.	Nitrate (as NO ₃)	mg/l	APHA Method	45	No relaxation	6.82
18.	Copper (as Cu)	mg/l	IS 3025 (Part 2)	0.05	1.5	< 0.03
19.	Manganese (as Mn)	mg/l	IS 3025 (Part 2)	0.1	0.3	< 0.05
20.	Mercury (as Hg)	mg/l	IS 3025 (Part 2)	0.001	No relaxation	< 0.0005
21.	Cadmium (as Cd)	mg/l	IS 3025 (Part 2)	0.003	No relaxation	< 0.001
22.	Selenium (as Se)	mg/l	IS 3025 (Part 2)	0.01	No relaxation	< 0.001
23.	Arsenic (as As)	mg/l	IS 3025 (Part 2)	0.01	0.05	< 0.01
24.	Aluminium (as Al)	mg/l	IS 3025 (Part 2)	0.03	0.2	< 0.005
25.	Lead (as Pb)	mg/l	IS 3025 (Part 2)	0.01	No relaxation	< 0.001
26.	Zinc (as Zn)	mg/l	IS 3025 (Part 2)	5	15	0.17

'<' indicates detection limit of the laboratory.

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(Contd.....)

Sr. No	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)		Test Result
				Acceptable Limit	*Permissible Limit	
27.	Nickel (as Ni)	mg/l	IS 3025 (Part 2)	0.02	No relaxation	< 0.01
28.	Total Chromium (as Cr)	mg/l	IS 3025 (Part 2)	0.05	No relaxation	< 0.03
29.	Barium (as Ba)	mg/l	Annexure F of IS 13428	0.7	No relaxation	< 0.01
30.	Ammonia (as N)	mg/l	IS 3025 (Part 34)	0.5	No relaxation	< 0.01
31.	Sulphide (as H ₂ S)	mg/l	IS 3025 (Part 29)	0.05	No relaxation	< 0.03
32.	Chloramines (as Cl ₂)	mg/l	APHA 4500-Cl ₂ G	4.0	No relaxation	< 0.01
33.	Molybdenum (as Mo)	mg/l	IS 3025 (Part 2)	0.07	No relaxation	< 0.001
34.	Silver (as Ag)	mg/l	Annexure J of IS 13428	0.1	No relaxation	< 0.001
35.	Polychlorinated Biphenyls (PCB)	µg/l	USEPA 508	0.5	No relaxation	< 0.03
36.	Boron (as B)	mg/l	IS 3025 (Part 2)	0.5	1.0	< 0.1
37.	Mineral Oil	mg/l	IS 3025 (Part 39)	0.5	No relaxation	< 0.001
38.	Tri Halo Methane					
	a. Bromoform	mg/l	APHA 6232	0.1	No relaxation	Absent
	b. Dibromochloromethane			0.1	No relaxation	Absent
	c. Bromodichloromethane			0.06	No relaxation	Absent
	d. Chloroform			0.2	No relaxation	Absent
39.	Phenolic compounds (as C ₆ H ₅ OH)	mg/l	IS 3025 (Part 43) :1001	0.001	0.002	< 0.001
40.	Anionic detergents (as MBAS)	mg/l	IS 13428:2005 (Annex K)	0.2	1.0	< 0.001
41.	Polynuclear aromatic hydrocarbon (PAH)	µg/l	USEPA : 550	0.1	No relaxation	< 0.03
42.	Total coliform	MPN/100 ml	IS 1622	Absent	Absent	< 2
43.	<i>Escherichia coli</i>	Per100 ml	IS 1622	Absent	Absent	Absent

'<' indicates detection limit of the laboratory.

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Hindalco Industries Limited
Tatijharia Mining Environmental Status Report for
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(Contd.....)

Sr. No.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)	Test Result
44.	Pesticides residues				
i.	Alpha-HCH	µg/l	USEPA 508	0.01	Absent
ii.	Beta HCH	µg/l	USEPA 508	0.04	Absent
iii.	Delta- HCH	µg/l	USEPA 508	0.04	Absent
iv.	Alachlor	µg/l	USEPA 508	20	Absent
v.	Aldrin / Dieldrin	µg/l	USEPA 508	0.03	Absent
vi.	Atrazine	µg/l	USEPA 1657	2	Absent
vii.	Butachlor	µg/l	USEPA 508	125	Absent
viii.	Chlorpyrifos	µg/l	USEPA 1657	30	Absent
ix.	DDT and its Isomers	µg/l	USEPA 508	1	Absent
x.	Gamma - HCH (Lindane)	µg/l	USEPA 508	2	Absent
xi.	2,4-Dichlorophenoxyacetic acid	µg/l	USEPA 1657	30	Absent
xii.	Endosulphan	µg/l	USEPA 508	0.4	Absent
xiii.	Ethion	µg/l	USEPA 1657	3	Absent
xiv.	Isoproturon	µg/l	USEPA 1657	9	Absent
xv.	Malathion	µg/l	USEPA 1657	190	Absent
xvi.	Methyl Parathion	µg/l	USEPA 1657	0.3	Absent
xvii.	Monocrotophos	µg/l	USEPA 1657	1	Absent
xviii.	Phorate	µg/l	USEPA 1657	2	Absent

Note: 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. *Permissible limit in the absence of alternate source. 4. 'mg/l' is equivalent to 'ppm' 5. 'µg/l' is equivalent to 'ppb' 6. '<' indicates detection limit of the laboratory. 7. MPN-Most probable number. 8. Results for test no. 7 are not applicable.

REMARKS: Based upon request of the party, sample was tested for above mentioned parameters only. Sample complies with IS:10500:2012, for tests conducted, indicating that it is fit for drinking purpose with respect to tested parameters.



Table 17
Monthly Report on Chemical Examination of Surface Water
(Nallah Near Mining Area)
April-2015

Sr. No.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)		Test Result
				Acceptable Limit	*Permissible Limit	
1.	pH value	-	IS 3025 (Part 11)	6.5 to 8.5	No relaxation	8.16 at 24°C
2.	Turbidity	NTU	IS 3025 (Part 10)	1	5	3.4
3.	Colour	Hazen units	IS 3025 (Part 4)	5	15	8
4.	Odour	-	IS 3025 (Part 5)	Agreeable	Agreeable	Agreeable
5.	Taste	-	IS 3025 (Part 8)	Agreeable	Agreeable	Agreeable
6.	Iron (as Fe)	mg/l	IS 3025 (Part 2)	0.3	No relaxation	0.24
7.	Free residual chlorine	mg/l	IS 3025 (Part 26)	Min. 0.2	Min. 1	< 0.1
8.	Total dissolved solids	mg/l	IS 3025 (Part 16)	500	2000	312
9.	Fluoride (as F)	mg/l	IS 3025 (Part 60)	1.0	1.5	0.21
10.	Cyanide (as CN)	mg/l	IS 3025 (Part 27)	0.05	No relaxation	< 0.005
11.	Chloride (as Cl)	mg/l	IS 3025 (Part 32)	250	1000	142.59
12.	Total Alkalinity (as CaCO ₃)	mg/l	IS 3025 (Part 23)	200	600	117.38
13.	Total hardness (as CaCO ₃)	mg/l	IS 3025 (Part 21)	200	600	250.58
14.	Calcium (as Ca)	mg/l	IS 3025 (Part 40)	75	200	81.52
15.	Magnesium (as Mg)	mg/l	IS 3025 (Part 46)	30	100	11.39
16.	Sulphate (as SO ₄)	mg/l	IS 3025 (Part 24)	200	400	94.26
17.	Nitrate (as NO ₃)	mg/l	APHA Method	45	No relaxation	8.19
18.	Copper (as Cu)	mg/l	IS 3025 (Part 2)	0.05	1.5	0.03
19.	Manganese (as Mn)	mg/l	IS 3025 (Part 2)	0.1	0.3	<0.05
20.	Mercury (as Hg)	mg/l	IS 3025 (Part 2)	0.001	No relaxation	< 0.0005
21.	Cadmium (as Cd)	mg/l	IS 3025 (Part 2)	0.003	No relaxation	< 0.001
22.	Selenium (as Se)	mg/l	IS 3025 (Part 2)	0.01	No relaxation	< 0.001
23.	Arsenic (as As)	mg/l	IS 3025 (Part 2)	0.01	0.05	< 0.01
24.	Aluminium (as Al)	mg/l	IS 3025 (Part 2)	0.03	0.2	< 0.005
25.	Lead (as Pb)	mg/l	IS 3025 (Part 2)	0.01	No relaxation	< 0.001
26.	Zinc (as Zn)	mg/l	IS 3025 (Part 2)	5	15	0.21

'<' indicates detection limit of the laboratory.

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(Contd.....)

Sr. No	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)		Test Result
				Acceptable Limit	*Permissible Limit	
27.	Nickel (as Ni)	mg/l	IS 3025 (Part 2)	0.02	No relaxation	< 0.01
28.	Total Chromium (as Cr)	mg/l	IS 3025 (Part 2)	0.05	No relaxation	< 0.03
29.	Barium (as Ba)	mg/l	Annexure F of IS 13428	0.7	No relaxation	< 0.001
30.	Ammonia (as N)	mg/l	IS 3025 (Part 34)	0.5	No relaxation	< 0.01
31.	Sulphide (as H ₂ S)	mg/l	IS 3025 (Part 29)	0.05	No relaxation	< 0.03
32.	Chloramines (as Cl ₂)	mg/l	APHA 4500-Cl ₂ G	4.0	No relaxation	< 0.01
33.	Molybdenum (as Mo)	mg/l	IS 3025 (Part 2)	0.07	No relaxation	< 0.001
34.	Silver (as Ag)	mg/l	Annexure J of IS 13428	0.1	No relaxation	< 0.001
35.	Polychlorinated Biphenyls (PCB)	µg/l	USEPA 508	0.5	No relaxation	< 0.03
36.	Boron (as B)	mg/l	IS 3025 (Part 2)	0.5	1.0	< 0.1
37.	Mineral Oil	mg/l	IS 3025 (Part 39)	0.5	No relaxation	< 0.001
38.	Tri Halo Methane					
	a. Bromoform	mg/l	APHA 6232	0.1	No relaxation	Absent
	b. Dibromochloromethane			0.1	No relaxation	Absent
	c. Bromodichloromethane			0.06	No relaxation	Absent
	d. Chloroform			0.2	No relaxation	Absent
39.	Phenolic compounds (as C ₆ H ₅ OH)	mg/l	IS 3025 (Part 43) :1001	0.001	0.002	< 0.001
40.	Anionic detergents (as MBAS)	mg/l	IS 13428:2005 (Annex K)	0.2	1.0	< 0.001
41.	Polynuclear aromatic hydrocarbon (PAH)	µg/l	USEPA : 550	0.1	No relaxation	< 0.03
42.	Total coliform	MPN/100 ml	IS 1622	Absent	Absent	>16
43.	<i>Escherichia coli</i>	Per100 ml	IS 1622	Absent	Absent	Present

'<' indicates detection limit of the laboratory.

Contd.....



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Sr. No.	Test Parameter	Measurement Unit	Test Method	As per IS 10500 : 2012 (Drinking Water - Specification)	Test Result
44.	Pesticides residues				
i.	Alpha-HCH	µg/l	USEPA 508	0.01	Absent
ii.	Beta HCH	µg/l	USEPA 508	0.04	Absent
iii.	Delta- HCH	µg/l	USEPA 508	0.04	Absent
iv.	Alachlor	µg/l	USEPA 508	20	Absent
v.	Aldrin / Dieldrin	µg/l	USEPA 508	0.03	Absent
vi.	Atrazine	µg/l	USEPA 1657	2	Absent
vii.	Butachlor	µg/l	USEPA 508	125	Absent
viii.	Chlorpyrifos	µg/l	USEPA 1657	30	Absent
ix.	DDT and its Isomers	µg/l	USEPA 508	1	Absent
x.	Gamma - HCH (Lindane)	µg/l	USEPA 508	2	Absent
xi.	2,4-Dichlorophenoxyacetic acid	µg/l	USEPA 1657	30	Absent
xii.	Endosulphan	µg/l	USEPA 508	0.4	Absent
xiii.	Ethion	µg/l	USEPA 1657	3	Absent
xiv.	Isoproturon	µg/l	USEPA 1657	9	Absent
xv.	Malathion	µg/l	USEPA 1657	190	Absent
xvi.	Methyl Parathion	µg/l	USEPA 1657	0.3	Absent
xvii.	Monocrotophos	µg/l	USEPA 1657	1	Absent
xviii.	Phorate	µg/l	USEPA 1657	2	Absent

Note: 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. *Permissible limit in the absence of alternate source. 4. 'mg/l' is equivalent to 'ppm' 5. 'µg/l' is equivalent to 'ppb' 6. '<' indicates detection limit of the laboratory. 7. MPN-Most probable number. 8. Results for test no. 7 are not applicable.

REMARKS: Based upon request of the party, sample was tested for above mentioned parameters only.



Table 18
Report on Soil Analysis, Tatijharia

Date of collection: April-2015.

Sample Location: Piprapat/Nr.Mining Area

Sr. No	Test Parameters	Measurement Unit	Results
1	pH	-	6.82 at 24°C
2	Electrical Conductivity at 25°C	µs/cm	352.7
3	Texture	-	Clay Loam
4	Sand	%	43.7
5	Silt	%	26.1
6	Clay	%	30.2
7	Bulk Density	g/cc	1.18
8	Porosity	%	16
9	Water Holding Capacity	%	51
10	Exchangeable Calcium as Ca	mg/kg	73
11	Exchangeable Magnesium as Mg	mg/kg	6.2
12	Exchangeable Sodium as Na	mg/kg	64.9
13	Available Potassium as K	kg/hect.	7.1
14	Available Phosphorous as P	kg/hect.	183
15	Available Nitrogen as N	kg/hect.	37.2
16	Organic Matter	%	0.28
17	Organic Carbon	%	0.17
18	Water Soluble Chloride as Cl ⁻	mg/kg	12.4
19	Water Soluble Sulphate as SO ₄	mg/kg	8.6
20	Sodium Absorption Ratio	-	4.87
21	CEC	meq/100 gm	16.1
22	Total Iron	%	3.92
23	Available Manganese	mg/kg	0.008
24	Available Zinc	mg/kg	0.003
25	Available Boron	mg/kg	0.002

Note: 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. 'mg/Kg' is equivalent to 'ppm'. 4. 'g/100g' is equivalent to '%w/w'. 5. All parameters are in 1:5 water extract.

REMARKS: Based upon request of party, sample was tested for above mentioned parameters only.

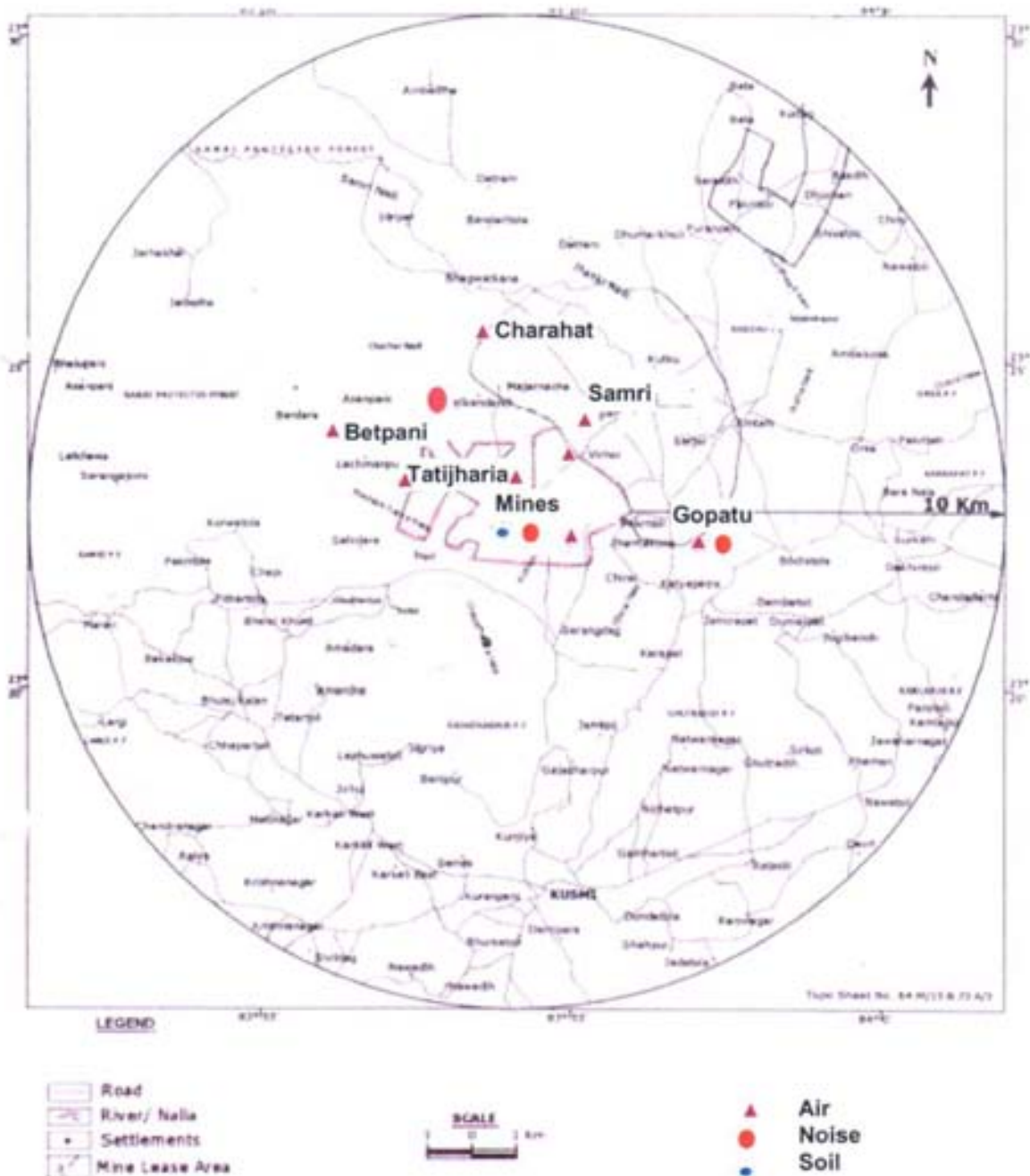


Figure 3: Sampling Locations For Air, Noise & Soil

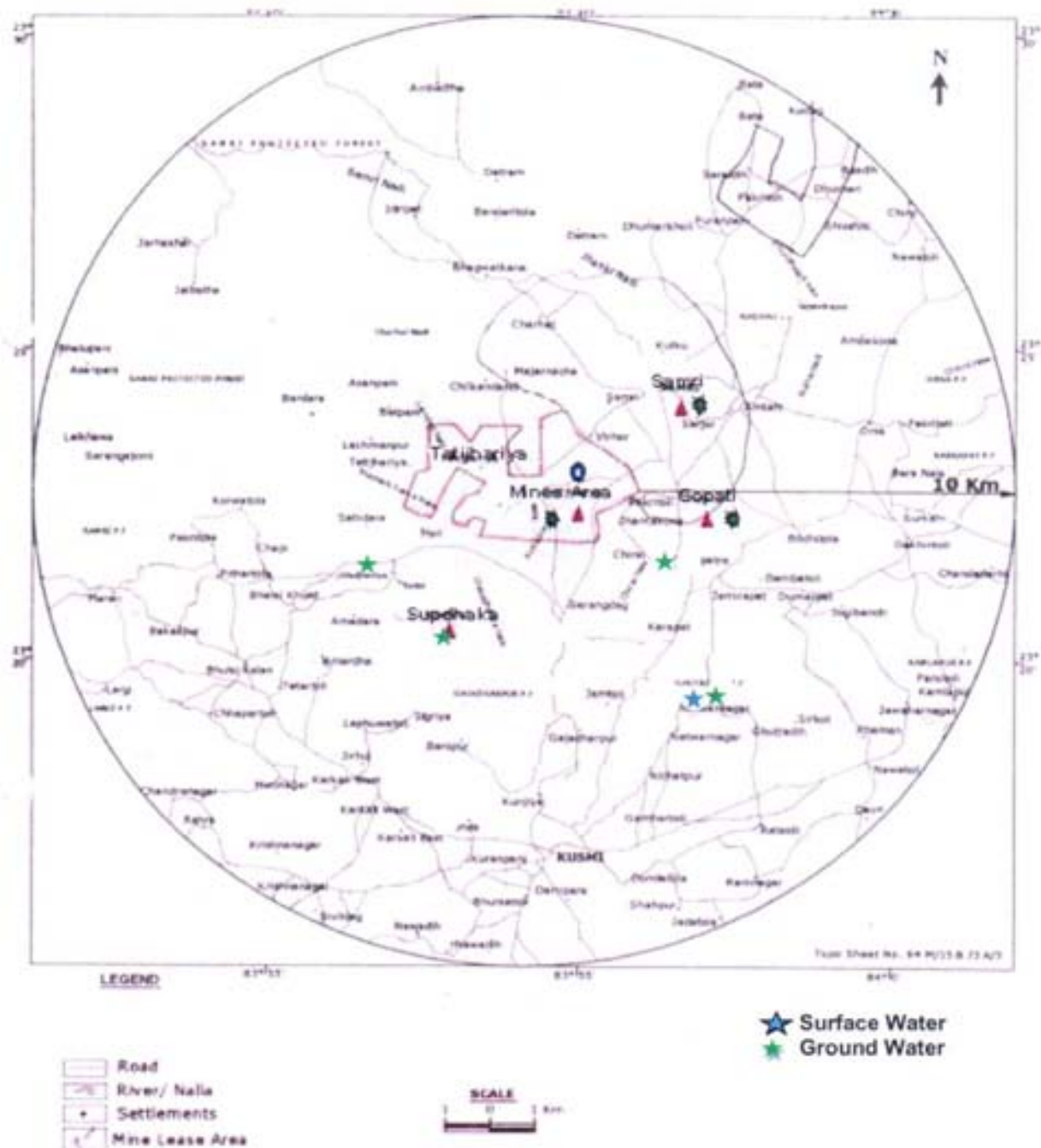


Figure 4: Sampling Locations for Water