

Annexure - II

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

**Duration: October-November-December-2019**

Name of Industry:-



**M/s. Hindalco Industries Limited.,**

Name of Laboratory:-



QCI-NABET Accredited EIA Consultant  
MoEF&CC (GOI) and NABL Recognized Laboratory  
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*Rupambhuti*

Agent of Mines  
Samri Mines Division  
Hindalco Industries Ltd

## 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 **October-2019 to December-2019** 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.

For ANACON LABORATORIES PVT. LTD.

Place : Nagpur  
Date : December, 2019

  
Authorized Signatory



	<b>Hindalco Industries Limited</b> <b>Tatijharia Mining Environmental Status</b> <b>Report for October-2019 to December-2019</b>	<b>Introduction</b>
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## 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 (October-November-December-2019) as per the requirement of Chhattisgarh Environment Conservation Board (CECB) and Ministry of Environment Forest and climate change (MoEFCC) 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.inTatijharia, Post Jamira, Tehsil Samri of Balrampur district, Chhattisgarh on 25/06/1998 for a period of 20 years. As per the Mines and Mineral (Development and Regulation) Amendment Act, 2015, Tatijharia lease has been extended up to 30 years i.e 24/06/2048. 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 <sup>o</sup> 21' 02"N to 23 <sup>o</sup> 24' 15"N
3.	Longitude	83 <sup>o</sup> 54' 50"E to 83 <sup>o</sup> 56' 30"E
4.	Elevation	1282-m above Mean Sea Level
5.	Climatic Conditions (as per IMD, Ambikapur)	Annual maximum temperature : 30.3 <sup>o</sup> C Annual minimum temperature : 17.7 <sup>o</sup> 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)**  
**(1218.762 hec.)**

<b>Sl. No.</b>	<b>(Core Zone)</b>	<b>Sl. No.</b>	<b>Buffer Zone</b>
<b>1</b>	Piprapat/Nr.Mining Area	<b>5</b>	Kutku Village/Nr.V.T.Center
<b>2</b>	Betpani	<b>6</b>	Sairaidh Campus
<b>3</b>	Virhorepat	<b>7</b>	Rajendrapur/Nr.Mining Area
<b>4</b>	Tatijharia Village/Nr.Weigh Bridge	<b>8</b>	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<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> and Pb, Hg, As and Cr above Ambient Air Quality Monitoring (AAQM) locations. The dust fall rate was measured in the mining area (BKB campus) and Tatijharia village during October-2019 to December-2019. The AAQM sampling sites are selected considering seasonal variation in wind speed and wind direction.

### **1.5.2 Sampling Duration and Frequency**

Ambient air quality monitoring was carried out for the parameters PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> and Pb, Hg, As and Cr from October-2019 to December-2019 as per CPCB norms.

Data is compared with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB) (November-18, 2009), and as per consent conditions mentioned in consent letter.



### **1.5.3 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 Particulate Matter (PM<sub>10</sub>), Sulphur Dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), Pb, Hg, As and Cr were monitored for establishing the baseline status. PM<sub>10</sub> 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 m<sup>3</sup>/min which collects the particles less than 10 µm diameter over glass fiber filter paper. The dust deposited over the filter paper is measured as PM<sub>10</sub> and the smaller particulates from PM<sub>2.5</sub> are collected into the membrane filter paper. 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-2019 to June-2019. The jar was filled with 2 lit of distilled water. The water in the jar is mixed with copper sulphate solution (0.02 N solutions) 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 3).

**Table 3**

#### **MONITORED PARAMETERS AND FREQUENCY OF SAMPLING**

<b>Parameters</b>	<b>Sampling frequency</b>
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 (So2)	24 hourly sample twice a week for Three months
Oxides of Nitrogen (NOx)	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



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**Table 4.0**  
**Measurement Techniques for various pollutants**

<b>Sr. No.</b>	<b>Parameter</b>	<b>Technique</b>	<b>Technical Protocol</b>	<b>Minimum Reportable Value(<math>\mu\text{g}/\text{m}^3</math>)</b>
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 Full	Gravimetric	IS-5182 (Part-1)	—



### 1.6 Meteorology: Wind Pattern

#### Meteorology: Wind Pattern

The data of wind pattern collected during the study period (April-May-June 2019) indicates that the wind was blowing predominately from (SW and SSW) directions, during study period.

**Table 5.0**

**Wind Frequency Distribution Data**

Sr. No.	Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	>= 11.1	Total (%)
1	348.75 - 11.25	0.004082	0.008163	0.000000	0.000000	0.000000	0.000000	0.012245
2	11.25 - 33.75	0.019048	0.008163	0.001361	0.000000	0.000000	0.000000	0.028571
3	33.75 - 56.25	0.034014	0.012245	0.000000	0.000000	0.000000	0.000000	0.046259
4	56.25 - 78.75	0.029932	0.019048	0.000000	0.000000	0.000000	0.000000	0.048980
5	78.75 - 101.25	0.019048	0.004082	0.000000	0.000000	0.000000	0.000000	0.023129
6	101.25 - 123.75	0.061224	0.006803	0.000000	0.000000	0.000000	0.000000	0.068027
7	123.75 - 146.25	0.051701	0.002721	0.000000	0.000000	0.000000	0.000000	0.054422
8	146.25 - 168.75	0.068027	0.001361	0.000000	0.000000	0.000000	0.000000	0.069388
9	168.75 - 191.25	0.118367	0.002721	0.000000	0.000000	0.000000	0.000000	0.121088
10	191.25 - 213.75	0.115646	0.001361	0.000000	0.000000	0.000000	0.000000	0.117007
11	213.75 - 236.25	0.089796	0.005442	0.000000	0.000000	0.000000	0.000000	0.095238
12	236.25 - 258.75	0.058503	0.014966	0.000000	0.000000	0.000000	0.000000	0.073469
13	258.75 - 281.25	0.055782	0.012245	0.001361	0.000000	0.000000	0.000000	0.069388
14	281.25 - 303.75	0.039456	0.014966	0.004082	0.000000	0.000000	0.000000	0.058503
15	303.75 - 326.25	0.019048	0.035374	0.001361	0.000000	0.000000	0.000000	0.055782
16	326.25 - 348.75	0.031293	0.009524	0.000000	0.000000	0.000000	0.000000	0.040816
	<b>Sub-Total</b>	<b>0.814966</b>	<b>0.159184</b>	<b>0.008163</b>	<b>0.000000</b>	<b>0.000000</b>	<b>0.000000</b>	<b>0.980978</b>
	Calms							0.017663
	Missing/Incomplete							0.001359
	Total							1.000000

#### Summary of Wind Pattern

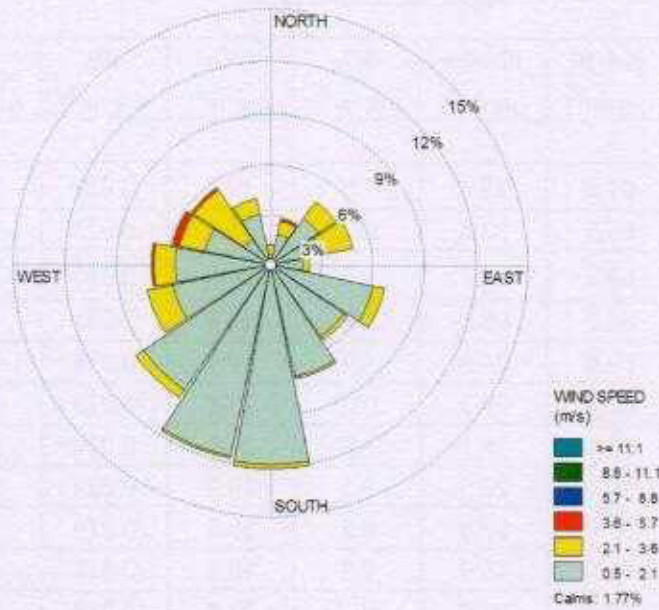
Season	First Predominant Wind Direction	Second Predominant Wind Direction	Calm Condition
October-November-December-2019	S (12.1%)	SW (11.7%)	1.7%



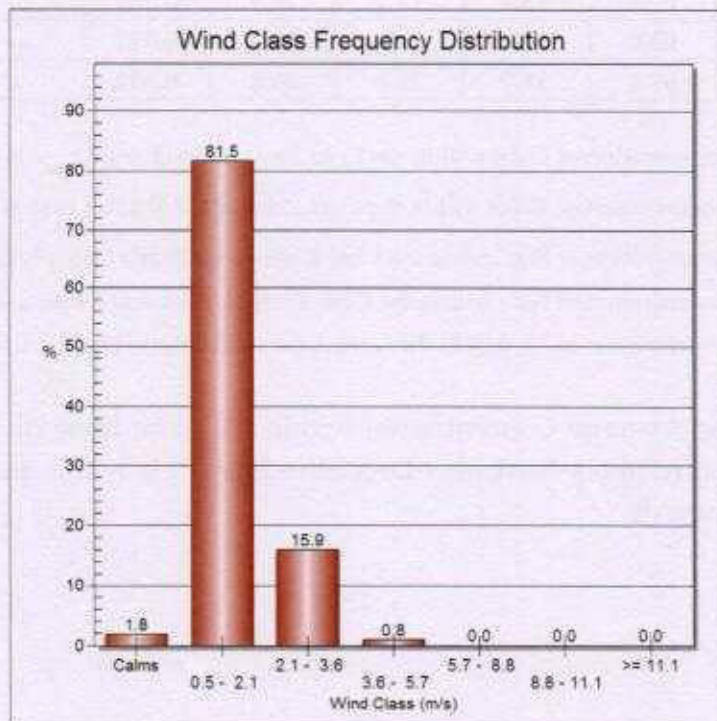


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**Figure.01: Wind Rose Diagram (Oct-Nov-Dec-2019)**



**Figure.02: Wind Class Frequency Distribution (Oct-Nov-Dec-2019).**



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**Table 6**

**Statistical Analysis**

Location	Month & Year	PM-10 ( $\mu\text{g}/\text{m}^3$ )	PM-2.5 ( $\mu\text{g}/\text{m}^3$ )	SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	Pb ( $\mu\text{g}/\text{m}^3$ )	Hg ( $\mu\text{g}/\text{m}^3$ )	As ( $\text{ng}/\text{m}^3$ )	Cr ( $\mu\text{g}/\text{m}^3$ )
<b>Core Zone</b>									
Tatijharia Village/ Nr. Weigh Bridge	Oct-2019	61.2	22.7	7.9	19.3	0.026	ND	ND	ND
	Nov-2019	65.5	33.4	12.2	25.4	0.025	ND	ND	ND
	Dec-2019	64.2	24.7	9.3	21.6	0.020	ND	ND	ND
Piprapat/Nr. Mining Area	Oct-2019	66.2	25.0	9.8	25.9	0.031	ND	ND	ND
	Nov-2019	59.9	26.8	8.9	19.9	0.032	ND	ND	ND
	Dec-2019	67.8	26.3	10.2	23.1	0.013	ND	ND	ND
Virhorepat	Oct-2019	62.4	18.1	6.9	20.6	0.019	ND	ND	ND
	Nov-2019	56.0	20.5	8.3	18.2	0.023	ND	ND	ND
	Dec-2019	57.9	20.8	8.5	19.5	0.019	ND	ND	ND
Betpani	Oct-2019	56.5	16.9	7.2	18.8	0.017	ND	ND	ND
	Nov-2019	63.6	24.0	10.1	22.0	0.019	ND	ND	ND
	Dec-2019	63.2	25.8	9.7	21.3	0.015	ND	ND	ND
<b>CPCB Standards</b>		100 (24 hrs)	60 (24 hrs)	80 (24 hrs)	80 (24 hrs)	1.0 (24 hrs)	---	6.0 (annual)	---
<b>Minimum</b>		56.0	16.9	6.9	18.2	0.013	---	---	---
<b>Maximum</b>		67.8	33.4	12.2	25.9	0.032	---	---	---
<b>Average</b>		62.0	23.8	9.1	21.3	0.022	---	---	---
<b>98% le</b>		67.4	31.9	11.8	25.8	0.032	---	---	---

- The Average Concentration of PM<sub>10</sub> within the Core Zone of Tatijharia Lease is 62.0  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of PM<sub>2.5</sub> within the Core Zone of Tatijharia Lease is 23.8  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of SO<sub>2</sub> within the Core Zone of Tatijharia Lease is 9.1  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of NO<sub>x</sub> within the Core Zone of Tatijharia Lease is 21.3  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of Pb within the Core Zone of Tatijharia Lease is 0.022  $\mu\text{g}/\text{m}^3$ .

**Conclusion :-** The Average Concentration within the Core Zone of Tatijharia Lease during this period (October-November-December-2019). It is within permissible limits as per CPCB Standards.



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Location	Month & Year	PM-10 ( $\mu\text{g}/\text{m}^3$ )	PM-2.5 ( $\mu\text{g}/\text{m}^3$ )	SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	NO <sub>x</sub> ( $\mu\text{g}/\text{m}^3$ )	Pb ( $\mu\text{g}/\text{m}^3$ )	Hg ( $\mu\text{g}/\text{m}^3$ )	As (ng/m <sup>3</sup> )	Cr ( $\mu\text{g}/\text{m}^3$ )
<b>Buffer Zone</b>									
Kutku Village/Nr.V. T.Center	Oct-2019	59.8	23.9	7.6	17.9	0.019	ND	ND	ND
	Nov-2019	57.0	22.5	7.1	17.9	0.017	ND	ND	ND
	Dec-2019	62.4	22.7	8.6	19.3	0.015	ND	ND	ND
Sairaidh Campus	Oct-2019	54.6	21.7	7.6	18.3	0.017	ND	ND	ND
	Nov-2019	61.7	23.2	9.4	20.6	0.020	ND	ND	ND
	Dec-2019	67.7	24.7	8.2	18.5	0.018	ND	ND	ND
Rajendrapur/ Nr.Mining Area	Oct-2019	56.1	20.1	8.5	18.5	0.021	ND	ND	ND
	Nov-2019	60.6	21.6	8.4	23.7	0.024	ND	ND	ND
	Dec-2019	59.4	21.2	7.9	17.6	0.017	ND	ND	ND
Dumerkholi/ Nr.Mining Area	Oct-2019	63.9	27.9	9.7	20.5	0.018	ND	ND	ND
	Nov-2019	62.4	23.7	8.8	21.1	0.021	ND	ND	ND
	Dec-2019	58.0	18.4	7.4	20.1	0.020	ND	ND	ND
<b>CPCB Standards</b>		100 (24 hrs)	60 (24 hrs)	80 (24 hrs)	80 (24 hrs)	1.0 (24 hrs)	---	6.0 (annual)	---
<b>Minimum</b>		54.6	18.4	7.1	17.6	0.015	---	---	---
<b>Maximum</b>		67.7	27.9	9.7	23.7	0.024	---	---	---
<b>Average</b>		60.3	22.6	8.3	19.5	0.019	---	---	---
<b>98% le</b>		66.9	27.2	9.6	23.1	0.023	---	---	---

- The Average Concentration of PM<sub>10</sub> within the Buffer Zone of Tatijharia Lease is 60.3  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of PM<sub>2.5</sub> within the Buffer Zone of Tatijharia Lease is 22.6  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of SO<sub>2</sub> within the Buffer Zone of Tatijharia Lease is 8.3  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of NO<sub>x</sub> within the Buffer Zone of Tatijharia Lease is 19.5  $\mu\text{g}/\text{m}^3$ .
- The Average Concentration of Pb within the Buffer Zone of Tatijharia Lease is 0.019  $\mu\text{g}/\text{m}^3$ .

**Conclusion :-** The Average Concentration within the Buffer Zone of Tatijharia Lease during this period (October-November-December-2019). It is within permissible limits as per CPCB Standards.



### Month-wise Summary of Statistical Analysis

#### **Tatijharia Lease (Core Zone):-**

##### **1.7 Ambient Air Quality:**

Ambient air quality has been generated as per NAAQS 2009 for the month of October-November-December-2019. PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> & NO<sub>x</sub>. The values obtained were then compared vis-a-vis the standards prescribed by CPCB for Industrial/ Rural / Residential uses.

##### **1.7.1 Presentation of Results:**

The summary of Ambient Air Quality monitoring results from October-2019 to December-2019 are presented in detail in Table 4.0. 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)/NAAQS for residential and rural zone.

##### **A. Particulate Matter-PM<sub>10</sub>:**

The minimum and maximum concentrations for Particulate Matter-PM<sub>10</sub> were recorded as 56.0µg/m<sup>3</sup> and 67.8µg/m<sup>3</sup> at Virhorepat and Piprapat/Nr. Mining area respectively. The average concentration of PM<sub>10</sub> was 62.0µg/m<sup>3</sup>.

##### **B. Particulate Matter-PM<sub>2.5</sub>:**

The minimum and maximum concentrations for Particulate Matter-PM<sub>2.5</sub> were recorded as 16.9µg/m<sup>3</sup> & 33.4µg/m<sup>3</sup> at Betpani and Tatijharia Village/Nr. Weigh Bridge respectively. The average concentration of PM<sub>2.5</sub> was 23.8µg/m<sup>3</sup>.

##### **C. Sulphur Dioxide (SO<sub>2</sub>):**

The minimum and maximum for SO<sub>2</sub> concentrations were recorded as 6.9µg/m<sup>3</sup> and 12.2µg/m<sup>3</sup> respectively. The minimum concentration was recorded at Virhorepat and maximum concentration was also recorded at Tatijharia Village/Nr. Weigh Bridge. The average concentration SO<sub>2</sub> was 9.1µg/m<sup>3</sup>.

##### **D. Nitrogen Oxide (NO<sub>x</sub>):**

The minimum and maximum for NO<sub>x</sub> concentrations were recorded as 18.2µg/m<sup>3</sup> and 25.9µg/m<sup>3</sup>. The maximum concentration was recorded at Piprapat/Nr. Mining area and the minimum concentration was recorded at Virhorepat. The average concentration of NO<sub>x</sub> was 21.3µg/m<sup>3</sup>.



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**E. Lead (Pb):**

Maximum Lead detected in PM<sub>10</sub> samples was 0.032µg/m<sup>3</sup> at Piprapat Village/Nr. Mining area and the minimum lead in PM<sub>10</sub> sample was 0.013/m<sup>3</sup> also detected at Piprapat Village location.

No lead could be detected in PM<sub>2.5</sub> samples at any of the Ambient Air samples at any of the locations.

**F. Mercury (Hg):**

Mercury was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.

**G. Arsenic (As):**

Arsenic was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.

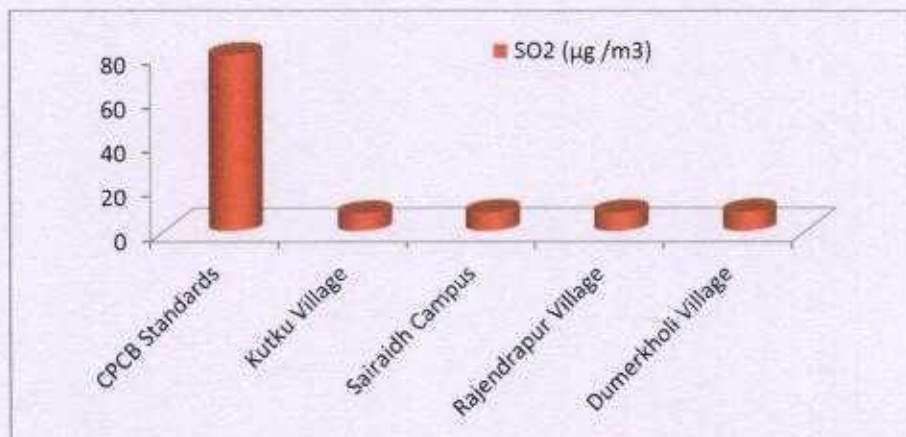
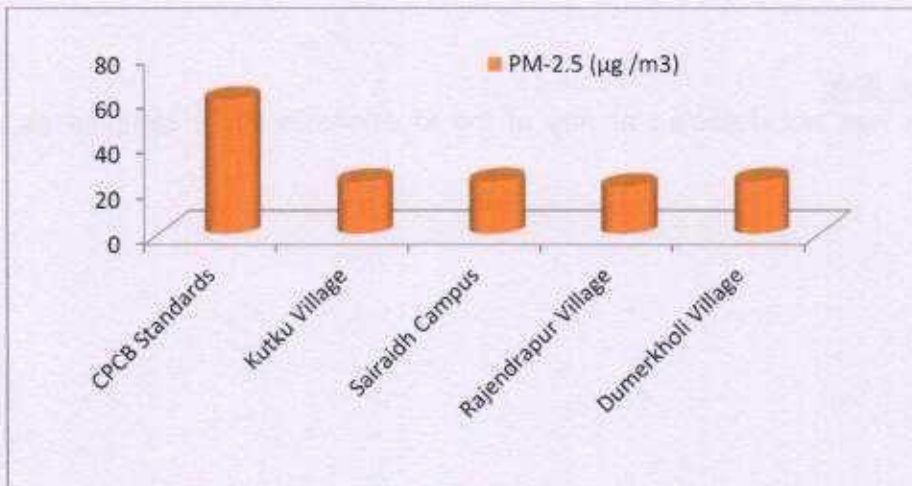
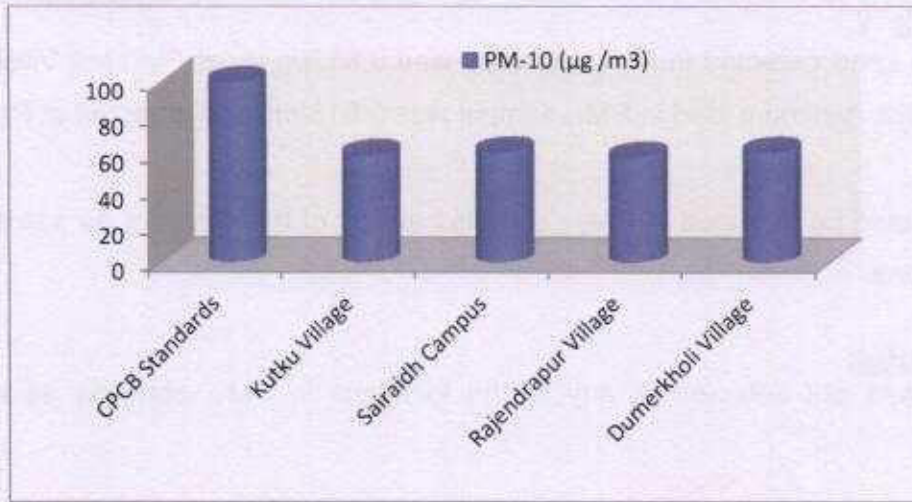
**H. Chromium (Cr):**

Chromium was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.



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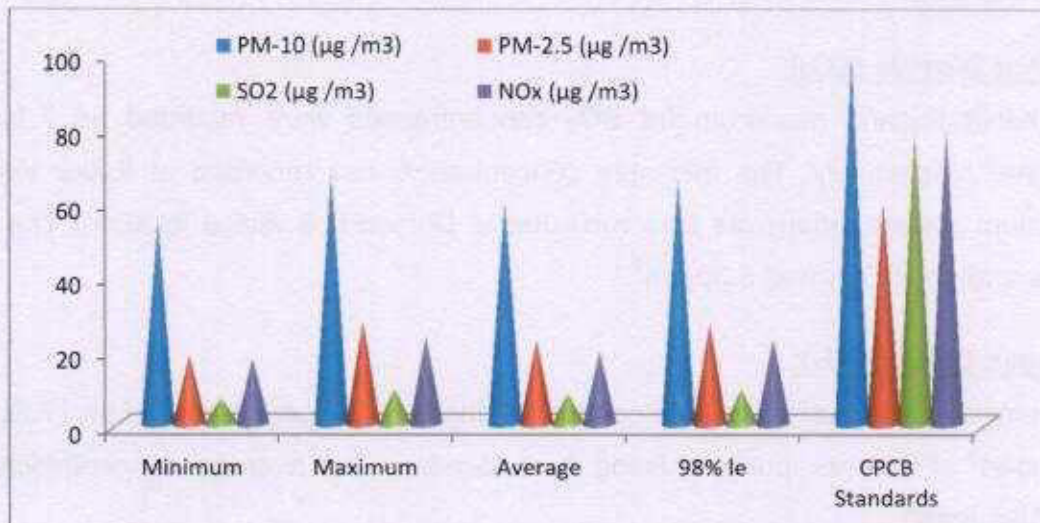
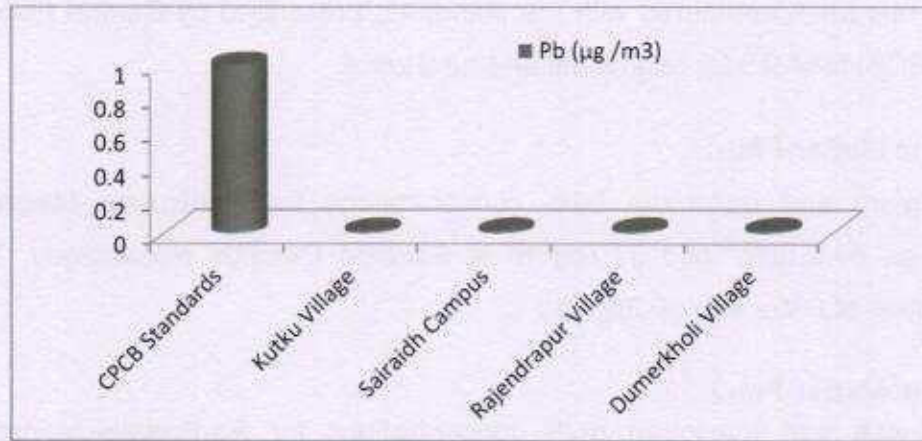
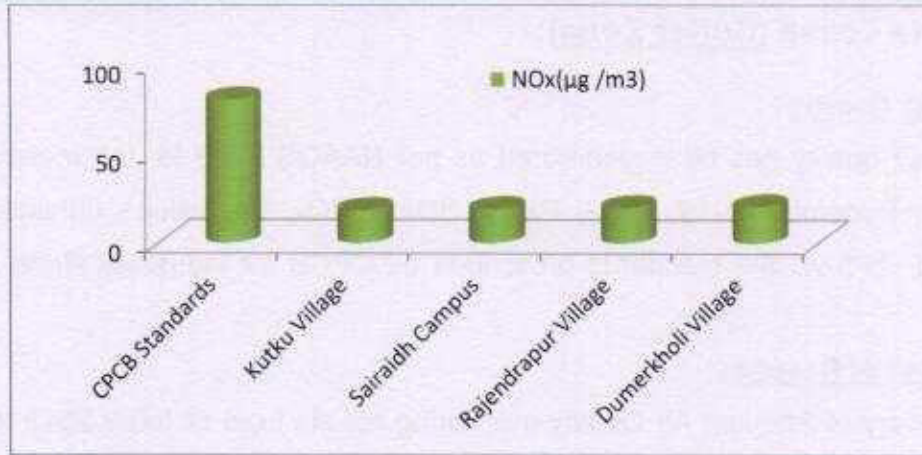
**Details of**  
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## **Tatijharia Lease (Buffer Zone):-**

### **1.8 Ambient Air Quality:**

Ambient air quality has been generated as per NAAQS 2009 for the month of October-November-December-2019. PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> & NO<sub>x</sub>, the values obtained were then compared vis-a-vis the standards prescribed by CPCB for Industrial/ Rural / Residential uses.

#### **1.8.1 Presentation of Results:**

The summary of Ambient Air Quality monitoring results from October-2019 to December-2019 are presented in detail in Table 4.0. 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)/NAAQS for residential and rural zone.

##### **I. Particulate Matter-PM<sub>10</sub>:**

The minimum and maximum both concentrations for Particulate Matter-PM<sub>10</sub> were recorded as 54.6µg/m<sup>3</sup> and 67.7µg/m<sup>3</sup> at Sairaidh Campus respectively. The average concentration of PM<sub>10</sub> was 60.3µg/m<sup>3</sup>.

##### **J. Particulate Matter-PM<sub>2.5</sub>:**

The minimum and maximum both concentrations for Particulate Matter-PM<sub>2.5</sub> were recorded as 18.4µg/m<sup>3</sup> & 27.9µg/m<sup>3</sup> at Dumerkholi village location. The average concentration of PM<sub>2.5</sub> was 22.6µg/m<sup>3</sup>.

##### **K. Sulphur Dioxide (SO<sub>2</sub>):**

The minimum and maximum for SO<sub>2</sub> concentrations were recorded as 7.1µg/m<sup>3</sup> and 9.7µg/m<sup>3</sup> respectively. The minimum concentration was recorded at Kutku Village and maximum concentration was also recorded at Dumerkholi village location. The average concentration of SO<sub>2</sub> was 8.3µg/m<sup>3</sup>.

##### **L. Nitrogen Oxide (NO<sub>x</sub>):**

The minimum and maximum both concentrations for NO<sub>x</sub> were recorded as 17.6µg/m<sup>3</sup> and 23.7µg/m<sup>3</sup> at Rajendrapur/Nr. Mining Area location. The average concentration of NO<sub>x</sub> was 19.5µg/m<sup>3</sup>.





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**M. Lead (Pb):**

Maximum Lead detected in PM<sub>10</sub> samples was 0.024µg/m<sup>3</sup> at Rajendrapur/Nr. Mining Area and the minimum lead in PM<sub>10</sub> sample was 0.015/m<sup>3</sup> detected at Kutku Village location.

No lead could be detected in PM<sub>2.5</sub> samples at any of the Ambient Air samples at any of the locations.

**N. Mercury (Hg):**

Mercury was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.

**O. Arsenic (As):**

Arsenic was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.

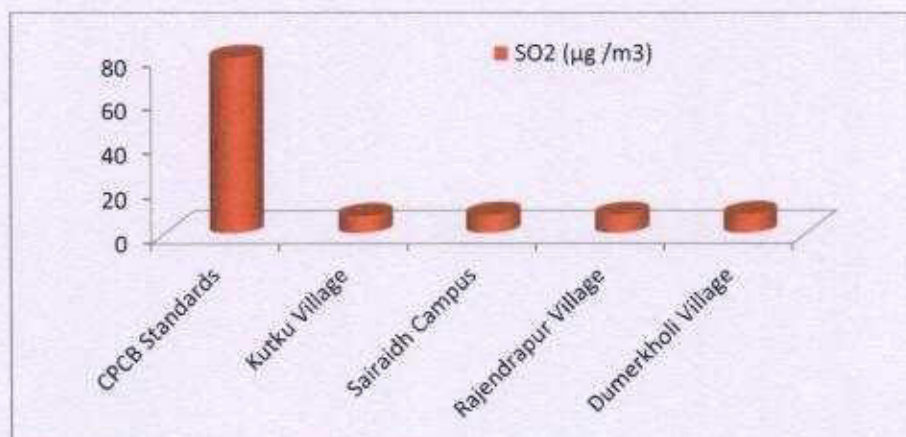
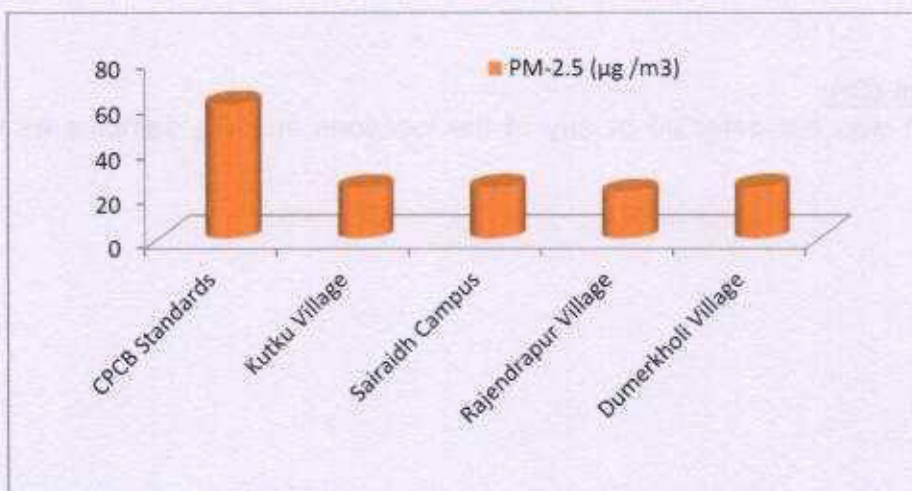
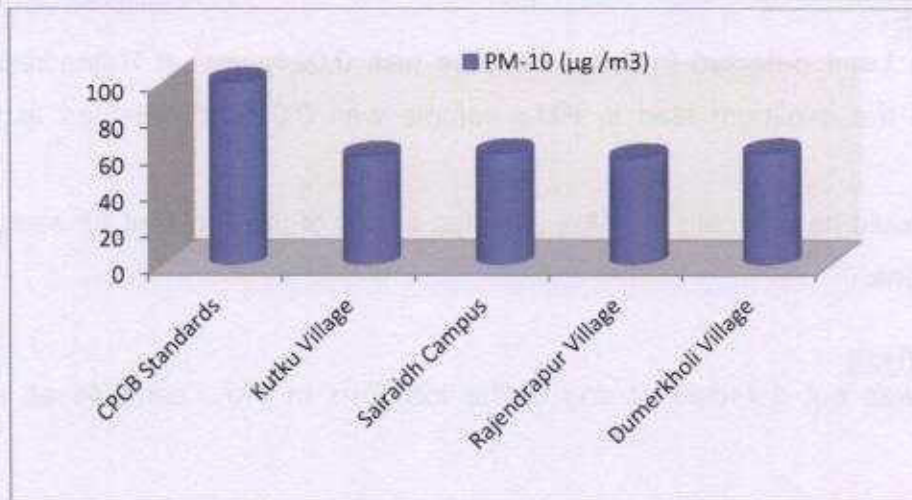
**P. Chromium (Cr):**

Chromium was not detected at any of the locations in PM<sub>10</sub> samples as well as PM<sub>2.5</sub> Samples.



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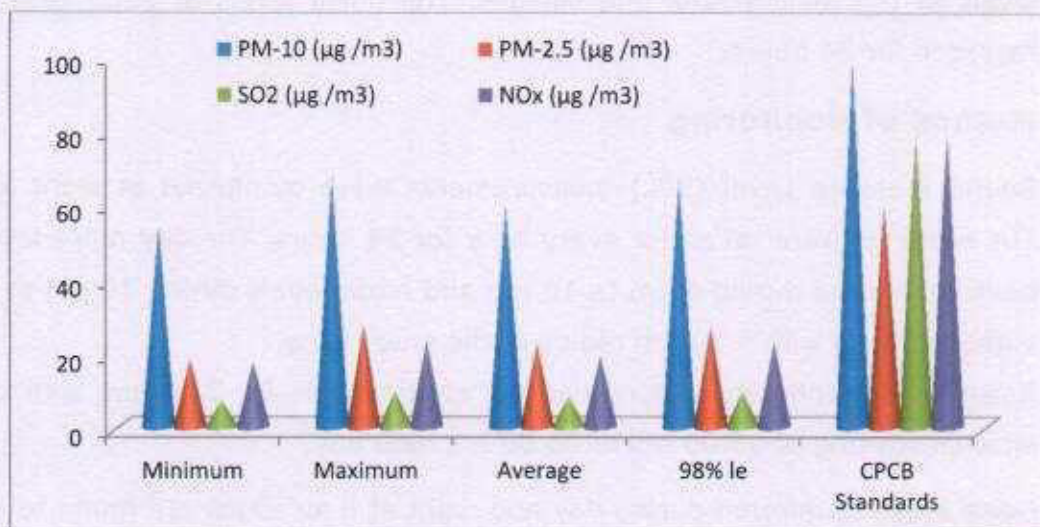
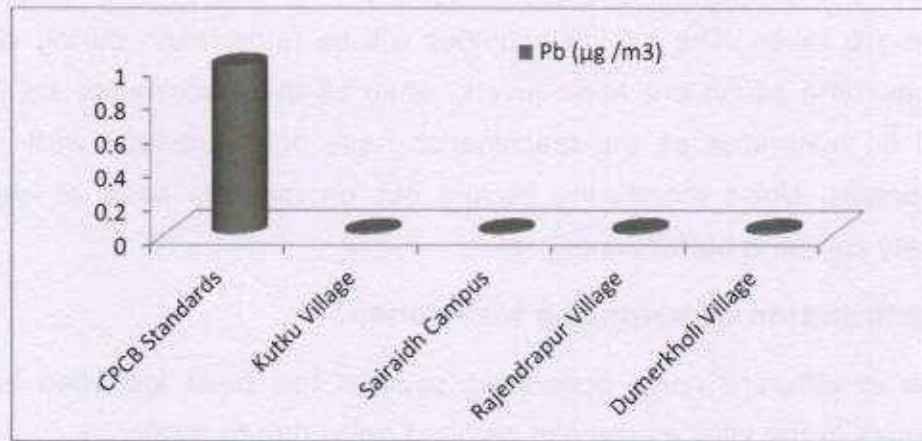
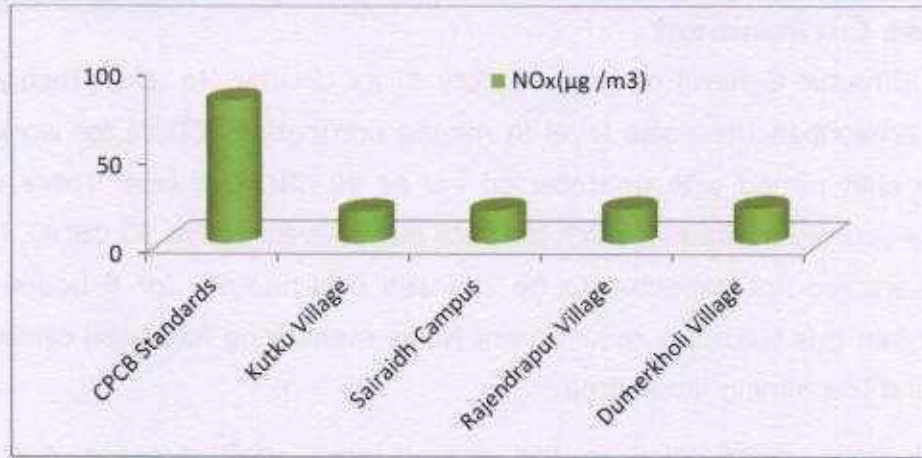
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## **1.9 Noise Environment**

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.

### **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 7)**.



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**Instrument used for monitoring**

Noise levels were measured using integrated sound level meter Model no. HTC-SL-1352. This instrument is capable of measuring the Sound Pressure Level (SPL), Leq.

**Table 7**

**Noise Emission Monitoring Report**

SR. NO.	LOCATION	Month	Noise-dB(A)	
			Day Time	Night Time
<b>Core Zone</b>				
1.	Tatijharia Village/Nr.Weigh Bridge	October-2019	63.7	50.8
		November-2019	62.7	52.5
		December-2019	59.4	47.2
2.	Piprapat/Nr. Mining Area	October-2019	59.2	47.6
		November-2019	56.4	45.2
		December-2019	57.1	46.5
<b>Buffer Zone</b>				
1.	Samri-Gopatu/ Near Weigh bridge	October-2019	61.5	48.2
		November-2019	62.1	49.6
		December-2019	61.6	48.7
2.	Rajendrapur/Nr.Mining Area	October-2019	56.8	45.6
		November-2019	53.7	42.4
		December-2019	54.9	43.8
<b>CPCB Standards</b>				
<b>Industrial Area</b>			75	70
<b>Residential area</b>			55	45

**Conclusion :-** The Noise Monitoring Results at Tatijharia Lease during this period (October-November-December-2019), it is within permissible limits as per CPCB Standards.

**Table 8**

**HEMM Spot Noise Level Monitoring**

Sl. No.	Location	Unit: dB(A)					
		October-2019		November-2019		December-2019	
		Min.	Max.	Min.	Max.	Min.	Max.
1.	Piprapat/Nr.Mining Area	56.5	67.2	58.2	66.7	57.6	65.9
2.	Tatijharia Village/ Nr.Weigh Bridge	58.7	71.5	61.5	73.2	62.3	72.4



## **2.0 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.

The purpose of the study is to assess the water quality characteristics for critical parameters, evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity and identification of impact on water quality by this project and related activities.

The physico-chemical analysis of water samples collected during the study period is given in **(Table-9 and Fig.5)**. The overall water quality found to be below the stipulated standards of IS 10500-2012 for ground water & found to be fit for drinking purpose for tested parameters. Thus the impacts due to mining activities have been found to be insignificant.

The drinking water is supplied by the tankers from for-away sources. Hence, additional care now be taken to chlorinate the tankers before leaving the supply source.



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**Table 9**  
**Report on Chemical Examination of Ground Water**  
**(Average of Three Months October-November-December-2019)**

<b>Location:</b>	<b>GW1) Piprapat/Near Mining Area</b> <b>Sample Source:-Borewell Water</b>
------------------	---

**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	7.64 at 25°C
2.	Turbidity	NTU	IS 3025 (Part 10)	1	5	0.3
3.	Colour	Hazen units	IS 3025 (Part 4)	5	15	1
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)	1.0	No relaxation	0.21
7.	Free residual chlorine	mg/l	IS 3025 (Part 26)	Min. 0.2	1	< 0.1
8.	Total dissolved solids	mg/l	IS 3025 (Part 16)	500	2000	463
9.	Fluoride (as F)	mg/l	IS 3025 (Part 60)	1.0	1.5	0.47
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	48.59
12.	Total Alkalinity (as CaCO <sub>3</sub> )	mg/l	IS 3025 (Part 23)	200	600	116.28
13.	Total hardness (as CaCO <sub>3</sub> )	mg/l	IS 3025 (Part 21)	200	600	171.05
14.	Calcium (as Ca)	mg/l	IS 3025 (Part 40)	75	200	47.59
15.	Magnesium (as Mg)	mg/l	IS 3025 (Part 46)	30	100	12.68
16.	Sulphate (as SO <sub>4</sub> )	mg/l	IS 3025 (Part 24)	200	400	21.41
17.	Nitrate (as NO <sub>3</sub> )	mg/l	APHA Method	45	No relaxation	9.52
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 48)	0.001	No relaxation	< 0.0005
21.	Cadmium (as Cd)	mg/l	IS : 3025 (Part 41)	0.003	No relaxation	< 0.001
22.	Selenium (as Se)	mg/l	IS : 3025 (Part 56)	0.01	No relaxation	< 0.001
23.	Arsenic (as As)	mg/l	IS : 3025 (Part 37)	0.01	No relaxation	< 0.01
24.	Aluminium (as Al)	mg/l	IS : 15302	0.03	0.2	< 0.005
25.	Lead (as Pb)	mg/l	IS : 3025 (Part 47)	0.01	No relaxation	< 0.001
26.	Zinc (as Zn)	mg/l	IS 3025 (Part 2)	5	15	1.1



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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	< 0.1
31.	Sulphide (as H <sub>2</sub> S)	mg/l	IS 3025 (Part 29)	0.05	No relaxation	< 0.03
32.	Chloramines (as Cl <sub>2</sub> )	mg/l	IS 3025 (Part 26)	4.0	No relaxation	< 0.05
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	2.4	< 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 <sub>6</sub> H <sub>5</sub> 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	< 0.01
41.	Polynuclear aromatic hydrocarbon (PAH)	µg/l	USEPA : 550	0.1	No relaxation	< 0.03
42.	Total coliform	Per 100 ml	IS 15185	Absent	Absent	Absent
43.	<i>Escherichia coli</i>	Per 100 ml	IS 15185 : 2016	Absent	Absent	Absent

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

**NOTES:** ● Please see watermark "Original Test Report" to confirm the authenticity of this report. ● Results shall be referred to tested sample(s) and applicable to tested parameters only. ● Test report shall not be reproduced except in full without prior written approval of Anacon Labs. ● Liability of Anacon Labs is limited to invoiced amount only. ● Non-perishable and perishable sample(s) shall be disposed off after 30 days and 15 days respectively from the date of issue of Test Report, unless specified otherwise. ● \*Permissible limit in absence of an alternate source for drinking water. ● MPN indicates most probable number. ● 'mg/l' is equivalent to 'ppm'. ● 'µg/l' is equivalent to 'ppb'. ● '<' indicates detection limit of instrument/method and shall be considered as 'absent'. ● Result for test no. 7 is not relevant.

**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.





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Table 10

Dust fall Rate

Sr.No.	Location	December-2019
		Rate (MT/km <sup>2</sup> /Month)
1.	Piprapat/Near Mining Area	21.84



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**Table 11**

**Soil Analysis Report**  
**Sampling Month: December-2019**  
**Sampling Location: Tatijharia**

S.N.	Test Parameter	Measurement Unit	Test Method	Test Result
1	Infiltration rate	mm/hr	ASTMD 3385	17.46
2	Bulk density	g/cm <sup>3</sup>	IS 2720 (Part 29)	1.327
3	Water holding capacity	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	23.52
4	Particle size distribution			
	Sand	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	26.43
	Silt	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	23.5
	Clay	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	50.00
5	Texture	-	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Clay
6	pH (1:2.5 Aq. Extract) at 25 <sup>o</sup> C	-	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	7.81 at 25 <sup>o</sup> C
7	Electrical Conductivity (1:2.5 Aq. Extract)	µs/cm	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	429.16
8	Water soluble Calcium (as Ca)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	463.38
9	Water soluble Magnesium (as Mg)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	113.52
10	Water soluble Sodium (as Na)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	247.19
11	Water soluble Potassium (as K)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	28.54
12	Water soluble Chloride (as Cl)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	273.16
13	Water soluble Sulphate (as SO <sub>4</sub> )	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	349.28
14	Exchangeable Sodium (as Na)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	127.39
15	Exchangeable Potassium (as K)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	16.54
16	Exchangeable Calcium (as Ca)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	212.62
17	Exchangeable Magnesium (as Mg)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	61.73
18	Sodium adsorption ratio	-	By Calculation	18.2
19	Total Organic matter	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	1.69
20	Total Organic Carbon	%	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	1.12
21	Available Nitrogen (as N)	Kg/hect	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	257.39
22	Available Phosphorous (as P)	Kg/hect	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	18.24
23	Available Potassium (as K)	Kg/hect	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	616.52
24	CEC	meq/100g	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	11.3



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S.N.	Test Parameter	Measurement Unit	Test Method	Test Result
25	Arsenic (As)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent
26	Boron (B)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	0.21
27	Cadmium (Cd)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent
28	Chromium (Cr)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent
29	Copper (Cu)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	1.56
30	Lead (Pb)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent
31	Nickel (Ni)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent
32	Cobalt (Co)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	0.24
33	Iron (Fe)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	7.62
34	Manganese (Mn)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	16.84
35	Zinc (Zn)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	1.21
36	Selenium (Se)	mg/Kg	Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India)	Absent

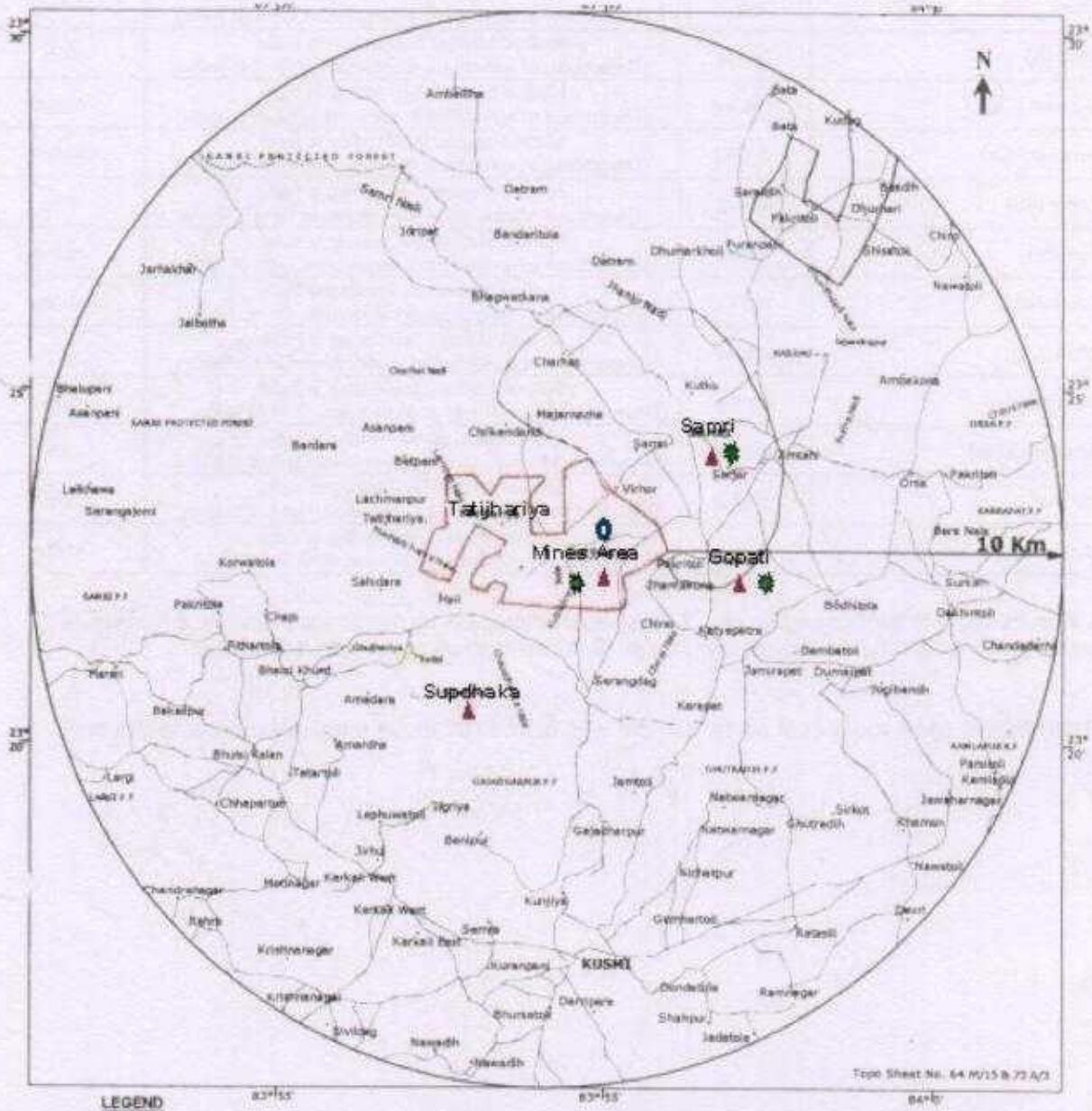
**Note:** 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. 'mg/Kg' is equivalent to 'ppm'. 4. 'g/100g' is equivalent to '%w/w'. 5. All parameters are in 1:5 water extract.

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

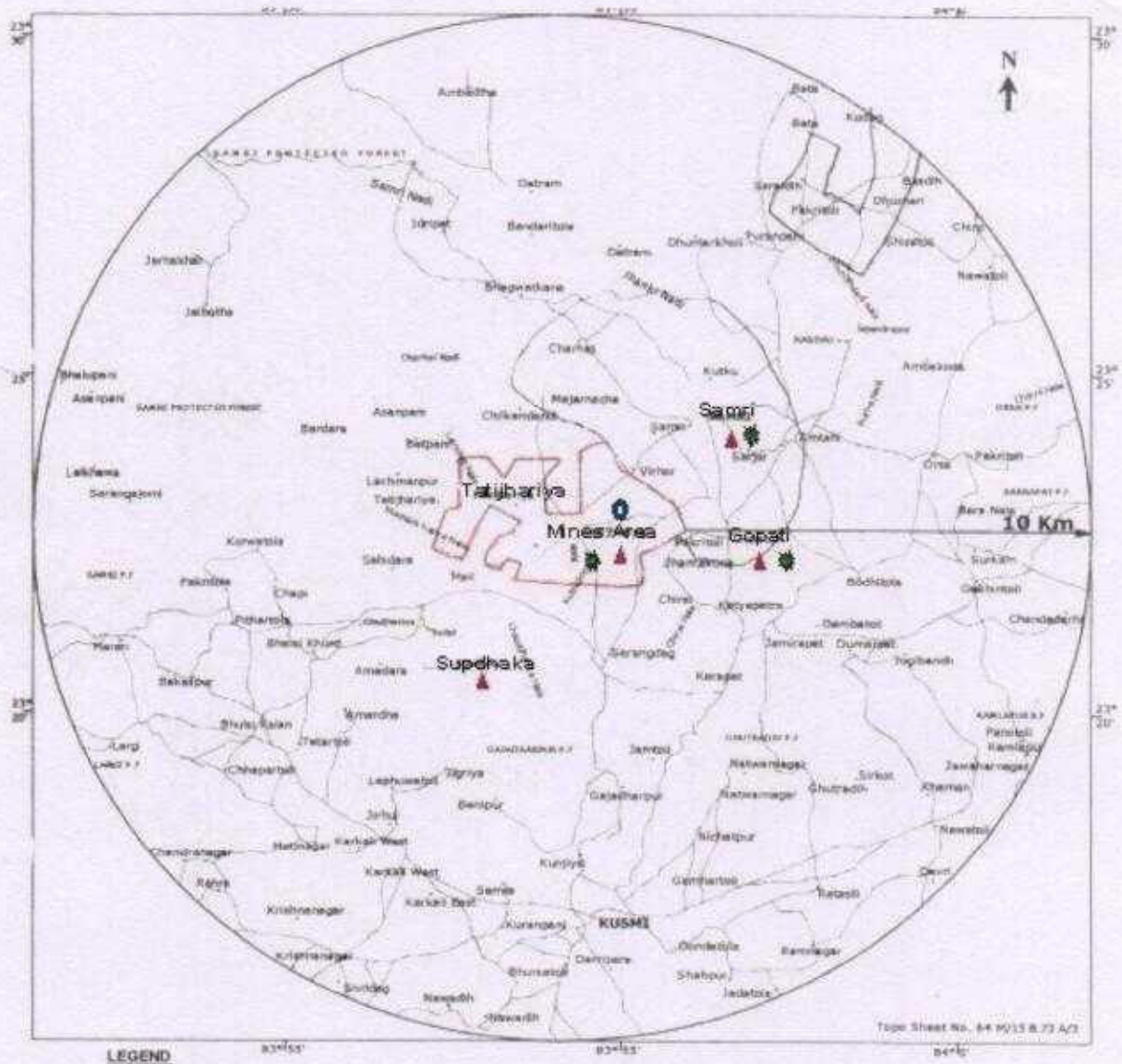


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


**FIG 3: SAMPLING LOCATIONS FOR AIR, NOISE & SOIL**



- LEGEND**
-  Road
  -  River/ Nalla
  -  Settlements
  -  Mine Lease Area



 Surface Water  
 Ground Water

**FIG 4: SAMPLING LOCATIONS FOR WATER**