

Ref:- HIL/SAM/CCF/SD/2014/K

24.5.2014

To,  
The Chief Conservator of Forest (Central),  
MoEF Regional Office (Western Zone)  
Kendriya Paryavaran Bhawan, Link Road  
Bhopal-462016

**Sub:-** Status of compliance of EC condition (Half yearly status of compliance report) Kudag Bauxite Mine (Lease area- 377.116 Ha.) of Hindalco Industries Limited of Chhattisgarh state from Oct-2013 to Mar-2014.

Ref No:- Environment Clearance Letter No-J-11015/354/2007-IA. II(M) dated July 27, 2007

Dear Sir,

We do hereby submit half yearly compliance status report of EC condition with respect of Kudag Bauxite Mine, Lease area -377.116 Ha, of Hindalco Industries Limited, located in Balrampur- Ramanujganj district of Chhattisgarh state from Oct -2013 to Mar-2014.

We assure that we comply all the conditions laid down in the consent letter and also abide to follow all the Rules and Regulations.

Thanking you,

Yours' faithfully

For, Hindalco Industries Limited

(M. K. Nayak)

GM- Mines

Encl:-

1. Half Yearly Status of compliance of Environment condition as annexure-I.
2. Copy of Diversion of Revenue Forest Land enclosed as annexure -II.
3. Jan-14 to Apr-14, Environment Status Report enclosed as annexure -III
4. Renewal copy of Consent to Operate from CECB enclosed as annexure -IV
5. Yearly Production report enclosed as annex-V.
6. Status report of mined out, reclaimed and afforested land as annexure-VI.
7. Actual expenditure incurred in environment measure from Oct-13 to Mar-14 as annex-VII.

HINDALCO INDUSTRIES LIMITED  
Samri Mines Division, Baba Chowk  
At & Post - Kusmi, PIN : 497 224,  
Distt. - Balrampur-Ramanujganj (CG), INDIA  
Telephone + 91 7778 274326-27,  
FAX + 91 7778 274325

REGISTERED OFFICE  
Century Bhawan, 3<sup>rd</sup> Floor,  
Dr. Annie Besant Road,  
Worli, Mumbai 400 030  
Telephone +91 22 6662 6666.

Website www.hindalco.com  
E mail hindalco@adityabirla.com  
Corporate Identity No- L27020MH1958PLCO11238.

20.5.2014


**Status of Compliance from Oct-2013 to Mar-2014 of Environmental  
Condition laid down by MOEF**

**Kudag Bauxite Mine**

The status of compliance of the conditions (as per point no.3) with reference to environment clearance letter no.J-11015/354/2007-11A.II(M) dated 27.07.07 of Ministry of Environment & Forests, New Delhi, for expansion of production capacity of Kudag Bauxite Mine is as under.

**A Specific condition:-**

- (i) The wild life management plan has been approved.
- (ii) We accept the condition.
- (iii) The conservation plan for schedule I fauna have been prepared. The authenticated list of flora and fauna for core and buffer zone is enclosed for perusal please. (Annexure- I).
- (iv) The mining operation will be restricted to above ground water table during current mining operation. The ultimate depth of working is about 14 meters below whereas the water table in the core zone is about 50-52 meters.
- (v) Top soil and solid waste is being utilized for simultaneous back filling of mined out area for reclamation purpose and practice is followed.
- (vi) OB is being stacked at earmark location and slope of dump is maintained less than 28 degree. All protective measure such as retaining walls, bunds and also plantation on available land are being taken to prevent erosion of soil.
- (vii) Garland drains have been made around the active mining pits coupled with arrester to arrest silt from soil and dumps are maintained. The garland drains are regularly desilted before the monsoon.

  
(M. K. Nayak)  
Agent of mines  
Samri mines Division  
Hindalco Industries Ltd

- (viii) We undertake that no natural water course is obstructed during mining operation.
  - (ix) Controlled blasting is being practiced in the mine. Dust extractors are being used during drilling operations. Cord relay & effective blast design are used to control blast vibration and fly rocks.
  - (x) The plantation in reclaimed area is carried out as per plan and is carried out as suggested. The density is being maintained about 2500 plant per hectare with the species like jatorpha, Kashia Samia, mango, babul, pears & guava etc. Social forestry is also being encouraged among the local villagers.
  - (xi) The ground water table does not intersect during our mining operation because of shallow depth of mining
  - (xii) Regular water spraying with 12 KL water tanker in the mine lease hold area is being carried out regularly to control air pollution. The ambient air quality is within the stipulated norms.
  - (xiii) Regular monitoring of ground water quality is being carried out. The analysis reports are being submitted to Regional Office, CECB, Ambikapur and other regulating authority.
  - (xiv) Till date three rain water harvesting ponds has been made at lease hold area.
  - (xv) If required, the permission will be taken from competent authority.
  - (xvi) No endanger fauna is present in mines area however all possible measures is taken to prevent ecological status of project area.
  - (xvii) Regular and periodic maintenance of HEMM is being carried out for control of vehicular emission in mines area. The bauxite ore are transported in trucks with tarpaulin cover.
  - (xviii) The report has been submitted to ministry, copy enclosed as Annexure- 2. The rehabilitation of land oustees is not involved in the project.
  - (xix) All workers are provided personal protective equipment and training are also being imparted to them for safety & health and will be continued. One doctor having MBBS qualification has been appointed for facilitation of OHS.
  - (xx) We accept the condition.
-



**(B) General Condition.**

- (i) No change in mining technology and scope of working will be done without approval of MOEF New Delhi.
  - (ii) Calendar plan will be followed and there will not be any change in calendar plan.
  - (iii) The suggestion of local forest department will be implemented for conservation of flora and fauna in and around lease hold area.
  - (iv) Ambient Air quality monitoring is being carried out as per guideline and will be followed.
  - (v) Data of ambient air quality (RPM, SPM, SO<sub>2</sub>, Nox) are being submitted to CECB and will be submitted as per guidelines.
  - (vi) Fugitive dust emission from generating sources is being controlled. The dust extractor, wet drilling, regular water spraying with 12 KL water tanker in the mine lease hold area is being carried out regularly.
  - (vii) The noise level in working are being maintained below the limit prescribed and will be maintained. The operators of HEMM are being provided earplag/muffs. The proper maintenance of HEMM is being carried out to control noise emission.
  - (viii) No waste water is generated from the mine however as suggested measures will be taken if required.
  - (ix) All workers are provided personal protective equipment and training are also being imparted to them for safety & health and will be continued as per guidelines.
  - (x) Periodical and Initial medical examination of all workers are being carried out as per provision of Mines Act.
  - (xi) Environment cell is already in place at Samri Mines Division headed by GM (Mines) and comprises of suitable qualified persons.
  - (xii) In case of final closure of mine the information will be submitted to Regional Office, Ministry of Environment & Forests, Bhopal.
  - (xiii) Adequate fund provision is already earmarked for environmental protection measures and will not be diverted to other purpose. The year wise expenditure will be submitted to concern authorities as per guidelines.
  - (xiv) The same will be intimated to Regional Office, Ministry of Environment & Forests, Bhopal.
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- (xv) All cooperation is being extended to regulatory authorities and will be extended as earlier.
- (xvi) Although no suggestion/representation has been received by any Panchayat/Local NGO while processing the proposal. However we have forwarded the copy of clearance letter to Panchayat in our area. The copy of same has been already submitted to your good office.
- (xvii) The copy has been displayed by CECB in Balrampur Collectorate.
- (xviii) The information regarding environment clearance has been published in two local new papers namely Hari Bhumi & Ambika Vani. The copy of same has been already submitted to your good office.

Hope the above compliance will be found in order.

**Yours truly,**  
(For Hindalco Industries Limited)



(M K Nayak)  
Agent of Mines.

(M. K. Nayak)  
Agent of mines  
Samin Mines Division  
Hindalco Industries Ltd

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KUDAG

आर

Telegram : PARYAVARAN.  
NEW DELHI

दूरभाष ।

Telephone :

टेलिक्स (द्विभाषीय) :

Telex : (bi-lingual) : W-66185 DOE IN

FAX : 4360678

भारत सरकार

पर्यावरण एवं वन मंत्रालय

GOVERNMENT OF INDIA

MINISTRY OF ENVIRONMENT &amp; FORESTS

पर्यावरण भवन, लो. प्रो. ओ. कॉम्प्लेक्स

PARYAVARAN BHAWAN, C.G.O. COMPLEX

लोदी रोड, नई दिल्ली - 110003

LODHI ROAD, NEW DELHI - 110003

Dated: 17<sup>th</sup> March, 1996.

No. 8-24/95-FC

To

The Secretary (Forests)  
Government of Madhya Pradesh  
Bhopal.Sub: Diversion of 124.109 ha. of revenue forest land in  
favour of M/s HINDALCO Industries Ltd. for Bauxite  
mining in District Sarguja.

Sir,

I am directed to refer to your letter no. F.5/17/95/10/3 dated 9.3.95 on the above mentioned subject seeking prior approval of the Central Government in accordance with Section-2 of the Forest (Conservation) Act, 1980 and to say that the proposal has been examined by the Advisory Committee constituted by the Central Government under Section-3 of the aforesaid Act.

2. After careful consideration of the proposal of the State Government and on the basis of the recommendation of the above mentioned Advisory Committee, the Central Government hereby conveys its approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 124.109 ha. of revenue forest land in favour of M/s HINDALCO Industries Ltd. for Bauxite mining in District Sarguja subject to the following conditions:

- i) Legal status of forest land shall remain unchanged.
- ii) Compensatory afforestation shall be carried out over double the degraded forest land at the project cost.

- iii) Reclamation of the mining area will be done in consultation with the State Forest Deptt. at the project cost as per plan prepared in this regard.
- iv) Demarcation of the mining area will be done on the ground at the project cost.
- v) Forest land will not be used for construction of buildings etc. and any purpose other than those mentioned in the proposal.
- vi) Lease period shall remain coterminus with lease under MMRD Act subject to maximum of 20 years.
- vii) Free fuelwood will be provided to the labourers and staff working at the project site at the project cost.
- viii) Any other condition the State Govt. may impose.
- ix) This clearance is subject to the environmental clearance of the project under the Environment Protection Act.

Yours faithfully,

( R.K. CHAUDHRY )  
Asstt. Inspector General of Forests.

Copy to:

- 1. The P rincipal Chief Conservator of Forests Government of Madhya Pradesh, Bhopal.
- 2. Nodal Officer, Office of the Principal Chief Conservator of Forests, Govt. of Madhya Pradesh, Bhopal.
- 3. The CCF (Central), Regional Office, Bhopal.
- 4. RO(HQ), New Delhi.
- 5. Guard file.

19.3.96  
( R.K. CHAUDHRY )  
AIGF.

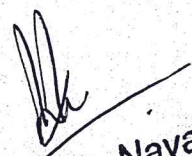


Environmental Status Report  
For  
Kudag Bauxite Mine  
at  
Post & Teh.: Samri, (Kusmi)  
Dist: Balrampur-Ramanujganj (C.G.)

**Duration: January-February-March-2014**

Sponsor:-



  
(M. K. Nayak)  
Agent of mines  
Samri mines Division  
Hindalco Industries Ltd

M/s. Hindalco Industries Limited.,

Prepared By :-



Recognised by MoEF (GOI) Notifn. No. D.L.33004/99 Dt.24.10.2007  
NABL (DST GOI) Cert. No. T-1550 Dt. 16/05/2011  
NABL (DST GOI) Cert. No.T-1826 dt. 04/10/2010  
QCI-NABET Scheme for Accreditation of EIA Consultant  
ISO 9001:2008 vide Registration No. 44 100 094152-E3  
Head Office: 60, Bajiprabhu Nagar, Nagpur-440 033, MS  
Lab. : FP-34, 35, Food Park, MIDC, Butibori, Nagpur - 441122  
Ph. : (0712) 2242077, 9373287475 Fax: (0712) 2242077  
Email: [anaconngp@gmail.com](mailto:anaconngp@gmail.com), [anaconlabngp@gmail.com](mailto:anaconlabngp@gmail.com)  
website: [www.anaconlaboratories.com](http://www.anaconlaboratories.com), [www.anacongarway.com](http://www.anacongarway.com)



## 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 January-2014 to March-2014 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.

*Stawf*

Authorized Signatory



Place : Nagpur

Date : March, 2014



## **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 Environmental monitoring of parameters for assessing pollution levels and preparation of monthly reports (*January-February-March-2014*) as per the requirement of Chhattisgarh Environment Conservation Board (CECB) and Ministry of Environment and Forest (MoEF) for Kudag mining lease in Balrampur District, Chhattisgarh State.

## **1.2 Background Information of Kudag Mine**

Hindalco was granted Kudag Bauxite mining lease over an area of 377.116 ha in Kudag village in Post office Dumarkholi, Tehsil Samri(Kusmi) of Balrampur district, Chhattisgarh on 24/12/1996 for a period of 20 years. The mining operations were started on 02/07/1997. The production capacity of Bauxite is 0.6 Lakh Tonnes Per Annum (LTPA).

## **1.3 Salient Features of Kudag Bauxite Mine**

The deposits occur in Kudag block, Post office Dumarkholi Tehsil Samri(Kusmi) 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 Kudag Bauxite Mines**

<b>S.No.</b>	<b>Particulars</b>	<b>Details</b>
1.	Survey of India Toposheet No.	64 M /15
2.	Latitude	23 <sup>0</sup> 26' 02"N to 23 <sup>0</sup> 29' 00"N
3.	Longitude	83 <sup>0</sup> 51' 00"E to 83 <sup>0</sup> 59' 00"E
4.	Elevation	1145-m above Mean Sea Level
5.	Climatic Conditions (as per IMD, Ambikapur)	Annual maximum temperature : 30.3 <sup>0</sup> C Annual minimum temperature : 17.7 <sup>0</sup> C Average annual rainfall : 1401.1 mm
6.	Mining lease area	377.116 Ha.
7.	Method of mining	Open cast (Semi-Mechanized)
8.	Mode of transportation	Trucks
9.	Landuse	Agricultural and Barren land
10.	Nearest Road	Samri to Kusmi (17 km)
11.	Nearest Airport	Ranchi Airport (151.09 Km)
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 environmental 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 the impact of mining activity on sensitive receptors, it is necessary to monitor Environmental Quality to know the level of concentrations of pollutants within and around the mining lease area. Accordingly Hindalco Industries through ALPL has been monitoring 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 and Fugitive emission monitored at 8 following locations with reference to Kudag mine lease area shown in **(Fig. 1)**.

**Table 2**

#### **Locations of Ambient Air Quality Monitoring (AAQM) & Fugitive Emission**

<b>Sr. No.</b>	<b>Core Zone</b>	<b>Sr.</b>	<b>Buffer Zone</b>
1	Saraidih (Hindalco Campus)	5	Village Khas Kudag
2	Mining Area (New Kudag)	6	Jaljali Village
3	Samri Chowk/Nr. Weigh Bridge	7	Tatijharia
4	Rajenderpur Mine	8	Piprapat Mines Area

The sampling stations are selected at the above mentioned locations, in downwind and upwind directions of the mining site. ALPL is carrying out regular monitoring for PM<sub>2.5</sub>, RPM (PM<sub>10</sub>), SO<sub>2</sub>, NO<sub>x</sub> and SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, Pb, Hg, As and Cr at above Ambient Air Quality Monitoring (AAQM) locations and Fugitive Emission. The dust fall rate was measured in the mining area and Khaskudag during March-2014. 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<sub>2.5</sub>, RPM (PM<sub>10</sub>), SO<sub>2</sub>, NO<sub>x</sub> and SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, Pb, Hg, As and Cr from January-February-March-2014 as per CPCB norms. Sampling conducted duration and Frequency is given in **(Table 3)**.

Data is compared with the standards mentioned in the 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 (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), 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 m<sup>3</sup>/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 and the smaller particulates from 2.5 µm 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 Samri Chowk during pre and post monsoon period. 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)**.

Sampling was carried out continuously for 24 hourly monitoring twice a week at each station during the stipulated study period using pre-calibrated Respirable Dust Samplers in each of the stations.

Earmarked samples were collected for Particulate Matter-PM<sub>10</sub>, Particulate Matter-PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub> for 24 hourly. Collected samples were sent to Laboratories for analysis.

The baseline data of air environment is generated for the parameters namely: Suspended Particulate Matter (SPM), Particulate Matter (PM<sub>10</sub>), Particulate Matter (PM<sub>2.5</sub>), Sulphur Dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), Lead (Pb), Mercury (Hg), Arsenic (As) and Chromium (Cr). **Table-4.0**





**Table-3.0**

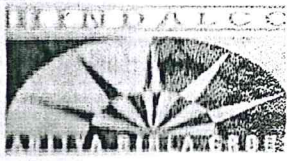
Parameters	Sampling frequency
Suspended Particulate Matter	24 hourly sample twice a week for Three months
Respirable Particulate Matter	24 hourly sample twice a week for Three months
Particulate Matter 2.5	24 hourly sample twice a week for Three months
Sulphur dioxide (SO <sub>2</sub> )	24 hourly sample twice a week for Three months
Oxides of Nitrogen (NO <sub>x</sub> )	24 hourly sample twice a week for Three months
Pb, Hg, As, Cr	8 hourly basis for 24 hour sample for three months

**Table 4.0**

**Measurement Techniques for various pollutants**

S.No.	Parameter	Technique	Technical Protocol	Minimum Reportable Value (µg/ m <sup>3</sup> )
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.	Mercury (Hg)	By Cold Vapor atomic Absorption	IS-5182 (Part-I)	0.001
8.	Dust Full	Gravimetric	IS-5182 (Part-I)	-





### 1.6 Fugitive Emission Monitoring

The summary of Fugitive Emission monitoring results for the month of January-2014 to March-2014 are presented in detail in **Table 6.0**. 98<sup>th</sup> 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.

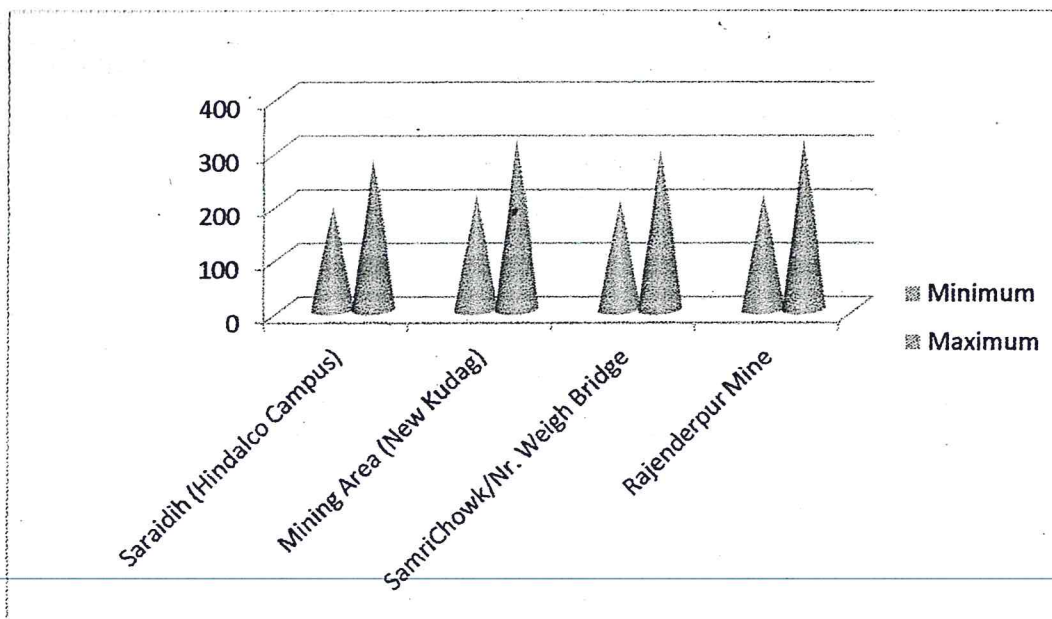
#### 1.6.1 Presentation of Results.

##### Suspended Particulate Matter-SPM

The minimum and maximum concentrations for Suspended Particulate Matter-SPM were recorded as 197  $\mu\text{g}/\text{m}^3$  and 321  $\mu\text{g}/\text{m}^3$  respectively. The average concentrations were ranged between 208 to 300  $\mu\text{g}/\text{m}^3$ . and 98<sup>th</sup> percentile values ranged between 218 to 321  $\mu\text{g}/\text{m}^3$  in the study area (**Table 6**).

#### Graphical Presentation Of Fugitive Emission Monitoring

### SPM

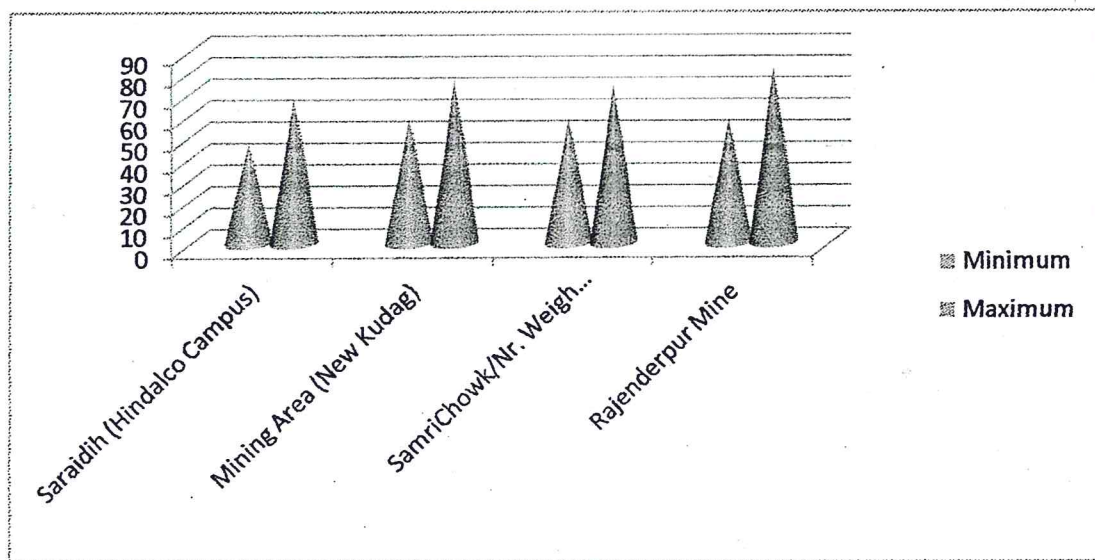




**Respirable Suspended Particulate Matter –RSPM**

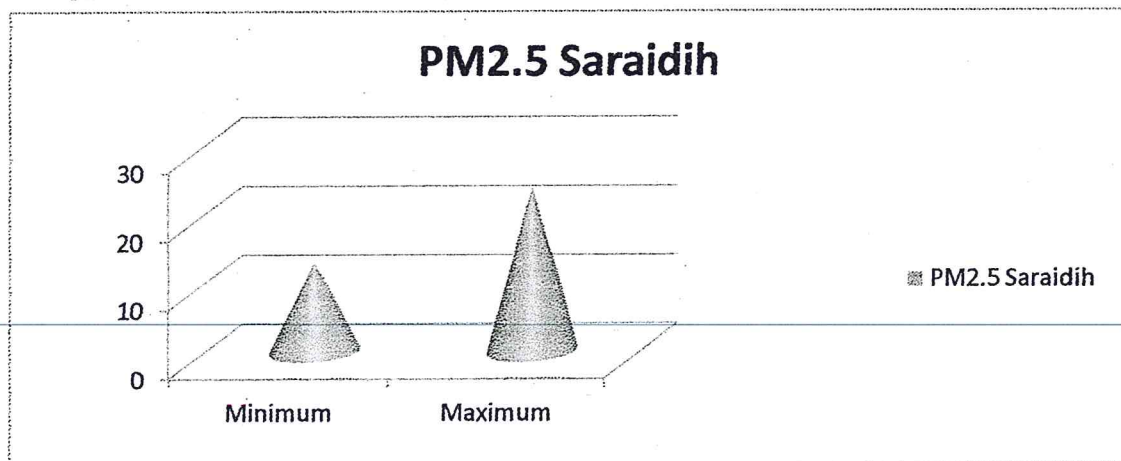
The minimum and maximum concentrations for RSPM were recorded as 47  $\mu\text{g}/\text{m}^3$  and 82  $\mu\text{g}/\text{m}^3$  respectively. The average values were observed to be in the range of 53 to 75  $\mu\text{g}/\text{m}^3$  and 98<sup>th</sup> percentile values ranged between 59 to 82  $\mu\text{g}/\text{m}^3$  in the study area (**Table 7**).

**Graphical Presentation Of Fugitive Emission Monitoring**  
**RSPM**



**Particulate Matter -PM<sub>2.5</sub>**

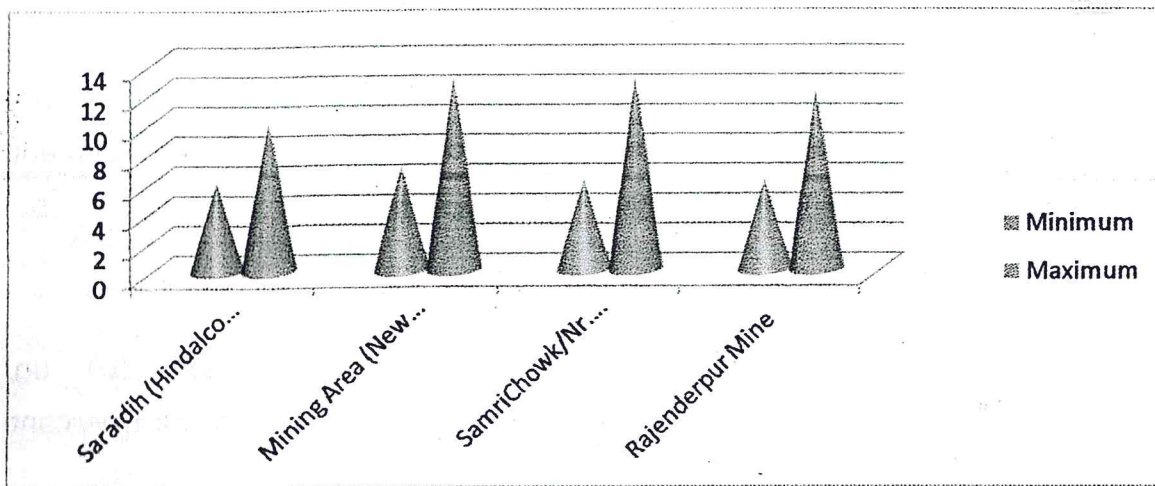
The minimum and maximum values of PM<sub>2.5</sub> concentrations varied between 13 to 24  $\mu\text{g}/\text{m}^3$  respectively. The average values range between 16 to 21  $\mu\text{g}/\text{m}^3$  and 98<sup>th</sup> percentile values varied between 19 to 24  $\mu\text{g}/\text{m}^3$  (**Table 8**).



**Sulphur Dioxide (SO<sub>2</sub>)**

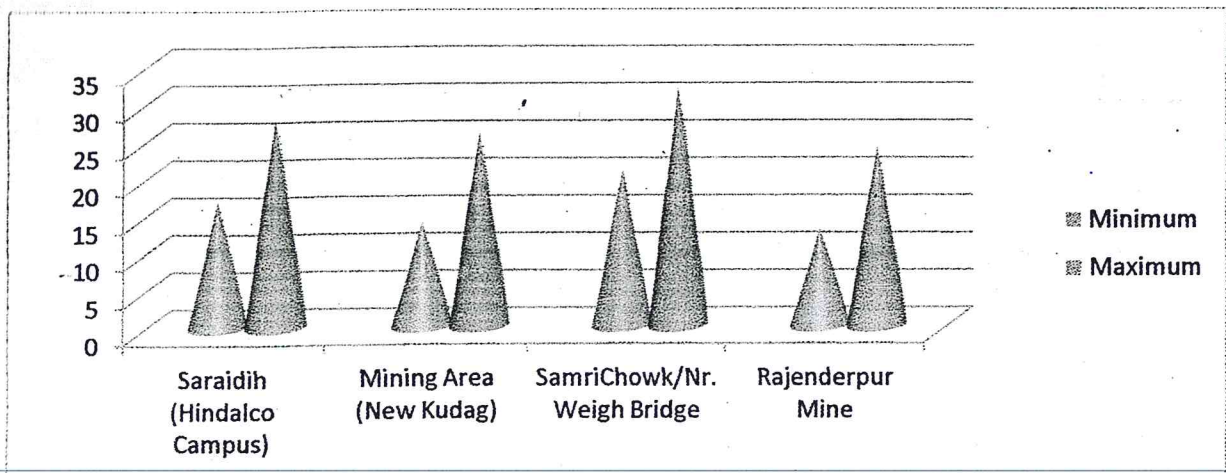
The minimum and maximum SO<sub>2</sub> concentrations were recorded as 6 µg/m<sup>3</sup> and 13 µg/m<sup>3</sup> respectively. The average values were observed to be in the range of 7 to 11 µg/m<sup>3</sup> and 98<sup>th</sup> percentile values varied between 8 to 13 µg/m<sup>3</sup> (Table 9).

**Graphical Presentation Of Fugitive Emission Monitoring**  
**SO<sub>2</sub>**

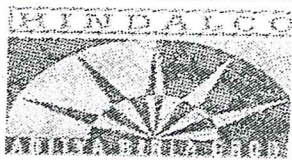


**Nitrogen Oxide (NO<sub>x</sub>)**

The minimum and maximum NO<sub>x</sub> concentrations were recorded as 13 µg/m<sup>3</sup> and 32 µg/m<sup>3</sup>. The average concentrations were ranged between 16 to 29 µg/m<sup>3</sup> and 98<sup>th</sup> percentile values varied between 19 to 32 µg/m<sup>3</sup> (Table 10).







### **Lead (Pb)**

The minimum and maximum Lead detected between  $<0.005$  to  $0.081\mu\text{g}/\text{m}^3$  respectively. The average Lead detected between  $<0.005$  to  $0.058\mu\text{g}/\text{m}^3$  & 98th percentile values varied between  $<0.005$  to  $0.081\mu\text{g}/\text{m}^3$  in the study region. **(Table 11).**

### **Mercury (Hg)**

The maximum concentrations of Hg varied  $0.052\mu\text{g}/\text{m}^3$  respectively. The average concentration varied  $0.042\mu\text{g}/\text{m}^3$  98th percentiles values varied  $0.052\mu\text{g}/\text{m}^3$  in the study region. **(Table 12).**

### **Arsenic (As)**

The maximum concentrations of As varied  $1.19\mu\text{g}/\text{m}^3$  respectively. The average concentration varied  $0.93\mu\text{g}/\text{m}^3$  and 98th percentiles values varied  $1.19\mu\text{g}/\text{m}^3$  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, RSPM(PM10), PM2.5, SO<sub>2</sub>, NO<sub>x</sub>, Pb, Hg, As, Cr and Dust fall are required to compute Buffer Zone. 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).

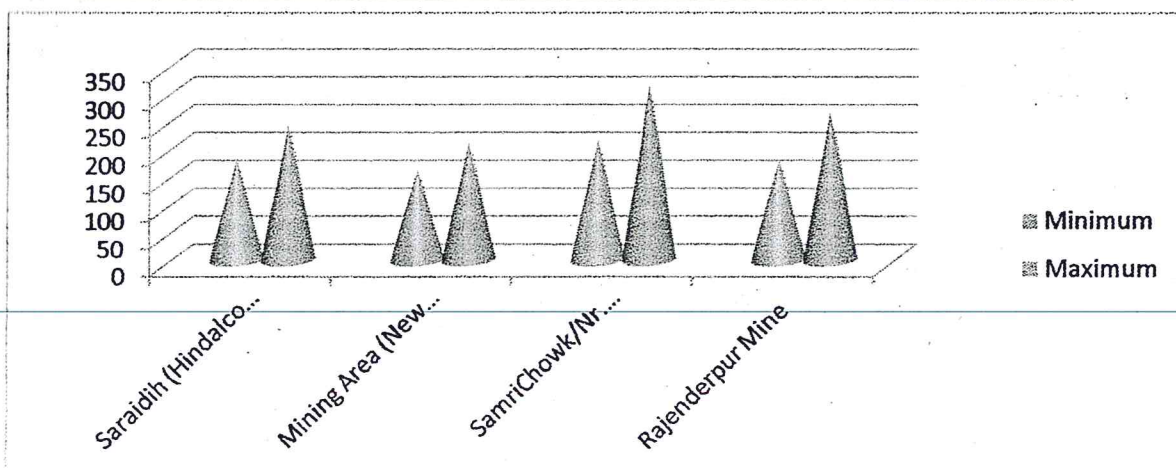
#### 1.7.1 Presentation of Results.

The summary of Ambient Air Quality monitoring results for the month of January to March 2014 are presented in detail in Table 6. 98<sup>th</sup> 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 Buffer Zone area. The minimum and maximum values varied between 164 to 317 µg/m<sup>3</sup> respectively during study period at all the 4 locations. The average values ranged between 179 to 293 µg/m<sup>3</sup> and 98<sup>th</sup> percentile values ranged between 193 to 317 µg/m<sup>3</sup> in the study area.

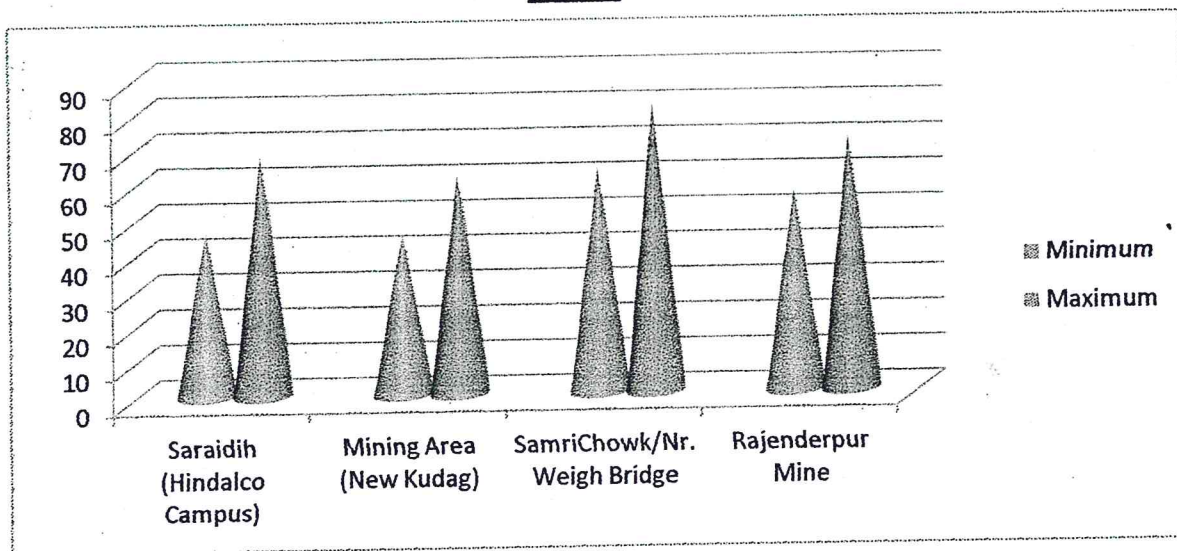
#### Graphical Presentation Of Ambient Air Quality (Buffer Zone)



**Particulate Matter-RSPM**

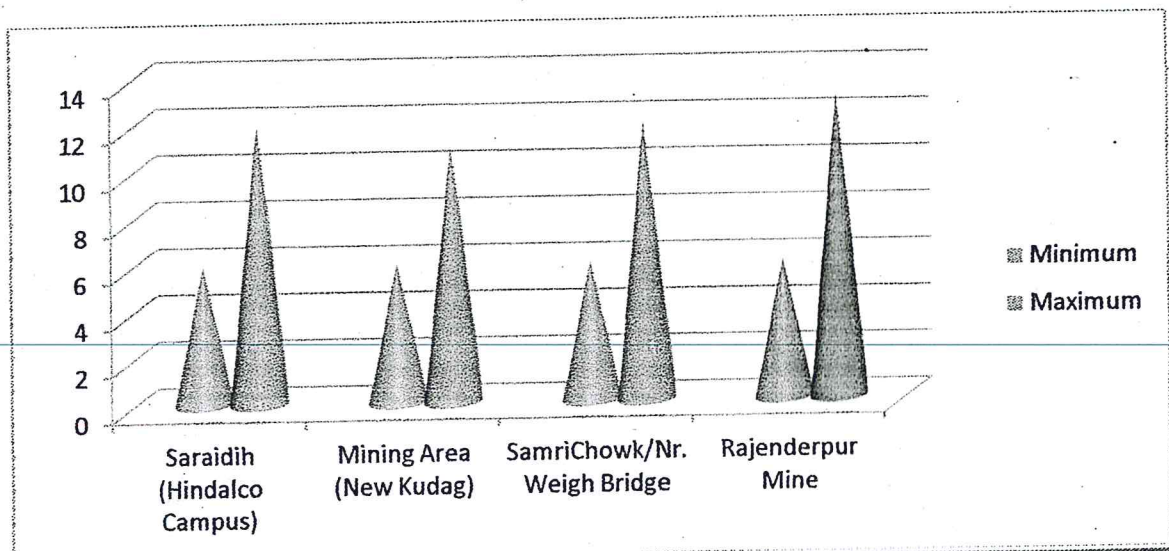
The minimum and maximum values of RSPM varied between 46 to 82  $\mu\text{g}/\text{m}^3$  respectively (**Table 7**). The average values varied between 50 to 77  $\mu\text{g}/\text{m}^3$ . The 98<sup>th</sup> percentile values varied between 53 to 82  $\mu\text{g}/\text{m}^3$  in the mining area. The 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.

**Graphical Presentation Of Ambient Air Quality (Buffer Zone)**  
**RSPM**



**Sulphur Dioxide (SO<sub>2</sub>)**

The minimum and maximum values of SO<sub>2</sub> concentrations varied between 6 to 13  $\mu\text{g}/\text{m}^3$  respectively. The average values range between 7 to 10  $\mu\text{g}/\text{m}^3$  and 98<sup>th</sup> percentile values varied between 8 to 13  $\mu\text{g}/\text{m}^3$  (**Table 9**).





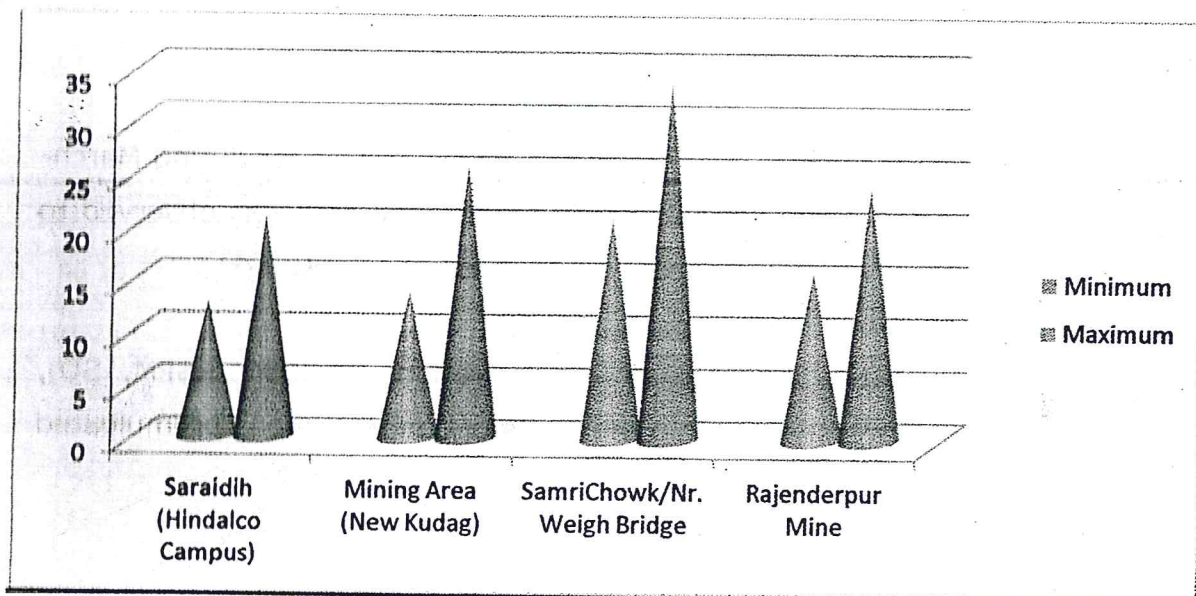


### Nitrogen Oxide (NO<sub>x</sub>)

The minimum and maximum values of NO<sub>x</sub> concentrations varied between 13 to 34 µg/m<sup>3</sup> respectively. The average values range between 16 to 30 µg/m<sup>3</sup> and 98th percentile values varied between 18 to 34 µg/m<sup>3</sup> (Table 10).

#### Graphical Presentation Of Ambient Air Quality (Buffer Zone)

##### NO<sub>x</sub>



### Lead (Pb)

The minimum and maximum Lead detected between <0.005 to 0.097 µg/m<sup>3</sup> respectively. The average Lead detected between <0.005 to 0.089 µg/m<sup>3</sup> & 98th percentile values varied between <0.005 to 0.097 µg/m<sup>3</sup> in the study region. (Table 11).

### Mercury (Hg)

The maximum concentrations of Hg varied 0.029 µg/m<sup>3</sup> respectively. The average concentration varied 0.025 µg/m<sup>3</sup> 98th percentiles values varied 0.029 µg/m<sup>3</sup> in the study region. (Table 12).





### **Arsenic (As)**

The maximum concentrations of As varied  $1.16 \mu\text{g}/\text{m}^3$  respectively. The average concentration varied  $1.04 \mu\text{g}/\text{m}^3$  and 98th percentiles values varied  $1.16 \mu\text{g}/\text{m}^3$  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.

The dust fall rate was measured by exposing a jar during March-2014 in mining area and KhasKudag village. The dust fall rate was observed to be 26.9 and 19.4 MT/km<sup>2</sup>/month respectively as given in (**Table 14**).

Overall the ambient air concentrations of SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub>, Pb, As, Cr and Hg 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 (January-February-March 2014) indicates that the wind was blowing predominantly from (N), during study period, for 80.0% hours wind was found to be calm. The details of wind pattern in form of wind frequency distribution are presented in table 2. The wind rose diagram and graphical illustration is presented in **Fig.1 & 2** respectively.

**Table.5**  
**Wind Frequency Distribution Data**

Wind Direction	Speed m/s						Total
	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 -11.1	>= 11.1	
348.75-11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.003738	0.003738
11.25 -33.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
33.75 - 56.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
56.25-78.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
78.75-101.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
101.25 - 123.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
123.75 - 146.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
146.25-168.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
168.75- 191.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
191.25 - 213.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
213.75-236.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
236.25 - 258.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
258.75 - 281.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
281.25 - 303.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
303.75 - 326.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
326.25 - 348.75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
<b>Sub Total</b>	0.000000	0.000000	0.000000	0.000000	0.000000	<b>0.003738</b>	<b>0.003003</b>
<b>Calms</b>							<b>0.800300</b>
<b>Missing/Incomplete</b>							<b>0.196697</b>
<b>Total</b>							<b>1.000000</b>

**SUMMARY OF WIND PATTERN**

Season	First Predominant Wind Direction	Second Predominant Wind Direction	Calm Condition
January-February-March -2014	N (0.3 %)	-	80.0 %



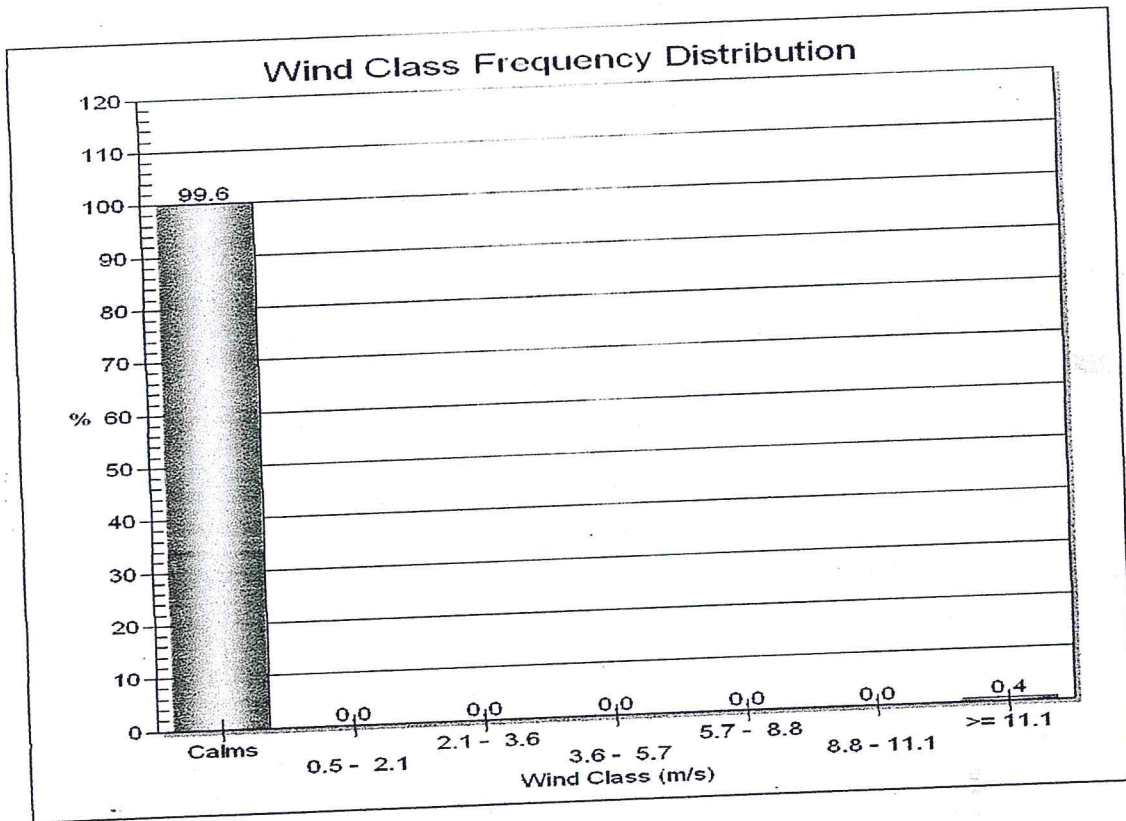


Fig.01 Wind Class Frequency Distribution

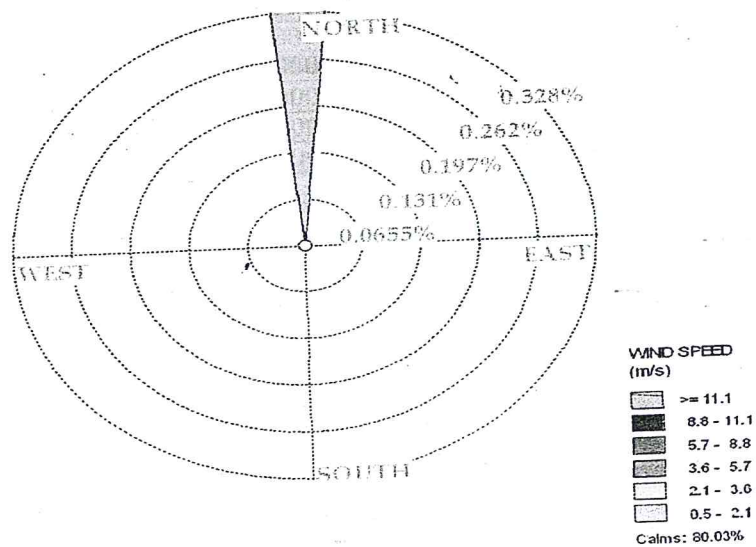


Fig.02 Wind Rose Diagram (January-February-March 2014)



## **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 control equipment. Noise monitoring carried out on monthly basis at mining site, village KhasKudag and Saraidih and Jaljali mines are as 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.

### **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.





## **Method of Monitoring**

Sound Pressure Level (SPL) measurements were monitored at three 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 three 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 three locations are found to be below in the Mining Area than the stipulated standard of CPCB for Industrial area as 75dB(A) and 70dB(A) for day and night respectively as given in **(Table15)**.

## **2.0 Water Quality Monitoring**

The existing status of water quality for ground water and surface water was assessed by collecting the water samples from underground wells from the village, Rajenderpur, Sariadih, Tatijharia Weighbridge, Samri weighbridge, Piprapat pit of Kudag mine.

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 **(Table16 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 far away sources. Hence, additional care may be taken to chlorinate the tankers before leaving the supply source.

The water sample from Nallahs near Mines Area was collected to know its chemical characteristics in order to find out the use of water for various utilities in the mine area As per IS : 2296 Class B for surface water results are within the permissible limit so that the water can be used after chlorination.

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





**Table 6**

**Statistical Analysis of SPM**

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%ile
<b>Fugitive Emission (Core Zone):-</b>						
<b>Saraldih (Hindalco Campus)</b>	January-2014	238	267	253	253	267
	February-2014	249	283	266	266	283
	March-2014	197	218	208	208	218
<b>Mining Area (New Kudag)</b>	January-2014	264	309	287	287	309
	February-2014	273	321	297	297	321
	March-2014	218	257	238	238	257
<b>Samri Chowk/Nr. Weigh Bridge</b>	January-2014	259	302	281	281	302
	February-2014	228	267	248	248	267
	March-2014	209	251	230	230	251
<b>Rajenderpur Mine</b>	January-2014	281	319	300	300	319
	February-2014	268	304	286	286	304
	March-2014	217	269	243	243	269
<b>Buffer Zone :-</b>						
<b>Village Khas Kudag</b>	January-2014	204	243	224	224	243
	February-2014	183	218	201	201	218
	March-2014	201	237	219	219	237
<b>Village Jaljali</b>	January-2014	172	212	192	192	212
	February-2014	164	193	179	179	193
	March-2014	179	204	192	192	204
<b>Tatjharla Near Weighbridge</b>	January-2014	258	301	280	280	301
	February-2014	269	317	293	293	317
	March-2014	218	283	251	251	283
<b>Piprapat Mines area</b>	January-2014	197	239	218	218	239
	February-2014	212	267	240	240	267
	March-2014	183	218	201	201	218



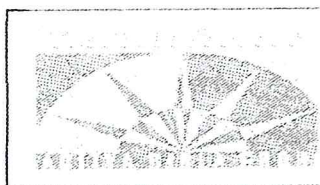


Table 7

Statistical Analysis of RSPM

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
<b>Fugitive Emission (Core Zone):-</b>						
Saraidih (Hindalco Campus)	January-2014	57	68	63	63	68
	February-2014	54	63	59	59	63
	March-2014	47	59	53	53	59
Mining Area (New Kudag)	January-2014	64	73	69	69	73
	February-2014	58	67	63	63	67
	March-2014	69	76	73	73	76
Samri Chowk/Nr.Weigh Bridge	January-2014	67	74	71	71	74
	February-2014	61	69	65	65	69
	March-2014	58	67	63	63	67
Rajenderpur Mine	January-2014	67	82	75	75	82
	February-2014	64	79	72	72	79
	March-2014	58	67	63	63	67
<b>Buffer Zone :-</b>						
Village Khas Kudag	January-2014	47	56	52	52	56
	February-2014	53	61	57	57	61
	March-2014	56	68	62	62	68
Village Jaljali	January-2014	46	53	50	50	53
	February-2014	49	57	53	53	57
	March-2014	51	62	57	57	62
Tatijharia Nr.Weighbridge	January-2014	67	73	70	70	73
	February-2014	71	82	77	77	82
	March-2014	64	71	68	68	71
Piprapat Mines area	January-2014	61	67	64	64	67
	February-2014	57	64	61	61	64
	March-2014	64	72	68	68	72
<b>CPCB Standard</b>				<b>100 <math>\mu\text{g}/\text{m}^3</math> (24 hrs)</b>		

Table 8

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

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
Saraidih	January-2014	16	21	19	19	21
	February-2014	18	24	21	21	24
	March-2014	13	19	16	16	19
<b>CPCB Standard</b>				<b>60 <math>\mu\text{g}/\text{m}^3</math> (24 hrs)</b>		



**Table 9**

**Statistical analysis of SO<sub>2</sub>**

Unit: µg/m<sup>3</sup>

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
<b>Fugitive Emission (Core Zone):-</b>						
<b>Saraldh (Hindalco Campus)</b>	January-2014	7	10	9	9	10
	February-2014	6	9	8	8	9
	March-2014	6	8	7	7	8
<b>Mining Area (New Kudag)</b>	January-2014	9	11	10	10	11
	February-2014	7	9	8	8	9
	March-2014	9	13	11	11	13
<b>Samri Chowk/Nr. Weigh Bridge</b>	January-2014	9	13	11	11	13
	February-2014	7	11	9	9	11
	March-2014	6	10	8	8	10
<b>Rajenderpur Mine</b>	January-2014	6	12	9	9	12
	February-2014	7	11	9	9	11
	March-2014	6	9	8	8	9
<b>Buffer Zone :-</b>						
<b>Village Khas Kudag</b>	January-2014	6	8	7	7	8
	February-2014	6	9	8	8	9
	March-2014	7	12	10	10	12
<b>Village Jaljali</b>	January-2014	7	11	9	9	11
	February-2014	6	9	8	8	9
	March-2014	7	9	8	8	9
<b>Tatijharia Nr. Weighbridge</b>	January-2014	6	12	9	9	12
	February-2014	7	11	9	9	11
	March-2014	6	12	9	9	12
<b>Piprapat Mines area</b>	January-2014	6	11	9	9	11
	February-2014	7	13	10	10	13
	March-2014	6	10	8	8	10
<b>CPCB Standard</b>		<b>80 µg/m<sup>3</sup></b> <b>(24 hrs)</b>				



**Table 10**

**Statistical Analysis of NOx**

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%ile
<b>Fugitive Emission (Core Zone):-</b>						
<b>Saraidih (Hindalco Campus)</b>	January-2014	17	24	21	21	24
	February-2014	21	28	25	25	28
	March-2014	19	23	21	21	23
<b>Mining Area (New Kudag)</b>	January-2014	18	26	22	22	26
	February-2014	17	23	20	20	23
	March-2014	14	19	17	17	19
<b>Samri Chowk/Nr.Weigh Bridge</b>	January-2014	26	32	29	29	32
	February-2014	24	29	27	27	29
	March-2014	21	27	24	24	27
<b>Rajenderpur Mine</b>	January-2014	13	18	16	16	18
	February-2014	17	24	21	21	24
	March-2014	16	21	19	19	21
<b>Buffer Zone :-</b>						
<b>Village Khas Kudag</b>	January-2014	13	19	16	16	19
	February-2014	16	21	19	19	21
	March-2014	14	18	16	16	18
<b>Village Jaljali</b>	January-2014	16	23	20	20	23
	February-2014	18	26	22	22	26
	March-2014	14	19	17	17	19
<b>Tatijharia Nr.Weighbridge</b>	January-2014	23	31	27	27	31
	February-2014	21	29	25	25	29
	March-2014	26	34	30	30	34
<b>Piprapat Mines area</b>	January-2014	16	21	19	19	21
	February-2014	19	24	22	22	24
	March-2014	17	23	20	20	23
<b>CPCB Standard</b>				<b>80 <math>\mu\text{g}/\text{m}^3</math> (24 hrs)</b>		





**Table 11**

**Statistical Analysis of Pb**

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%ile
<b>Fugitive Emission (Core Zone):-</b>						
<b>Saraldih (Hindalco Campus)</b>	January-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	February-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	March-2014	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Mining Area (New Kudag)</b>	January-2014	0.042	0.064	0.053	0.053	0.064
	February-2014	0.031	0.057	0.044	0.044	0.057
	March-2014	0.047	0.069	0.058	0.058	0.069
<b>Samri Chowk/Nr. Welgh Bridge</b>	January-2014	0.029	0.048	0.039	0.039	0.048
	February-2014	0.034	0.081	0.058	0.058	0.081
	March-2014	0.031	0.074	0.053	0.053	0.074
<b>Rajenderpur Mine</b>	January-2014	0.024	0.052	0.038	0.038	0.052
	February-2014	0.037	0.071	0.054	0.054	0.071
	March-2014	0.029	0.048	0.053	0.053	0.048
<b>Buffer Zone :-</b>						
<b>Village Khas Kudag</b>	January-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	February-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	March-2014	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Village Jaljali</b>	January-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	February-2014	<0.005	<0.005	<0.005	<0.005	<0.005
	March-2014	<0.005	<0.005	<0.005	<0.005	<0.005
<b>Tatijharla Nr. Weighbridge</b>	January-2014	0.081	0.097	0.089	0.089	0.097
	February-2014	0.068	0.083	0.076	0.076	0.083
	March-2014	0.062	0.079	0.071	0.071	0.079
<b>Piprapat Mines area</b>	January-2014	0.034	0.061	0.048	0.048	0.061
	February-2014	0.029	0.048	0.039	0.039	0.048
	March-2014	0.031	0.057	0.044	0.044	0.057
<b>CPCB Standard</b>		<b>1.0 <math>\mu\text{g}/\text{m}^3</math> (24 hrs)</b>				





Table 12

Statistical Analysis of Hg

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
<b>Fugitive Emission (Core Zone):-</b>						
Saraidih (Hindalco Campus)	January-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	February-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	March-2014	<0.01	<0.01	<0.01	<0.01	<0.01
Mining Area (New Kudag)	January-2014	0.021	0.026	0.024	0.024	0.026
	February-2014	0.019	0.024	0.022	0.022	0.024
	March-2014	0.023	0.037	0.030	0.030	0.037
Samri Chowk/Nr.WeighBridge	January-2014	0.031	0.052	0.042	0.042	0.052
	February-2014	0.029	0.048	0.039	0.039	0.048
	March-2014	0.027	0.042	0.035	0.035	0.042
Rajenderpur Mine	January-2014	0.021	0.032	0.027	0.027	0.032
	February-2014	0.019	0.027	0.023	0.023	0.027
	March-2014	0.023	0.038	0.031	0.031	0.038
<b>Buffer Zone :-</b>						
Village Khas Kudag	January-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	February-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	March-2014	<0.01	<0.01	<0.01	<0.01	<0.01
Village Jaljali	January-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	February-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	March-2014	<0.01	<0.01	<0.01	<0.01	<0.01
Tatijharia Nr. Weighbridge	January-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	February-2014	<0.01	<0.01	<0.01	<0.01	<0.01
	March-2014	<0.01	<0.01	<0.01	<0.01	<0.01
Piprapat Mines area	January-2014	0.019	0.024	0.025	0.025	0.024
	February-2014	0.021	0.029	0.019	0.019	0.029
	March-2014	0.016	0.021	0.025	0.025	0.021



**Table 13**

**Statistical Analysis of As**

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

Location	Month & Year	Min.	Max.	A.M.	G.M.	98%
<b>Fugitive Emission (Core Zone):-</b>						
<b>Saraidih (Hindalco Campus)</b>	January-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	February-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	March-2014	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Mining Area(New Kudag)</b>	January-2014	0.21	0.47	0.34	0.34	0.47
	February-2014	0.32	0.58	0.45	0.45	0.58
	March-2014	0.19	0.37	0.28	0.28	0.37
<b>Samri Chowk/Nr.Weigh ridge</b>	January-2014	0.51	0.93	0.72	0.72	0.93
	February-2014	0.48	0.83	0.66	0.66	0.83
	March-2014	0.49	1.01	0.75	0.75	1.01
<b>Rajenderpur Mine</b>	January-2014	0.67	1.19	0.93	0.93	1.19
	February-2014	0.59	0.93	0.76	0.76	0.93
	March-2014	0.61	1.03	0.82	0.82	1.03
<b>Buffer Zone :-</b>						
<b>Village Khas Kudag</b>	January-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	February-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	March-2014	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Village Jaljall</b>	January-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	February-2014	<0.1	<0.1	<0.1	<0.1	<0.1
	March-2014	<0.1	<0.1	<0.1	<0.1	<0.1
<b>Tatijharla Nr.Weighbridge</b>	January-2014	0.64	0.97	0.81	0.81	0.97
	February-2014	0.58	0.83	0.71	0.71	0.83
	March-2014	0.73	1.08	0.91	0.91	1.08
<b>Piprapat Mines area</b>	January-2014	0.91	1.16	1.04	1.04	1.16
	February-2014	0.84	1.07	0.96	0.96	1.07
	March-2014	0.67	0.93	0.80	0.80	0.93
<b>CPCB Standard</b>		<b>06 <math>\mu\text{g}/\text{m}^3</math> (Annual)</b>				





**Table 14**

**Dust fall rate (March-2014)**

Sl.No.	Location	Rate (mt/km <sup>2</sup> /month)
1	Mining Area	26.9
2	Khaskudag village	19.4

**Table 15**

**Noise Level Monitoring**

Unit: dB(A) Leq

Sl. No.	Location	January-2014		February-2014		March-2014	
		Day	Night	Day	Night	Day	Night
1	Mining Area (New Kudag)	71	64	68	59	61	57
2	Saraidih (Hindalco Campus)	53	41	51	41	49	38
3	Village KhasKudag	51	42	53	41	49	41
4	Village Jaljali	47	39	52	41	51	43

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) Leq

Sl. No.	Location	January-2014		February-2014		March 2014	
		Min.	Max.	Min.	Max.	Min.	Max.
1	Mining Area (New Kudag)	68	79	73	84	64	78



**2.1 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: Rajenderpur**

**GW2: KudagaiesSaraidih**

**GW3: Tatijharia Weigh Bridge**

**GW4: Tatijharia Camp**

**GW5: Samri Weigh Bridge**

**GW6: Piprapat Pit**

Sr. No	Test Parameters	Units	Acceptable Limit	Results		
				GW1	GW2	GW3
1.	pH Value	-	6.5 to 8.5	7.29 at 23°C	7.91 at 23°C	8.16 at 23°C
2.	Electrical Conductivity at 25°C	µs/cm	-	718	691	427
3.	Turbidity NTU	NTU	1	0.8	1	0.7
4.	Apparent Colour	Hazen units	5	3	2	3
5.	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
6.	Taste	-	Acceptable	--	--	--
7.	Free Residual Chlorine	mg / l	Min.0.2	< 0.1	< 0.1	< 0.1
8.	TDS	mg / l	500	402	387	239
9.	Fluoride (as F)	mg / l	1.0	0.16	0.21	0.18
10.	Cyanide as (CN)	mg / l	0.05	< 0.005	< 0.005	< 0.005
11.	Iron (as Fe)	mg / l	0.3	< 0.01	< 0.01	< 0.01
12.	Chlorides (as Cl)	mg / l	250	49.7	51.6	37.2
13.	Total Alkalinity	mg / l	200	141.7	129.8	132.8
14.	Total Hardness	mg / l	200	187.43	172.23	190.91
15.	Calcium (as Ca)	mg / l	75	63.8	59.2	64.7
16.	Magnesium (as Mg)	mg / l	30	6.8	5.9	7.1
17.	Sulphate (as SO <sub>4</sub> )	mg / l	200	32.7	28.4	21.3
18.	Nitrates (as NO <sub>3</sub> )	mg / l	45	8.1	9.2	7.6
19.	Sodium (as Na)	mg / l	-	23.9	17.4	19.2
20.	Potassium (as K)	mg / l	-	0.21	0.28	0.32
21.	Copper as(Cu)	mg / l	0.05	< 0.03	< 0.03	< 0.03
22.	Manganese as (Mn)	mg / l	0.1	< 0.05	< 0.05	< 0.05





**Hindalco Industries Limited**  
**Kudag Mining Environmental Status Report for**  
**January-2014 to March-2014**

**Data Analysis**

Sr. No	Test Parameters	Units	Acceptable Limit	Results		
				GW1	GW2	GW3
23.	Mercury as (Hg)	mg / l	0.001	< 0.0005	= 0.0005	< 0.0005
24.	Cadmium as (Cd)	mg / l	0.003	< 0.001	= 0.001	< 0.001
25.	Selenium as (Se)	mg / l	0.01	< 0.001	= 0.001	< 0.001
26.	Arsenic as (As)	mg / l	0.01	< 0.01	= 0.01	< 0.01
27.	Lead as (Pb)	mg / l	0.05	< 0.001	= 0.001	< 0.001
28.	Zinc as (Zn)	mg / l	5	< 0.1	= 0.1	< 0.1
29.	Boron as (B)	mg / l	0.5	0.16	0.08	0.14
30.	Aluminum as (Al)	mg / l	0.03	< 0.005	= 0.005	< 0.005
31.	Mineral oil	mg / l	Absent	< 0.001	= 0.001	< 0.001
32.	Poly aromatic hydrocarbon (as PAH)	µg/l	-	< 0.03	= 0.03	< 0.03
33.	Anionic Detergent	mg / l	0.2	< 0.001	= 0.001	< 0.001
34.	Phenolic Compounds	mg / l	0.001	< 0.001	= 0.001	< 0.001
35.	Total Coliform	MPN/100 ml	Absent	< 1	= 1	< 1

ND: Not Detected (< 0.001), Unob : Unobjectionable\*

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



Contd.....

**Table 16**

**Report on Chemical Examination of Ground Water**

Sr. No	Test Parameters	Units	Acceptable Limit	Results		
				GW4	GW5	GW6
1	pH Value	-	6.5 to 8.5	7.61 at 23°C	7.27 at 23°C	7.48 at 23°C
2	Electrical Conductivity at 25°C	µs/cm	-	617	539	512
3	Turbidity NTU	NTU	1	1.6	0.9	0.7
4	Apparent Colour	Hazen units	5	4	3	4
5	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
6	Taste	-	Acceptable	--	--	--
7	Free Residual Chlorine	mg / l	Min.0.2	< 0.1	< 0.1	< 0.1
8	TDS	mg / l	500	352	312	296
9	Fluoride (as F)	mg / l	1.0	0.16	0.14	0.19
10	Cyanide as (CN)	mg / l	0.05	< 0.005	< 0.005	< 0.005
11	Iron (as Fe)	mg / l	0.3	< 0.01	< 0.01	< 0.01
12	Chlorides (as Cl)	mg / l	250	61.8	54.9	68.3
13	Total Alkalinity	mg / l	200	119.7	108.3	134.9
14	Total Hardness	mg / l	200	166	143.11	159.80
15	Calcium (as Ca)	mg / l	75	57.2	48.7	53.9
16	Magnesium (as Mg)	mg / l	30	5.6	5.2	6.1
17	Sulphate (as SO <sub>4</sub> )	mg / l	200	32.7	28.9	31.6
18	Nitrates (as NO <sub>3</sub> )	mg / l	45	6.1	5.4	5.7
19	Sodium (as Na)	mg / l	-	34.9	28.7	24.3
20	Potassium (as K)	mg / l	-	0.17	0.23	0.18
21	Copper as (Cu)	mg / l	0.05	< 0.03	< 0.03	< 0.03
22	Manganese as (Mn)	mg / l	0.1	< 0.05	< 0.05	< 0.05
23	Mercury as (Hg)	mg / l	0.001	< 0.0005	< 0.0005	< 0.0005
24	Cadmium as (Cd)	mg / l	0.003	< 0.001	< 0.001	< 0.001
25	Selenium as (Se)	mg / l	0.01	< 0.001	< 0.001	< 0.001
26	Arsenic as (As)	mg / l	0.01	< 0.01	< 0.01	< 0.01
27	Lead as (Pb)	mg / l	0.05	< 0.001	< 0.001	< 0.001
28	Zinc as (Zn)	mg / l	5	< 0.1	< 0.1	< 0.1
29	Chromium as (Cr <sup>+6</sup> )	mg / l	0.05	< 0.03	< 0.03	< 0.03
30	Boron as (B)	mg / l	0.5	0.08	0.14	0.09
31	Aluminum as (Al)	mg / l	0.03	< 0.005	< 0.005	< 0.005
32	Mineral oil	mg / l	Absent	< 0.001	< 0.001	< 0.001
33	Poly aromatic hydrocarbon (as PAH)	µg/l	-	< 0.03	< 0.03	< 0.03
34	Anionic Detergent	mg / l	0.2	< 0.001	< 0.001	< 0.001
35	Phenolic Compounds	mg / l	0.001	< 0.001	< 0.001	< 0.001
36	Total Coliform	MPN/100 ml	Absent	< 1	< 1	< 1

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





**Table 17**

**Monthly Report on Chemical Examination of Surface Water  
(Nalags near Mines Area)**

S.No.	Parameters	Unit	IS 2296 Class 'D' Limits	Results
				January-2014
1	pH Value	-	6.5 to 8.5	6.91 at 23°C
2	Total Hardness (CaCO <sub>3</sub> )	mg / l	\$	236
3	Iron as (Fe)	mg / l	\$	3.1
4	Chlorides as (Cl)	mg / l	\$	57.9
5	Electrical Conductivity	µs/cm	\$	403
6	Total Dissolved Solids (TDS)	mg / l	\$	197.68
7	Calcium as (Ca)	mg / l	\$	67.9
8	Magnesium as (Mg)	mg / l	\$	6.8
9	Sulphate as (SO <sub>4</sub> )	mg / l	\$	73.7
10	Nitrates as (NO <sub>3</sub> )	mg / l	\$	< 2
11	Fluoride as (F)	mg / l	1.5	0.6
12	Alkalinity	mg / l	\$	78.1
13	Chemical Oxygen Demand (COD)	mg / l	\$	23.8
14	BOD at 27°C for 3days	mg / l	3	7.4
15	Total Suspended Solid (TSS)	mg / l	\$	76

\$: Limits not specified



**Table 18**

**Report on Soil Analysis, Kudag**

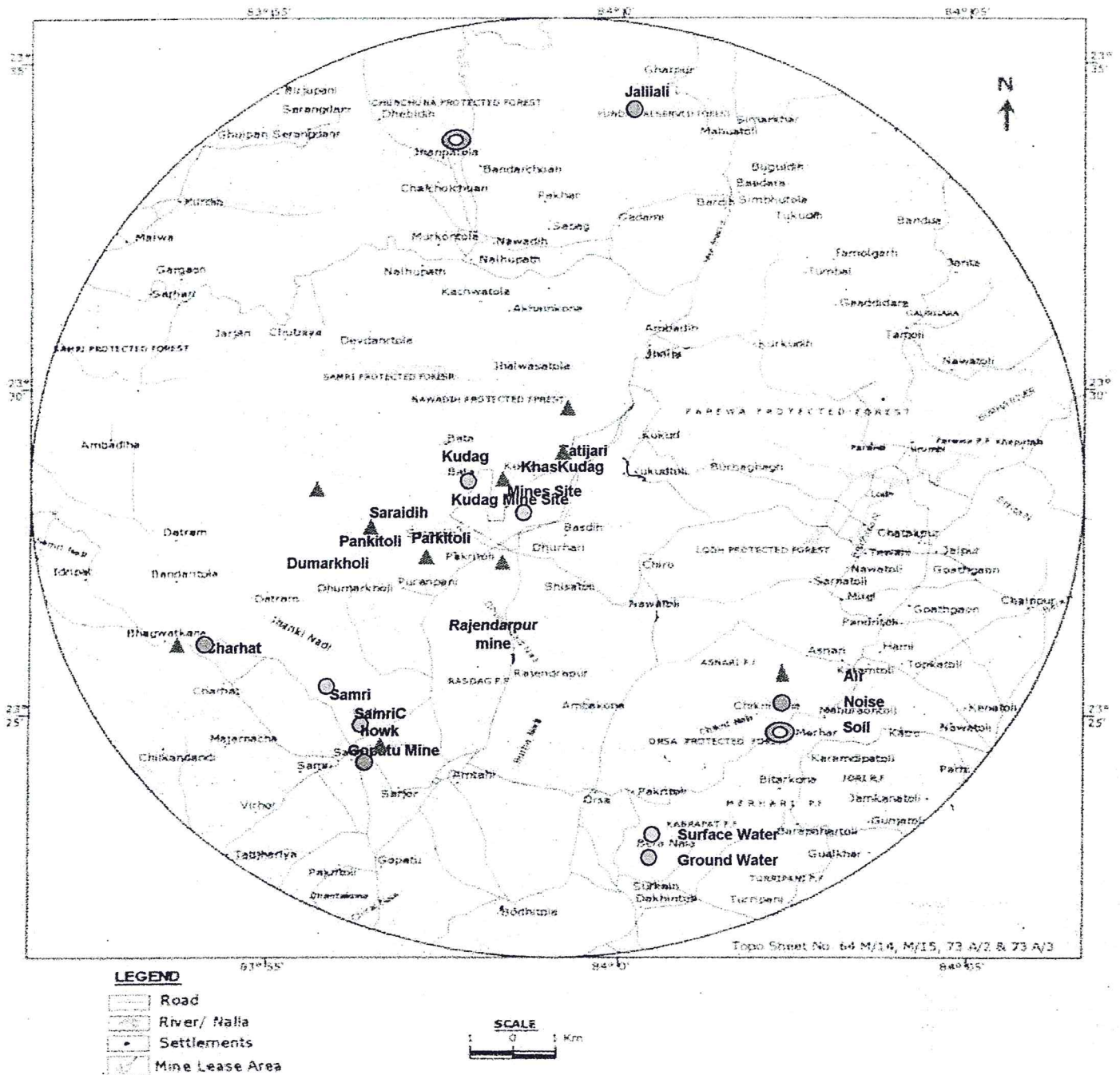
**Date of collection: January-2014**

**Sample Location:(Nr. Kudag Mines)**

Sr. No	Test Parameters	Measurement Unit	Results
1	pH	-	6.91 at 23°C
2	Electrical Conductivity at 25°C	µs/cm	347
3	Texture	-	Clay Loam
4	Sand	%	19.2
5	Silt	%	31.6
6	Clay	%	50.8
7	Bulk Density	g/cc	1.24
8	Porosity	%	19
9	Water Holding Capacity	%	63
10	Exchangeable Calcium as Ca	mg/kg	7.1
11	Exchangeable Magnesium as Mg	mg/kg	3.4
12	Exchangeable Sodium as Na	mg/kg	72.9
13	Available Potassium as K	kg/hect.	11.8
14	Available Phosphorous as P	kg/hect.	67.2
15	Available Nitrogen as N	kg/hect.	21.4
16	Organic Matter	%	0.62
17	Organic Carbon	%	0.51
18	Water Soluble Chloride as Cl <sup>-</sup>	mg/kg	11.6
19	Water Soluble Sulphate as SO <sub>4</sub>	mg/kg	5.92
20	Sodium Absorption Ratio	-	31.82
21	CEC	meq/100 gm	21.4
22	Total Iron	%	4.7
23	Available Manganese	mg/kg	0.06
24	Available Zinc	mg/kg	0.009
25	Available Boron	mg/kg	0.003







**Fig 5: Sampling Locations for Air, Noise, Soil and Water**







CHHATTISGARH ENVIRONMENT CONSERVATION BOARD  
Commercial Complex, Housing Board Colony,  
Kabir Nagar, Raipur (C.G.)

No. S-701 /TS/CECB/2014

Raipur, dated: 10/03/2014

To,

✓ M/s Hindalco Industries Limited,  
Kudag Bauxite Mine,  
Village- Kudag, Bata & Saridih,  
Tehsil-Samri,  
District- Balrampur (C.G.)

Recd.  
*[Signature]*  
19.3.14.

Sub: Renewal of consent of the Board for Bauxite Ore Mine under section 21 of the Air (Prevention and Control of Pollution) Act, 1981.

- Ref: 1. Consent of the Board for Bauxite Ore Mine issued under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 6882/TS/CECB/2007 Raipur, dated: 24/12/2007.
2. Last renewal of the Board for Bauxite Ore Mine issued under section 21 of the Air (Prevention and Control of Pollution) Act, 1981 vide letter no. 1819/TS/CECB/2013 Raipur, dated: 05/07/2013.
3. Your Letter No. HIL/SAM/CECB/117/2013/K, dated: 26/07/2013 and subsequent correspondence ending letter dated: 11/01/2014.

--: 00 :--

With reference to your above application consent is hereby renewed for a period of one year i.e. from 01/12/2013 to 30/11/2014, subject to the fulfillment of the terms and conditions incorporated in the consent letter No. 6882/TS/CECB/2007 Raipur, dated: 24/12/2007 and additional conditions mentioned below.

This renewal of consent is valid for: -

Name of Product	Production Capacity
Mining of bauxite ore	0.6 Lakhs Tonne per Annum [Zero Point Six Lakhs Tonne per Annum]

**Additional Conditions**

1. Industry shall operate & maintain the existing air pollution control facilities to ensure the emission of air pollutants within the prescribed emission standard the all time. Industry shall install some additional fixed type water sprinklers in haul roads approach roads for dust suppression. The industry shall also maintain the ambient air quality in and around the mine lease area within prescribed limits.

*[Signature]*



2. All internal roads shall be made pucca. Good house keeping practices shall be adopted by the industry.
3. Blasting operations shall be carried out as per the standards prescribed by Director General of Mine Safety.
4. Industry shall transport Bauxite Ore in duly covered vehicles to avoid dust emission during transportation.
5. Industry shall submit Environment Statement to this Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
6. Extensive tree plantation shall be carried out in the reclaimed areas and with mining lease area to the plants.

Please acknowledge the receipt of this letter.

For & on behalf of  
Chhattisgarh Environment Conservation Board Raipur (C.G.)



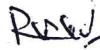
**Member Secretary**  
Chhattisgarh Environment Conservation Board  
of Raipur (C.G.)

Endt. No. /TS/CECB/2014  
Copy to: -

Raipur, dated: \_\_\_ / \_\_\_ /2014

Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Ambikapur (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.

**Member Secretary**  
Chhattisgarh Environment Conservation Board  
Raipur (C.G.)





CHHATTISGARH ENVIRONMENT CONSERVATION BOARD  
Commercial Complex, Housing Board Colony,  
Kabir Nagar, Raipur (C.G.)

No. 5699 ITS/CECB/2014

Raipur, dated: 10/03/2014

To,

✓ M/s Hindalco Industries Limited,  
Kudag Bauxite Mine,  
Village- Kudag, Bata & Saridih,  
Tehsil-Samri,  
District- Balrampur (C.G.)

Sub: Renewal of consent of the Board for Bauxite Ore Mine under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974.

- Ref: 1. Consent of the Board for Bauxite Ore Mine issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 6880/TS/C ECB/2007 Raipur, dated: 24/12/2007.
2. Last renewal of the Board for Bauxite Ore Mine issued under section 25/26 of the Water (Prevention and Control of Pollution) Act, 1974 vide letter no. 1817/TS/CECB/2013 Raipur, dated: 05/07/2013.
3. Your Letter No. HIL/SAM/CECB/117/2013/K, dated: 26/07/2013 and subsequent correspondence ending letter dated: 11/01/2014.

--: 00 :--

With reference to your above application consent is hereby renewed for a period of One year i.e. from 01/12/2013 to 30/11/2014, subject to the fulfillment of the terms and conditions incorporated in the schedule of the consent letter No. 6880/TS/CECB/2007 Raipur, dated: 24/12/2007 and additional conditions mentioned below.

This renewal of consent is valid for: -

Name of Product	Production Capacity
Mining of bauxite ore	0.6 Lakhs Tonne per Annum [Zero Point Six Lakhs Tonne per Annum]

**Additional Conditions**

1. Industry shall ensure the treated effluent quality within prescribed effluent standard all the time. Industry shall not discharge effluent out side the mine lease area in any circumstances; hence zero discharge condition shall be maintained all the time.
2. All internal roads shall be made pucca. Good house keeping practices shall be adopted. Dust muck generated on the road shall be dispose doff properly.
3. Bauxite ore shall be transported in duly covered vehicles.



4. Industry shall submit Environment Statement to this Board as per provision of Environment (Protection) amendment Rule, 1993 for the previous year ending 31st March on or before 30th September every year.
5. All the solid waste rejects shall be disposed off properly and reclaimed scientifically. Industry shall obtain authorization under Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 from the Board (If required).
6. Extensive tree plantation shall be carried out in the reclaimed areas and within the mining lease area.

Please acknowledge the receipt of this letter.


For & on behalf of  
Chhattisgarh Environment Conservation Board Raipur (C.G.)

  
**Member Secretary**  
Chhattisgarh Environment Conservation Board  
of Raipur (C.G.)

Endt. No. /TS/CECB/2014  
Copy to: -


Raipur, dated: \_\_\_ / \_\_\_ /2014

- 1- Regional Officer, Regional Office, Chhattisgarh Environment Conservation Board, Ambikapur (C.G.). Please ensure compliance and report, if any condition/conditions are violated by the industry.
- 2- Cess Section, Chhattisgarh Environment Conservation Board, Raipur (C.G.)

  
**Member Secretary**  
Chhattisgarh Environment Conservation Board  
Raipur (C.G.)



Lease	Production Capacity approved by MoEF ( in Lakh Tonnes)	Production ( April - 2013 to March -2014 ( in Tonnes)
Samri	5.0	450449.000
Tatijharia	4.0	339284.000
Kudag	0.6	51724.000



(M. K. Nayak)  
Agent of mines  
Samri mines Division  
Hindalco Industries Ltd





KUDAG LEASE

Particulars	Kudag Lease
Approved lease area	377.116 Ha.
Total Mined out up to the year (2013-14)	57.0985 Ha.
Total Reclaimed up to the year ( 2013-14)	51.5021 Ha.
Total afforestation in reclaimed land up to the year (2013-14)	43.350 Ha.
Total nos. of plants up to the year (2013-14)	103605
% of survival of plants	73 %
Mined out during April 2012 to March 2014	1.750 Ha.
Reclaimed during April 2013 to March 2014	1.079 Ha.
Afforestation ( 2013-14)	950
Afforestation in 2013-14 (Ha.)	0.400 Ha.

  
 (M. K. Nayak)  
 Agent of mines  
 Samri mines Division  
 Hindalco Industries Ltd





Annexure-VII

Actual Expenditure incurred in Environment Management Plan:-

Composite cost during the F.Y. 2013-14 for environment protection & pollution control by Samri Mines division, it includes Samri Bauxite Mine , Tatijharia Bauxite Mine & Kudag Bauxite Mine of Chhattisgarh state.

SI No-	Environment Protection Measures	Actual Cost (Lacs) (F.Y. 2013-14)
1	Pollution Control.	3.20
2	Environment Monitoring	3.10
3	Green Belt	10.80
4	Reclamation/Rehabilitation of mined out area	--
5	Rural Development (This include capital cost of on going construction of 2.5km ring road , Building for 6 Bed hospital & Primary School)	237.85
6	Total	254.95

- Environment monitoring jobs has been out sourced to Annacon Lab, recognized by MoEF (GOI) & NABL etc.
- One centralized nursery has been established at Samri mines among three leases viz, Samri, Tatijharia & Kudag.
- Reclamation and rehabilitation is part of mining operation. Mined out area has been backfilled by using mines rejects, laterite, morrum and followed top of surface by top soil. As per type of the land we decide for cultivation or planting species. Cost of reclamation /rehabilitation already included in the mining operation.

  
(M. K. Nayak)  
Agent of mines  
Samri mines Division  
Hindalco Industries Ltd



