

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

Duration: July-August-September-2020

Name of Industry



M/s. Hindalco Industries Limited.,

Name of Laboratory:-



QCI-NABET, MoEF & CC (GOI)
ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2007
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Rupam Bhatnagar
Agent of Mines
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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.

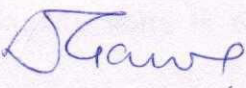
This report presents the Environmental Status for the period **July-2020 to September-2020** as compliance to the statutory requirements.

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 : September, 2020




Authorized Signatory



1.1 Introduction

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

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

HINDALCO INDUSTRIES LTD., awarded the work to M/s ANACON LABORATORIES PVT. LTD. Nagpur (ALPL) for carrying out Environmental monitoring of parameters for assessing pollution levels and preparation of monthly reports (*July-August-September-2020*) as per the requirement of Chhattisgarh Environment Conservation Board (CECB) and Ministry of Environment, Forest and Climate Change (MoEF&CC) 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 hec. In Kudag village, Post office-Dumarkholi, Tehsil-Samri (Kusmi) of Balrampur district, Chhattisgarh on 24/12/1996 for a period of 20 years. As per the Mines and Mineral (Development and Regulation) Amendment Act, 2015, Kudag lease has been extended up to another 30 years i.e 23/12/2046. The mining operations were started on 02/07/1997. The production capacity of Kudag Bauxite Mine is 60,000 Tonne /Year.

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 in Table 1.



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Table: 1

Salient Features of Kudag Bauxite Mines

| Sl. No. | Particulars | Details |
|---------|--|---|
| 1. | Survey of India Toposheet No. | 64 M /15 |
| 2. | Latitude | 23 ^o 26' 02"N to 23 ^o 29' 00"N |
| 3. | Longitude | 83 ^o 51' 00"E to 83 ^o 59' 00"E |
| 4. | Elevation | 1145-m above Mean Sea Level |
| 5. | Climatic Conditions (as per IMD, Ambikapur) | Annual maximum temperature : 30.3 ^o C Annual minimum temperature : 17.7 ^o C Average annual rainfall : 1401.1 mm |
| 6. | Mining lease area | 377.116 Hec. |
| 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 Airport (151.09 Km) |
| 12. | Nearest Town | Ambikapur (127 km, SW) |

14 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).



15 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) (377.116 hec.)

| Sr. No. | Core Zone | Sr. No. | Buffer Zone |
|---------|-------------------------------|---------|--------------------|
| 1 | Sairaidh Campus | 5 | Kutku Village |
| 2 | New Kudag/Nr.Weigh Bridge | 6 | Rajendrapur |
| 3 | Old Kudag/Mining Area | 7 | Tatijharia Village |
| 4 | Samri Gopatu/Nr. Weigh Bridge | 8 | Virhorepat |

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 PM₁₀, PM_{2.5}, SO₂, NO_x and Pb, Hg, As and Cr at above Ambient Air Quality Monitoring (AAQM) locations. The dust fall rate was measured in the mining area and Khas kudag during July-August-September-2020. 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 PM₁₀, PM_{2.5}, SO₂, NO_x and Pb, Hg, As & Cr from July-2020 to September-2020 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) 18th November, 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 (PM₁₀), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Pb, Hg, As and Cr were monitored for establishing the baseline status. PM₁₀ was collected with the help of Respirable particulate sampler operating 24 hours by drawing air which passes through the cyclone at the rate of 1.0 -1.3 m³/min which collects the particles less than 10 µm diameter over glass fiber filter paper. The dust deposited over the filter paper is measured as PM₁₀ and the smaller particulates from PM_{2.5} 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 July-2020 to September- 2020. 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 **(Table3)**.

Table 3

MONITORED PARAMETERS AND FREQUENCY OF SAMPLING

| Parameters | Sampling frequency |
|-------------------------------|--|
| Suspended Particulate Matter | 24 hourly sample twice a week for Three months |
| Respirable Particulate Matter | 24 hourly sample twice a week for Three months |
| Particulate Matter 2.5 | 24 hourly sample twice a week for Three months |
| Sulphur dioxide (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 |



Table 4.0

Measurement Techniques for various pollutants

| Sr. No. | Parameter | Technique | Technical Protocol | Minimum Reportable Value($\mu\text{g}/\text{m}^3$) |
|----------------|-------------------------------|--|---------------------------|--|
| 1. | Suspended Particulate Matter | Respirable Dust Sampler (Gravimetric Method) | IS-5182 (Part - 23) | 5 |
| 2. | Respirable Particulate Matter | Respirable Dust Sampler (Gravimetric Method) | IS-5182 (Part-23) | 5 |
| 3. | Particulate Matter 2.5 | Respirable Dust Sampler (Gravimetric Method) | USEPA-40 (Part-50) | 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-I) | — |



1.6 Meteorology: Wind Pattern

The data of wind pattern collected during the study period (July-August-September-2020) indicates that the wind was blowing predominately from (SW and SSW) directions, during study period.

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 | 0.002721 | 0.004082 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.0068 |
| 2 | 11.25 - 33.75 | 0.005442 | 0.000000 | 0.001361 | 0.000000 | 0.000000 | 0.000000 | 0.0068 |
| 3 | 33.75 - 56.25 | 0.008163 | 0.010884 | 0.002721 | 0.002721 | 0.000000 | 0.000000 | 0.0244 |
| 4 | 56.25 - 78.75 | 0.021769 | 0.013605 | 0.017687 | 0.002721 | 0.000000 | 0.000000 | 0.0557 |
| 5 | 78.75 - 101.25 | 0.013605 | 0.010884 | 0.012245 | 0.001361 | 0.000000 | 0.000000 | 0.0380 |
| 6 | 101.25 - 123.75 | 0.023129 | 0.008163 | 0.006803 | 0.001361 | 0.000000 | 0.000000 | 0.0394 |
| 7 | 123.75 - 146.25 | 0.035374 | 0.014966 | 0.008163 | 0.004082 | 0.000000 | 0.000000 | 0.0625 |
| 8 | 146.25 - 168.75 | 0.036735 | 0.023129 | 0.004082 | 0.001361 | 0.000000 | 0.000000 | 0.0653 |
| 9 | 168.75 - 191.25 | 0.065306 | 0.021769 | 0.001361 | 0.000000 | 0.000000 | 0.000000 | 0.0884 |
| 10 | 191.25 - 213.75 | 0.111565 | 0.035374 | 0.004082 | 0.000000 | 0.000000 | 0.000000 | 0.1510 |
| 11 | 213.75 - 236.25 | 0.100680 | 0.036735 | 0.016327 | 0.000000 | 0.000000 | 0.000000 | 0.1537 |
| 12 | 236.25 - 258.75 | 0.039456 | 0.031293 | 0.014966 | 0.000000 | 0.000000 | 0.000000 | 0.0857 |
| 13 | 258.75 - 281.25 | 0.046259 | 0.031293 | 0.023129 | 0.004082 | 0.000000 | 0.000000 | 0.1047 |
| 14 | 281.25 - 303.75 | 0.023129 | 0.031293 | 0.009524 | 0.002721 | 0.000000 | 0.000000 | 0.0666 |
| 15 | 303.75 - 326.25 | 0.010884 | 0.023129 | 0.002721 | 0.000000 | 0.000000 | 0.000000 | 0.0367 |
| 16 | 326.25 - 348.75 | 0.002721 | 0.006803 | 0.002721 | 0.000000 | 0.000000 | 0.000000 | 0.0122 |
| | Sub-Total | 0.546939 | 0.303401 | 0.353352 | 0.020408 | 0.000000 | 0.000000 | 0.9972 |
| | Calms | | | | | | | 0.0013 |
| | Missing/Incomplete | | | | | | | 0.0013 |
| | Total | | | | | | | 1.0000 |

Summary of Wind Pattern

| Season | First Predominant Wind Direction | Second Predominant Wind Direction | Calm Condition |
|-----------------------|----------------------------------|-----------------------------------|----------------|
| July-August-Sept-2020 | SW (15.4%) | SSW (15.1%) | 0.14% |

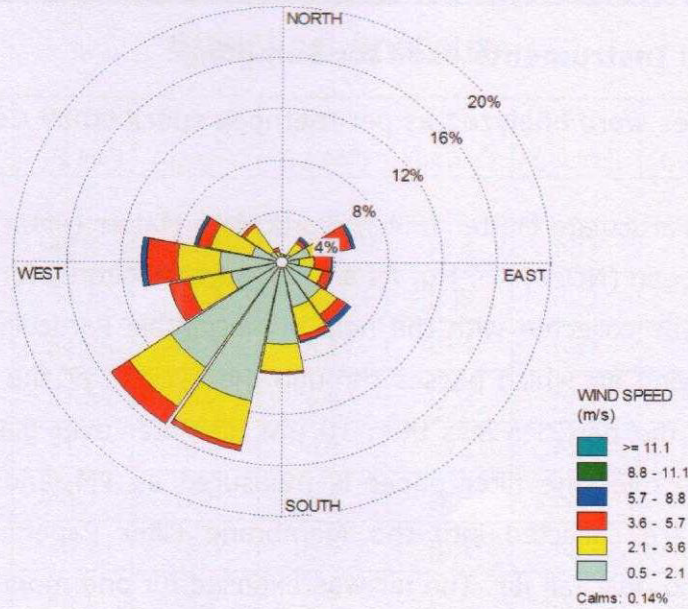


Figure.01: Wind Rose Diagram (July-August-September-2020)

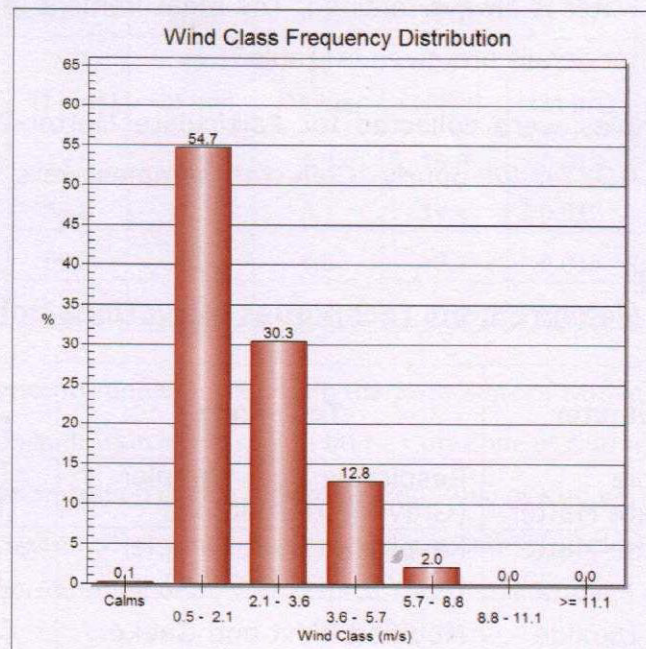


Figure.02: Wind Class Frequency Distribution (July-August-September-2020).



1.6 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 (PM₁₀), Particulate Matter (PM_{2.5}), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Pb, Hg, As and Cr were monitored for establishing the baseline status. PM₁₀ was collected with the help of Respirable Particulate Sampler operating 24 hours by drawing air which passes through the cyclone at the rate of 1.0 -1.3 m³/min which collects the particles less than 10 µm diameter over glass fiber filter paper. The dust deposited over the filter paper is measured as PM₁₀ 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 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).

Earmarked samples were collected for Particulate Matter-PM₁₀, Particulate Matter-PM_{2.5}, SO₂ and NO_x for 24 hourly. Collected samples were sent to Laboratories for analysis.

Table 3.0
Measurement Techniques for various pollutants

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



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Table 4
Statistical Analysis

| Location | Month & Year | PM-10 ($\mu\text{g}/\text{m}^3$) | PM-2.5 ($\mu\text{g}/\text{m}^3$) | SO ₂ ($\mu\text{g}/\text{m}^3$) | NO _x ($\mu\text{g}/\text{m}^3$) | Pb ($\mu\text{g}/\text{m}^3$) | Hg ($\mu\text{g}/\text{m}^3$) | As (ng/m ³) | Cr ($\mu\text{g}/\text{m}^3$) |
|--------------------------------|--------------|---------------------------------------|--|---|---|------------------------------------|------------------------------------|----------------------------|------------------------------------|
| Core Zone | | | | | | | | | |
| Sairaidh Campus | July-2020 | 43.8 | 14.9 | 5.2 | 16.4 | ND | ND | ND | ND |
| | Aug-2020 | 54.1 | 17.3 | 7.6 | 16.9 | ND | ND | ND | ND |
| | Sept-2020 | 54.8 | 18.3 | 8.1 | 19.4 | ND | ND | ND | ND |
| New Kudag/Nr. Weigh Bridge | July-2020 | 51.6 | 16.2 | 6.4 | 17.3 | ND | ND | ND | ND |
| | Aug-2020 | 51.7 | 16.4 | 6.8 | 16.2 | ND | ND | ND | ND |
| | Sept-2020 | 48.3 | 17.6 | 6.4 | 17.3 | ND | ND | ND | ND |
| Old Kudag/Mining Area | July-2020 | 46.1 | 15.3 | 5.9 | 16.7 | ND | ND | ND | ND |
| | Aug-2020 | 46.1 | 14.9 | 5.4 | 15.8 | ND | ND | ND | ND |
| | Sept-2020 | 52.9 | 18.1 | 7.3 | 18.2 | ND | ND | ND | ND |
| Samri Gopatu/ Nr. Weigh Bridge | July-2020 | 48.3 | 15.8 | 5.7 | 16.2 | 0.013 | ND | ND | ND |
| | Aug-2020 | 52.8 | 18.2 | 7.3 | 17.3 | 0.016 | ND | ND | ND |
| | Sept-2020 | 51.7 | 16.8 | 6.7 | 17.1 | 0.017 | ND | ND | ND |
| CPCB Standards | | 100 (24 hrs) | 60 (24 hrs) | 80 (24 hrs) | 80 (24 hrs) | 1.0 (24 hrs) | --- | 6.0 (annual) | --- |
| Minimum | | 43.8 | 14.9 | 5.2 | 15.8 | 0.013 | --- | --- | --- |
| Maximum | | 54.8 | 18.3 | 8.1 | 19.4 | 0.017 | --- | --- | --- |
| Average | | 50.2 | 16.7 | 6.6 | 17.1 | 0.015 | --- | --- | --- |
| 98% le | | 54.6 | 18.3 | 8.0 | 19.1 | 0.017 | --- | --- | --- |

- The Average Concentration of PM₁₀ within the Core Zone of Kudag Lease is 50.2 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of PM_{2.5} within the Core Zone of Kudag Lease is 16.7 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of SO₂ within the Core Zone of Kudag Lease is 6.6 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of NO_x within the Core Zone of Kudag Lease is 17.1 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of Pb within the Core Zone of Kudag Lease is 0.015 $\mu\text{g}/\text{m}^3$.

Conclusion :-

The Average Concentration within the Core Zone of Kudag Lease during this period (July-August-September-2020), 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 ₂ ($\mu\text{g}/\text{m}^3$) | NO _x ($\mu\text{g}/\text{m}^3$) | Pb ($\mu\text{g}/\text{m}^3$) | Hg ($\mu\text{g}/\text{m}^3$) | As (ng/m ³) | Cr ($\mu\text{g}/\text{m}^3$) |
|-----------------------|--------------|---------------------------------------|--|---|---|------------------------------------|------------------------------------|----------------------------|------------------------------------|
| Buffer Zone | | | | | | | | | |
| Kutku Village | July-2020 | 48.9 | 16.4 | 6.8 | 17.1 | 0.016 | ND | ND | ND |
| | Aug-2020 | 46.2 | 16.9 | 7.3 | 16.7 | 0.017 | ND | ND | ND |
| | Sept-2020 | 48.3 | 16.2 | 5.8 | 16.1 | 0.013 | ND | ND | ND |
| Rajendrapur | July-2020 | 53.1 | 18.2 | 7.3 | 18.6 | 0.014 | ND | ND | ND |
| | Aug-2020 | 56.1 | 21.7 | 9.4 | 18.3 | 0.016 | ND | ND | ND |
| | Sept-2020 | 54.9 | 18.3 | 9.4 | 21.7 | 0.021 | ND | ND | ND |
| Tatijharia Village | July-2020 | 48.3 | 17.3 | 6.8 | 18.9 | 0.014 | ND | ND | ND |
| | Aug-2020 | 51.6 | 18.2 | 7.6 | 21.4 | 0.016 | ND | ND | ND |
| | Sept-2020 | 54.8 | 21.6 | 8.4 | 23.9 | 0.018 | ND | ND | ND |
| Virhorepat | July-2020 | 47.1 | 16.2 | 6.1 | 17.3 | 0.013 | ND | ND | ND |
| | Aug-2020 | 49.7 | 17.4 | 6.4 | 18.2 | 0.017 | ND | ND | ND |
| | Sept-2020 | 49.3 | 18.2 | 6.8 | 19.4 | 0.016 | ND | ND | ND |
| CPCB Standards | | 100 (24 hrs) | 60 (24 hrs) | 80 (24 hrs) | 80 (24 hrs) | 1.0 (24 hrs) | --- | 6.0 (annual) | --- |
| Minimum | | 46.2 | 16.2 | 5.8 | 16.1 | 0.013 | --- | --- | --- |
| Maximum | | 56.1 | 21.7 | 9.4 | 23.9 | 0.021 | --- | --- | --- |
| Average | | 50.7 | 18.1 | 7.3 | 19.0 | 0.016 | --- | --- | --- |
| 98% le | | 55.8 | 21.7 | 9.4 | 23.4 | 0.020 | --- | --- | --- |

- The Average Concentration of PM₁₀ within the Buffer Zone of Kudag Lease is 50.7 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of PM_{2.5} within the Buffer Zone of Kudag Lease is 18.1 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of SO₂ within the Buffer Zone of Kudag Lease is 7.3 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of NO_x within the Buffer Zone of Kudag Lease is 19.0 $\mu\text{g}/\text{m}^3$.
- The Average Concentration of Pb within the Buffer Zone of Kudag Lease is 0.016 $\mu\text{g}/\text{m}^3$.

Conclusion :-

The Average Concentration within the Buffer Zone of Kudag Lease during this period (July-August-September-2020). It is within permissible limits as per CPCB Standards.



Month-wise Summary of Statistical Analysis

Kudag Lease (Core Zone):-

3.1 Ambient Air Quality:

Ambient air quality has been generated as per NAAQS 2009 for the month of July-2020 to September-2020. PM₁₀, PM_{2.5}, SO₂& NO_x, The values obtained were then compared vis-a-vis the standards prescribed by CPCB for Industrial/ Rural/ Residential uses.

3.2 Presentation of Results:

The summary of Ambient Air Quality monitoring results from July-2020 to September-2020 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-PM₁₀:

The minimum and maximum concentrations for Particulate Matter-PM₁₀ were recorded as 43.8 µg/m³ and 54.8µg/m³ respectively. The minimum and maximum concentration was recorded at Sairaidh Campus. The average concentration of PM₁₀ was 50.2µg/m³..

B. Particulate Matter-PM_{2.5}:

The Minimum and maximum concentrations for Particulate Matter-PM_{2.5} were recorded as 14.9µg/m³ & 18.3µg/m³ respectively. The minimum concentration was recorded at Old Kudag/Mining area. The maximum concentration was also recorded at Sairaidh Campus. The average concentration of PM_{2.5} was 16.7µg/m³.

C. Sulphur Dioxide (SO₂):

The minimum and maximum for SO₂ concentrations were recorded as 5.2µg/m³ and 8.1µg/m³at respectively. The minimum and maximum concentration was recorded at Sairaidh Campus. The average concentration of SO₂ was 6.6µg/m³.



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D. Nitrogen Oxide (NO_x):

The minimum and maximum for NO_x concentrations were recorded as 15.8µg/m³ and 19.4µg/m³. The minimum concentration was recorded at Old Kudag/Mining area. The maximum concentration was also recorded at Sairaidh Campus. The average concentration of NO_x was 17.1µg/m³.

E. Lead (Pb):

Maximum Lead detected in PM₁₀ samples was 0.017µg/m³ at Samri-Gopatu/Nr. Weigh Bridge location.

No lead could be detected in PM_{2.5} 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 PM₁₀ samples as well as PM_{2.5} Samples.

G. Arsenic (As):

Arsenic was not detected at any of the locations in PM₁₀ samples as well as PM_{2.5} Samples.

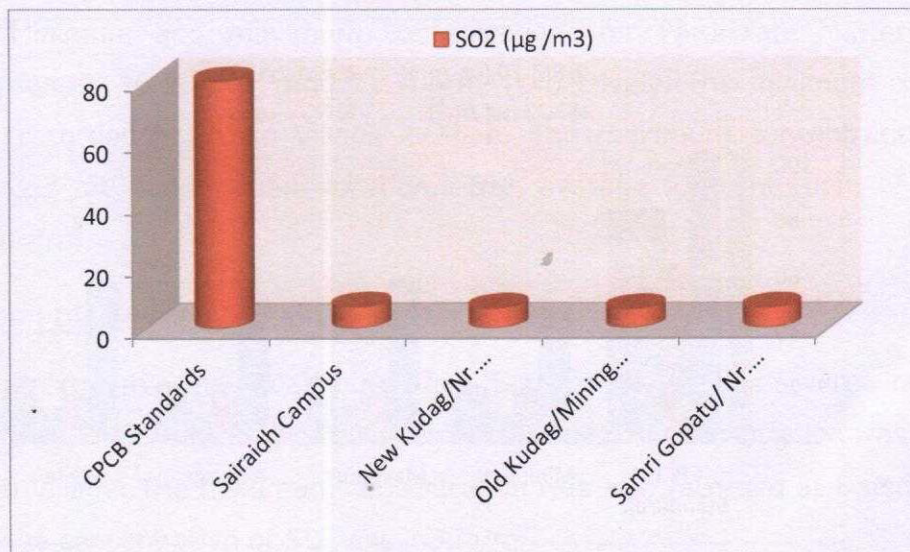
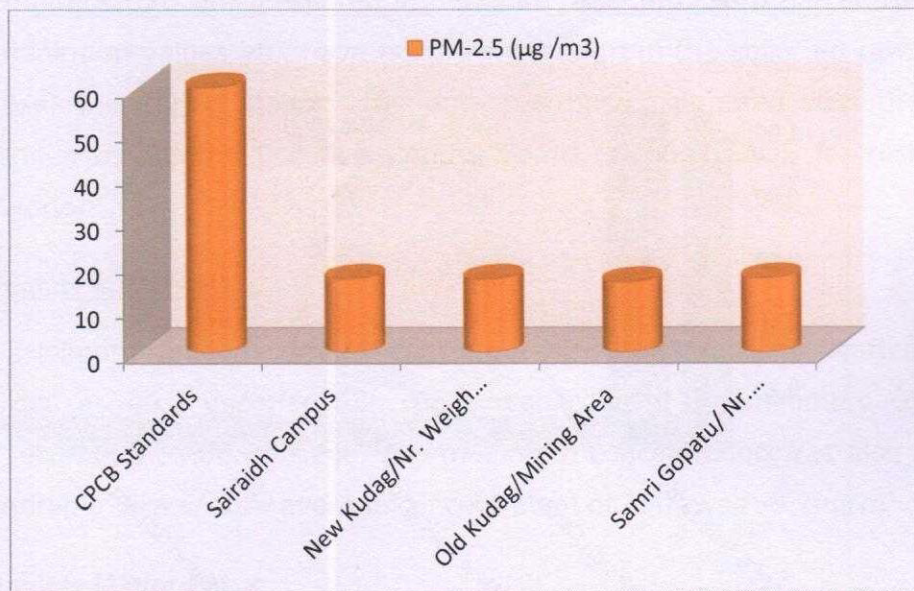
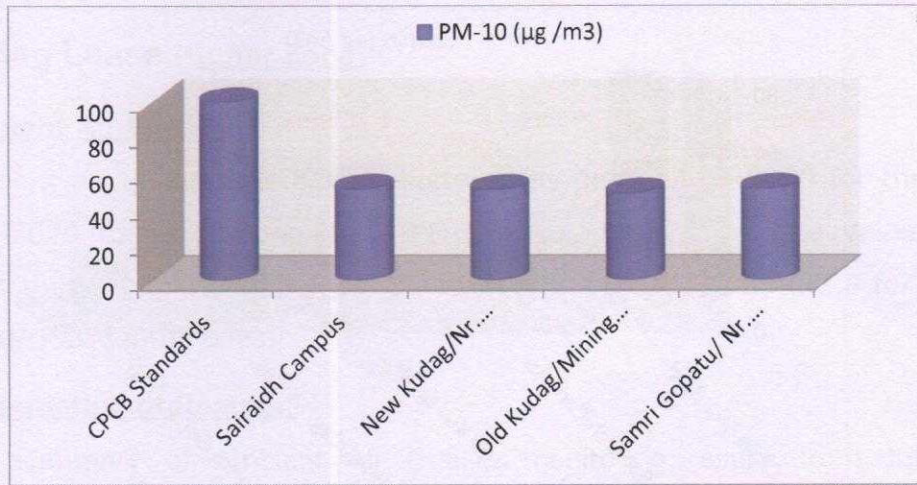
H. Chromium (Cr):

Chromium was not detected at any of the locations in PM₁₀ samples as well as PM_{2.5} Samples.



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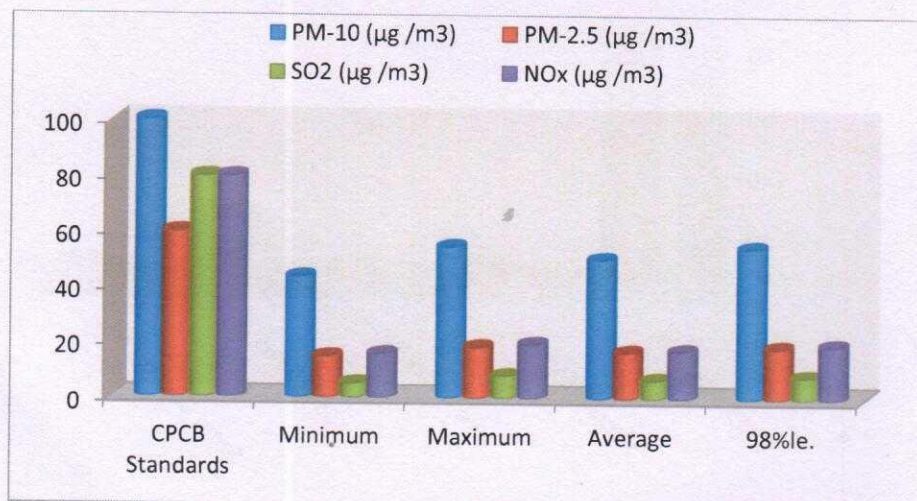
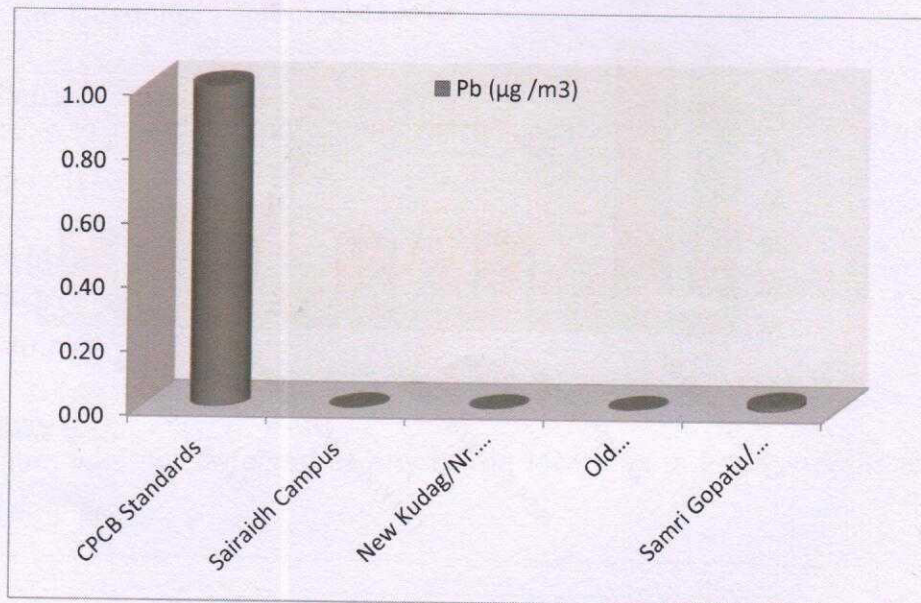
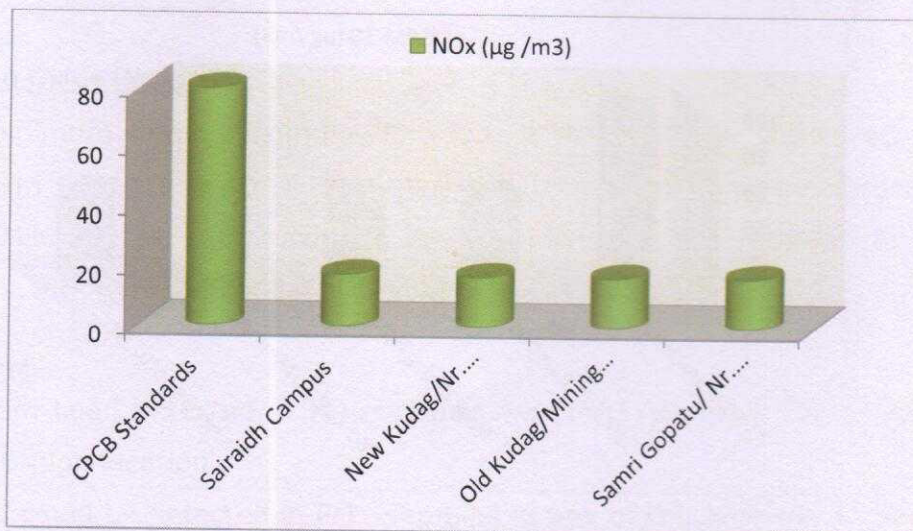
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Kudag Lease (Buffer Zone):-

3.3 Ambient Air Quality:

Ambient air quality has been generated as per NAAQS 2009 for the month of July-2020 to September-2020. PM₁₀, PM_{2.5}, SO₂& NO_x, The values obtained were then compared vis-a-vis the standards prescribed by CPCB for Industrial/ Rural/ Residential uses.

3.3.1 Presentation of Results:

The summary of Ambient Air Quality monitoring results from July-2020 to September-2020 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-PM₁₀:

The Minimum and maximum concentrations for Particulate Matter-PM₁₀ were recorded as 46.2 µg/m³ and 56.1µg/m³ respectively. The minimum concentration was recorded at Kutku Village. The maximum concentration was also recorded at Rajendrapur village. The average concentration of PM₁₀ was 50.7µg/m³.

B. Particulate Matter-PM_{2.5}:

The Minimum and maximum concentrations for Particulate Matter-PM_{2.5} were recorded as 16.2 µg/m³ and 21.7µg/m³ respectively. The minimum concentration was recorded at Kutku Village location. The maximum concentration was also recorded at Rajendrapur location. The average concentration of PM_{2.5} was 18.1µg/m³.

C. Sulphur Dioxide (SO₂):

The minimum and maximum for SO₂ concentrations were recorded as 5.8µg/m³ and 9.4µg/m³ at respectively. The minimum concentration was recorded at Kutku Village. The maximum concentration was also recorded at Rajendrapur. The average concentration of SO₂ was 7.3µg/m³.



D. Nitrogen Oxide (NO_x):

The minimum and maximum for NO_x concentrations were recorded as 16.1µg/m³ and 23.9µg/m³. The minimum concentration was recorded at Kutku Village location and the maximum concentration was recorded at Tatijhara village. The average concentration of NO_x was 19.0µg/m³.

E. Lead (Pb):

Maximum Lead detected in PM₁₀ samples was 0.021 µg/m³ at Rajendrapur location and the minimum lead in PM₁₀ sample was 0.013 µg/m³ detected at Kutku village location.

No lead could be detected in PM_{2.5} 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 PM₁₀ samples as well as PM_{2.5} Samples.

G. Arsenic (As):

Arsenic was not detected at any of the locations in PM₁₀ samples as well as PM_{2.5} Samples.

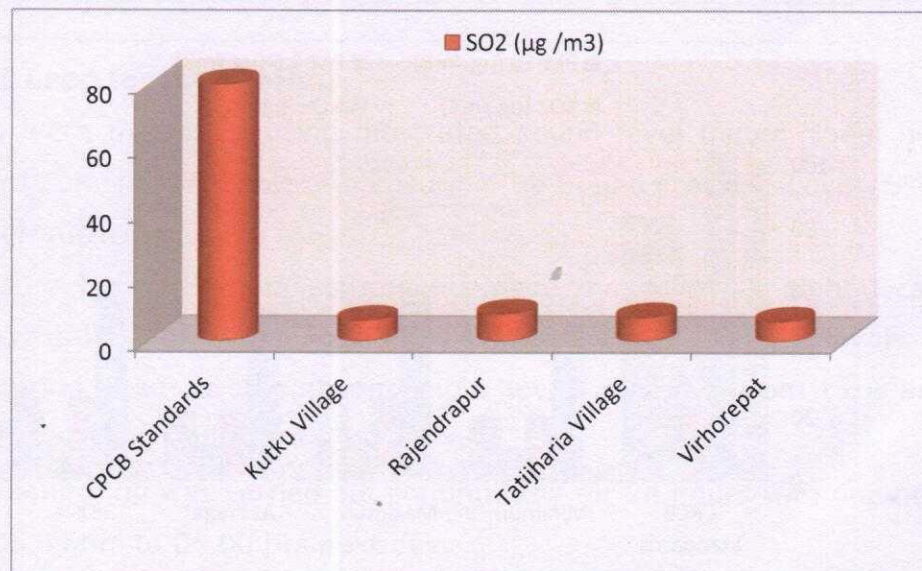
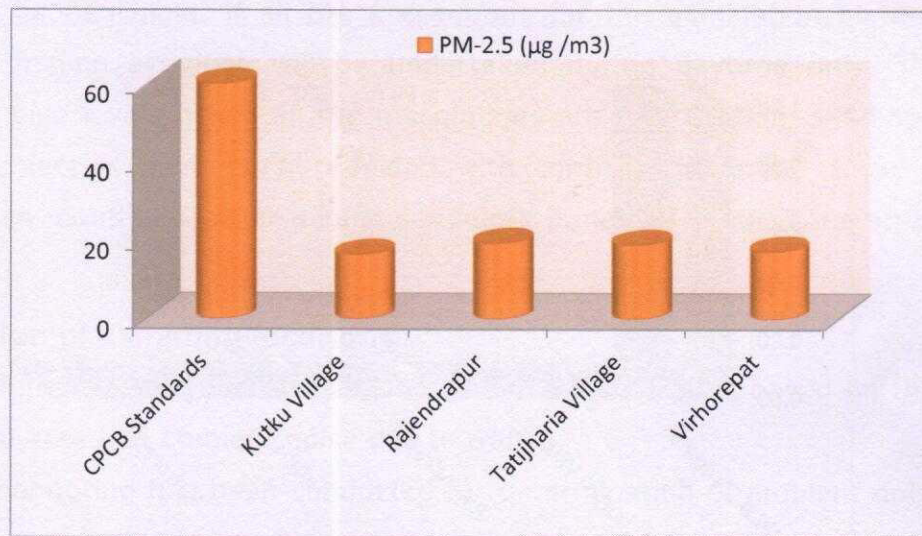
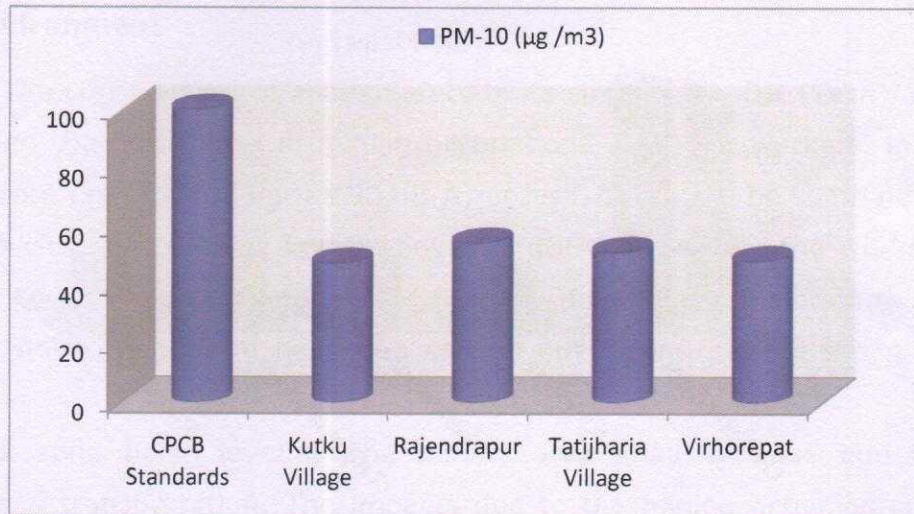
H. Chromium (Cr):

Chromium was not detected at any of the locations in PM₁₀ samples as well as PM_{2.5} Samples.



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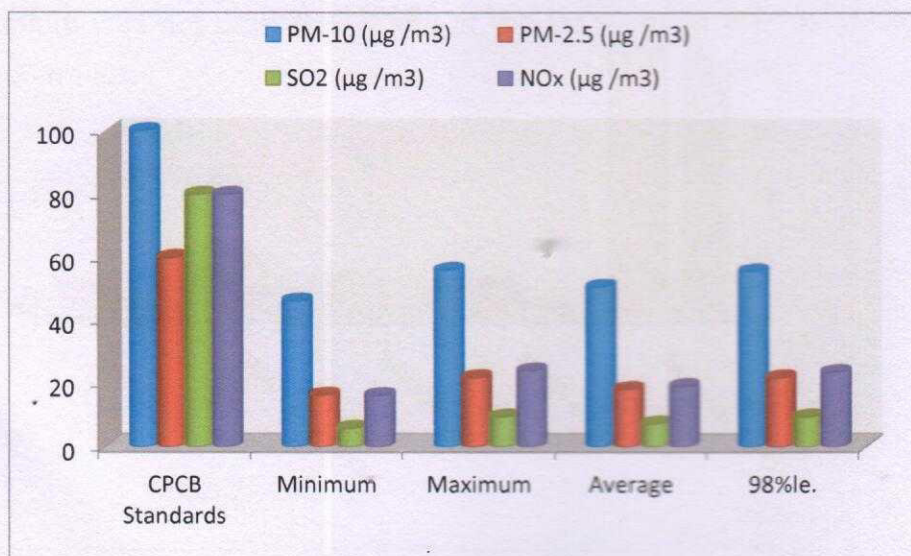
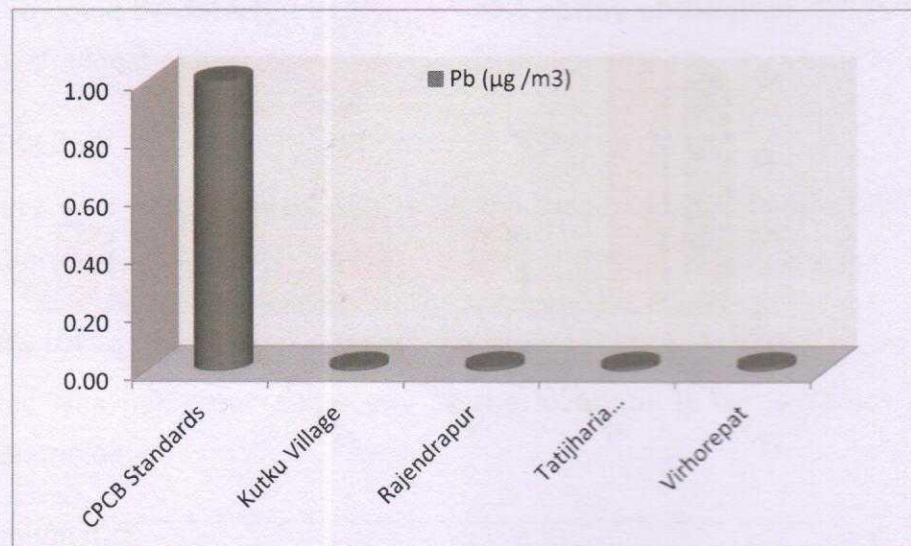
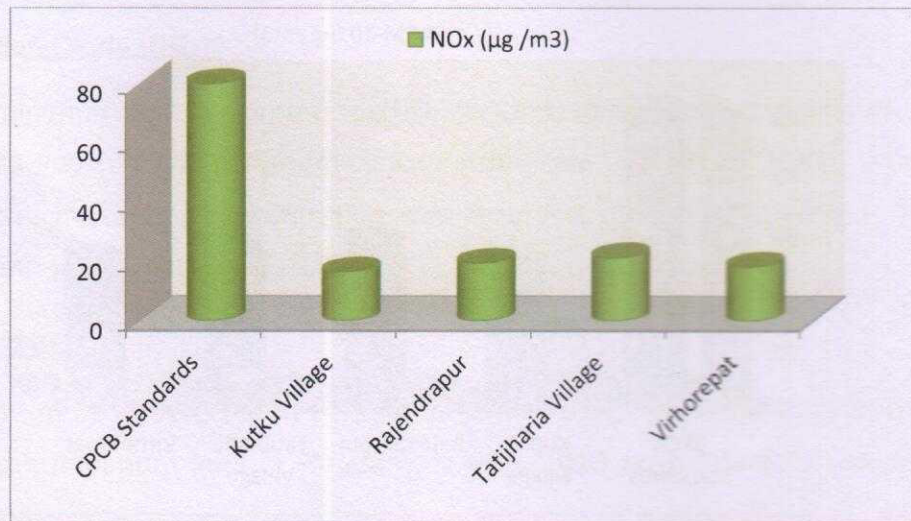
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17 Noise Environment

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; Core Zone and Buffer Zone areas 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 Model no. HTC-SL-1352. This instrument is capable of measuring the Sound Pressure Level (SPL), Leq.

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.



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Noise levels monitored during day and night at Four 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 **(Table 5)**.

Table 5

Noise Emission Monitoring Report

| SR. NO. | LOCATION | Month | Noise-dB(A) | |
|-------------------------|----------------------------|----------------|-------------|------------|
| | | | Day Time | Night Time |
| Core Zone | | | | |
| 1. | New Kudag/Nr. Weigh Bridge | July-2020 | 47.3 | 38.9 |
| | | August-2020 | 53.9 | 42.7 |
| | | September-2020 | 52.7 | 42.6 |
| 2. | Old Kudag/Mining Area | July-2020 | 51.2 | 41.6 |
| | | August-2020 | 48.1 | 37.3 |
| | | September-2020 | 49.3 | 38.7 |
| Buffer Zone | | | | |
| 1. | Rajendrapur | July-2020 | 47.1 | 37.3 |
| | | August-2020 | 51.7 | 39.2 |
| | | September-2020 | 49.3 | 37.1 |
| 2. | Tatijharia Village | July-2020 | 47.2 | 38.1 |
| | | August-2020 | 49.1 | 41.6 |
| | | September-2020 | 52.1 | 39.8 |
| CPCB Standards | | | | |
| Industrial Area | | | 75 | 70 |
| Residential area | | | 55 | 45 |


Conclusion: -The Noise Monitoring Results at Kudag Lease during this period (July-August-September-2020), it is within permissible limits as per CPCB Standards.

Table 6

HEMM Spot Noise Level Monitoring

Unit: dB(A) Leq

| Sl. No. | Location | July-2020 | | August-2020 | | Sept-2020 | |
|---------|------------------|-----------|------|-------------|------|-----------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. |
| 1. | Nr. Weigh Bridge | 52.6 | 61.4 | 54.7 | 62.9 | 57.3 | 68.1 |
| 2. | Mining Area | 48.9 | 57.2 | 49.2 | 58.6 | 51.7 | 62.4 |

| | | |
|---|--|----------------------------|
|  | <p><i>Hindalco Industries Limited Kudag Mining Environmental Status Report for July-2020 to September-2020</i></p> | <p><i>Introduction</i></p> |
|---|--|----------------------------|

2.0 Water Quality Monitoring

The existing status of water quality for ground water was assessed by collecting the water samples from underground wells from the mining area/old kudag.

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-8 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 now be taken to chlorinate the tankers before leaving the supply source.



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Table 7

Report on Chemical Examination of Ground Water Quality
(September-2020)

| | |
|------------------|--|
| Location: | GW1) Saraidih (Hindalco Campus) Sample Source:-Borewell Water |
|------------------|--|

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 | 7.14 at 25°C |
| 2. | Turbidity | NTU | IS 3025 (Part 10) | 1 | 5 | 0.4 |
| 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 | 0.28 |
| 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 | 473 |
| 9. | Fluoride (as F) | mg/l | IS 3025 (Part 60) | 1.0 | 1.5 | 0.41 |
| 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 | 57.29 |
| 12. | Total Alkalinity (as CaCO ₃) | mg/l | IS 3025 (Part 23) | 200 | 600 | 131.76 |
| 13. | Total hardness (as CaCO ₃) | mg/l | IS 3025 (Part 21) | 200 | 600 | 194.46 |
| 14. | Calcium (as Ca) | mg/l | IS 3025 (Part 40) | 75 | 200 | 58.17 |
| 15. | Magnesium (as Mg) | mg/l | IS 3025 (Part 46) | 30 | 100 | 11.94 |
| 16. | Sulphate (as SO ₄) | mg/l | IS 3025 (Part 24) | 200 | 400 | 18.52 |
| 17. | Nitrate (as NO ₃) | mg/l | APHA Method | 45 | No relaxation | 8.76 |
| 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 ₂ S) | mg/l | IS 3025 (Part 29) | 0.05 | No relaxation | < 0.03 |
| 32. | Chloramines (as Cl ₂) | 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 ₆ H ₅ OH) | mg/l | IS 3025 (Part 43) :1001 | 0.001 | 0.002 | < 0.001 |
| 40. | Anionic detergents (as MBAS) | mg/l | IS 13428:2005 (Annex K) | 0.2 | 1.0 | < 0.01 |
| 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 | Absent | Absent | Absent |



Hindalco Industries Limited
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Introduction

| Sr. No. | Test Parameter | Measurement Unit | Test Method | As per IS 10500 : 2012 (Drinking Water - Specification) | Test Result |
|--------------------------------|--------------------------------|------------------|-------------|---|-------------|
| 44. Pesticides residues | | | | | |
| i. | Alpha-HCH | µg/l | USEPA 508 | 0.01 | < 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 |

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REMARKS: 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.


| | | |
|---|---|---------------------|
|  | Hindalco Industries Limited Kudag Mining Environmental Status Report for July-2020 to September-2020 | Introduction |
|---|---|---------------------|

Table 8

Report of Dust Fall Rate

TEST RESULTS

| Sr. No. | Location | September-2020 |
|---------|-----------------------|----------------------------------|
| | | Rate (MT/km ² /Month) |
| 1. | Old Kudag/Mining Area | 19.26 |

Report on Soil Analysis, Kudag

Date of Sampling:-16.09.2020

Sample Location: (Old Kudag/Mining Area)

TEST RESULTS

(Page 1 of 2)

| S.N. | Test Parameter | Measurement Unit | Test Method | Test Result |
|------|--|-------------------|--|---------------------------|
| 1 | Infiltration rate | mm/hr | ASTMD 3385 | 15.28 |
| 2 | Bulk density | g/cm ³ | IS 2720 (Part 29) | 1.26 |
| 3 | Water holding capacity | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 24.41 |
| 4 | Particle size distribution | | | |
| | Sand | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 27.59 |
| | Silt | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 31.27 |
| | Clay | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 41.14 |
| 5 | Texture | - | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | Clay Loam |
| 6 | pH (1:2.5 Aq. Extract) at 25 ^o C | - | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 6.87 at 25 ^o C |
| 7 | Electrical Conductivity (1:2.5 Aq. Extract) | µs/cm | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 358.16 |
| 8 | Water soluble Calcium (as Ca) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 482.71 |
| 9 | Water soluble Magnesium (as Mg) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 127.64 |
| 10 | Water soluble Sodium (as Na) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 168.59 |
| 11 | Water soluble Potassium (as K) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 32.7 |
| 12 | Water soluble Chloride (as Cl) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 403.92 |
| 13 | Water soluble Sulphate (as SO ₄) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 167.51 |



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Introduction

Report on Soil Analysis, Kudag
Date of Sampling: - 16.09.2020
Sample Location: (Old Kudag/Mining Area)

TEST RESULTS

(Page 2 of 2)

| S.N. | Test Parameter | Measurement Unit | Test Method | Test Result |
|------|--------------------------------|------------------|--|-------------|
| 14 | Exchangeable Sodium (as Na) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 56.82 |
| 15 | Exchangeable Potassium (as K) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 17.29 |
| 16 | Exchangeable Calcium (as Ca) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 217.52 |
| 17 | Exchangeable Magnesium (as Mg) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 58.39 |
| 18 | Sodium adsorption ratio | - | By Calculation | 12.4 |
| 19 | Total Organic matter | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 0.61 |
| 20 | Total Organic Carbon | % | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 0.47 |
| 21 | Available Nitrogen (as N) | Kg/hect | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 121.38 |
| 22 | Available Phosphorous (as P) | Kg/hect | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 7.27 |
| 23 | Available Potassium (as K) | Kg/hect | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 502.64 |
| 24 | CEC | meq/100g | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 12.7 |
| 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) | 0.14 |
| 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) | 2.78 |
| 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) | 0.17 |
| 33 | Iron (Fe) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 7.38 |
| 34 | Manganese (Mn) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 16.24 |
| 35 | Zinc (Zn) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | 0.29 |
| 36 | Selenium (Se) | mg/Kg | Method Manual, Soil testing in India (Department of agriculture & corporation, Govt of India) | Absent |

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Remarks: As requested by the client, sample was tested for above parameters only.

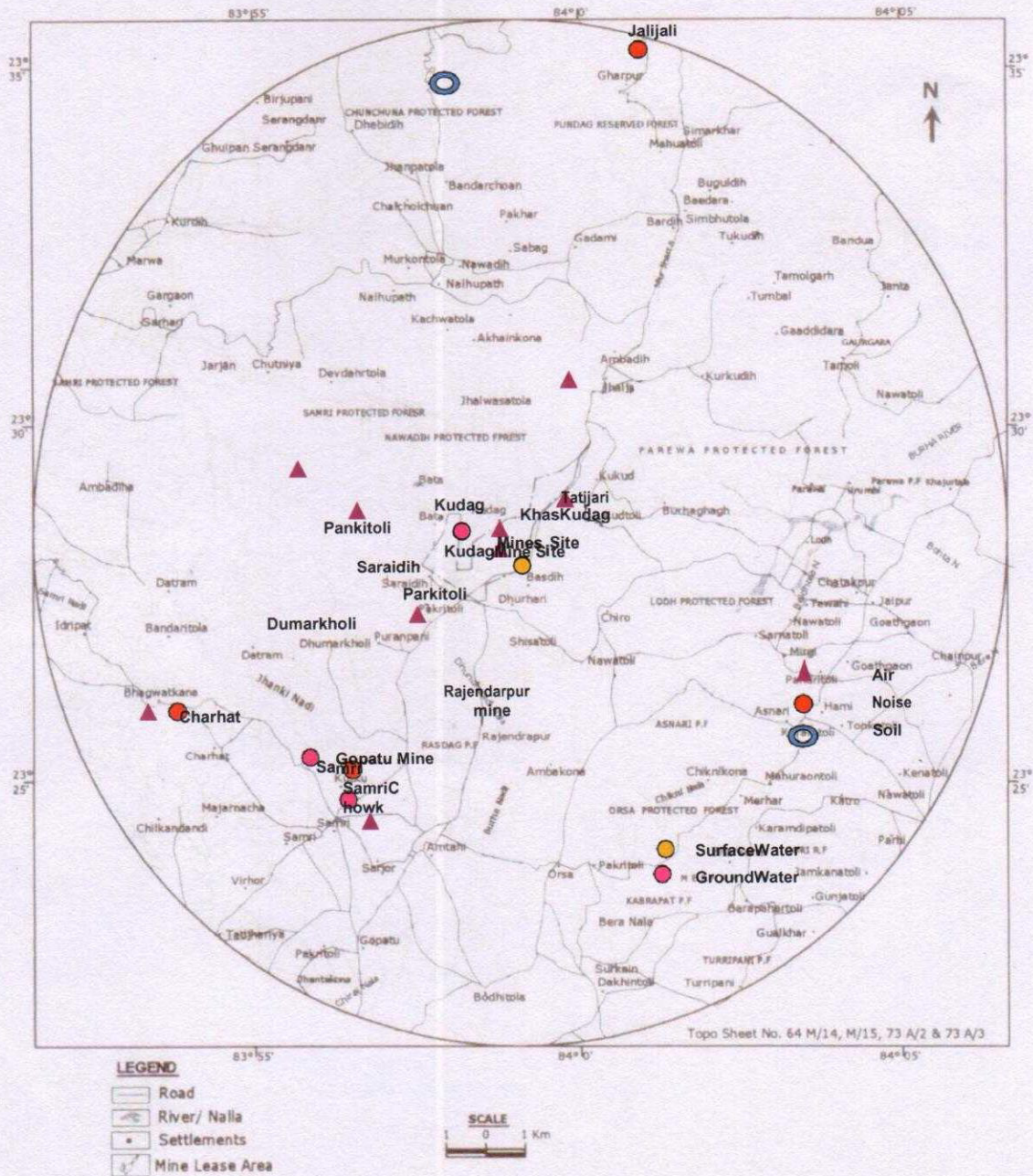


Fig 5: Sampling Locations for Water