

ENVIRONMENTAL MONITORING

at

NORTH EASTERN COALFIELDS

COAL INDIA LTD.

MARGHERITA

WINTER SEASON

(JANUARY 2010 - MARCH 2010)

Submitted To:

North-Eastern Coalfields
Coal India Limited
Margherita
Assam.

Submitted By:

ENVIROCON
Digboi Stores Building
New Market
Digboi, Assam

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BACKGROUND

Coal is the primary source of energy and is the most abundant fossil fuel resource in our country. The Nation's endeavour has been only partly successful in locating and exploiting coal in the North Eastern region and much is yet to be done. Assam, one of the major states of this region, possesses a moderate reserve of coal. **The North Eastern Coal Fields**, a division of the Public Sector giant **COAL INDIA LTD.** having its headquarter at Guwahati is looking after the coal mining activities in the North Eastern Region. The North Eastern Coal Fields office at Margherita in the upper Assam district of Tinsukia, specifically looks after the coal mining activities in the state of Assam.

Coalmines of Assam, known to have the worst natural conditions of all the coalmines of India, have had a long and varied history of operation. Although coal was discovered in the northeastern region more than 250 years ago, systematic mining of coal was started only in 1888 by the erstwhile AR & T Co. (Assam Railways and Trading Company). Mining was first -started at Makum coalfields near Margherita. In the following years many new collieries were started in the nearby areas. Production, which was around 2 lakh tonnes at the beginning of this century, increased to 12.10 lakh tonnes during 1993-94.

Coal like any other mineral, lies in the earth's body and extraction of coal by mining, is carried out in either of the two ways – Opencast mining or Under-ground mining. Among the collieries of the North Eastern Coalfields under Margherita, "Tikak" and "Tirap" mines use opencast mining method and in the rest underground mining system is used.

Coal shares over 61.6% of total commercial primary energy sources in India (as estimated in 1991- 92) and hence coal is essential for development and progress of a nation. Development, Environment and Mining all have become complimentary to each other and none of them can be separated or ignored in the interest of the development of a particular country. Environmental problems, related to coal mining activities, start from extraction, continues during beneficiation, during transportation of the minerals to the users and during ultimate use. Process of coal mining, thus, is not the only one, which creates environmental problems. During the use of coal and other fossil fuels also, emissions of gases take place resulting in greenhouse effect and other related environmental problems. Coal mining operation though, particularly opencast mining always causes certain environmental degradation. The Environmental damages associated with coal mining are as follows:

a) By Open Cast mining method:

- Damages to the landscape and topography.
- Dumping of mine waste/ overburden in an unplanned manner.
- Loss of topsoil and greenery due to disruption of topography.
- Effect of rainfall in eroding and transporting topsoil/ OB material with consequent siltation in downstream of watercourses and water bodies.
- Potential health hazard due to storage of water in abandoned quarries.

b) By Underground mining method:

- Loss of productive land and property due to subsidence and surface/ underground mine fires.
- Lowering of ground water bodies.
- Adverse effect on surface water through release of polluted effluents etc.
- Noise, vibration and occupational health problems etc.

Besides, release of solid and gaseous pollutants to the atmosphere disturbs the air to be breathed. All the above adverse effects of mining may cause environmental degradation and ecological imbalance through disturbances to atmosphere, hydrosphere, lithosphere and biosphere.

To protect and safeguard the environment against the resultant effects due to multiple activities, various stringent laws, rules and regulations at National and International levels have been framed and are being enforced by Environment Ministries, Pollution Control Boards and other similar organizations.

In order to curb the adverse effects of the abovementioned problems, the management of North Eastern Coalfields, has taken various measures for Pollution control and given a new thrust in the direction of environmental restoration to confine better mining scenario vis-à-vis environment. Suitable studies were initiated to generate data on existing status of the environment; a number of measures have been adopted to prevent degradation due to deforestation, soil erosion, water and air pollution etc., and at the same time provide concrete and exemplary works of land restoration to establish the credibility of the company's intention of environmental management.

As part of the Environmental Management programme of NEC- Margherita and to keep an eye on the state of the environment at the collieries and their adjacent residential areas, periodical Ambient Air Quality monitoring is carried out at the collieries of *Tikak, Tirap, Tipong, Baragolai* and *Ledo* together with the *Central Hospital* in Margherita. Water quality monitoring is also being carried out for Effluent (raw and treated) and Drinking water available from different sources in and around the collieries. Noise level monitoring is also conducted at some selected locations.

ENVIROCON, a Digboi based Environmental Consultancy firm, which is engaged in Environmental Data Generation, Pollution Monitoring, Environmental Study and other allied works, was assigned with this important job of regular Ambient Air, Water and Noise monitoring at selected locations of the different collieries of Coal India Ltd., NEC- Margherita.

SCOPE OF THE STUDY

The present study included the two open cast mines i.e. *Tikak* and *Tirap* and the underground mines of *Tipong & Baragolai* together with the *Margherita Central Hospital*, for Ambient Air Quality monitoring; all the mines and adjoining areas for Water/Waste Water analysis, and some selected locations for noise level monitoring.

OBJECTIVE OF THE STUDY

The major objectives of the study were,

- *To assess the ambient air quality at the selected mines (both open- cast & underground) and adjacent residential areas and also at the Central Hospital in Margherita.*
- *To assess the quality of effluent (raw and treated) and drinking water collected from different sources in and around the mine areas.*
- *To determine the noise levels at some selected locations near the mines and the residential areas.*

This report is prepared on the basis of available literature and on the data obtained by onsite monitoring through the Winter Season (January 2010 to March 2010) for the relevant environmental components and parameters.

METHODOLOGY

Ambient Air Quality monitoring was conducted with respect to the following parameters-

- ◇ Respirable Particulate Matter (**RPM**).
- ◇ Suspended Particulate Matter (**SPM**).
- ◇ Sulphur Dioxide (**SO₂**).
- ◇ Oxides of Nitrogen (**NO_x**).

For collecting samples for the determination of RPM, SPM, SO₂ and NO_x, 'ENVIROTECH High Volume Respirable Dust Sampler, APM 460' together with gaseous attachment APM 411 was used. The instrument is capable of drawing air at a flow rate of 1 to 1.3 m³/ min, with very little pressure drop. The APM 460 sampler uses an improved cyclone to separate the coarser particles (larger than 10 microns) from the air stream before filtering it on the 0.5 micron pore-size filter allowing a measurement of both TSPM (Total Suspended Particulate Matter) and the Respirable fraction of Suspended Particulate Matter. Glass micro-fibre filter papers (GFA sheets, Whatman or equivalent) were used for the collection of RPM. To determine the SO₂ component in ambient air, sample was collected by drawing air at a flow rate of 0.5 liters per minute (LPM) through an absorbing solution of *Sodium tetrachloromercurate*. For the NO_x component, sample was collected by drawing air at a similar flow rate through another absorbing solution (*a mixture of Sodium hydroxide and Sodium arsenite*). While the measurements of RPM and SPM were done gravimetrically, measurements of both SO₂ and NO_x were carried out colorimetrically. Samples for all the parameters were collected after every eight hours during the twenty-four hours of total sampling period at each of the sampling points. All the analysis was done as per standard methodology of **IS-5182**.

For analysis of water, the water samples collected from different sources was sent to the 'Public Health Laboratory, Guwahati, for analysis as per relevant norms and standards.

For monitoring of noise, an appropriate sound level meter was used to measure the sound pressure levels. In environmental noise monitoring, the assessment of loudness is very important for its effects on people. This was achieved by the use of A-weighting filters in the noise measuring instrument which gives a direct reading of the approximate loudness. Moreover, A-weighted equivalent sound pressure levels (L_{eq}) were also computed from the hourly values of A-weighted sound levels. Noise monitoring was carried out at some carefully selected locations covering industrial, commercial and residential areas to assess the baseline noise levels

ENVIRONMENTAL MONITORING RESULTS

AMBIENT AIR QUALITY MONITORING RESULTS

a) RPM Levels:

Date	Location	6 am - 2 pm ($\mu\text{g}/\text{m}^3$)	2 pm - 10 pm ($\mu\text{g}/\text{m}^3$)	10 pm - 6 am ($\mu\text{g}/\text{m}^3$)	Daily Average ($\mu\text{g}/\text{m}^3$)
09.02.2010	Tipong Colliery Coal dump Area	19	26	12	19
09.02.2010	Tipong Colliery Residential Area	16	14	10	13
10.02.2010	Tirap Colliery Mine Area (1) (Eagle's Eye Viewpoint, Core Zone).	48	56	17	40
10.02.2010	Tirap Colliery mine Area (2) (Near OB dumping & NH-38)	31	20	16	22
12.02.2010	Tirap Colliery Residential Area (Near Community Centre)	10	14	12	12
15.02.2010	Ledo Colliery Coal dump Area	28	12	14	18
15.02.2010	Tikak Colliery Mine Area (Hill- top viewpoint).	14	16	10	13
16.02.2010	Tikak Colliery Residential Area (Shiva mandir campus).	12	8	10	10
17.02.2010	Baragolai Colliery Coal dump Area	23	16	10	16
17.02.2010	Central Hospital, Margherita.	15	15	13	14

b) SPM Levels:

Date	Location	6 am - 2 pm ($\mu\text{g}/\text{m}^3$)	2 pm - 10 pm ($\mu\text{g}/\text{m}^3$)	10 pm - 6 am ($\mu\text{g}/\text{m}^3$)	Daily Average ($\mu\text{g}/\text{m}^3$)
09.02.2010	Tipong Colliery Coal dump Area	233	206	137	192
09.02.2010	Tipong Colliery Residential Area	59	77	41	59
10.02.2010	Tirap Colliery Mine Area (1) (Eagle's Eye Viewpoint, Core Zone).	314	255	289	286
10.02.2010	Tirap Colliery mine Area (2) (Near OB dumping & NH-38)	181	216	238	212
12.02.2010	Tirap Colliery Residential Area (Near Community Centre)	76	60	42	59
15.02.2010	Ledo Colliery Coal dump Area	193	162	108	154
15.02.2010	Tikak Colliery Mine Area (Hill- top viewpoint).	198	102	110	137
16.02.2010	Tikak Colliery Residential Area (Shiva mandir campus).	65	52	40	52
17.02.2010	Baragolai Colliery Coal dump Area	213	179	156	183
17.02.2010	Central Hospital, Margherita.	86	97	55	79

c) SO₂ Levels:

Date	Location	6 am - 2 pm ($\mu\text{g}/\text{m}^3$)	2 pm - 10 pm ($\mu\text{g}/\text{m}^3$)	10 pm - 6 am ($\mu\text{g}/\text{m}^3$)	Daily Average ($\mu\text{g}/\text{m}^3$)
09.02.2010	Tipong Colliery Coal dump Area	18	22	16	19
09.02.2010	Tipong Colliery Residential Area	15	17	20	17
10.02.2010	Tirap Colliery Mine Area (1) (Eagle's Eye Viewpoint, Core Zone)	36	29	12	26
10.02.2010	Tirap Colliery Mine Area (2) (Near OB Dumping & NH-38)	14	25	10	16
12.02.2010	Tirap Colliery Residential Area (Near Community Centre)	10	12	13	12
15.02.2010	Ledo Colliery Coal dump Area	17	12	16	15
15.02.2010	Tikak Colliery Mine Area (Hill- top viewpoint)	ND	ND	ND	ND
16.02.2010	Tikak Colliery Residential Area (Shiva mandir campus)	ND	ND	ND	ND
17.02.2010	Baragolai Colliery Coal dump Area	21	14	14	16
17.02.2010	Central Hospital, Margherita	ND	ND	ND	ND

d) NO_x Levels:

Date	Location	6 am - 2 pm ($\mu\text{g}/\text{m}^3$)	2 pm - 10 pm ($\mu\text{g}/\text{m}^3$)	10 pm - 6 am ($\mu\text{g}/\text{m}^3$)	Daily Average ($\mu\text{g}/\text{m}^3$)
09.02.2010	Tipong Colliery Coal dump Area	32	27	15	25
09.02.2010	Tipong Colliery Residential Area	18	15	10	14
10.02.2010	Tirap Colliery Mine Area (1) (Eagle's Eye Viewpoint, Core Zone)	70	52	29	50
10.02.2010	Tirap Colliery Mine Area (2) (Near OB Dumping & NH-38)	55	41	20	39
12.02.2010	Tirap Colliery Residential Area (Near Community Centre)	21	25	12	19
15.02.2010	Ledo Colliery Coal dump Area	43	22	15	27
15.02.2010	Tikak Colliery Mine Area (Hill- top viewpoint)	18	25	13	19
16.02.2010	Tikak Colliery Residential Area (Shiva mandir campus)	16	22	15	18
17.02.2010	Baragolai Colliery Coal dump Area	51	40	21	37
17.02.2010	Central Hospital, Margherita	18	26	08	17

REMARKS

Onsite Ambient Air monitoring was carried out from 09/02/2010 to 17/02/2010 at the abovementioned 10 nos. locations of NEC for the parameters of RPM, SPM, SO₂ & NO_x. From the monitoring results it can be seen that the daily average RPM levels are well within the limit of 300 µg/ m³ of ambient air prescribed for existing mines. The average SPM levels too are within the prescribed limit of 600 µg/ m³ of ambient air for existing mines.

The ambient SO₂ levels at all the sampling stations are also within the prescribed limit of 120 µg/ m³ of ambient air.

The ambient NO_x levels too, are within the limit of 120 µg/ m³ of ambient air at all the sampling stations.

WATER ANALYSIS RESULTS

(For the Monitoring Period of 'January 2010 --- March 2010', for the Winter Season)

a) Effluent Water Analysis Results

[19 (Nineteen) nos. of Effluent/ Waste Water Samples were collected in the period between 05/01/2010 and 27/02/2010, and analyzed for the following parameters].

Parameters & Units	E 01	E 02	E 03	E 04	E 05	E 06
pH	8.3	6.0	3.1	5.5	6.4	6.6
COD (mg/L)	96	54	196	81	88	19
Suspended Solids. (mg/L)	87	91	156	102	79	57
Oil & Grease. (mg/L)	4.2	2.1	3.4	1.1	3.4	1.0
Nitrate Nitrogen (mg/L)	9.6	2.4	1.8	1.9	4.2	3.3

E 01: Colony Effluent- *MARGHERITA*.

E 02: Central Hospital effluent- *MARGHERITA*.

E 03: Raw mine water- *BARAGOLAI*.

E 04: Mine water after neutralization- *BARAGOLAI*.

E 05: Near temple by the side of NH- *BARAGOLAI*.

E 06: Downstream of Namdang river- *BARAGOLAI*.

Effluent Water Analysis Results (contd-1):

Parameters & Units	E 07	E 08	E 09	E 10	E 11	E 12
pH	2.6	6.8	2.2	2.1	6.6	6.2
COD (mg/L)	102	31	206	183	73	49
Suspended Solids. (mg/L)	354	83	318	271	126	203
Oil & Grease. (mg/L)	4.6	3.4	6.5	4.3	5.9	5.8
Nitrate Nitrogen (mg/L)	1.0	2.9	2.3	1.2	4.2	4.7

E 07: Effluent from Tikak mine (Raw) - *TIKAK*.

E 08: Treated Water - *TIKAK*.

E 09: Nallah water surrounding coal dump outlet of Samukjan Nallah - *TIKAK*.

E 10: Raw Mine Water – *LEDO*.

E 11: Upstream of Ledo Pani Nallah - *LEDO*.

E 12: Downstream of Ledo Pani Nallah - *LEDO*.

Effluent Water Analysis Results (contd-2):

Parameters & Units	E 13	E 14	E 15	E 16	E 17	E 18	E 19
pH	2.3	6.5	6.5	3.3	6.7	6.8	6.7
COD (mg/L)	123	16	152	219	42	22	36
Suspended Solids. (mg/L)	207	119	288	336	91	61	187
Oil & Grease. (mg/L)	3.5	1.1	2.9	4.2	2.1	1.0	2.2
Nitrate Nitrogen (mg/L)	3.1	2.6	3.6	3.3	1.5	2.8	1.6

E 13: Raw mine water - *TIRAP*.

E 14: Treated water - *TIRAP*.

E 15: Ledo pani nallah water after meeting the diverted water from Tirap OCP (confluence) - *TIRAP*.

E 16: Raw mine water - *TIPONG*.

E 17: Treated water - *TIPONG*.

E 18: Upstream of Tipong river - *TIPONG*.

E 19: Downstream of Tipong river - *TIPONG*.

Effluent Water Analysis Results (contd-3):

Parameters & Units	E 20	E 21	E 22	E 23	E 24
pH	5.8	4.4	5.0	4.2	5.0
COD (mg/L)	77	69	52	73	36
Suspended Solids. (mg/L)	52	101	85	116	86
Oil & Grease. (mg/L)	ND	1.4	ND	1.0	ND
Nitrate Nitrogen (mg/L)	1.9	1.2	2.0	1.7	1.4

E 20: Surface run-off of active OB dump - *TIKAK*.

E 21: Surface run-off of new OB dump - *TIKAK*.

E 22: Surface run-off of active OB dump - *TIRAP*.

E 23: Surface run-off of new OB dump - *TIRAP*.

E 24: Surface run-off of old OB dump - *TIRAP*.

b) Drinking Water Analysis Results

[6 (Six) nos. of Drinking Water Samples were collected in the period between 09/01/2010 -- 25/02/2010, and analyzed for the following parameters.]

Parameter and Unit	DW 1	DW 2	DW 3	DW 4	DW 5	DW 6
Appearance	Cl	Cl	Cl	Cl	Cl	Cl
Colour	CL	CL	CL	CL	CL	CL
Odour	OL	OL	OL	OL	OL	OL
pH	6.8	7.1	6.9	7.3	7.1	6.9
Turbidity (NTU)	1.14	1.05	0.8	0.9	1.06	1.23
Total Solids (mg/L)	180	164	177	231	219	168
Total Hardness as CaCO ₃ (mg/L)	104	86	93	117	102	109
Carbonate Hardness as CaCO ₃ (mg/L)	71	63	74	82	76	63
M-Alkalinity as CaCO ₃ (mg/L)	64	71	69	64	54	71
P-Alkalinity as CaCO ₃ (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
Total Iron as Fe (mg/L)	0.02	0.05	0.07	0.11	0.06	0.04
Total Chloride as Cl (mg/L)	08.0	12.0	16.0	09.0	18.0	10.0
Residual Chloride as Cl (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
Ammonical Nitrogen as NH ₃ (mg/L)	0.026	0.18	0.010	0.044	0.28	0.019
Albuminoid Nitrogen as NH ₃ (mg/L)	0.026	0.18	0.010	0.044	0.28	0.019
Nitrite Nitrogen as N (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
Nitrate Nitrogen as N (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
Fluoride as F (ppm)	Nil	Nil	Nil	Nil	Nil	Nil

Cl – Clear

CL - Colourless

OL - Odourless

DW 1: Drinking Water – *BARAGOLAI COLLIERY*.

DW 2: Drinking Water – *TIKAK COLLIERY*.

DW 3: Drinking Water – *TIRAP COLLIERY*.

DW 4: Drinking Water of *RODEGAON – TIRAP COLLIERY*.

DW 5: Drinking Water of *SIPEGAON – TIRAP COLLIERY*.

DW 6: Drinking Water – *TIPONG COLLIERY*.

REMARKS

A total of Nineteen numbers of Waste water/ Effluent samples (raw and treated) collected from different locations, were analyzed as per IS- 2490. The raw mine water samples are mostly acidic in nature and require chemical treatment to bring the pH values to acceptable limits. The overall quality of the effluent samples is satisfactory.

All the Six Drinking Water samples conformed to the standards as per IS- 10500. Overall, the drinking water samples were soft in nature and parameter levels well within the prescribed limits.

NOISE LEVEL MONITORING RESULTS

[Conducted between 08/02/2010 and 28/02/2010]

SL. NO.	LOCATION	dB (A) as L_{eq}	
		Day time	Night time
1	Central Hospital- Margherita	50	32
2	Baragolai Coal Dump Area.	52	35
3	Tikak Weigh Bridge.	55	38
4	Tikak Mine Area.	51	32
5	Ledo Coal Dump Area.	54	34
6	Tirap Mine Area.	58	42
7	Tirap Residential Area.	59	43
8	Tipong Coal Dump Area.	50	35

REMARKS

As can be seen from the monitoring results, the ambient noise level at the study area is very satisfactory and well within the stipulated limits.

AMBIENT NOISE LEVEL STANDARDS

SCHEDULE

[Rule 3(1) and 4(1) of Noise Pollution (Regulation & Control) Rules, 2000]

Area Code	Category of Area/ Zone	Limit in dB (A) in L_{eq}
A	Industrial Area	75
B	Commercial Area	65
C	Residential Area	55
D	Silence Zone	50

NB:

Silence Zone is an area comprising an area not less than 100 m around Hospitals, Educational Institutions, Courts, Religious Places or any other area which is declared as such by the competent authority.

CONCLUSION

The onsite monitoring was conducted for the Winter Season during the period of 'January 2010 and March 2010'. From the air monitoring results, it is seen that, the levels of all the four pollutants i.e. RPM, SPM, SO₂ & NO_x present in ambient air are within the prescribed limits at all the monitoring stations, which includes both active mine areas and nearby residential areas. Movement of heavy trucks and dumpers while transporting coal and OB leads to the production of dust along the haul roads. For the purpose of suppressing this airborne dust, the Coal India Ltd. authority carries out frequent watering with the help of water tankers. High humidity and rainfall of the area, particularly during the summer and monsoon seasons also make this job easier.

The quality of Waste Water/ Effluents (raw and treated) is satisfactory. The quality of drinking water samples also conformed to the relevant standards.

The Ambient Noise scenario is satisfactory and Noise Levels well under the prescribed limits at all the monitoring stations.

BILL

Coal India Limited
North Eastern Coalfields
Margherita

----- Dr.

Sl. No.	Particulars	Quantity	Rate/Unit (Rs)	Amount (Rs)
1	Ambient air quality monitoring (Sampling and Analysis)	10 stations.	5,645.00	56,450.00
2	Effluent/ Drinking Water quality monitoring (Sampling and Analysis)	25 nos.	1,100.00	27,500.00
3	Noise Level measurement	8 stations	663.00	5,304.00
			Total	89,254.00

Amount (In Words): Rupees Eighty Nine Thousand Two Hundred Fifty Four only.

Bill No. – ENV/CIL/B 04/09-10

Dated - 13/03/2010

E & O.E.

Order No. - EMLR/2009/68/134

Dated - 29/07/2009

Please pay by A/ c Payee Cheque/ Draft only, in favour of 'ENVIROCON' payable at Digboi.

B. Mahanta

For ENVIROCON

To,

15.01.2007

The Superintending Engineer (Civil)

(Environmental Management),

North Eastern Coalfields,

Coal India Limited,

P.O.-Margherita,

Assam.

Sub: Environmental Monitoring at North Eastern Coalfields, Margherita

Dear Sir,

Herewith we are submitting three copies of report on Environmental Monitoring conducted at different locations of North Eastern Coalfields, Coal India Ltd. Margherita, during October 2006 and December 2006 (Post- Monsoon Season), for your kind perusal. Hope you would be satisfied with the report and let us know about your views on the same.

Bill for the above job is also attached herewith. Kindly do the needful and arrange to release the bill at the earliest.

Thanking you and assuring of our best services always.

Yours truly,

(B. Mahanta)

For ENVIROCON.

INDIAN STANDARDS
FOR INDUSTRIAL AND SEWAGE EFFLUENT DISCHARGE

IS: 2490

Parameters	Into Public Sewers	On Land for Irrigation	Into Inland Surface Water	Sewage Farming
01. Colour	--	--	--	--
02. pH Value	5.5- 9	5.5- 9	5.5- 9	5.5- 9
03. Suspended Solids, (mg/l)	600	200	100	30
04. Dissolved Solids, (mg/l)	2100	2100	2100	--
05. Oil & Grease, (mg/l)	20	10	10	--
06. Total Residual Chlorine, (mg/l)	--	--	1	--
07. Ammonical Nitrogen, (mg/l)	50	--	50	--
08. Total Kjeldhal Nitrogen, (mg/l)	--	--	100	--
09. Free Ammonia [as NH ₃], (mg/l)	--	--	5	--
10. Biochemical Oxygen Demand, (mg/l)	350	100	30	20
11. Chemical Oxygen Demand, (mg/l)	--	--	250	--
12. Arsenic [as As], (mg/l)	0.2	0.2	0.2	--
13. Mercury [as Hg], (mg/l)	0.01	--	0.01	--
14. Lead [as Pb], (mg/l)	1	--	0.1	--
15. Cadmium [as Cd], (mg/l)	1	--	2	--
16. Hexavalent Chromium [as Cr ⁶⁺], (mg/l)	2	--	0.1	--
17. Total Chromium [as Cr], (mg/l)	2	--	2	--
18. Copper [as Cu], (mg/l)	3	--	3	--
19. Zinc [as Zn], (mg/l)	15	--	5	--
20. Selenium [as Se], (mg/l)	0.05	--	0.05	--
21. Nickel [as Ni], (mg/l)	3	--	3	--
22. Boron [as B], (mg/l)	2	2	2	--
23. Percent Sodium	--	60	--	--
24. Residual Sodium Carbonate, (mg/l)	--	50	--	--
25. Cyanide [as Cn], (mg/l)	0.2	0.2	0.2	--
26. Chloride [as Cl], (mg/l)	1000	600	1000	--
27. Fluoride [as F], (mg/l)	15	--	2	--
28. Dissolved Phosphate [as P], (mg/l)	--	--	5	--
29. Sulphate [as SO ₄], (mg/l)	1000	1000	1000	--
30. Sulphide [as S], (mg/l)	--	--	2	--
31. Pesticides	Absent	Absent	Absent	Absent
32. Phenolic Compounds [as C ₆ H ₅ OH], (mg/l)	6	--	1	--

AIR QUALITY STANDARDS FOR EXISTING COAL MINES

The Respirable Particulate Matter (RPM), Suspended Particulate Matter (SPM), Sulfur dioxide (SO₂) and Oxides of Nitrogen (NO_x) concentrations at downward direction, considering predominant wind direction at 500 mts. from the dust generating source shall not exceed the following standards-

Dust Generating Sources : Loading or unloading, Haul road, coal transportation road, Coal handling plant (CHP), Railway sliding, Blasting, Drilling, Overburden dumps, or any other dust generating external sources like coke ovens (hard as well as soft), briquette industry, nearby road etc.

Pollutant	Time Weighted Average	Concentration in Ambient Air	Method of Measurement
Respirable Particulate Matter (RPM)	Annual Average*	215 µg/ m ³	Respirable Particulate Matter sampling and analysis.
	24 hrs.**	300 µg/ m ³	
Suspended Particulate Matter (SPM)	Annual Average*	430 µg/ m ³	High volume sampling. (Average flow rate not less than 1.1 m ³ / minute)
	24 hrs.**	600 µg/ m ³	
Sulfur dioxide (SO ₂)	Annual average*	80 µg/ m ³	1. Improved West & Gaeke Method. 2. Ultraviolet Fluorescence
	24 hrs.**	120 µg/ m ³	
Oxides of Nitrogen (NO _x)	Annual Average*	80 µg/ m ³	1. Jacob & Hochheiser Modified (Na- Aresnic) Method. 2. Gas phase chemiluminescence
	24 hrs.**	120 µg/ m ³	

Note

*Annual arithmetic mean for the measurements taken in a year following the guidelines of frequency of sampling as laid down by CPCB.

**24 hourly/ 8 hourly values should be met 98% of the time in a year. However 2% of the time it may exceed, but not on two consecutive days.

- The Ambient air quality standard shall apply to the nearest residential/ commercial places (existing/ likely) on the leeward direction of the mining and allied activities.
- Unauthorized construction will not be taken as reference of nearest residential/ commercial place for monitoring.