A REPORT ON

Ambient Air Quality, Water/ Waste Water Analysis

&

Noise Level Measurement

at

NORTH EASTERN COALFIELDS

COAL INDIA LTD.

MARGHERITA

POST-MONSOON SEASON

(OCTOBER 2010 - DECEMBER 2010)

Submitted To:

North-Eastern Coalfields
Coal India Limited
Margherita
Assam

Submitted By:

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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 it's 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. Presently, two more OCPs namely "Ledo" & "Tikak Extension" are being developed to augment the production capacity.

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) <u>By Open Cast mining method</u>:

- 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 measurement at selected locations of the different collieries of Coal India Ltd., NEC- Margherita.

SCOPE OF THE STUDY

The present study included the open cast mines i.e. *Tikak, Tirap* and *Ledo* and the underground mine of *Tipong* together with the *Margherita Central Hospital* and residential and commercial areas surrounding the mine areas, for Ambient Air Quality testing; all the mines and adjoining areas for Water/ Waste Water analysis, and some selected locations for noise level measurement.

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 Post-Monsoon Season (October 2010 to December 2010) for the relevant environmental components and parameters.

METHODOLOGY

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

- ◊ Respirable Particulate Matter (**RPM**).
- ◊ Suspended Particulate Matter (**SPM**).
- ◊ Sulphur Dioxide (**SO_2**).
- ◊ Oxides of Nitrogen (**NO_x**).

For collecting samples for the determination of RPM, SPM, SO_2 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 m^3/ 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 SO_2 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 SO_2 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 were analysed as per relevant norms and standards.

For measurement of noise, an appropriate sound level meter was used to measure the sound pressure levels. In environmental noise measurement, 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 measurement was carried out at some carefully selected locations covering industrial, commercial and residential areas to assess the baseline noise levels.

ENVIRONMENTAL TEST RESULTS

AMBIENT AIR QUALITY

a) RPM Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
05.11.2010	Tipong Colliery Coal Dump Area	41	29	24	31
05.11.2010	Tipong Colliery Residential Area	29	22	17	23
10.11.2010	Tirap Colliery Mine Area (1)	51	62	55	56
10.11.2010	Tirap Colliery mine Area (2)	54	63	40	52
15.11.2010	Tirap Colliery Residential Area	20	25	18	21
19.11.2010	Ledo OCP Area	50	44	37	44
19.11.2010	Ledo Colliery Coal Dump Area	56	49	42	49
25.11.2010	Ledo Bazaar Area	20	25	18	21
25.11.2010	Tikak Colliery Mine Area	54	44	25	41
01.12.2010	Tikak Colliery Coal Dump Area	53	48	32	44
01.12.2010	Tikak Colliery Residential Area	23	20	11	18
06.12.2010	Baragolai Residential Area	22	13	19	18
06.12.2010	Central Hospital, Margherita.	26	20	12	19

b) SPM Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
05.11.2010	Tipong Colliery Coal dump Area	258	279	230	256
05.11.2010	Tipong Colliery Residential Area	182	206	151	180
10.11.2010	Tirap Colliery Mine Area (1)	436	417	373	409
10.11.2010	Tirap Colliery mine Area (2)	416	372	326	371
15.11.2010	Tirap Colliery Residential Area	232	210	165	202
19.11.2010	Ledo OCP Area	396	348	339	361
19.11.2010	Ledo Colliery Coal Dump Area	371	364	317	351
25.11.2010	Ledo Bazaar Area	260	214	178	217
25.11.2010	Tikak Colliery Mine Area	293	284	260	279
01.12.2010	Tikak Colliery Coal Dump Area	316	307	285	303
01.12.2010	Tikak Colliery Residential Area	161	137	125	141
06.12.2010	Baragolai Residential Area	137	114	106	119
06.12.2010	Central Hospital, Margherita.	149	122	115	129

c) SO_2 Levels:

Date	Location	6 am - 2 pm (µg/m³)	2 pm - 10 pm (µg/m³)	10 pm - 6 am (µg/m³)	Daily Average (µg/m³)
05.11.2010	Tipong Colliery Coal Dump Area	15	19	18	17
05.11.2010	Tipong Colliery Residential Area	13	16	11	13
10.11.2010	Tirap Colliery Mine Area (1)	35	27	16	26
10.11.2010	Tirap Colliery Mine Area (2)	32	26	14	24
15.11.2010	Tirap Colliery Residential Area	19	18	12	16
19.11.2010	Ledo OCP Area	27	22	15	21
19.11.2010	Ledo Colliery Coal Dump Area	25	19	11	18
25.11.2010	Ledo Bazaar Area	15	12	10	12
25.11.2010	Tikak Colliery Mine Area	BDL	BDL	BDL	BDL
01.12.2010	Tikak Colliery Coal Dump Area	29	24	18	24
01.12.2010	Tikak Colliery Residential Area	BDL	BDL	BDL	BDL
06.12.2010	Baragolai Residential Area	BDL	BDL	BDL	BDL
06.12.2010	Central Hospital, Margherita	BDL	BDL	BDL	BDL

d) NOx Levels:

Date	Location	6 am - 2 pm (μg/m³)	2 pm - 10 pm (μg/m³)	10 pm - 6 am (μg/m³)	Daily Average (μg/m³)
05.11.2010	Tipong Colliery Coal Dump Area	32	25	20	26
05.11.2010	Tipong Colliery Residential Area	18	12	09	13
10.11.2010	Tirap Colliery Mine Area (1)	70	58	21	50
10.11.2010	Tirap Colliery Mine Area (2)	50	49	29	43
15.11.2010	Tirap Colliery Residential Area	16	15	12	14
19.11.2010	Ledo OCP Area	45	52	24	40
19.11.2010	Ledo Colliery Coal Dump Area	56	50	31	46
25.11.2010	Ledo Bazaar Area	22	30	19	24
25.11.2010	Tikak Colliery Mine Area	41	25	17	28
01.12.2010	Tikak Colliery Coal Dump Area	43	35	22	33
01.12.2010	Tikak Colliery Residential Area	17	15	11	14
06.12.2010	Baragolai Residential Area	23	18	14	18
06.12.2010	Central Hospital, Margherita	23	17	08	16

REMARKS

Onsite Ambient Air Quality testing was carried out from 05/11/2010 to 06/12/2010 at the abovementioned 13 nos. locations of NEC for the parameters of RPM, SPM, SO_2 & NOx. From the test results it can be seen that the daily average RPM levels are well within the limit of 300 μg/ m^3 of ambient air prescribed for existing mines. The average SPM levels too are within the prescribed limit of 600 μg/ m^3 of ambient air for existing mines.

The ambient SO_2 levels at all the sampling stations are also within the prescribed limit of 120 μg/ m^3 of ambient air.

The ambient NOx levels too, are within the limit of 120 μg/ m^3 of ambient air at all the sampling stations.

WATER/ WASTE WATER ANALYSIS

(For the Period of 'October 2010 --- December 2010', for the Post-Monsoon Season)

a) Effluent Water Analysis Results

[18 (Eighteen) nos. of Effluent/ Waste Water Samples were collected in the period between 03/11/2010 and 30/11/2010, and analyzed for the following parameters].

Parameters & Units	**E 01**	**E 02**	**E 03**	**E 04**	**E 05**	**E 06**
pH	8.9	6.4	6.6	6.7	3.1	6.5
COD (mg/L)	187	148	130	75	256	63
Suspended Solids. (mg/L)	150	107	86	55	191	46
Oil & Grease. (mg/L)	4.8	3.7	1.5	ND	5.4	2.6
Nitrate Nitrogen (mg/L)	13.5	5.7	3.3	1.5	3.1	2.4

ND: Not Detected

E 01: Colony Effluent- *MARGHERIT.*

E 02: Central Hospital effluent- *MARGHERITA*

E 03: Near temple by the side of NH - *BARAGOLAI*

E 04: Downstream of Namdang river- *BARAGOLAI*

E 05: Raw mine water- *TIKAK*

E 06: Treated water- *TIKAK*

Effluent Water Analysis Results (contd-1):

Parameters & Units	**E 07**	**E 08**	**E 09**	**E 10**	**E 11**	**E 12**
pH	5.5	2.2	6.8	6.5	6.1	2.3
COD (mg/L)	127	162	55	151	178	136
Suspended Solids. (mg/L)	188	195	64	182	202	218
Oil & Grease. (mg/L)	3.1	4.4	1.3	4.2	4.9	3.3
Nitrate Nitrogen (mg/L)	7.4	4.5	2.7	3.5	3.8	3.3

E 07: Nallah water surrounding coal dump outlet of Samukjan Nallah – *TIKAK*

E 08: Raw mine water- *LEDO OCP*

E 09: Treated water – *LEDO OCP*

E 10: Upstream of Ledo Pani Nallah - *LEDO*

E 11: Downstream of Ledo Pani Nallah – *LEDO*

E 12: Raw mine water- TIRAP

Effluent Water Analysis Results (contd-2):

Parameters & Units	**E 13**	**E 14**	**E 15**	**E 16**	**E 17**	**E 18**
pH	6.7	6.4	2.8	6.2	6.6	6.5
COD (mg/L)	82	121	235	145	48	70
Suspended Solids. (mg/L)	67	172	185	76	61	73
Oil & Grease. (mg/L)	2.7	1.5	2.1	1.8	ND	ND
Nitrate Nitrogen (mg/L)	2.6	4.5	4.1	3.7	2.4	3.4

ND: Not Detected

E 13: Treated water - *TIRAP*

E 14: Ledo pani nallah water after meeting the diverted water from Tirap OCP (confluence) - *TIRAP*

E 15: Raw mine water – *TIPONG*

E 16: Treated water- *TIPONG*

E 17: Upstream of Tipong river - *TIPONG*

E 18: Downstream of Tipong river - *TIPONG*

b) Drinking Water Analysis Results

[6 (Six) nos. of Drinking Water Samples were collected in the period between 03/11/2010 -- 30/11/2010, and analyzed for the following parameters]

Parameter and Unit	**DW 1**	**DW 2**	**DW 3**	**DW 4**	**DW 5**	**DW 6**
Appearance	C	C	C	C	C	C
Colour	CL	CL	CL	CL	CL	CL
Odour	OL	OL	OL	OL	OL	OL
pH	6.6	6.7	6.7	7.3	7.3	6.8
Turbidity (NTU)	1.08	1.12	1.19	1.01	1.05	1.14
Total Solids (mg/L)	194	171	188	157	186	153
Total Hardness as $CaCO_3$ (mg/L)	89	81	95	78	108	94
Carbonate Hardness as $CaCO_3$ (mg/L)	84	76	61	72	91	75
M-Alkalinity as $CaCO_3$ (mg/L)	61	75	72	65	54	43
P-Alkalinity as $CaCO_3$ (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
Total Chloride as Cl (mg/L)	10.2	10.5	12.9	11.8	12.2	12.4
Residual Chloride as Cl (mg/L)	ND	ND	ND	ND	ND	ND
Ammonical Nitrogen as NH_3 (mg/L)	0.13	0.11	0.07	0.021	0.37	0.17
Fluoride as F (mg/L)	ND	ND	ND	ND	ND	ND
Nitrate as NO_3 (mg/L)	0.8	0.4	0.9	0.6	0.8	0.5
Total Iron as Fe (mg/L)	0.14	0.07	0.15	0.12	0.07	0.06
Calcium as Ca (mg/L)	39	32	28	42	35	25
Copper as Cu (mg/L)	ND	ND	ND	ND	ND	ND
Arsenic as As (mg/L)	ND	ND	ND	ND	ND	ND
Lead as Pb (mg/L)	ND	ND	ND	ND	ND	ND
Phenolics as C_6H_5OH (mg/L)	ND	ND	ND	ND	ND	ND
Faecal Coliform (as MPN/100 ml)	Nil	Nil	Nil	Nil	Nil	Nil

C – Clear **CL** - Colourless **OL** - Odourless

ND: Not Detected

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 Eighteen 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 are soft in nature and parameter levels well within the prescribed limits.

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NOISE LEVEL MEASUREMENT

[Conducted between 05/11/2010 and 29/11/2010]

SL. NO.	LOCATION	dB (A) as L_{eq}	
		Day time	Night time
1	Central Hospital- Margherita	61	38
2	Tikak Weighbridge Area	53	33
3	Tikak Mine Area.	51	35
4	Ledo OCP Mine Area.	65	36
5	Tirap Mine Area.	68	41
6	Tirap Residential Area.	53	37
7	Tipong Coal Dump Area.	56	36

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.

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AMBIENT NOISE LEVEL STANDARDS

[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 sampling was conducted for the Post-Monsoon Season during the period of 'October 2010 and December 2010'. From the air quality results, it is seen that, the levels of all the four pollutants i.e. RPM, SPM, SO_2 & NOx present in ambient air are within the prescribed limits at all the sampling 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.

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AIR QUALITY STANDARDS FOR EXISTING COAL MINES

The Respirable Particulate Matter (RPM), Suspended Particulate Matter (SPM), Sulfur dioxide (SO_2) 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* 24 hrs.**	215 µg/ m^3 300 µg/ m^3	Respirable Particulate Matter sampling and analysis.
Suspended Particulate Matter (SPM)	Annual Average* 24 hrs.**	430 µg/ m^3 600 µg/ m^3	High volume sampling. (Average flow rate not less than 1.1 m^3/ minute)
Sulfur dioxide (SO_2)	Annual average* 24 hrs.**	80 µg/ m^3 120 µg/ m^3	1. Improved West & Gaeke Method. 2. Ultraviolet Fluorescence
Oxides of Nitrogen (NOx)	Annual Average* 24 hrs.**	80 µg/ m^3 120 µg/ m^3	1. Jacob & Hochheiser Modified (Na- Aresnic) Method. 2. Gas phase chemiluminescence

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.

INDIAN STANDARDS

FOR INDUSTRIAL AND SEWEGE 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_6H_5OH], (mg/l)	6	--	1	--

DRINKING WATER STANDARDS

[IS: 10500]

Sl. No.	Parameters	Desirable Limit
01	Odour	Unobjectionable
02	Taste	Agreeable
03	Turbidity, NTU	5
04	pH value	6.5 – 8.5
05	Total hardness (as $CaCO_3$), mg/l	300
06	Alkalinity (as $CaCO_3$), mg/l	200
07	Iron (as Fe), mg/l	0.30
08	Chlorides (as Cl), mg/l	250
09	Dissolved solids, mg/l	500
10	Calcium (as Ca), mg/l	75
11	Copper (as Cu), mg/l	0.05
12	Sulfate (as SO_4), mg/l	200
13	Nitrate (as NO_3), mg/l	45
14	Fluoride (as F), mg/l	1
15	Residual free chlorine, mg/l	0.20
16	Arsenic (as As), mg/l	0.05
17	Lead (as Pb), mg/l	0.05
18	Boron (as B), mg/l	1.00
19	Phenolics (as C_6,H_5OH), mg/l	0.001
20	Faecal coliform (as MPN/100ml)	NIL