ACTION PLAN FOR INDUSTRIAL CLUSTER IN CRITICALLY POLLUTED AREA

Monitoring, sampling, analysis of Stack, Ambient Air Quality, Surface Water, Ground Water, Waste Water

चंद्रपूर Chandrapur

Maharashtra Pollution Control Board

Kalptaru Point, Sion East, Mumbai - 400022

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We would also like to extend our thanks to the concerned staff of Regional Hospitals, who has provided us the health data, which is the most important component of this revised concept of CEPI.

By undertaking this project and completing in schedule time, we consider ourselves very lucky since we have helped the mankind by giving the data on pollution load and further action by the Board, to bring down the pollution level.

We also thank our associates for working on this project for making the write up, making graphs and feeding the data on computer.

This acknowledgement will be incomplete if we do not thank our laboratory analysts and others who made this project a success by timely analysing the samples.

We also thank our sampling team members for conducting the sampling in this vast area.

Abbreviations:

APHA	American Public Health Association
BDL	Below Detection Limit
BOD	Biochemical Oxygen Demand
CEPI	Comprehensive Environmental Pollution Index
CETP	Common Effluent Treatment Plant
COD	Chemical Oxygen Demand
CPA	Critically Polluted Areas
SPA	Severely Polluted Areas
DO	Dissolved Oxygen
ETP	Effluent Treatment Plant
MIBK	Methyl Isobutyl Ketone
MPCB	Maharashtra Pollution Control Board
NAAQS	National Ambient Air Quality Standards
NO_x	Oxides of Nitrogen
ND	Not Detected
PAH	Poly Aromatic Hydrocarbons
PCB	Poly Chlorinated Biphenyls
PCT	Poly Chlorinated Terphenyls
PM_{10}	Particulate Matter (size less than 10 µm)
$PM_{2.5}$	Particulate Matter (size less than 2.5 µm)
SO_2	Sulphur Dioxide
STAP	Short Term Action Plan
WHO	World Health Organization

1. Introduction:

India has experienced rapid industrial growth in last few years. Maharashtra is one of the most industrialised states in the country. The state has identified industrial sectors like auto, engineering, chemical, electronics and textile as focus sectors. Industrial processes and activities consume materials and resources for manufacturing products generating emissions, effluents and solid wastes. Rise in growth in industrial activities is leading to manifold impacts to the environment. This environmental pollution is a wide reaching problem and if not controlled to certain tolerable levels, it is likely to influence the human health too. Long term exposure to the polluted air and water causes chronic health problems. Hence, scientists are exploring the quantum of pollution load as well as to device certain strategies and technologies so that our sustainable development would not be jeopardized otherwise our long cherished dream of establishing eco-socialism on this watery planet could not come true.

The extent of pollution varies with the size of the industry, the nature of the industry, the type of products used and produced etc. In view of this, Central Pollution Control Board (CPCB) has evolved the concept of Comprehensive Environmental Pollution Index (CEPI) during 2009-10 as a tool for comprehensive environmental assessment of prominent industrial clusters and formulation of remedial Action Plans for the identified critically polluted areas. The index captures the various dimensions of environment including air, water and land. Comprehensive Environmental Pollution Index (CEPI), which is a rational number to characterize the environmental quality at a given location following the algorithm of source, pathway and receptor have been developed. Later-on proposals were received from the SPCBs, State Governments, and Industrial Associations and concerned Stake-holders for revisiting the criteria of assessment under CEPI concept. After careful examination and consideration of the suggestions of concerned stake-holders, it was decided to prepare the revised concept of CEPI by eliminating the subjective factors but retaining the factors which can be measured precisely. Hence, revised concept came into existence, which is termed as Revised CEPI Version 2016.

The present report is also based on the revised CEPI version 2016. The results of the application of the Comprehensive Environmental Pollution Index (CEPI) to selected industrial clusters or areas are presented in this report. The main objective of the study is to identify polluted industrial clusters or areas in order to take concerted action and to centrally monitor them at the national level to improve the current status of their environmental components such as air and water quality data, ecological damage, and visual environmental conditions. For the study, Central Pollution Control Board (CPCB) has selected a total of 88 industrial areas or clusters in consultation with the Ministry of Environment & Forests Government of India. Out of these, 5 critically polluted industrial clusters namely Tarapur, Dombivali, Navi Mumbai, Aurangabad and Chandrapur, are identified and 3 severely polluted industrial clusters namely Pimpri-chinchwad, Nashik and Chembur from Maharashtra are added into this list.

About 6000 small, medium and large scale industries are located at Chandrapur district. Chandrapur has large deposits of coal and lime stone. The mammoth coal mines around the city also contribute to the heavy industrialization of the city. Western Coalfields Limited (WCL), a subsidiary of Coal India, has many mines here. Chandrapur Super Thermal Power Station by Maharashtra State Power Generation Company Limited is its biggest pit head thermal power station. The city houses various cement factories in its vicinity. They are Manikgarh Cement, a division of Century Textile and Industries, part of the BK Birla group of companies, UltraTech Cement (formerly L&T Cement), a division of Grasim Industries, part of the Aditya Birla Group; Chandrapur Cement Works, a division of Associated Cement Companies, part of Holcim Group; and Maratha Cement Works, part of Ambuja Cements Limited. The district also boasts of having Ballarpur Industries Limited, the largest manufacturer and exporter of paper in India. Other major industries

include a Chandrapur ferro alloy plant (formerly Maharashtra Elektrosmelt Ltd), a ferro-manganese plant, and a silico-manganese plant of Steel Authority of India Limited. Chandrapur's ferro alloy plant is the largest manganese-based ferro alloy producer in the country.

2. Scope of Work

The Scope of Work consisted of the following:

Monitoring, Sampling, Analysis for Stack, Ambient Air Quality, Surface Water, Waste Water, and Ground Water Quality for identified five Critically Polluted areas (CPAs) in Maharashtra i.e. **Chandrapur, Dombivli, Aurangabad, Navi Mumbai** and **Tarapur** and 3 Severely Polluted areas (SPAs) in Maharashtra i.e. **Chembur, Pimpri-Chinchwad** and **Nashik** as per standard methods.

- At each of the 5 CPAs and 3 SPAs, 24 hourly ambient air quality monitoring to be carried out.
- Representative samples for surface water quality, waste water quality and Ground Water quality to be collected from prominent surface and Ground Water bodies located in and around the clusters/areas.
- Submission of complete monitoring, sampling and analysis reports including the summary of the parameters exceeding the prescribed standards/norms for all the 5 CPAs and 3 SPAs.
- Submission of 3 copies of final report with photographs at prominent locations and the CD (soft copy) on completion of the project for every critically polluted and severely polluted area separately.

Monitoring, Sampling, Analysis for Stack, Ambient Air Quality, Surface Water, Waste Water and Ground Water Quality for Chandrapur:

- The sampling was carried out in 4 days i.e. on 4th, 5th, 7th, and 8th June 2018 for MIDC Tadali, MIDC Ghugus, MIDC Chandrapur and MIDC Ballarpur.
- In MIDC Tadali, a total of 6 Stack Monitoring Samples, 3 Ambient Air Quality Monitoring Samples, 5 Waste Water Samples, 4 Ground Water Samples and 2 VOC Samples were collected and analyzed.
- In MIDC Ghugus, a total of 6 Stack Monitoring Samples, 3 Ambient Air Quality Monitoring Samples, 6 Waste Water Samples, 3 Ground Water Samples and 2 VOC Samples were collected and analyzed.
- In MIDC Chandrapur, a total of 6 Stack Monitoring Samples, 3 Ambient Air Quality Monitoring Samples, 5 Waste Water Samples, 4 Ground Water Samples and 2 VOC Samples were collected and analyzed.
- In MIDC Ballarpur, a total of 4 Stack Monitoring Samples, 3 Ambient Air Quality Monitoring Samples, 6 Waste Water Samples, 3 Ground Water Samples and 2 VOC Samples were collected and analyzed.

2.1 Stack Emission Parameters

The Stack Emissions were analyzed with the following parameters:

1. Acid Mist
2. Ammonia
3. Carbon Monoxide
4. Chlorine
5. Fluoride(gaseous)
6. Fluoride (particulate)
7. Hydrogen Chloride
8. Hydrogen Sulphide
9. Oxides of Nitrogen
10. Oxygen
11. Polyaromatic Hydrocarbons (Particulate)
12. Suspended Particulate Matter
13. Sulphur Dioxide
14. Benzene
15. Toluene
16. Xylene
17. Volatile Organic Compounds (VOCs)

2.2 Ambient Air Quality Parameters

The Ambient Air Quality was analyzed with the following parameters:

1. Sulphur Dioxide (SO_2)
2. Nitrogen Dioxide (NO_2)
3. Particulate Matter (PM_{10})
4. Particulate Matter ($PM_{2.5}$)
5. Ozone (O_3)
6. Lead (Pb)
7. Carbon Monoxide (CO)
8. Ammonia (NH_3)

9. Benzene (C_6H_6)
10. Benzo (a) Pyrene (BaP) (Particulate Phase Only)
11. Arsenic (As)
12. Nickel (Ni)

2.3 Water/Waste Water Parameters

The Water/ Waste Water was analyzed with the following parameters:

a. Prominent Surface Water bodies such as outfalls of CETPs, ETPs, treated effluent drainage, river, canal, ponds, lakes and other such water supply resources flowing through the area or flowing adjoining the CPA.

b. Ground Water Quality data of prominent ground water resources such as observation wells of Central Ground Water Board, drinking water wells, hand pumps, bore wells, hand pumps, bore wells and other such water supply resources located in the industrial cluster/area under consideration or in the peripheral areas.

Basic water quality parameters for surface water and ground water both are as follows:

i. Simple Parameters:

1. Sanitary Survey
2. General Appearance
3. Colour
4. Smell
5. Transparency
6. Ecological(Presence of animals like fish, insects) (Applicable to only surface water)

ii. Regular Monitoring Parameters:

7. pH
8. Oil & Grease
9. Suspended Solids
10. Dissolved Oxygen (% saturation) (Not applicable for ground waters)
11. Chemical Oxygen Demand
12. Biochemical Oxygen Demand

13. Electrical Conductivity
14. Nitrite-Nitrogen
15. Nitrate-Nitrogen
16. (NO_2 + NO_3)-Nitrogen
17. Free Ammonia
18. Total Residual Chlorine
19. Cyanide
20. Fluoride
21. Sulphide
22. Dissolved Phosphate
23. Sodium Absorption Ratio (SAR)
24. Total Coliforms (MPN/100 ml)
25. Faecal Coliforms (MPN/100 ml)

iii. Special Parameters:

26. Total Phosphorous
27. Total Kjeldahl Nitrogen(TKN)
28. Total Ammonia (NH_4 +NH_3)-Nitrogen
29. Phenols
30. Surface Active Agents
31. Organo Chlorine Pesticides
32. Polynuclear aromatic hydrocarbons (PAH)
33. Polychlorinated Biphenyls (PCB)and Polychlorinated Terphenyls (PCT)
34. Zinc
35. Nickel

36. Copper
37. Hexavalent Chromium
38. Chromium (Total)
39. Arsenic (Total)
40. Lead
41. Cadmium
42. Mercury
43. Manganese
44. Iron
45. Vanadium
46. Selenium
47. Boron

iv. Bioassay (Zebra Fish) Test: For specified samples only.

2.4 Methodology followed in Sampling and Analysis

Industries, places and locations that have been chosen for the sampling are representative of the city/area. Sampling has been done at the potential polluted areas so as to arrive at the CEPI. This will further help the authorities to monitor the areas in order to improve the current status of their environmental components such as air and water quality data, ecological damage and visual environmental conditions. Methodology for sampling, preservation and analysis have been done according to the references incorporated. Methodology of various types of parameters is presented under following annexure:

1. Stack Emission Sampling and Analysis Methodology – **Annexure II**
2. Ambient Air Sampling and Analysis Methodology **- Annexure III**
3. Water/Wastewater Sampling and Analysis Methodology - **Annexure IV**

3. Result of Analysis:

Results of Analysis are tabulated below for Stack Emission Monitoring, Ambient Air Quality Monitoring, Waste Water Analysis and Water Analysis. These are followed by their respective graphical representation.

***Kindly note:**

- NA specifies the sample is not analysed for the specific parameter.
- BDL specifies that the result obtained is below deductable limit.
- ND specifies the sample is not detectable for the specific parameter.

Please Note: Industrial clusters observed with below detection limit parameters are NOT included into the graphs

3.1 Stack Emission:

Stack Emission Monitoring Results are compared against The Environment (Protection) Rules, 1986 General Emission Standard - Part D.

Sr.	Name of Industries	Stack Identity	MIDC	Table No.
1.	Gopani Iron & Power (India) Pvt. Ltd.	Unit -1, 300MW Power Plant	Tadali	**I**
2.	Gopani Iron & Power (India) Pvt. Ltd.	Unit -2, 300MW Power Plant	Tadali	**I**
3.	Gopani Iron & Power (India) Pvt. Ltd.	15 MW Power Plant (Boiler)	Tadali	**I**
4.	Gopani Iron & Power (India) Pvt. Ltd.	SMS (Furnace) 3 & 4	Tadali	**II**
5.	Grace Industries Ltd.	WHRBs Kiln 1 & 2	Tadali	**II**
6.	Dhariwal Infrastructure Ltd.	WHRBs Kiln 3 & 4	Tadali	**II**
7.	Multi Organics Ltd.	Boiler B-2604	Chandrapur	**III**
8.	Multi Organics Ltd.	Boiler B-2606	Chandrapur	**III**
9.	Maharashtra Carbon Pvt. Ltd.	Boiler (Furnace)	Chandrapur	**III**
10.	Earth Greentech P.Ltd	Boiler-Reactor	Chandrapur	**IV**
11.	Superb Hygienic Ltd.	Boiler Incinerator	Chandrapur	**IV**
12.	Sourav Oil & Mill	Boiler Furnace	Chandrapur	**IV**
13.	Lloyds Metal& Energy Ltd.	100 TPD Kiln-1 & 2	Ghugus	**V**
14.	Lloyds Metal& Energy Ltd.	100 TPD Kiln-3 & 2	Ghugus	**V**

Sr.	Name of Industries	Stack Identity	MIDC	Table No.
15.	Lloyds Metal& Energy Ltd.	WHRBS 30MW Power Plant	Ghugus	**V**
16.	ACC Cement Ltd.	Boiler Stack 15MW	Ghugus	**VI**
17.	ACC Cement Ltd.	Coal Mill	Ghugus	**VI**
18.	ACC Cement Ltd.	Kiln RABH	Ghugus	**VI**
19.	Bamni Proteins	Boiler Stack-Dust Collector	Ballarpur	**VII**
20.	Bamni Proteins	Calcium Chloride Stack-Dust Collector	Ballarpur	**VII**
21.	BILT Graphic PPL	Coal Fired Boiler No. 9	Ballarpur	**VII**
22.	BILT Graphic PPL	Coal Fired Boiler No. 8	Ballarpur	**VIII**
23.	Multiorganics Ltd	Process Stack of Belto Napthol-Fusion Point	Chandrapur	**IX**

***The VOC result of stack emission is provided in Table No. IX & X**

Table No. I

Name of Industries			**Gopani Iron & Power (India) Pvt. Ltd.**	**Gopani Iron & Power (India) Pvt. Ltd.**	**Gopani Iron & Power (India) Pvt. Ltd.**
Date of Sampling			**04.06.2018**	**04.06.2018**	**04.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	24	31	48
	Std. Limit	**mg/Nm^3**	**100**	**100**	**100**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	546	935	147
		kg/day	15397	26234	463
	Std. Limit	**mg/Nm^3**	**200**	**200**	**200**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	145	193	52.9
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
4.	Carbon Monoxide (CO)	mg/Nm^3	2.99	3.2	12.7

Table No. II

Name of Industries			**Gopani Iron & Power (India) Pvt. Ltd.**	**Grace Industries Ltd.**	**Dhariwal Infrastructure Ltd.**
Date of Sampling			**04.06.2018**	**05.06.2018**	**05.06.2018**
1.	Particulate Matter(as PM)	mg/Nm^3	36	48	48
	Std. Limit	**mg/Nm^3**	**100**	**100**	**50**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	BDL	288	202
		kg/day	BDL	476	2246
	Std. Limit	**mg/Nm^3**	**200**	**200**	**200**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	BDL	136	175
	Std. Limit	**mg/Nm^3**	**150**	**150**	**300**
4.	Carbon Monoxide (CO)	mg/Nm^3	951	24.9	15.8

Table No. III

Name of Industries			**Multi Organics Ltd.**	**Multi Organics Ltd.**	**Maharashtra Carbon Pvt. Ltd.**
Date of Sampling			**04.06.2018**	**04.06.2018**	**04.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	40	38	43
	Std. Limit	**mg/Nm^3**	**100**	**100**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	676	397	232
		kg/day	138.7	293	9
	Std. Limit	**mg/Nm^3**	**200**	**200**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	93.7	79.6	114
	Std. Limit	**mg/Nm^3**	**150**	**150**	**50**
4.	Carbon Monoxide (CO)	mg/Nm^3	13.7	21.8	50.1

Table No. IV

Name of Industries			**Earth Greentech P. Ltd.**	**Superb Hygienic Ltd.**	**Sourav Oil & Mill**
Date of Sampling			**04.06.2018**	**05.06.2018**	**05.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	52	61	38
	Std. Limit	**mg/Nm^3**		**150**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	47	64	149
		kg/day	1.4	4.4	2.2
	Std. Limit	**mg/Nm^3**		**100**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	13.4	44.1	54.2
	Std. Limit	**mg/Nm^3**		**50**	**50**
4.	Carbon Monoxide (CO)	mg/Nm^3	32.2	1.28	94

Table No. V

Name of Industries			**Lloyds Metal**	**Lloyds Metal**	**Lloyds Metal**
Date of Sampling			**07.06.2018**	**07.06.2018**	**07.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	25	27	23
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	329	343	446
		kg/day	575	612	3368
	Std. Limit	**mg/Nm^3**	**200**	**200**	**200**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	108	94.7	132
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
4.	Carbon Monoxide (CO)	mg/Nm^3	118	97	14.1

Table No. VI

Name of Industries			**ACC Cement Ltd.**	**ACC Cement Ltd.**	**ACC Cement Ltd.**
Date of Sampling			**07.06.2018**	**08.06.2018**	**08.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	56	35	51
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	611	BDL	618
		kg/day	1477	BDL	9733
	Std. Limit	**mg/Nm^3**	**200**	**200**	**200**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	110	BDL	126
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
4.	Carbon Monoxide (CO)	mg/Nm^3	13.1	5.03	4.8

Table No. VII

Name of Industries			**Bamni Proteins**	**Bamni Proteins**	**BILT Graphic PPL**
Date of Sampling			**07.06.2018**	**07.06.2018**	**07.06.2018**
1.	Particulate Matter (as PM)	mg/Nm^3	34	29	57.0
	Std. Limit	**mg/Nm^3**	**100**	**100**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	50	17	1232
		kg/day	9.1	1.8	3196
	Std. Limit	**mg/Nm^3**	**200**	**200**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	45	44	144
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**
4.	Carbon Monoxide (CO)	mg/Nm^3	16.5	13.6	17.9

Table No. VIII

Name of Industries			**BILT Graphic PPL**
Date of Sampling			**08.06.2018**
1.	Particulate Matter(as PM)	mg/Nm^3	42
	Std. Limit	**mg/Nm^3**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	819
		kg/day	1841
	Std. Limit	**mg/Nm^3**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	128
	Std. Limit	**mg/Nm^3**	**50**
4.	Carbon Monoxide (CO)	mg/Nm^3	12.5

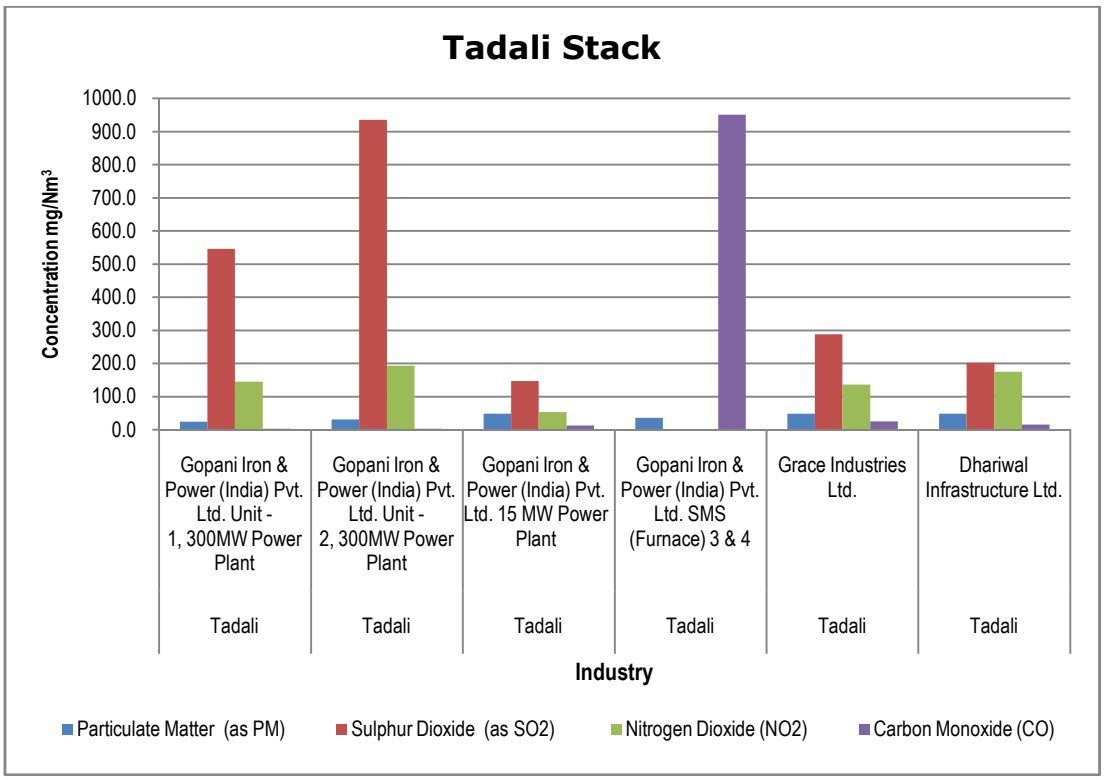
Table No. IX

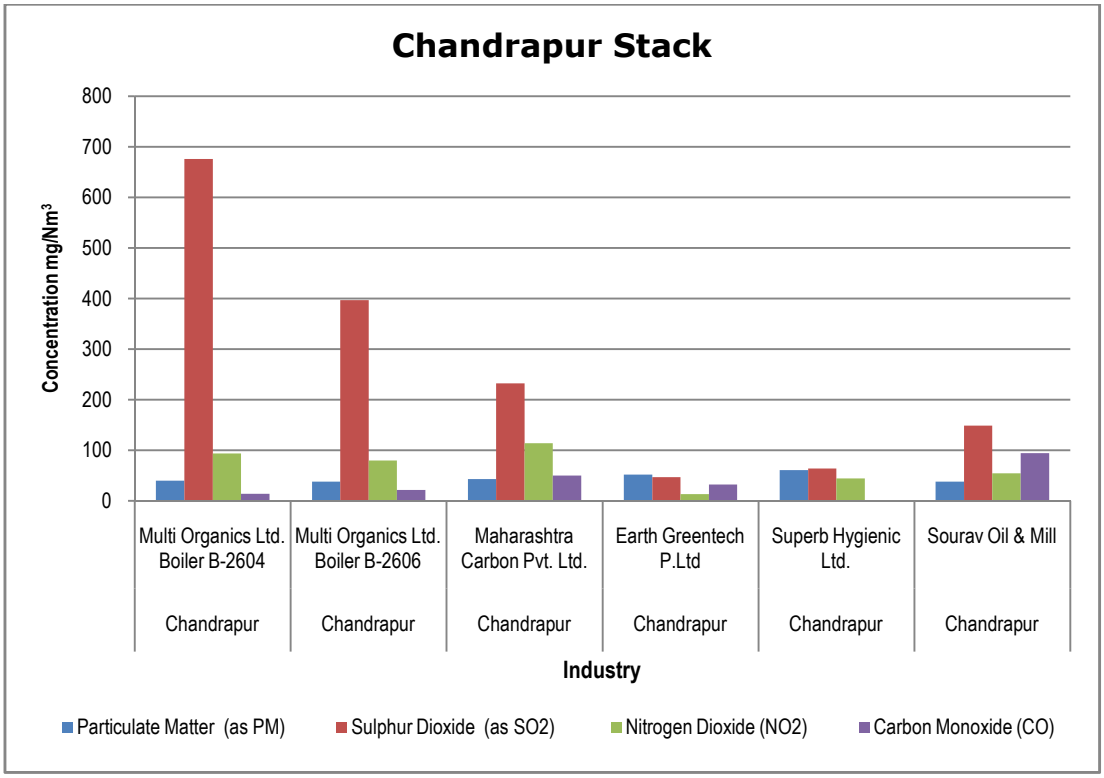
Name of Industries			**Gopani Iron & Power (India) Pvt. Ltd.**	**Grace Industries Ltd.**	**Superb Hygienic Ltd.**	**Multi Organics Ltd.**
Date of Sampling			**04.06.2018**	**05.06.2018**	**05.06.2018**	**04.06.2018**
Sr.	**Parameter**	**Unit**	**Results**			
1.	VOC					
I.	Methyl Isobutyl Ketone	mg/Nm^3	ND	ND	ND	ND
II.	Benzene	mg/Nm^3	0.001	0.002	0.005	0.001
III.	Toulene	mg/Nm^3	ND	ND	ND	ND
IV.	Xylene	mg/Nm^3	ND	ND	ND	ND
V.	Ethyl Benzene	mg/Nm^3	ND	ND	ND	ND
VI.	Ethyl Acetate	mg/Nm^3	ND	ND	ND	ND

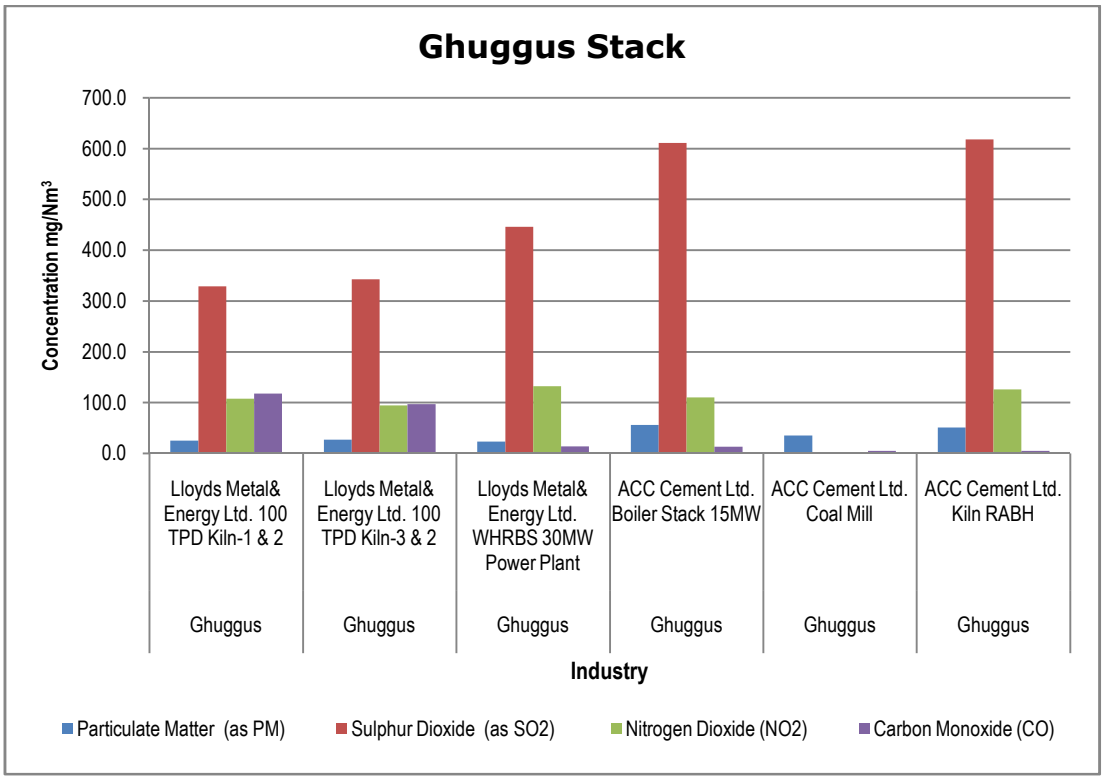
Table No. X

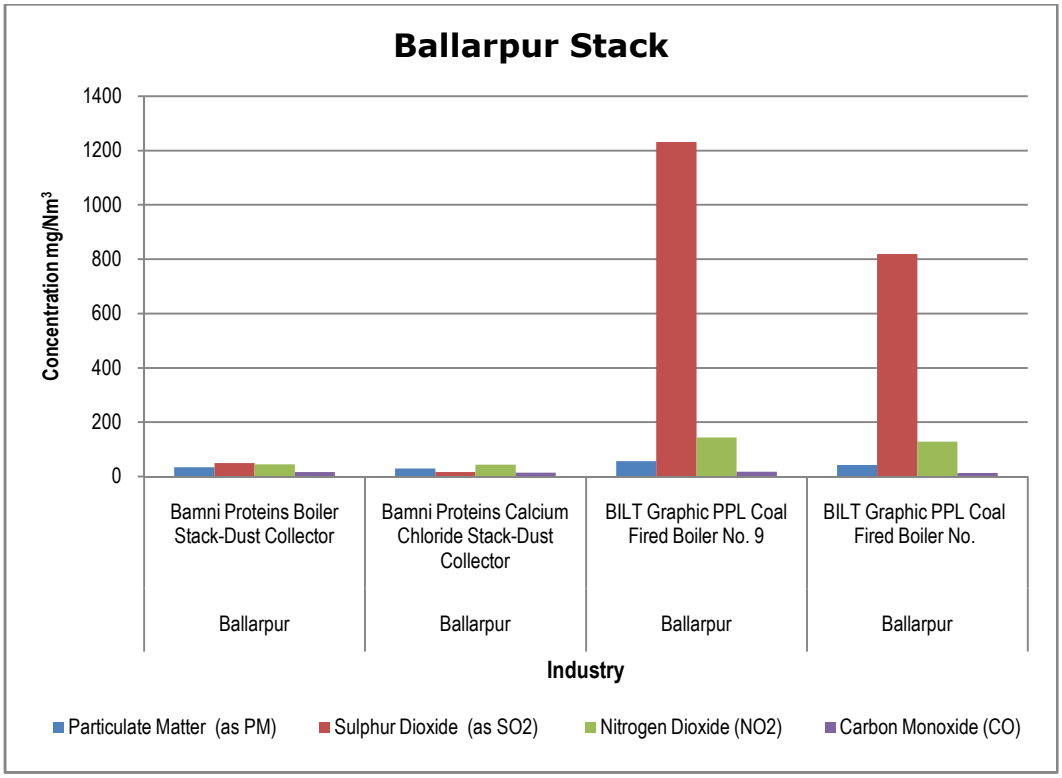
Name of Industries			**Lloyds Metal**	**ACC Cement Ltd.**	**Bamni Proteins**	**BILT Graphic PPL**
Date of Sampling			**07.06.2018**	**08.06.2018**	**07.06.2018**	**08.06.2018**
Sr.	**Parameter**	**Unit**	**Results**			
1.	VOC					
I.	Methyl Isobutyl Ketone	mg/Nm^3	ND	ND	ND	ND
II.	Benzene	mg/Nm^3	0.33	0.005	0.008	0.007
III.	Toulene	mg/Nm^3	ND	ND	ND	ND
IV.	Xylene	mg/Nm^3	ND	ND	ND	ND
V.	Ethyl Benzene	mg/Nm^3	ND	ND	ND	ND
VI.	Ethyl Acetate	mg/Nm^3	ND	ND	ND	ND

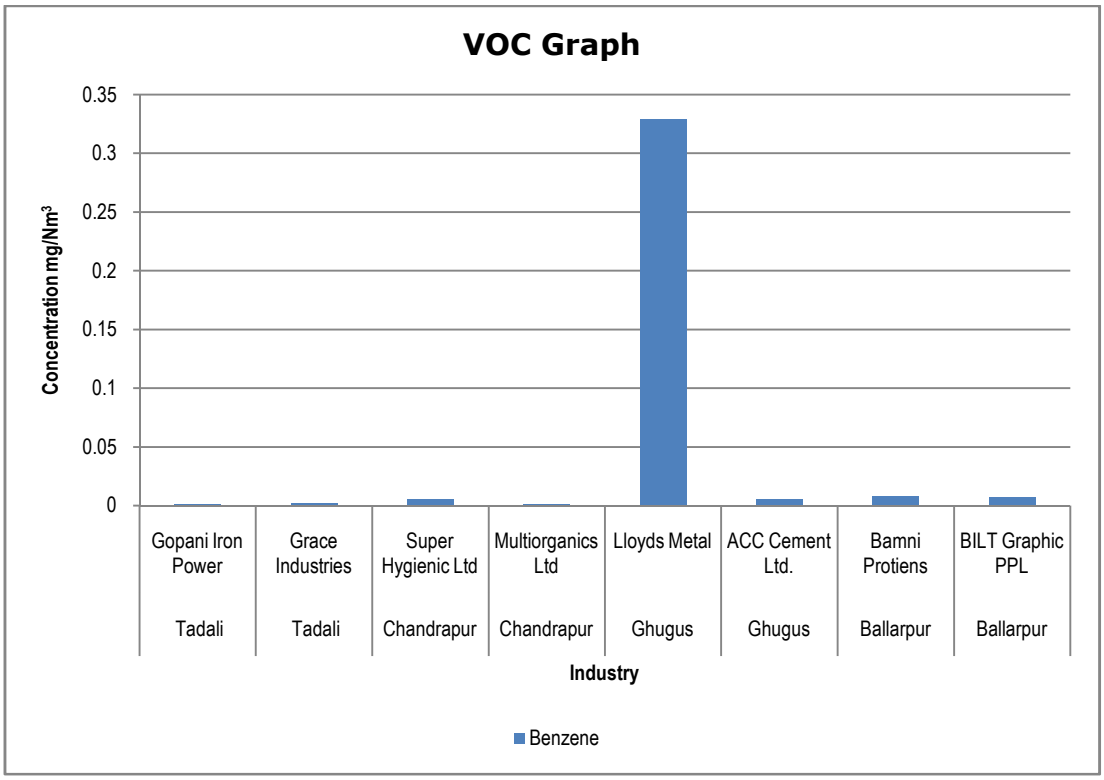
Graphs: Stack Monitoring for Chandrapur region:




Chandrapur Stack
800
700
600
500
400
300
200
100
0
Concentration mg/Nm³
Multi Organics Ltd. Boiler B-2604
Multi Organics Ltd. Boiler B-2606
Maharashtra Carbon Pvt. Ltd.
Earth Greentech P.Ltd
Superb Hygienic Ltd.
Sourav Oil & Mill
Chandrapur
Industry
Particulate Matter (as PM)
Sulphur Dioxide (as SO2)
Nitrogen Dioxide (NO2)
Carbon Monoxide (CO)


Ghuggus Stack
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
Concentration mg/Nm³
Lloyds Metal& Energy Ltd. 100 TPD Kiln-1 & 2
Lloyds Metal& Energy Ltd. 100 TPD Kiln-3 & 2
Lloyds Metal& Energy Ltd. WHRBS 30MW Power Plant
ACC Cement Ltd. Boiler Stack 15MW
ACC Cement Ltd. Coal Mill
ACC Cement Ltd. Kiln RABH
Ghuggus
Industry
Particulate Matter (as PM)
Sulphur Dioxide (as SO2)
Nitrogen Dioxide (NO2)
Carbon Monoxide (CO)


Ballarpur Stack
1400
1200
1000
800
600
400
200
0
Concentration mg/Nm³
Bamni Proteins Boiler Stack-Dust Collector
Bamni Proteins Calcium Chloride Stack-Dust Collector
BILT Graphic PPL Coal Fired Boiler No. 9
BILT Graphic PPL Coal Fired Boiler No.
Ballarpur
Ballarpur
Ballarpur
Ballarpur
Industry
Particulate Matter (as PM)
Sulphur Dioxide (as SO2)
Nitrogen Dioxide (NO2)
Carbon Monoxide (CO)


VOC Graph
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Concentration mg/Nm³
Gopani Iron Power
Grace Industries
Super Hygienic Ltd
Multiorganics Ltd
Lloyds Metal
ACC Cement Ltd.
Bamni Protiens
BILT Graphic PPL
Tadali
Tadali
Chandrapur
Chandrapur
Ghugus
Ghugus
Ballarpur
Ballarpur
Industry
Benzene

3.2 Ambient Air Quality:

In order to arrive at conclusions, the Ambient Air Quality Monitoring Results are compared against National Ambient Air Quality Standards, 2009 (**Annexure V**).

Sr.	Location	Location detail	MIDC	Table No.
1.	Dhariwal Infrastructure Ltd.	Main Gate	Tadali	**I**
2.	MIDC Water Treatment Plant	Near WTP	Tadali	**I**
3.	Grace Industries Ltd.	Terrace	Tadali	**I**
4.	Green Tech	Main Gate	Chandrapur	**II**
5.	MIDC Office	Terrace	Chandrapur	**II**
6.	HPCL	Main Gate	Chandrapur	**II**
7.	Lloyds Colony	Mathardevi Village	Ghugus	**III**
8.	Transit Hostel Rajiv Colony WCL	Terrace	Ghugus	**III**
9.	Lloyds Metal	New CAAQMS Station	Ghugus	**III**
10.	Ram Mandir	Near Mangal Karyalaya	Ballarpur	**IV**
11.	BILT Colony	Near Guest House	Ballarpur	**IV**
12.	WCL	OCM Office	Ballarpur	**IV**

Table No. I

Location				**Dhariwal Infrastructure Ltd.**	**MIDC Water Treatment Plant**	**Grace Industries Ltd.**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	12.1	12	8
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	15.3	17.7	13.5

Location				**Dhariwal Infrastructure Ltd.**	**MIDC Water Treatment Plant**	**Grace Industries Ltd.**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
3.	Particulate Matter(size less than 10 µm) or PM_{10}	µg/m^3	**100**	71	56	68
4.	Particulate Matter(size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	26	25	23
5.	Ozone (O_3)	µg/m^3	**180**	BDL	BDL	7.6
6.	Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	1.3	1.14	1.21
8.	Ammonia (NH_3)	µg/m^3	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	µg/m^3	**5**	4.29	3.9	4.66
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL	ND
11.	Arsenic (As)	ng/m^3	**6**	1.1	1.8	0.9
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	BDL

Table No. II

Location				**Green Tech**	**MIDC Office**	**HPCL**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	10.5	12	9
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	15.3	18.2	13.7
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	62	69	51
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	20	30	21
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL	39.5
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	1.1	1.52	1.24
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	8.6	4.1	2.8
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	ND	ND	ND
11.	Arsenic (As)	ng/m^3	**6**	1	2.6	2.4
12.	Nickel (Ni)	ng/m^3	**20**	3.3	3.3	3.3

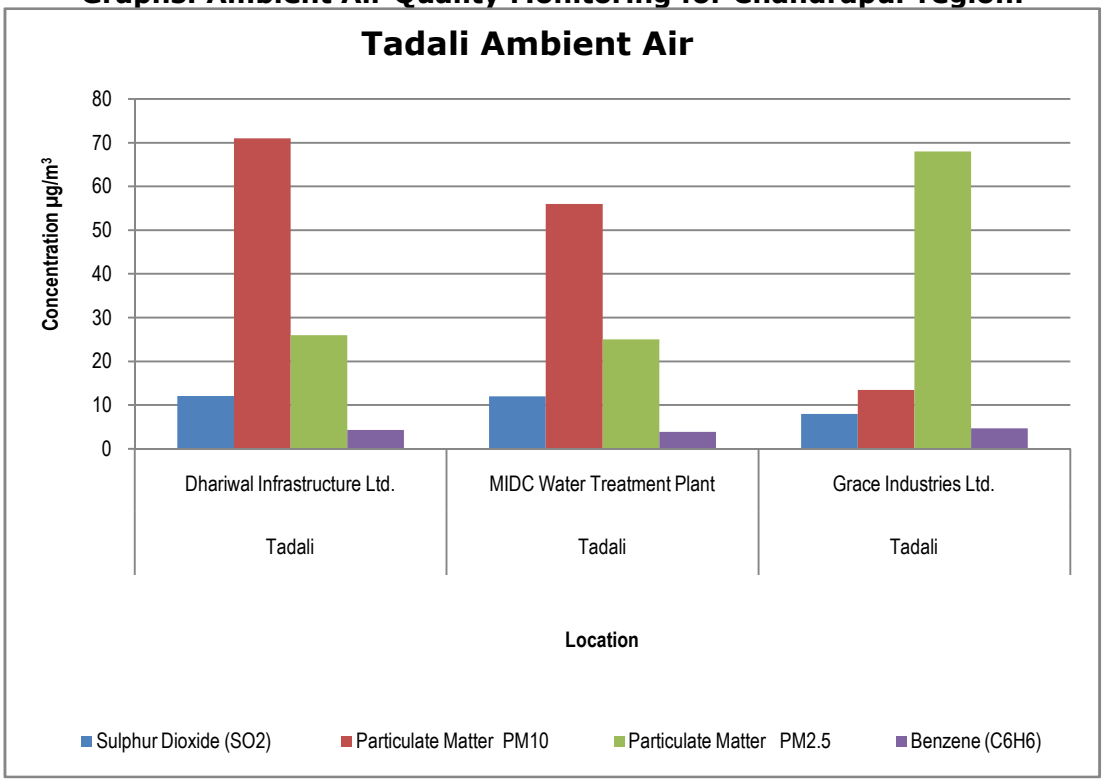
Table No. III

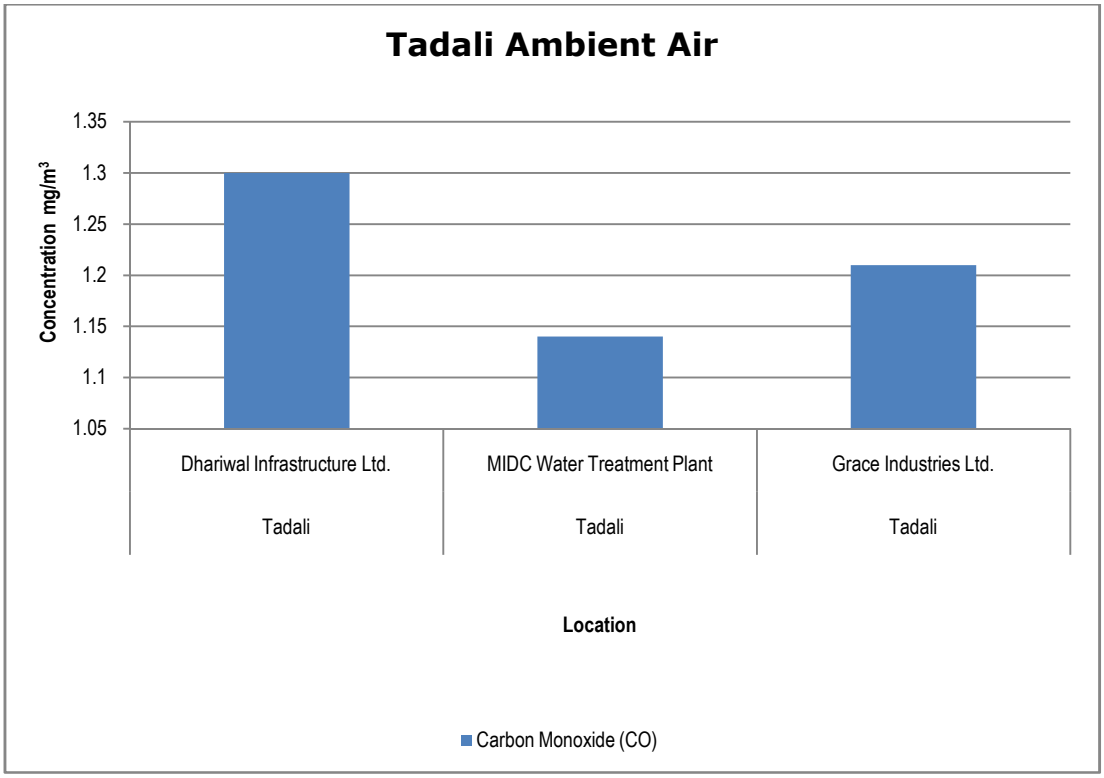
Location				**Lloyds Colony**	**Transit Hostel Rajiv Colony WCL**	**Lloyds Metal**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	8.6	12.3	16.4
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	15.3	13.2	15.8
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	71	58	59
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	30	22	26
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	7.3	BDL
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	1.02	1.01	1.05
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	2.13	5.79	2.02
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	ND	ND	ND
11.	Arsenic (As)	ng/m^3	**6**	0.7	0.6	1.2
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	4.6

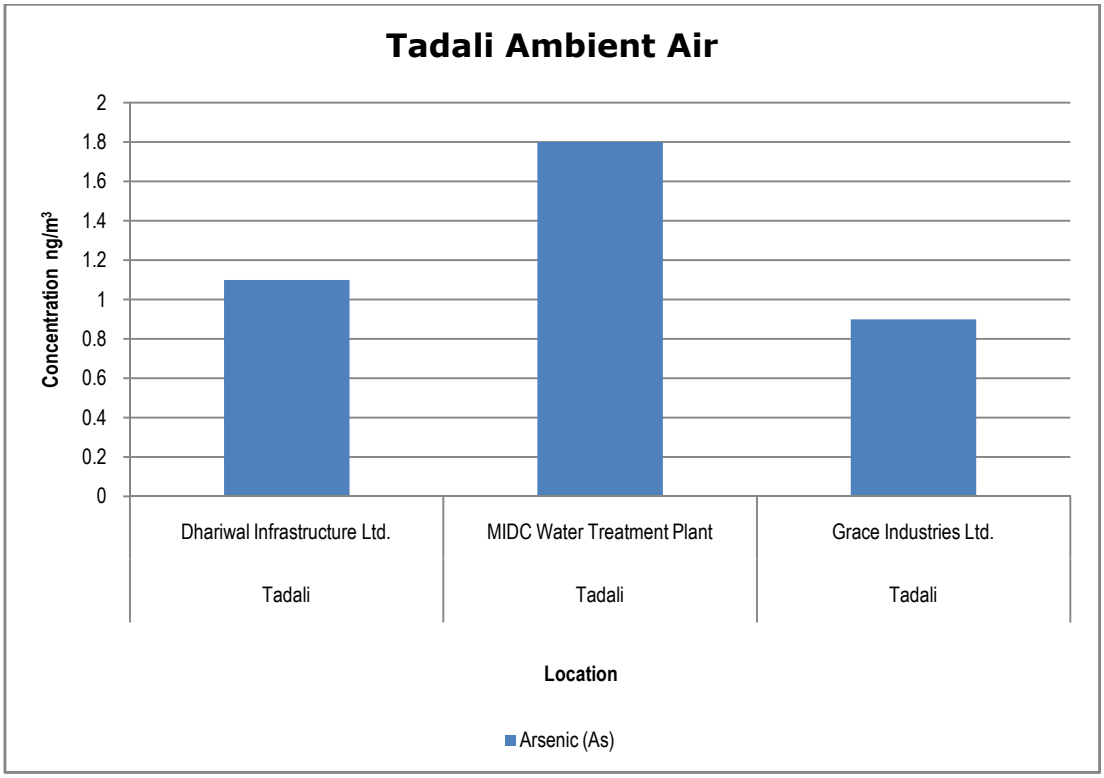
Table No. IV

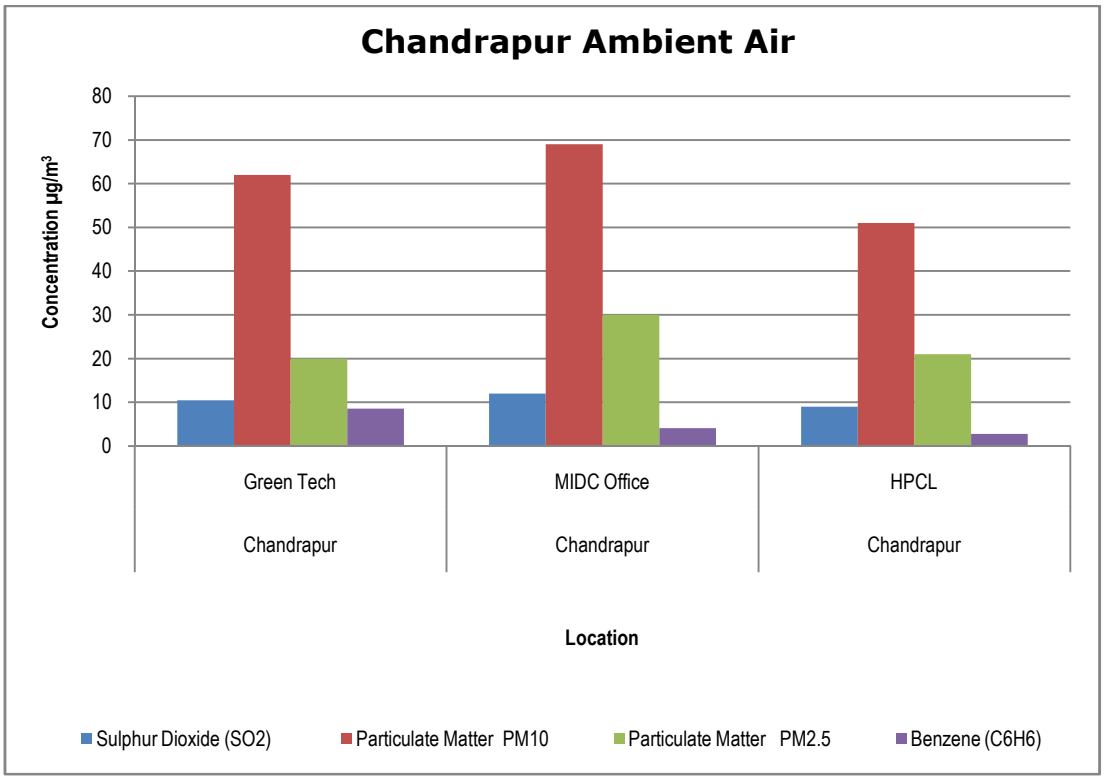
Location				**Ram Mandir**	**BILT Colony**	**WCL**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	13.6	8.3	13.5
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	16.3	11.1	15.4
3.	Particulate Matter(size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	52	45	56
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	21	18	28
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL	5.6
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	1.27	1.10	1.06
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	3.6	2.4	3.8
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	ND	ND	ND
11.	Arsenic (As)	ng/m^3	**6**	1.1	BDL	1.2
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	4.2

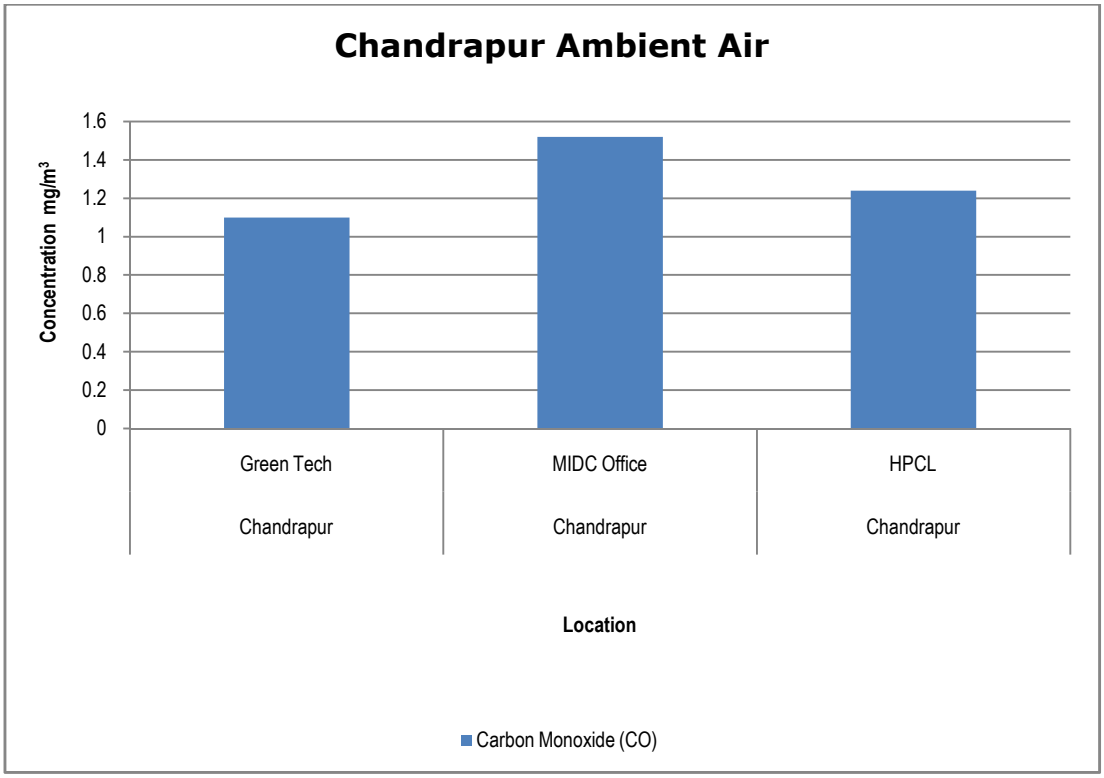
Graphs: Ambient Air Quality Monitoring for Chandrapur region:

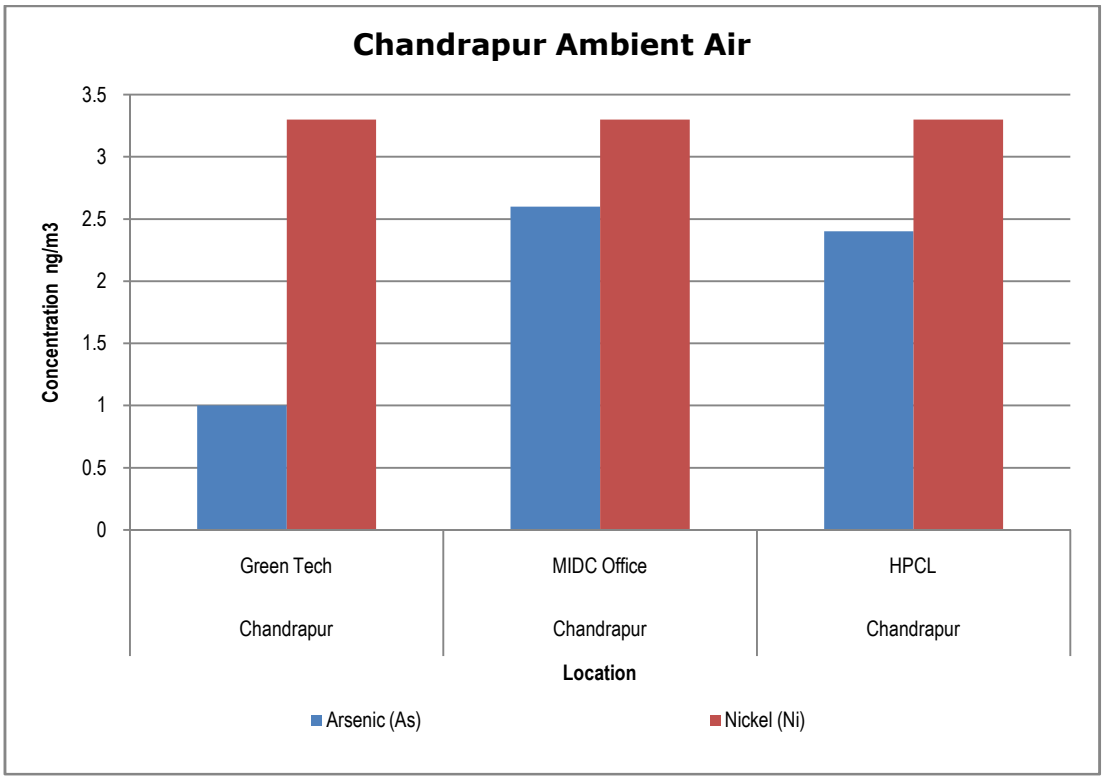


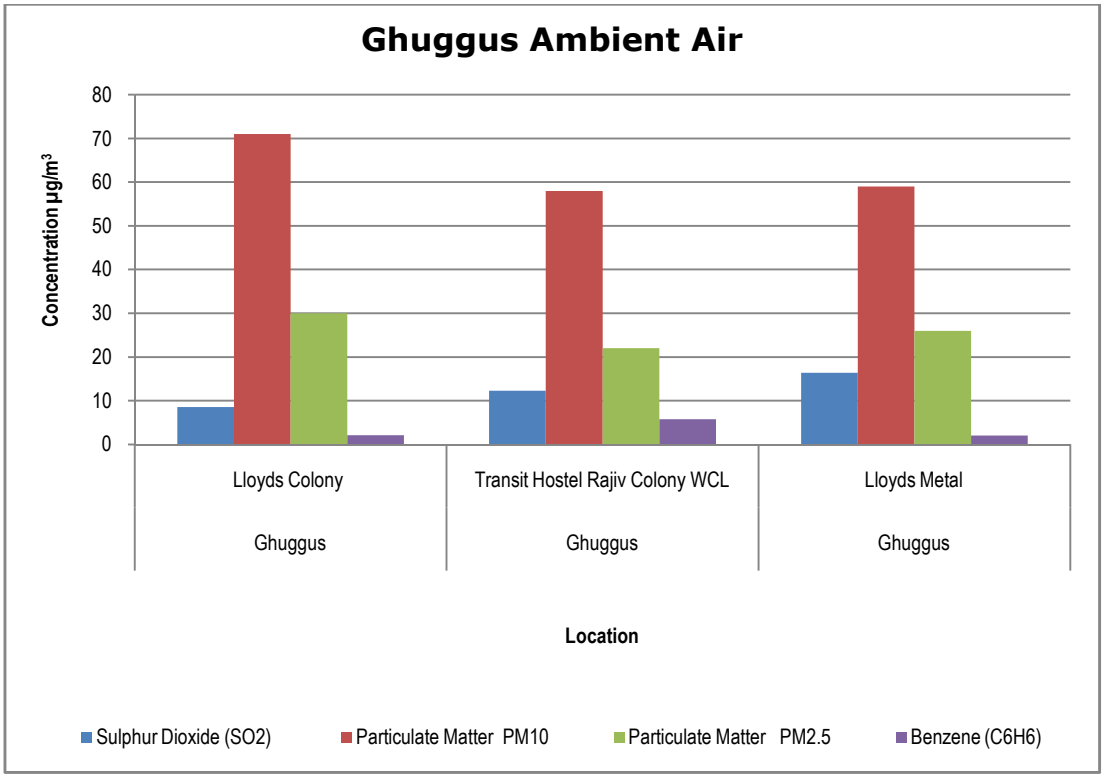


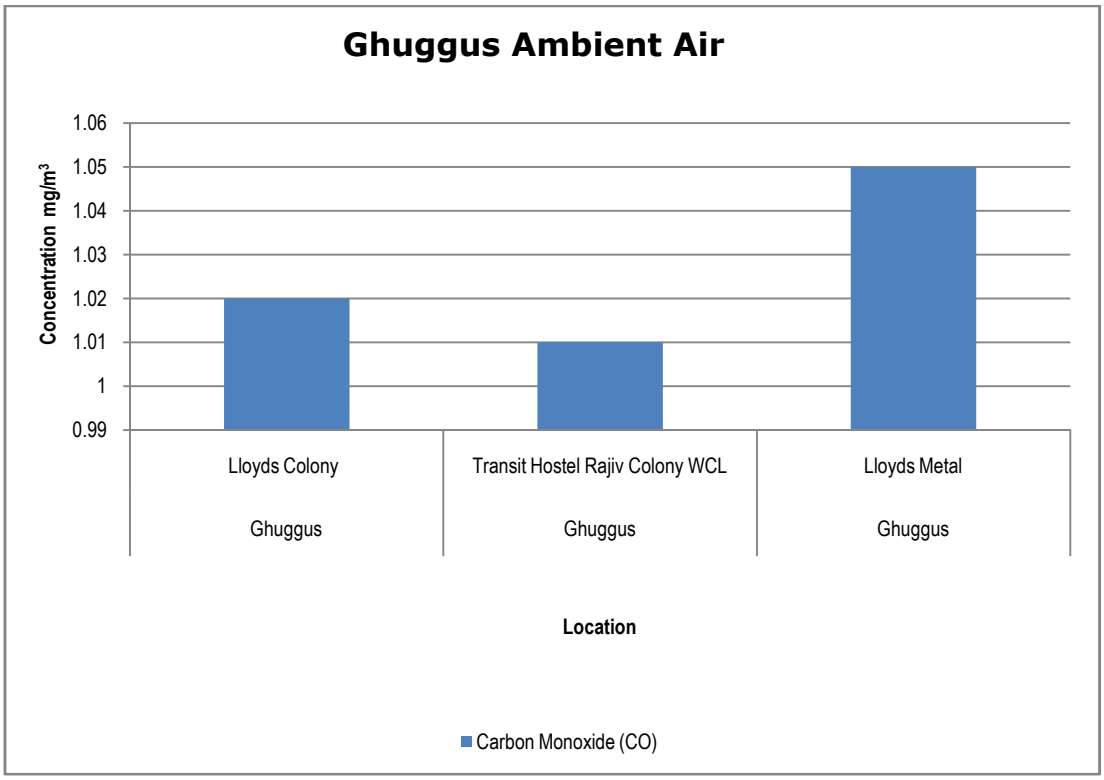

Tadali Ambient Air
Concentration ng/m³
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Dhariwal Infrastructure Ltd.
Tadali
MIDC Water Treatment Plant
Tadali
Grace Industries Ltd.
Tadali
Location
Arsenic (As)

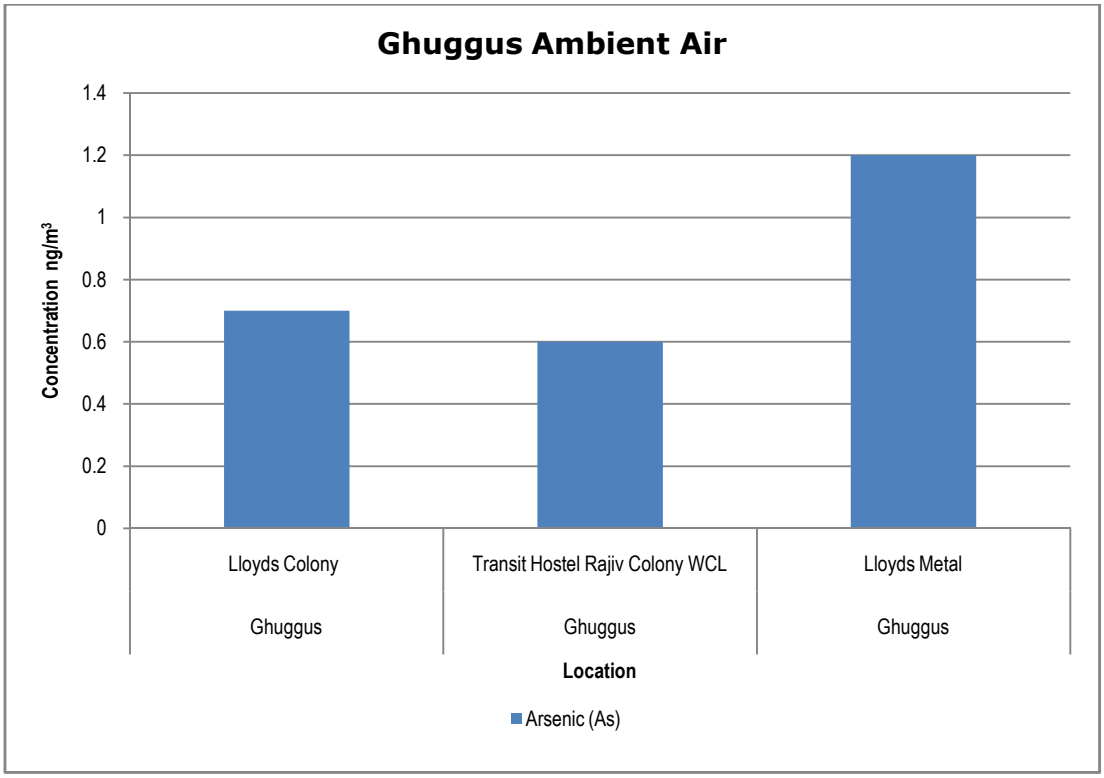

Chandrapur Ambient Air
Concentration µg/m³
80
70
60
50
40
30
20
10
0
Green Tech
Chandrapur
MIDC Office
Chandrapur
HPCL
Chandrapur
Location
Sulphur Dioxide (SO2)
Particulate Matter PM10
Particulate Matter PM2.5
Benzene (C6H6)

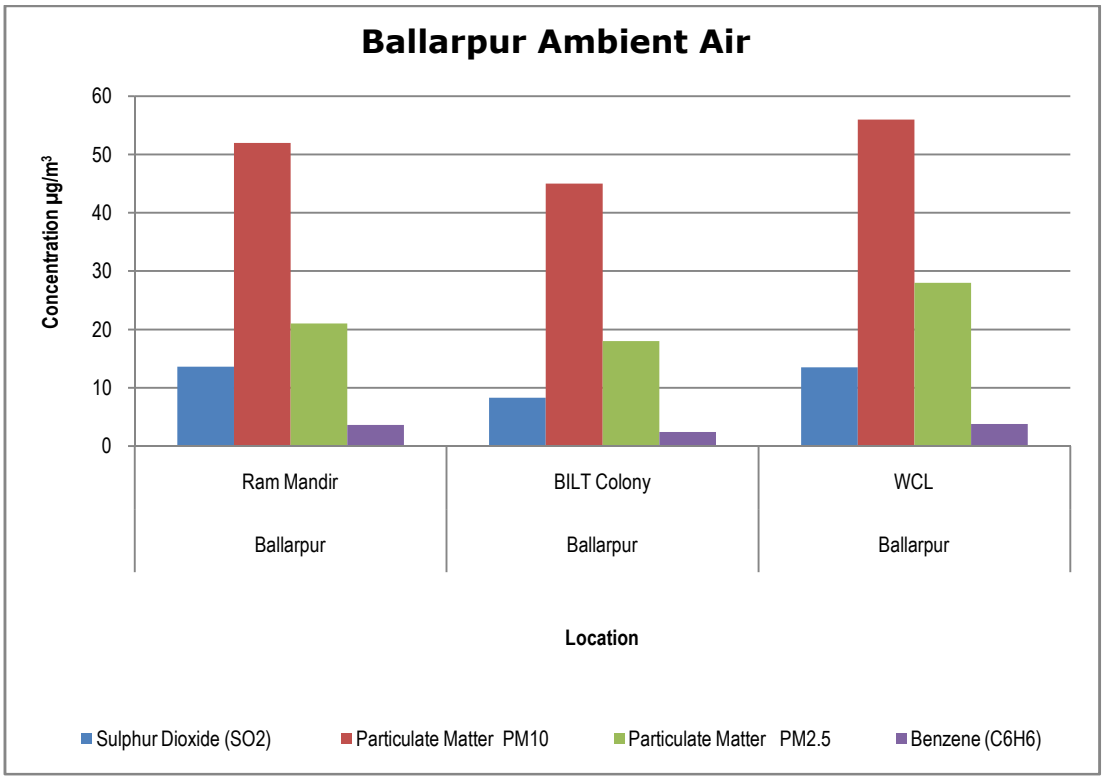

Chandrapur Ambient Air
Concentration mg/m3
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Green Tech Chandrapur
MIDC Office Chandrapur
HPCL Chandrapur
Location
Carbon Monoxide (CO)

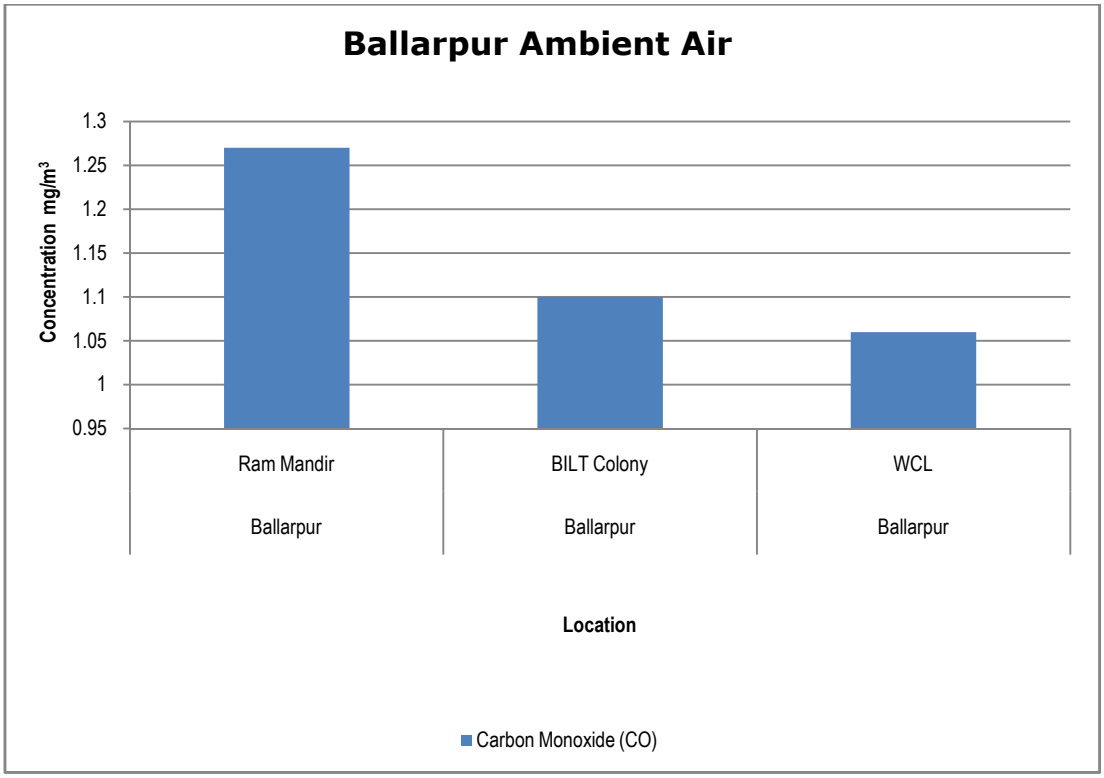

Chandrapur Ambient Air
Concentration ng/m3
3.5
3
2.5
2
1.5
1
0.5
0
Green Tech Chandrapur
MIDC Office Chandrapur
HPCL Chandrapur
Location
Arsenic (As)
Nickel (Ni)

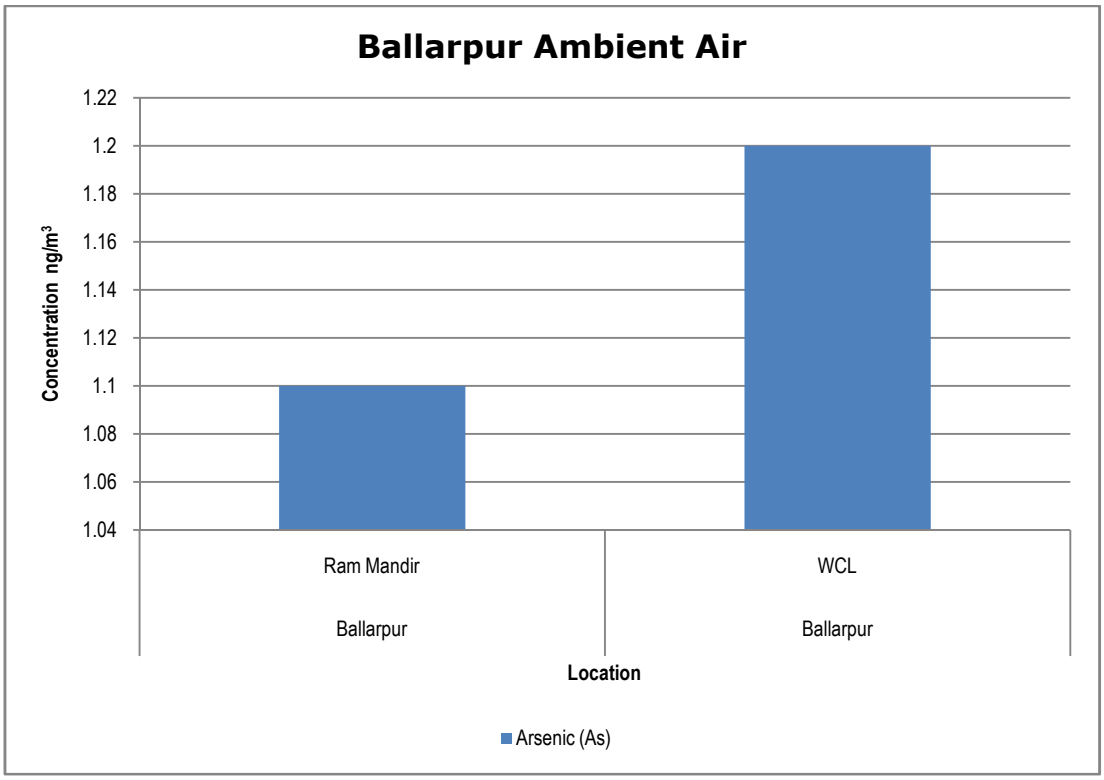

Ghuggus Ambient Air
Concentration µg/m³
80
70
60
50
40
30
20
10
0
Lloyds Colony
Ghuggus
Transit Hostel Rajiv Colony WCL
Ghuggus
Lloyds Metal
Ghuggus
Location
Sulphur Dioxide (SO2)
Particulate Matter PM10
Particulate Matter PM2.5
Benzene (C6H6)


Ghuggus Ambient Air
Concentration mg/m³
1.06
1.05
1.04
1.03
1.02
1.01
1
0.99
Lloyds Colony
Ghuggus
Transit Hostel Rajiv Colony WCL
Ghuggus
Lloyds Metal
Ghuggus
Location
Carbon Monoxide (CO)


Ghuggus Ambient Air
Concentration ng/m³
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Lloyds Colony
Ghuggus
Transit Hostel Rajiv Colony WCL
Ghuggus
Lloyds Metal
Ghuggus
Location
Arsenic (As)


Ballarpur Ambient Air
Concentration µg/m³
60
50
40
30
20
10
0
Ram Mandir
Ballarpur
BILT Colony
Ballarpur
WCL
Ballarpur
Location
Sulphur Dioxide (SO2)
Particulate Matter PM10
Particulate Matter PM2.5
Benzene (C6H6)





3.3 Surface Water/ Waste Water Quality:

Water Analysis Results are compared against CPCB document on criteria for Comprehensive Environmental Assessment of Industrial Clusters-Water Quality Parameters Requirement and Classification (Annexure IX), CPCB Water Quality Criteria (Annexure VIII) and Drinking Water Specification, IS 10500:2012 (Annexure VII),

Wastewater Analysis Results are compared with General Standards for Discharge of Environmental Pollutants Part A: Effluents, The Environment (Protection) Rules, 1986, Schedule VI.

Sr.	Location	Source	MIDC	Table No.
1.	GIPL	Nallah	Tadali	**I**
2.	Tadali Village	Lake	Tadali	**I**
3.	Gopani Iron & Power (I) Pvt. Ltd., Colony	Tap water	Tadali	**I**
4.	Nallah Adjacent to Grace Industries	Nallah	Tadali	**II**
5.	MIDC WTP (Tank)	Raw Water	Tadali	**II**
6.	Nallah Opposite Manidhari Industries, Plot No. c-2	Nallah	Chandrapur	**II**
7.	Gagangiri Village Bridge	Surface water	Chandrapur	**III**
8.	Dhanora Bridge	Surface water	Chandrapur	**III**
9.	Multi Organic Ltd.	ETP outlet	Chandrapur	**III**
10.	Super Hygienic (Bio Medical waste disposal unit)	ETP outlet	Chandrapur	**IV**
11.	HPCL	ETP outlet	Chandrapur	**IV**
12.	Wardha river near WTP of WCL Ghugus opencast mine	Surface water	Ghugus	**IV**
13.	Lokhandi Bridge at WTP of Ghugus opencast mine	Nallah	Ghugus	**V**
14.	Wardha River Behind ACC Plant (Mungoli Coal Mine Road)	Surface water	Ghugus	**V**
15.	Nallah at Usgaon, Shengaon Road (Behind Gupta Energy Power Ltd)	Nallah	Ghugus	**V**
16.	Nallah water domestic effluent of ACC LTD., Colony& Ghugus village	Nallah	Ghugus	**VI**
17.	BILT RCC Pipe Outlet Ballarpur Bamni Rd	ETP outlet	Ballarpur	**VI**
18.	Bhagirathi Nallah Bridge, Gondpipri Road	Nallah	Ballarpur	**VI**

Sr.	Location	Source	MIDC	Table No.
19.	Wardha River	Surface water	Ballarpur	**VII**
20.	Nallah Near MSW Municipal Corporation	Nallah	Ballarpur	**VII**
21.	Ballarpur Open Cast Mine Discharge	ETP outlet	Ballarpur	**VII**
22.	Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump	Nallah	Ballarpur	**VIII**

Table No. I

Location				**GIPL Nallah**	**Tadali Village Lake**	**Gopani Iron & Power (I) Pvt. Ltd., Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		4	3	BDL
2.	Smell	-		Disagreeable	Disagreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	7.7	7.6	7.9
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	18	88	BDL
6.	Dissolved Oxygen (% Saturation)	%		57	71.4	85
7.	Chemical Oxygen Demand	mg/L	**250.0**	52	40	8
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	14	10	2.0

Location				**GIPL Nallah**	**Tadali Village Lake**	**Gopani Iron & Power (I) Pvt. Ltd., Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
9.	Electrical Conductivity (at 25° C)	µmho/cm		4259	592	659
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.023	0.017	BDL
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.396	0.307	BDL
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.419	0.324	BDL
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	0.31	0.31	BDL
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.395	0.623	0.160
17.	Sulphide (as S^{2-})	mg/L	**2.0**	ND	BDL	ND
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.067	0.103	BDL
19.	Sodium Absorption Ratio	mg/L		4.10	1.800	1.55
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	350	920	BDL
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	240	540	BDL

Location				**GIPL Nallah**	**Tadali Village Lake**	**Gopani Iron & Power (I) Pvt. Ltd., Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.121	0.674	BDL
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	1.12	0.784	0.112
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	0.801	0.472	BDL
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	ND	ND	ND
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	0.20	BDL	ND
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL

Location				**GIPL Nallah**	**Tadali Village Lake**	**Gopani Iron & Power (I) Pvt. Ltd., Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	0.0006	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	BDL	0.024	BDL
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	BDL	ND	ND
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.113	0.109	0.099

Location				**GIPL Nallah**	**Tadali Village Lake**	**Gopani Iron & Power (I) Pvt. Ltd., Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
35.	Total Arsenic (as As)	mg/L	**0.2**	ND	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.1**	0.101	0.01	BDL
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.034	BDL	BDL
40.	Iron (as Fe)	mg/L	**3.0**	0.307	0.859	0.341
41.	Vanadium (as V)	mg/L	**0.2**	BDL	BDL	BDL
42.	Selenium (as Se)	mg/L	**0.05**	BDL	BDL	ND
43.	Boron (as B)	mg/L		0.162	BDL	0.156
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	100%

Table No. II

Location				**Nallah Adjacent to Grace Motor**	**Raw Water of MIDC WTP (Tank)**	**Nallha Opposite Manidhari Industries, Plot No. c-2**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		BDL	BDL	50
2.	Smell	-		Disagreeable	Agreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	6.8	7.9	7.3
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	8	BDL	28
6.	Dissolved Oxygen (% Saturation)	%		81	88	0.0
7.	Chemical Oxygen Demand	mg/L	**250.0**	36	4	304
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	9.3	BDL	100
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		3241	598	9342
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.031	BDL	0.019
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.297	0.294	0.397
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.328	0.298	0.415

Location				**Nallah Adjacent to Grace Motor**	**Raw Water of MIDC WTP (Tank)**	**Nallha Opposite Manidhari Industries, Plot No. c-2**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	BDL	BDL	7.6
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.500	0.697	0.642
17.	Sulphide (as S^{2-})	mg/L	**2.0**	ND	BDL	0.385
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.106	0.096	1.29
19.	Sodium Absorption Ratio	mg/L		7.01	1.63	10.3
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	79	79	>1600
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	49	49	>1600
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.145	0.110	1.39
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	0.56	0.168	18.0
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	BDL	BDL	9.54

Location				**Nallah Adjacent to Grace Motor**	**Raw Water of MIDC WTP (Tank)**	**Nallha Opposite Manidhari Industries, Plot No. c-2**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	ND	ND	0.058
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	ND	1.72
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL

Location				**Nallah Adjacent to Grace Motor**	**Raw Water of MIDC WTP (Tank)**	**Nallha Opposite Manidhari Industries, Plot No. c-2**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	ND	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	BDL	BDL	0.023
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	ND	ND	ND
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.099	0.104	0.131
35.	Total Arsenic (as As)	mg/L	**0.2**	ND	BDL	ND
36.	Lead (as Pb)	mg/L	**0.1**	BDL	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND

Location				**Nallah Adjacent to Grace Motor**	**Raw Water of MIDC WTP (Tank)**	**Nallha Opposite Manidhari Industries, Plot No. c-2**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
39.	Manganese (as Mn)	mg/L	**2.0**	0.064	0.022	0.128
40.	Iron (as Fe)	mg/L	**3.0**	0.276	0.457	0.374
41.	Vanadium (as V)	mg/L	**0.2**	BDL	BDL	0.011
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	ND
43.	Boron (as B)	mg/L		BDL	BDL	0.143
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	0%

Table No. III

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		3	5	30
2.	Smell	-		Disagreeable	Agreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	8.3	7.8	7.4

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	9	25	10
6.	Dissolved Oxygen (% Saturation)	%		92.0	88.0	70
7.	Chemical Oxygen Demand	mg/L	**250.0**	28	40	64
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	8.4	11	18
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		699	1451	3724
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.172	BDL	0.018
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.560	0.557	4.17
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.732	0.543	4.19
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	0.07
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
16.	Fluoride (as F)	mg/L	**2.0**	0.716	0.611	1.26
17.	Sulphide (as S^{2-})	mg/L	**2.0**	ND	ND	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.464	0.101	0.230
19.	Sodium Absorption Ratio	mg/L		2.89	5.39	2.69
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	11	1600	94
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	7.8	920	79
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.599	0.120	0.259
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	1.01	0.50	0.672
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	0.366	BDL	0.275
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	0.008	BDL	0.007
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	BDL	BDL

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	0.027	BDL	0.069
31.	Nickel (as Ni)	mg/L	**3.0**	0.024	0.024	0.019
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	ND	ND	BDL
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.104	0.065	0.09
35.	Total Arsenic (as As)	mg/L	**0.2**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.1**	0.096	0.04	0.078
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.305	0.05	0.023
40.	Iron (as Fe)	mg/L	**3.0**	0.278	BDL	0.187
41.	Vanadium (as V)	mg/L	**0.2**	0.015	0.015	0.02

Location				**Surface water from Gagangiri Village Bridge**	**Surface water from Dhanora Bridge**	**Multi Organic Ltd. ETP outlet**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	ND
43.	Boron (as B)	mg/L		0.194	BDL	0.242
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	100%

Table No. IV

Location				**Super Hygienic ETP outlet**	**HPCL ETP outlet**	**Wardha river near WTP of WCL Ghugus**
Date of Sampling				**04.06.2018**	**04.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		30	BDL	BDL
2.	Smell	-		Disagreeable	Agreeable	Agreeable
3.	pH	-	**5.5 -9.0**	6.2	7.9	8
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	61	BDL	13
6.	Dissolved Oxygen (% Saturation)	%		33	70.0	90

Location				**Super Hygienic ETP outlet**	**HPCL ETP outlet**	**Wardha river near WTP of WCL Ghugus**
Date of Sampling				**04.06.2018**	**04.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
7.	Chemical Oxygen Demand	mg/L	**250.0**	40	12	4
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	11	3.1	BDL
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		1610	1206	520
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.054	BDL	BDL
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	3.13	BDL	BDL
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	3.18	BDL	BDL
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	2.56	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.0**	0.06	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.956	0.79	0.438
17.	Sulphide (as S^{2-})	mg/L	**2.0**	BDL	ND	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.354	0.054	0.050

Location				**Super Hygienic ETP outlet**	**HPCL ETP outlet**	**Wardha river near WTP of WCL Ghugus**
Date of Sampling				**04.06.2018**	**04.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
19.	Sodium Absorption Ratio	mg/L		1.43	7.05	2.34
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	33	11	130
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	23	4.5	79
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.567	0.064	0.092
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	6.4	0.336	0.448
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	3.81	0.118	<0.1
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	0.037	ND	ND
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	3.18	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL

Location				**Super Hygienic ETP outlet**	**HPCL ETP outlet**	**Wardha river near WTP of WCL Ghugus**
Date of Sampling				**04.06.2018**	**04.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	0.0018	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	0.576	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	0.097	0.018	0.019

Location				**Super Hygienic ETP outlet**	**HPCL ETP outlet**	**Wardha river near WTP of WCL Ghugus**
Date of Sampling				**04.06.2018**	**04.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	BDL	ND	ND
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.106	0.104	0.041
35.	Total Arsenic (as As)	mg/L	**0.2**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.1**	0.091	0.098	0.029
37.	Cadmium (as Cd)	mg/L	**2.0**	0.004	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.324	0.052	0.023
40.	Iron (as Fe)	mg/L	**3.0**	4.6	0.268	BDL
41.	Vanadium (as V)	mg/L	**0.2**	BDL	BDL	0.012
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	ND
43.	Boron (as B)	mg/L		0.675	0.411	0.179
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	70%	100%	100%

Table No. V

Location				**Nallah near Lokhandi Bridge at WTP of Ghugus O/C Mine**	**Wardha River Behind ACC Plant (Mungoli Coal Mine Road)**	**Nallah at Usgaon, Shengaon Road**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		5	2	7
2.	Smell	-		Disagreeable	Agreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	7.8	7.9	7.4
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	18	11	20
6.	Dissolved Oxygen (% Saturation)	%		82.4	92.1	75
7.	Chemical Oxygen Demand	mg/L	**250.0**	16	8	16
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	4.9	2	4.6
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		742	565	1302
10.	Nitrite Nitrogen (as NO_2)	mg/L		BDL	BDL	BDL
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.264	BDL	BDL
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.274	BDL	BDL

Location				**Nallah near Lokhandi Bridge at WTP of Ghugus O/C Mine**	**Wardha River Behind ACC Plant (Mungoli Coal Mine Road)**	**Nallah at Usgaon, Shengaon Road**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.753	0.747	1.39
17.	Sulphide (as S^{2-})	mg/L	**2.0**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.166	0.071	0.127
19.	Sodium Absorption Ratio	mg/L		1.92	2.37	2
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	540	540	130
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	350	350	130
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.23	0.074	0.195
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	0.672	0.392	0.392
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	0.251	BDL	0.266

Location				**Nallah near Lokhandi Bridge at WTP of Ghugus O/C Mine**	**Wardha River Behind ACC Plant (Mungoli Coal Mine Road)**	**Nallah at Usgaon, Shengaon Road**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	ND	ND	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL

Location				**Nallah near Lokhandi Bridge at WTP of Ghugus O/C Mine**	**Wardha River Behind ACC Plant (Mungoli Coal Mine Road)**	**Nallah at Usgaon, Shengaon Road**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	BDL	BDL	0.057
31.	Nickel (as Ni)	mg/L	**3.0**	BDL	0.024	0.024
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	ND	ND	ND
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.025	0.099	0.111
35.	Total Arsenic (as As)	mg/L	**0.2**	BDL	ND	BDL
36.	Lead (as Pb)	mg/L	**0.1**	BDL	0.091	0.1
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL

Location				**Nallah near Lokhandi Bridge at WTP of Ghugus O/C Mine**	**Wardha River Behind ACC Plant (Mungoli Coal Mine Road)**	**Nallah at Usgaon, Shengaon Road**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND
39.	Manganese (as Mn)	mg/L	**2.0**	BDL	0.043	0.084
40.	Iron (as Fe)	mg/L	**3.0**	BDL	0.464	0.409
41.	Vanadium (as V)	mg/L	**0.2**	BDL	0.017	BDL
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	ND
43.	Boron (as B)	mg/L		0.157	0.176	0.252
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	100%

Table No. VI

Location				**Nallah water Domestic Effluent of ACC Ltd, Colony & Ghugus Village**	**BILT RCC Pipe Outlet Ballarpur Bamni Rd**	**Bhagirathi Nallah Bridge, Gondpipri Road, Near Bamni Protiesn**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		5	50	10
2.	Smell	-		Disagreeable	Disagreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	7.4	6.7	6.3
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	17	17	56
6.	Dissolved Oxygen (% Saturation)	%		71	45	20
7.	Chemical Oxygen Demand	mg/L	**250.0**	52	68	248
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	16	19	80
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		730	2936	17875
10.	Nitrite Nitrogen (as NO_2)	mg/L		BDL	BDL	BDL
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.219	1.07	0.457
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.223	1.08	0.46

Location				**Nallah water Domestic Effluent of ACC Ltd, Colony & Ghugus Village**	**BILT RCC Pipe Outlet Ballarpur Bamni Rd**	**Bhagirathi Nallah Bridge, Gondpipri Road, Near Bamni Protiesn**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	0.892	0.27	3.1
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.84	0.537	0.481
17.	Sulphide (as S^{2-})	mg/L	**2.0**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.727	0.12	0.195
19.	Sodium Absorption Ratio	mg/L		2.191	9.08	1
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	1600	350	1600
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	920	240	540
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.965	0.135	0.411
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	6.38	1.18	23.5

Location				**Nallah water Domestic Effluent of ACC Ltd, Colony & Ghugus Village**	**BILT RCC Pipe Outlet Ballarpur Bamni Rd**	**Bhagirathi Nallah Bridge, Gondpipri Road, Near Bamni Protiesn**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	2.46	0.826	19.5
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	ND	0.005	ND
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	0.863	3.68
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL

Location				**Nallah water Domestic Effluent of ACC Ltd, Colony & Ghugus Village**	**BILT RCC Pipe Outlet Ballarpur Bamni Rd**	**Bhagirathi Nallah Bridge, Gondpipri Road, Near Bamni Protiesn**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL	ND	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	0.02	0.019	0.025
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	ND	BDL	0.049
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.104	0.113	0.089
35.	Total Arsenic (as As)	mg/L	**0.2**	ND	0.0002	BDL

Location				**Nallah water Domestic Effluent of ACC Ltd, Colony & Ghugus Village**	**BILT RCC Pipe Outlet Ballarpur Bamni Rd**	**Bhagirathi Nallah Bridge, Gondpipri Road, Near Bamni Protiesn**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
36.	Lead (as Pb)	mg/L	**0.1**	0.098	0.093	0.083
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	ND	BDL	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.091	0.141	0.26
40.	Iron (as Fe)	mg/L	**3.0**	0.355	0.221	0.316
41.	Vanadium (as V)	mg/L	**0.2**	BDL	0.035	BDL
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	ND
43.	Boron (as B)	mg/L		0.318	0.245	0.23
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	TLM 50%

Table No. VII

Location				**Wardha River, Rajura Bridge**	**Nallah Near MSW Municipal Corporation, Near Railway Line**	**Ballarpur Open Cast Mine Discharge**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		12	BDL	4
2.	Smell	-		Disagreeable	Agreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	7.3	7.1	7.3
4.	Oil & Grease	mg/L	**10.0**	ND	ND	ND
5.	Suspended Solids	mg/L	**100.0**	19	28	15
6.	Dissolved Oxygen (% Saturation)	%		65	47	83
7.	Chemical Oxygen Demand	mg/L	**250.0**	20	60	16
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	5.3	17.0	4.8
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		783	2788	1573
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.082	0.18	0.471
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.226	0.956	0.42
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.307	1.140	0.89

Location				**Wardha River, Rajura Bridge**	**Nallah Near MSW Municipal Corporation, Near Railway Line**	**Ballarpur Open Cast Mine Discharge**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	BDL	0.878	0.378
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND	ND	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.79	0.840	0.66
17.	Sulphide (as S^{2-})	mg/L	**2.0**	0.009	BDL	0.009
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.092	0.330	0.074
19.	Sodium Absorption Ratio	mg/L		1.81	2.23	1.52
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	350	1600	14
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	240	540	9.3
22.	Total Phosphorous (as P)	mg/L	**1.0**	0.096	0.39	0.078
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	0.28	6.050	2.46
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	0.111	3.25	1.34

Location				**Wardha River, Rajura Bridge**	**Nallah Near MSW Municipal Corporation, Near Railway Line**	**Ballarpur Open Cast Mine Discharge**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	ND	ND	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	1.04	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**2.0**	BDL	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL	BDL

Location				**Wardha River, Rajura Bridge**	**Nallah Near MSW Municipal Corporation, Near Railway Line**	**Ballarpur Open Cast Mine Discharge**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XVI.	Beta Endosulfan	µg/L		BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	0.053	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	0.015	0.021	0.024
32.	Copper (as Cu)	mg/L		BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	0.037	0.042	0.020
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.067	0.11	0.104
35.	Total Arsenic (as As)	mg/L	**0.2**	ND	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.1**	0.057	0.087	0.092
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL	BDL

Location				**Wardha River, Rajura Bridge**	**Nallah Near MSW Municipal Corporation, Near Railway Line**	**Ballarpur Open Cast Mine Discharge**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
38.	Mercury (as Hg)	mg/L	**0.01**	ND	ND	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.043	0.263	0.247
40.	Iron (as Fe)	mg/L	**3.0**	0.299	0.302	0.305
41.	Vanadium (as V)	mg/L	**0.2**	BDL	0.021	BDL
42.	Selenium (as Se)	mg/L	**0.05**	ND	ND	0.012
43.	Boron (as B)	mg/L		0.387	0.333	BDL
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%	100%	100%

Table No. VIII

Location				**Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump**
Date of Sampling				**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**
1.	Colour	Hazen		4
2.	Smell	-		Disagreeable
3.	pH	-	**5.5 -9.0**	7.3

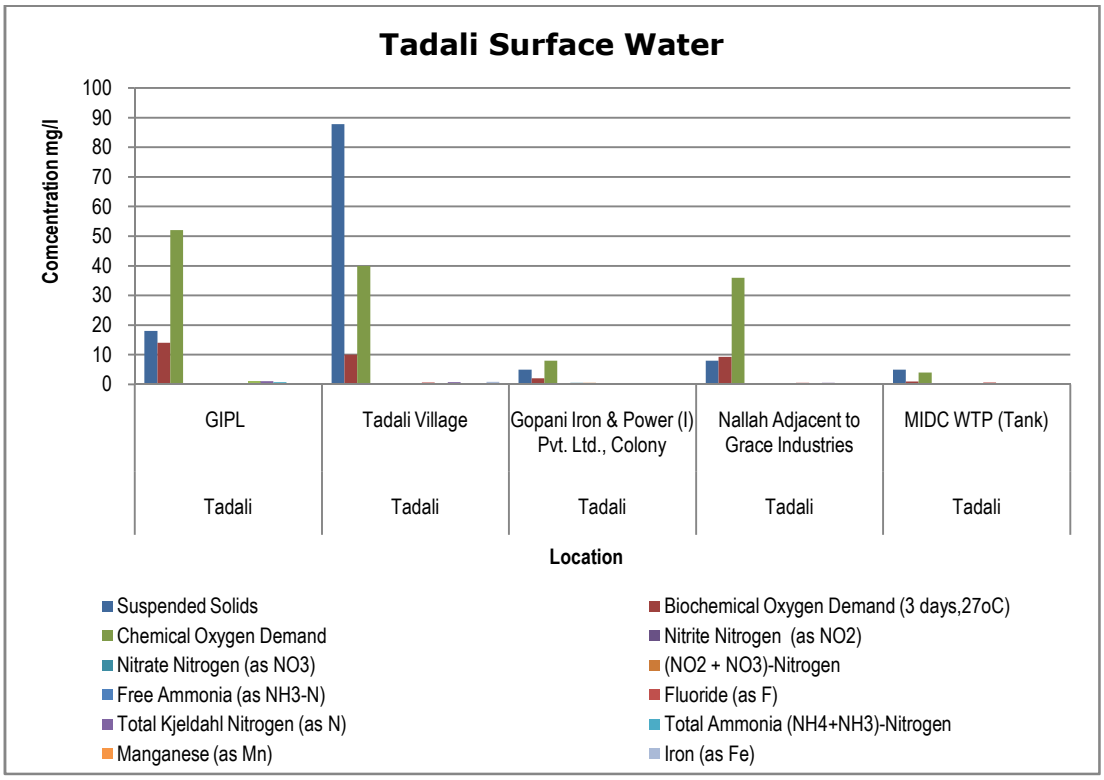
Location				**Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump**
Date of Sampling				**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**
4.	Oil & Grease	mg/L	**10.0**	ND
5.	Suspended Solids	mg/L	**100.0**	82
6.	Dissolved Oxygen (% Saturation)	%		55.0
7.	Chemical Oxygen Demand	mg/L	**250.0**	64
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	18
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		814
10.	Nitrite Nitrogen (as NO_2)	mg/L		BDL
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	0.77
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	0.77
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	1.26
14.	Total Residual Chlorine	mg/L	**1.0**	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	ND
16.	Fluoride (as F)	mg/L	**2.0**	0.475
17.	Sulphide (as S^{2-})	mg/L	**2.0**	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	1.11
19.	Sodium Absorption Ratio	mg/L		2.62

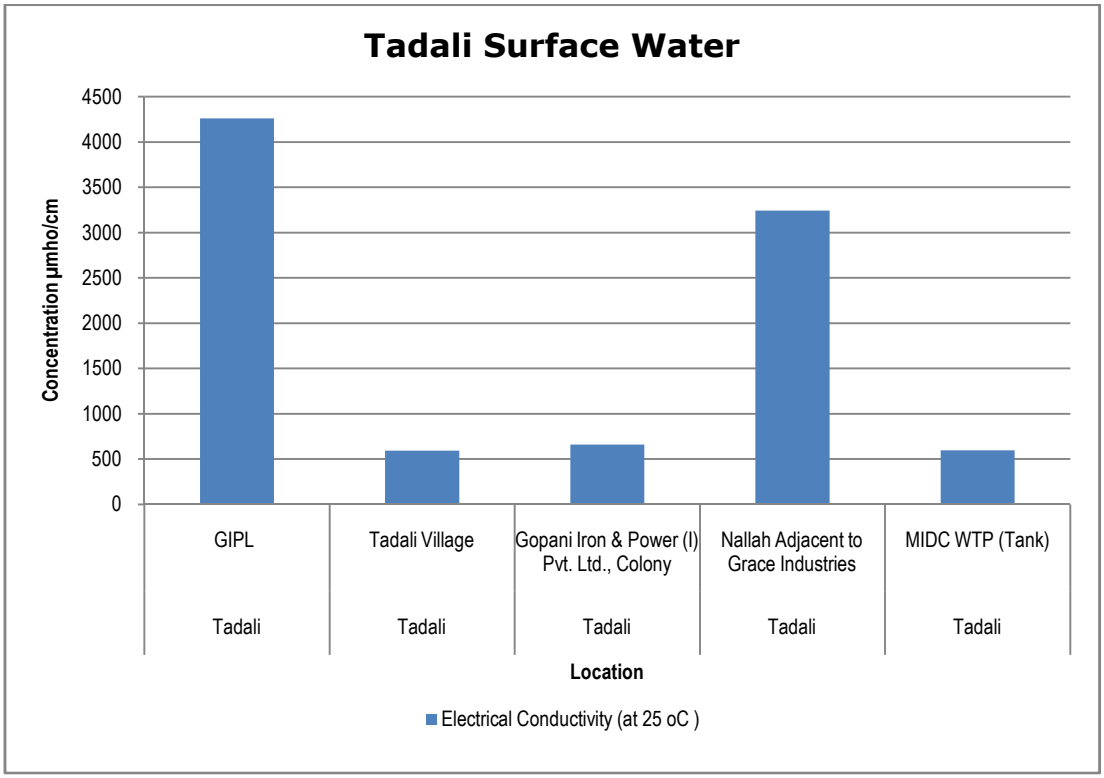
Location				**Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump**
Date of Sampling				**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	>1600
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	>1600
22.	Total Phosphorous (as P)	mg/L	**1.0**	1.22
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	4.2
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	2.97
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	0.022
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	1.2
27.	Organo Chlorine Pesticides			
I.	Alachlor	µg/L	**2.0**	BDL
II.	Atrazine	µg/L	**0.2**	BDL
III.	Aldrin	µg/L	**0.1**	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL
X.	o,p DDT	µg/L	**100.0**	BDL

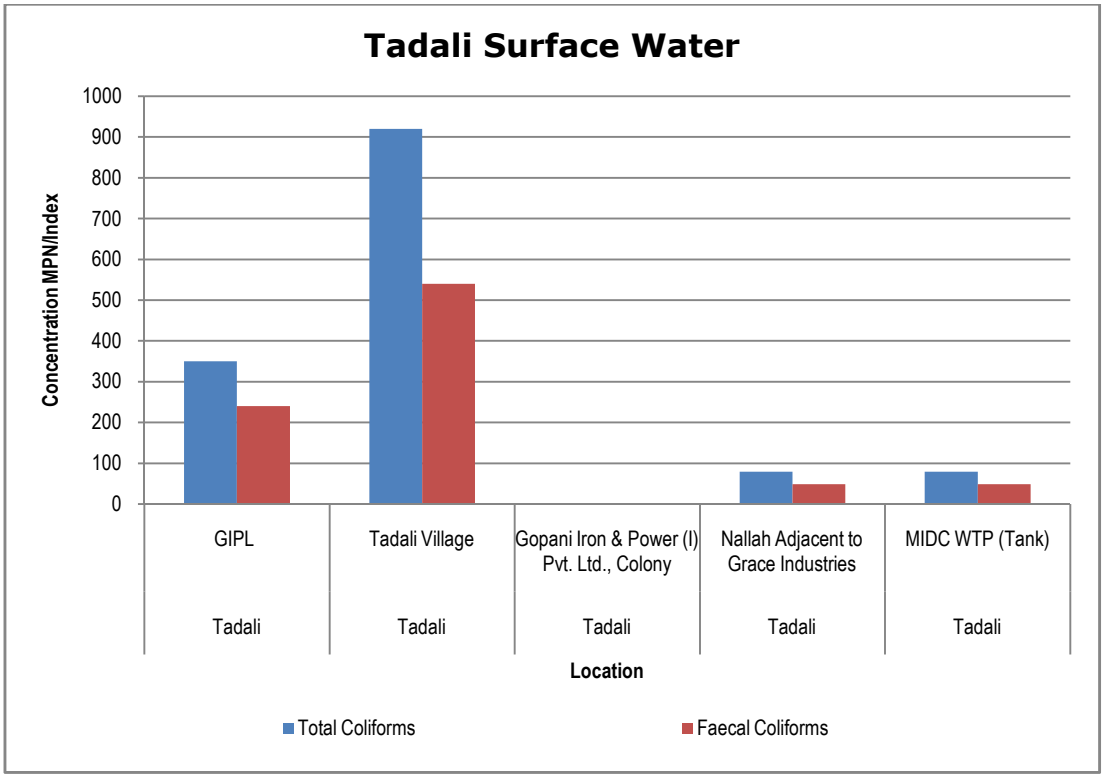
Location				**Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump**
Date of Sampling				**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**
XI.	p,p DDE	µg/L	**250.0**	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL
XIII.	p,p DDD	µg/L		BDL
XIV.	o,p DDD	µg/L		BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL
XVI.	Beta Endosulfan	µg/L		BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL
30.	Zinc (as Zn)	mg/L	**5.0**	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	0.027
32.	Copper (as Cu)	mg/L		BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	BDL
34.	Total Chromium (as Cr)	mg/L	**2.0**	0.107
35.	Total Arsenic (as As)	mg/L	**0.2**	BDL
36.	Lead (as Pb)	mg/L	**0.1**	0.088
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL

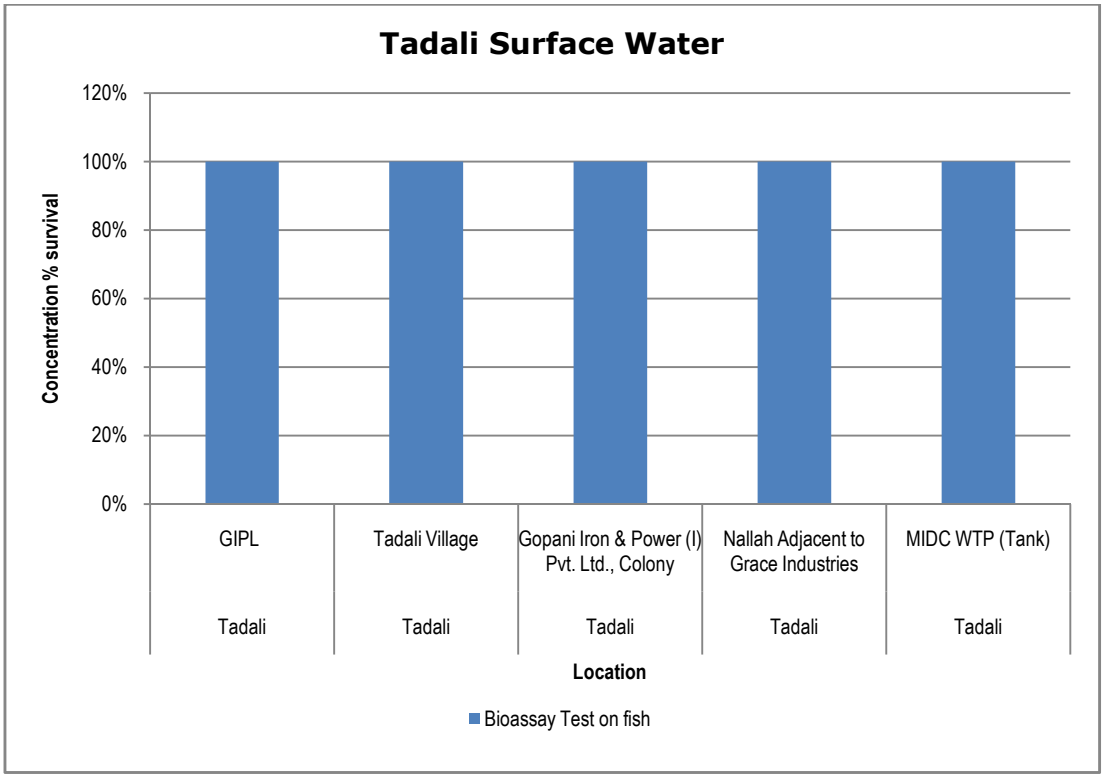
Location				**Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump**
Date of Sampling				**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**
38.	Mercury (as Hg)	mg/L	**0.01**	ND
39.	Manganese (as Mn)	mg/L	**2.0**	0.064
40.	Iron (as Fe)	mg/L	**3.0**	0.403
41.	Vanadium (as V)	mg/L	**0.2**	BDL
42.	Selenium (as Se)	mg/L	**0.05**	ND
43.	Boron (as B)	mg/L		0.233
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100% effluent**	100%

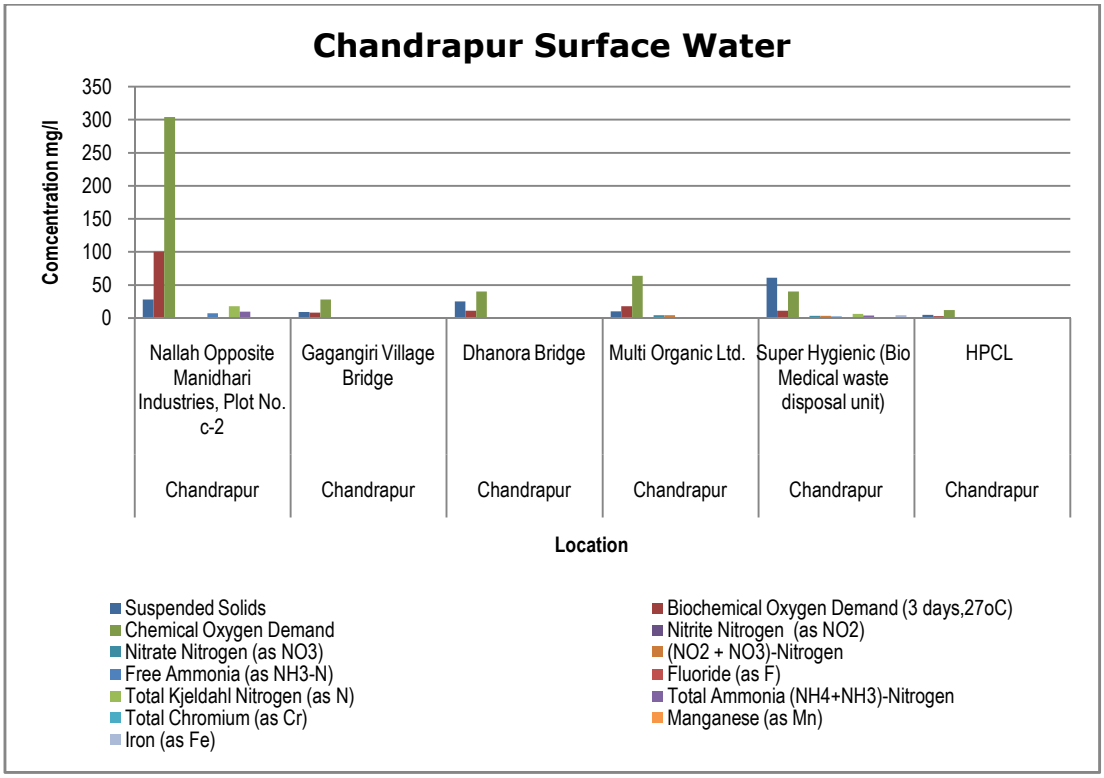
Graphs: Water/Waste Water Quality Monitoring for Chandrapur:

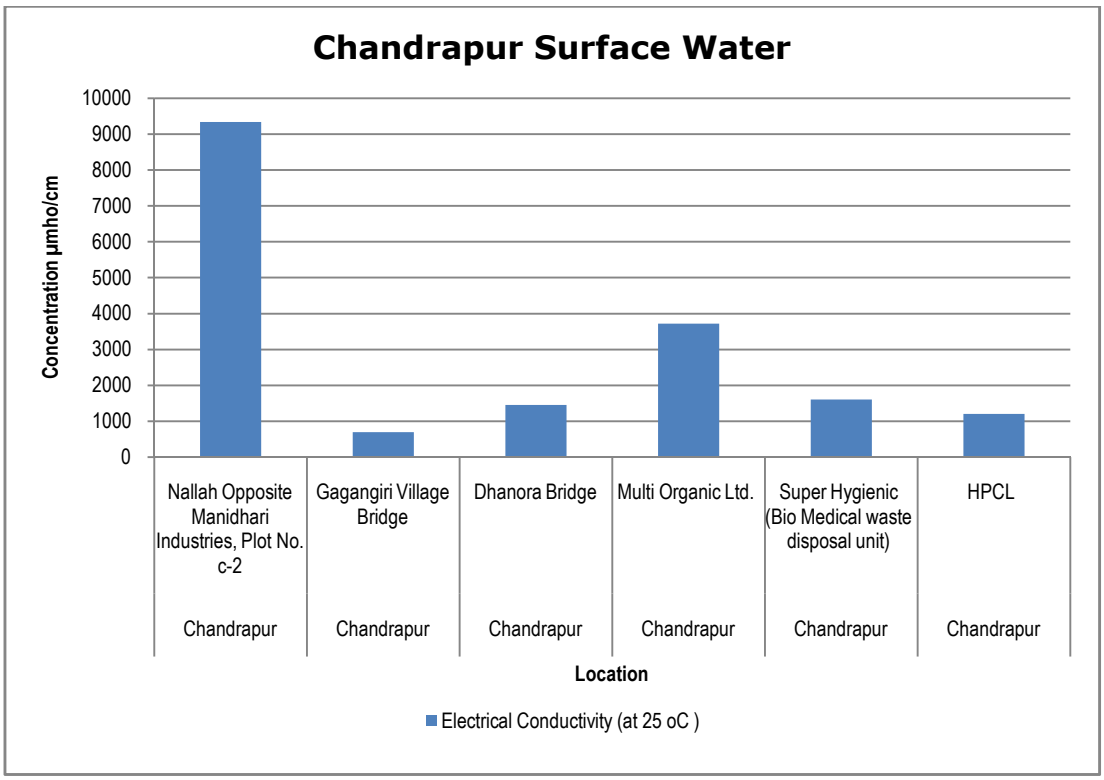


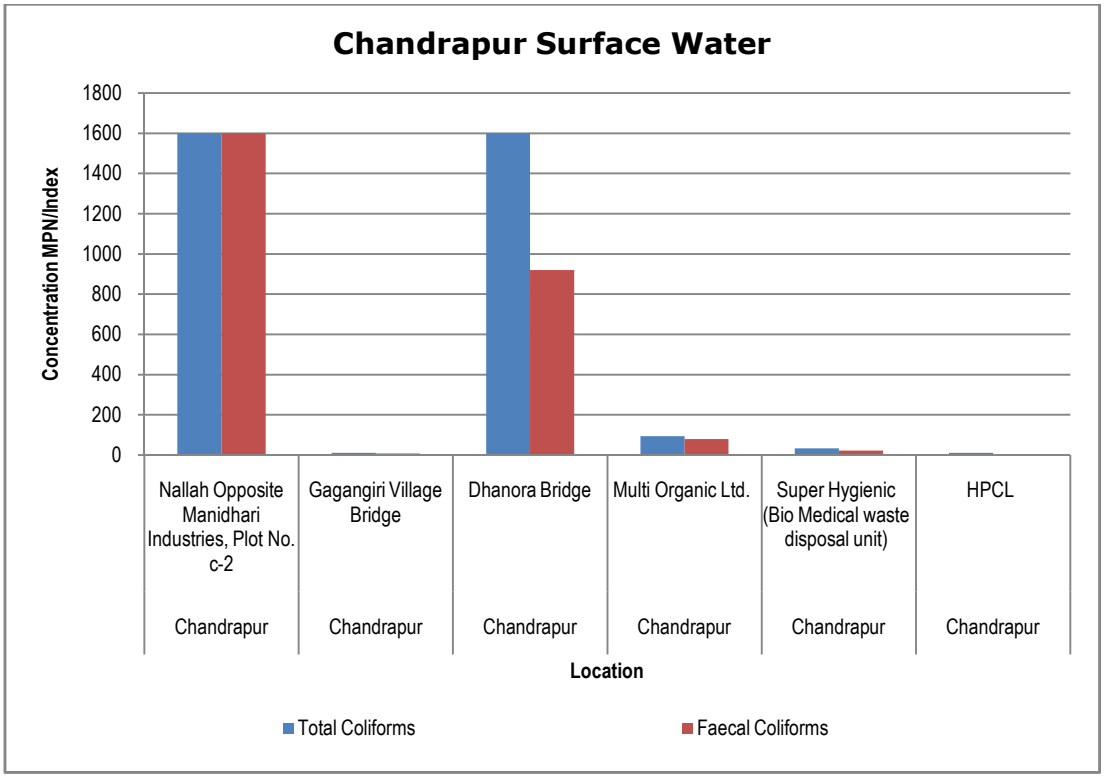


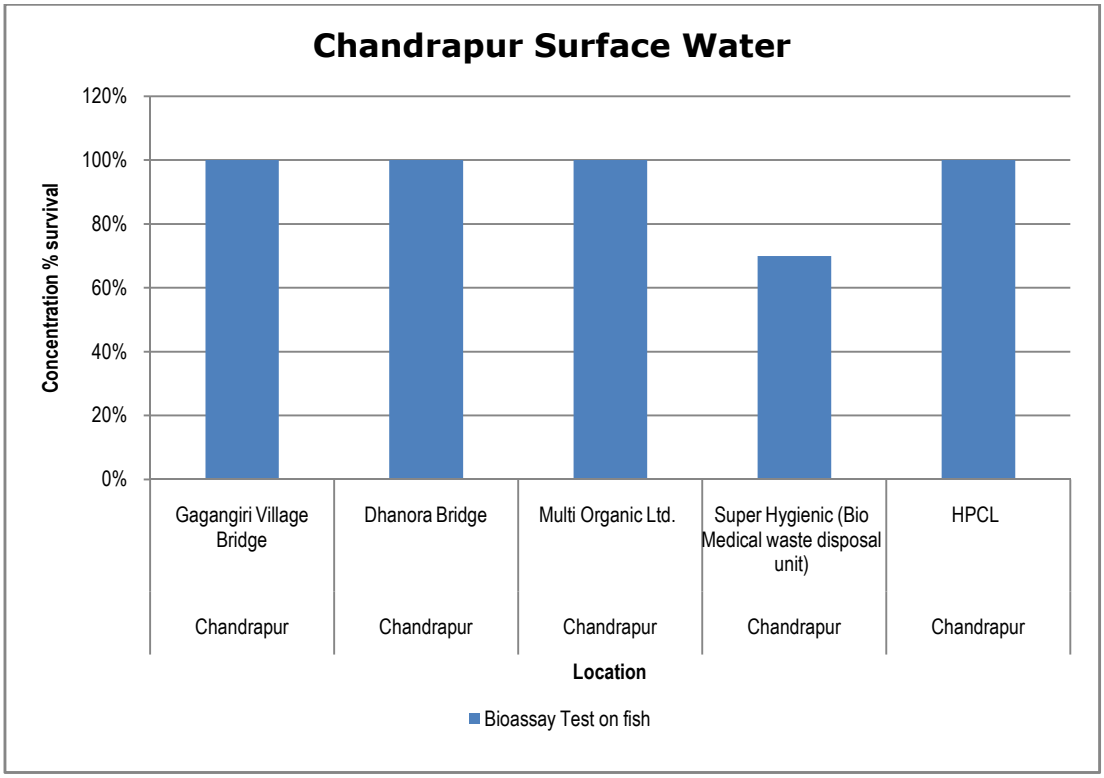

Tadali Surface Water
Concentration MPN/Index
1000
900
800
700
600
500
400
300
200
100
0
GIPL
Tadali
Tadali Village
Tadali
Gopani Iron & Power (I) Pvt. Ltd., Colony
Tadali
Nallah Adjacent to Grace Industries
Tadali
MIDC WTP (Tank)
Tadali
Location
Total Coliforms
Faecal Coliforms

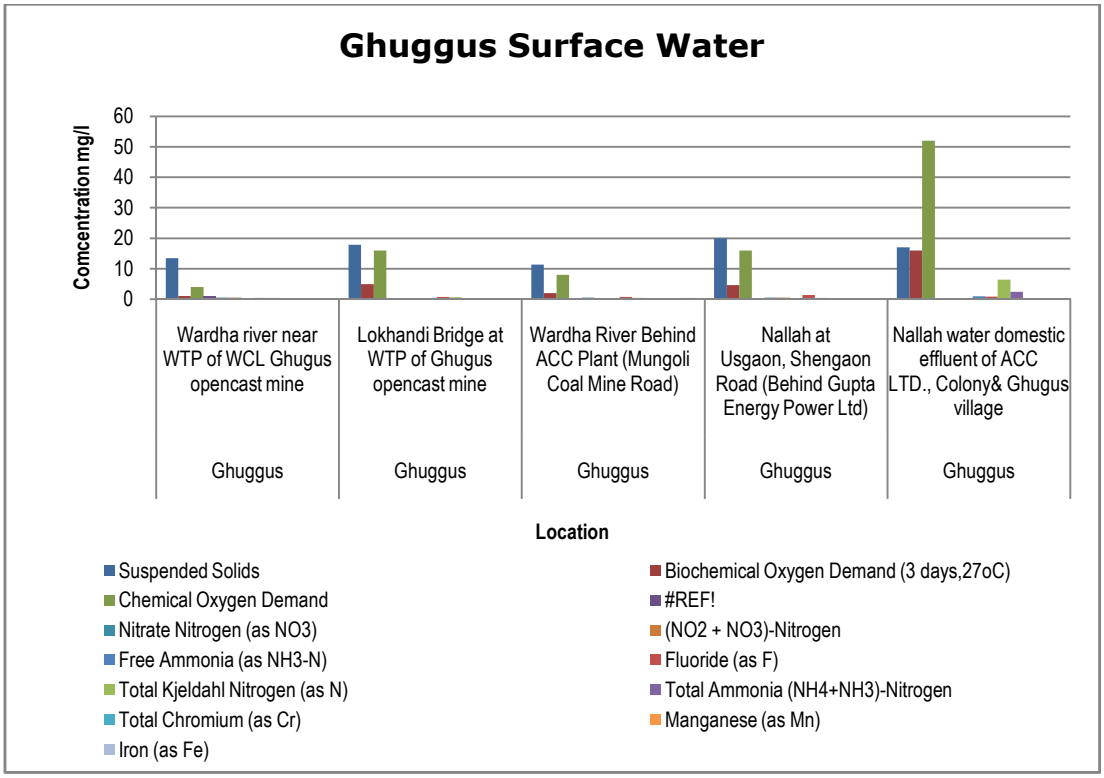

Tadali Surface Water
Concentration % survival
120%
100%
80%
60%
40%
20%
0%
GIPL
Tadali
Tadali Village
Tadali
Gopani Iron & Power (I) Pvt. Ltd., Colony
Tadali
Nallah Adjacent to Grace Industries
Tadali
MIDC WTP (Tank)
Tadali
Location
Bioassay Test on fish

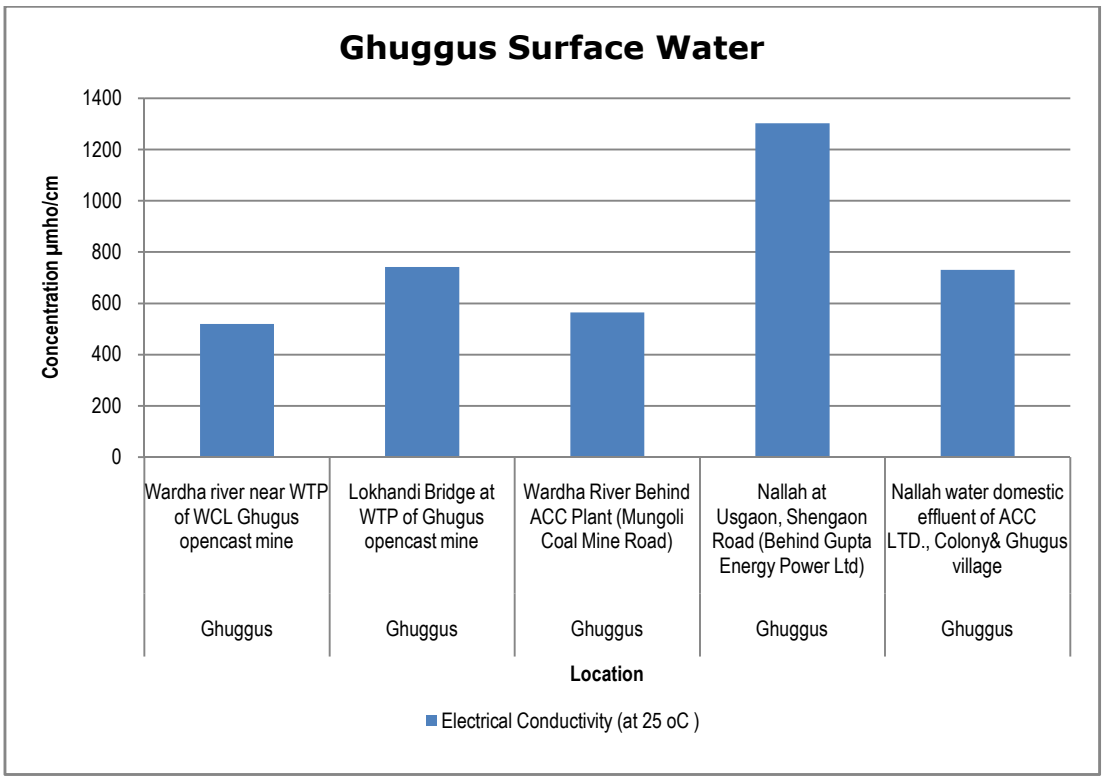

Chandrapur Surface Water
Comcentration mg/l
350
300
250
200
150
100
50
0
Nallah Opposite Manidhari Industries, Plot No. c-2
Gagangiri Village Bridge
Dhanora Bridge
Multi Organic Ltd.
Super Hygienic (Bio Medical waste disposal unit)
HPCL
Chandrapur
Location
Suspended Solids
Chemical Oxygen Demand
Nitrate Nitrogen (as NO3)
Free Ammonia (as NH3-N)
Total Kjeldahl Nitrogen (as N)
Total Chromium (as Cr)
Iron (as Fe)
Biochemical Oxygen Demand (3 days,27oC)
Nitrite Nitrogen (as NO2)
(NO2 + NO3)-Nitrogen
Fluoride (as F)
Total Ammonia (NH4+NH3)-Nitrogen
Manganese (as Mn)

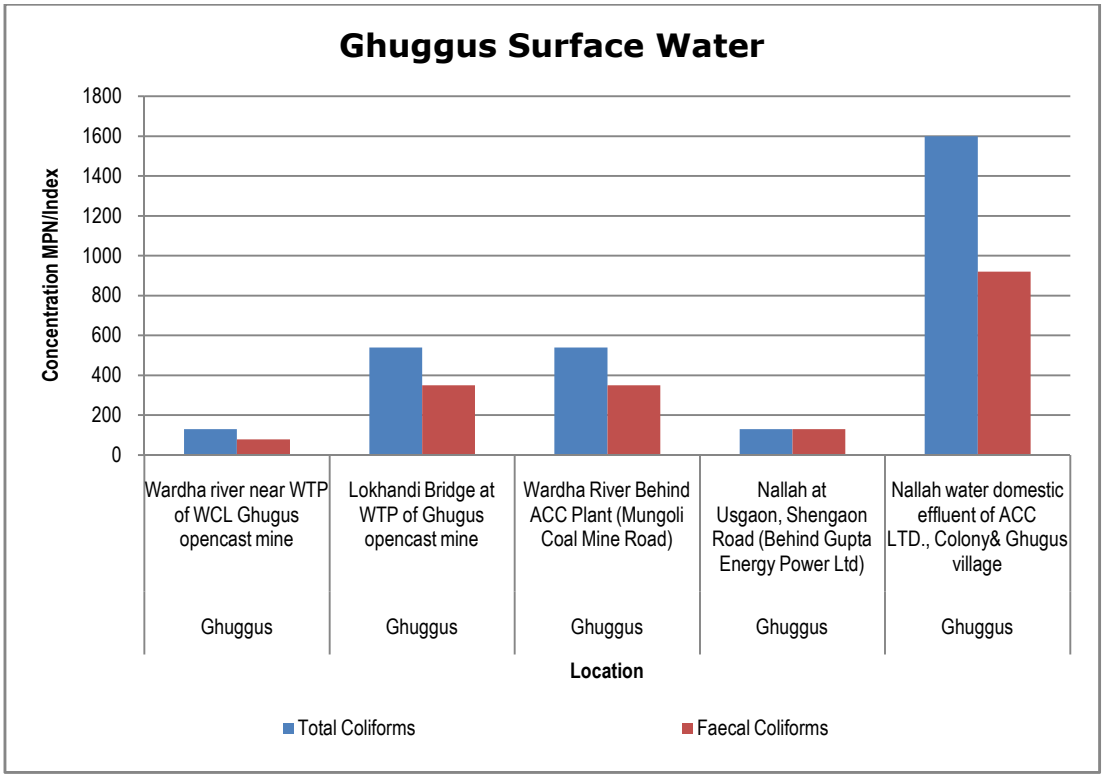

Chandrapur Surface Water
Concentration µmho/cm
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Nallah Opposite Manidhari Industries, Plot No. c-2
Gagangiri Village Bridge
Dhanora Bridge
Multi Organic Ltd.
Super Hygienic (Bio Medical waste disposal unit)
HPCL
Chandrapur
Location
Electrical Conductivity (at 25 oC)

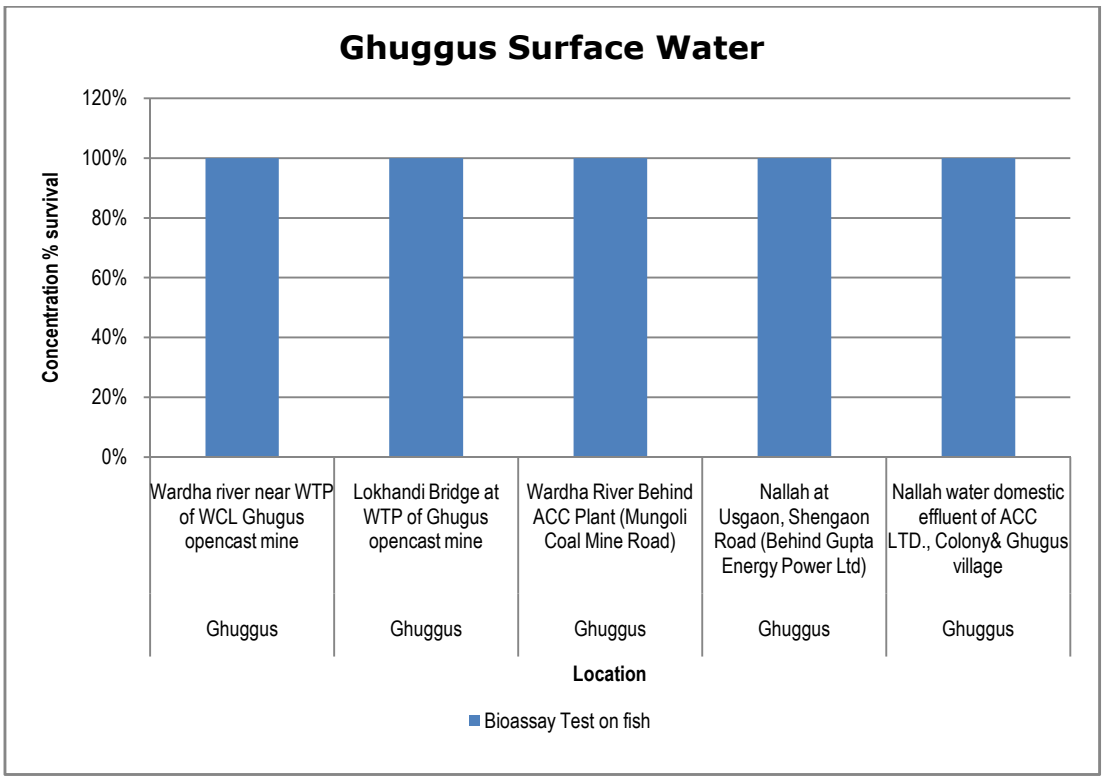

Chandrapur Surface Water
Concentration MPN/Index
1800
1600
1400
1200
1000
800
600
400
200
0
Nallah Opposite Manidhari Industries, Plot No. c-2
Gagangiri Village Bridge
Dhanora Bridge
Multi Organic Ltd.
Super Hygienic (Bio Medical waste disposal unit)
HPCL
Chandrapur
Location
Total Coliforms
Faecal Coliforms

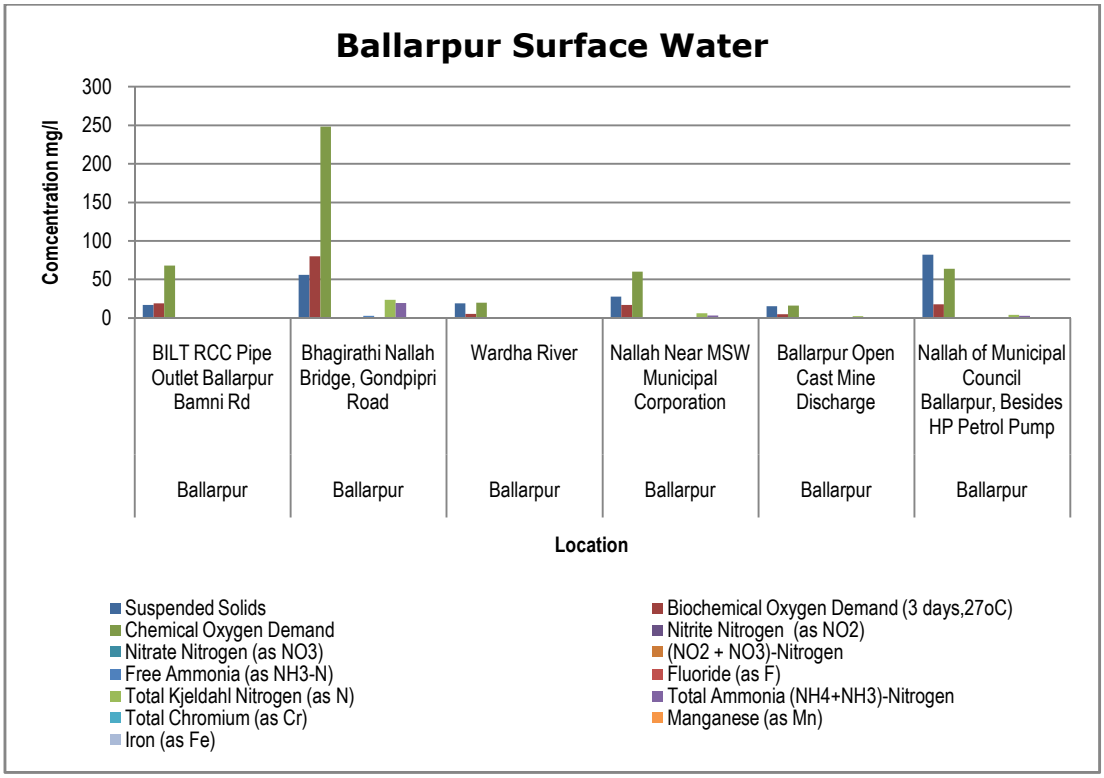

Chandrapur Surface Water
Concentration % survival
120%
100%
80%
60%
40%
20%
0%
Gagangiri Village Bridge
Dhanora Bridge
Multi Organic Ltd.
Super Hygienic (Bio Medical waste disposal unit)
HPCL
Chandrapur
Location
Bioassay Test on fish

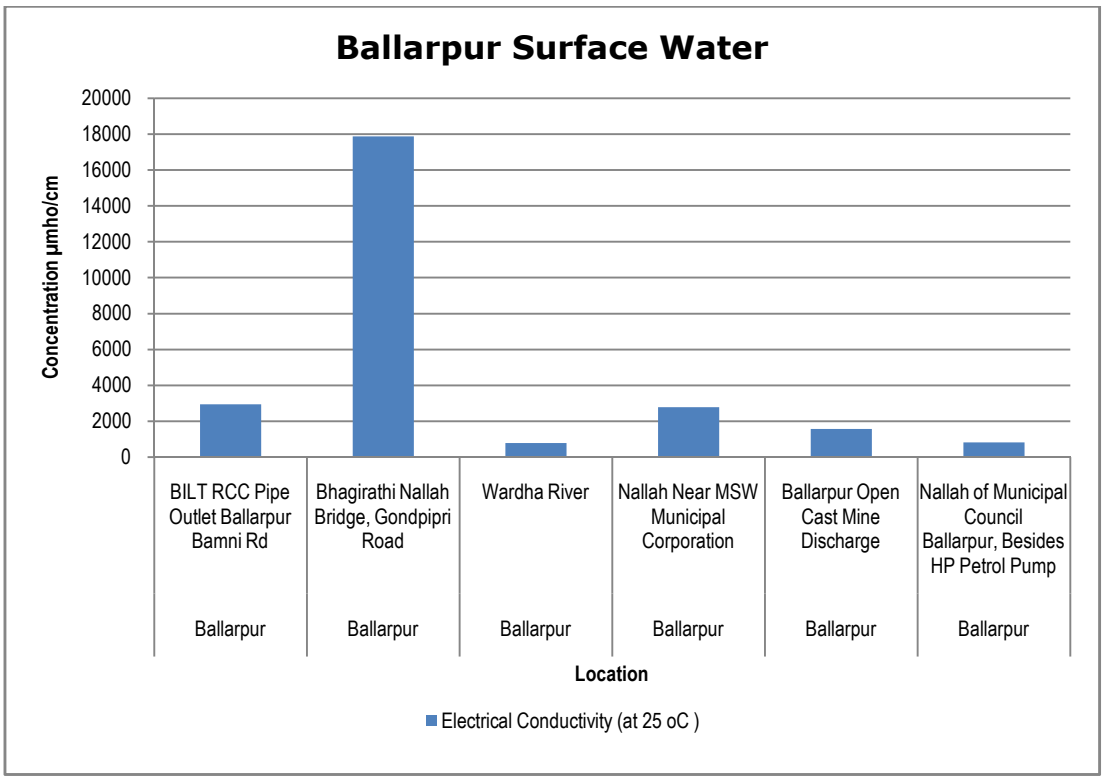

Ghuggus Surface Water
Comcentration mg/l
60
50
40
30
20
10
0
Wardha river near WTP of WCL Ghugus opencast mine
Lokhandi Bridge at WTP of Ghugus opencast mine
Wardha River Behind ACC Plant (Mungoli Coal Mine Road)
Nallah at Usgaon, Shengaon Road (Behind Gupta Energy Power Ltd)
Nallah water domestic effluent of ACC LTD., Colony& Ghugus village
Ghuggus
Location
Suspended Solids
Biochemical Oxygen Demand (3 days,27oC)
Chemical Oxygen Demand
#REF!
Nitrate Nitrogen (as NO3)
(NO2 + NO3)-Nitrogen
Free Ammonia (as NH3-N)
Fluoride (as F)
Total Kjeldahl Nitrogen (as N)
Total Ammonia (NH4+NH3)-Nitrogen
Total Chromium (as Cr)
Manganese (as Mn)
Iron (as Fe)

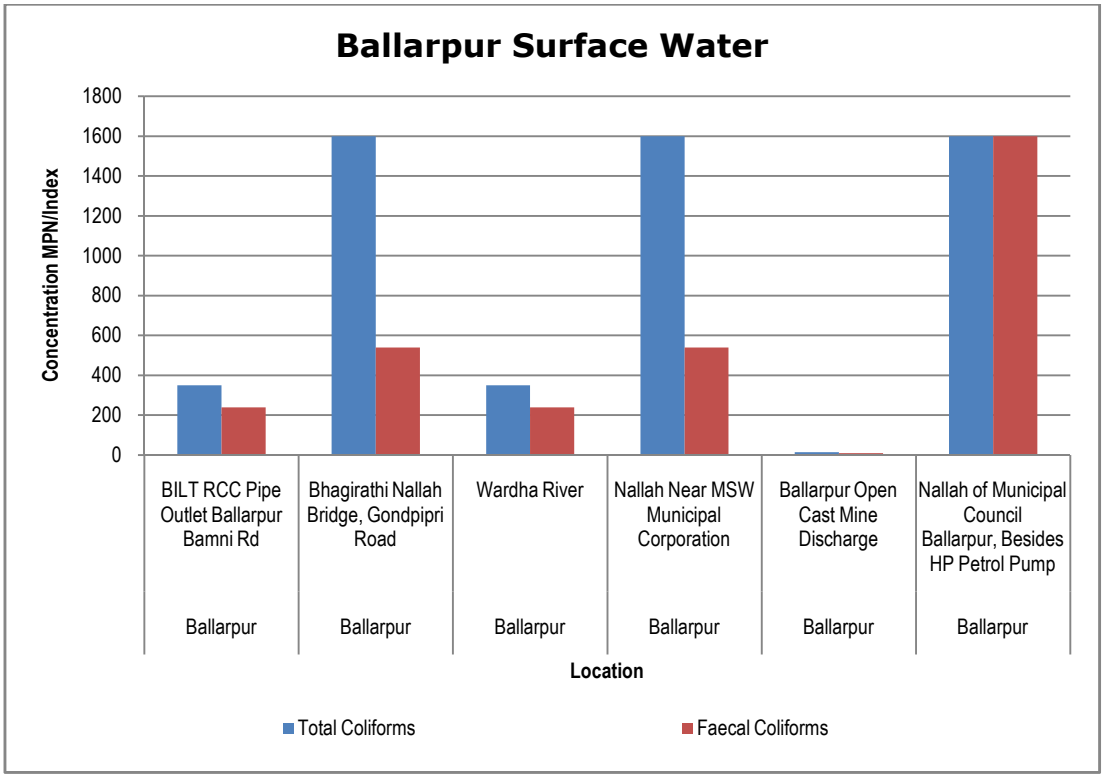

Ghuggus Surface Water
Concentration µmho/cm
1400
1200
1000
800
600
400
200
0
Wardha river near WTP of WCL Ghugus opencast mine
Lokhandi Bridge at WTP of Ghugus opencast mine
Wardha River Behind ACC Plant (Mungoli Coal Mine Road)
Nallah at Usgaon, Shengaon Road (Behind Gupta Energy Power Ltd)
Nallah water domestic effluent of ACC LTD., Colony& Ghugus village
Ghuggus
Location
Electrical Conductivity (at 25 oC)

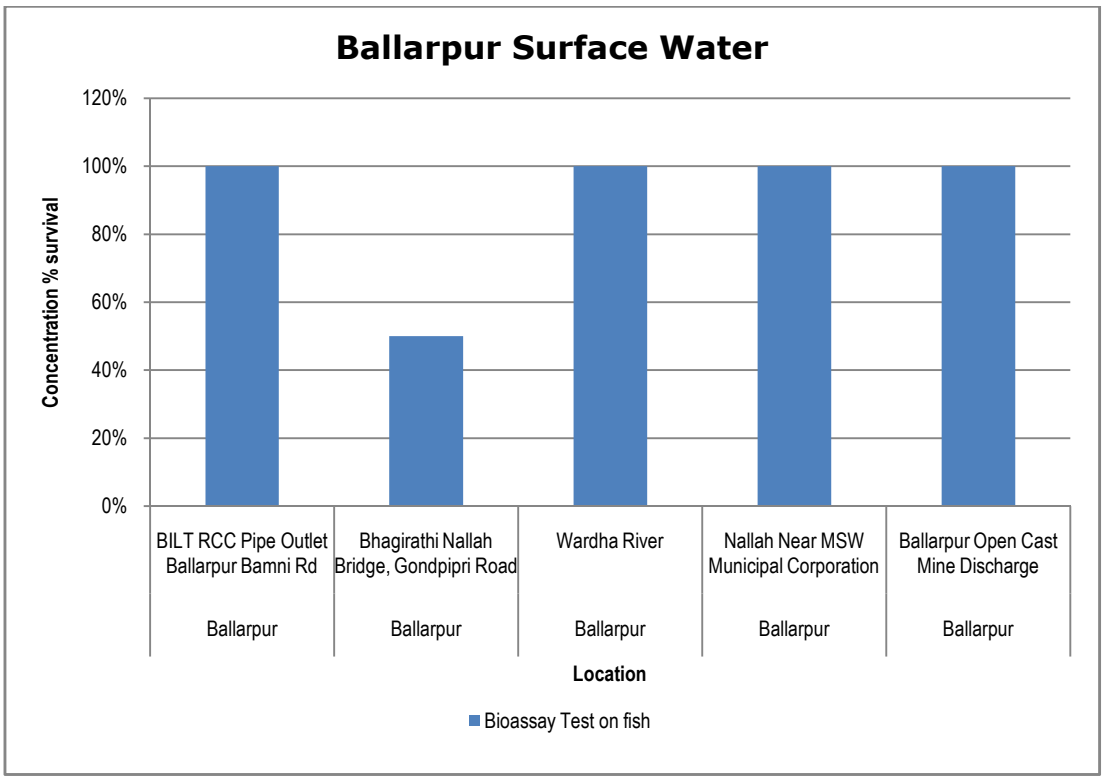

Ghuggus Surface Water
Concentration MPN/Index
1800
1600
1400
1200
1000
800
600
400
200
0
Wardha river near WTP of WCL Ghugus opencast mine
Lokhandi Bridge at WTP of Ghugus opencast mine
Wardha River Behind ACC Plant (Mungoli Coal Mine Road)
Nallah at Usgaon, Shengaon Road (Behind Gupta Energy Power Ltd)
Nallah water domestic effluent of ACC LTD., Colony& Ghugus village
Ghuggus
Location
Total Coliforms
Faecal Coliforms


Ghuggus Surface Water
Concentration % survival
120%
100%
80%
60%
40%
20%
0%
Wardha river near WTP of WCL Ghugus opencast mine
Lokhandi Bridge at WTP of Ghugus opencast mine
Wardha River Behind ACC Plant (Mungoli Coal Mine Road)
Nallah at Usgaon, Shengaon Road (Behind Gupta Energy Power Ltd)
Nallah water domestic effluent of ACC LTD., Colony& Ghugus village
Ghuggus
Location
Bioassay Test on fish


Ballarpur Surface Water
Comcentration mg/l
300
250
200
150
100
50
0
BILT RCC Pipe Outlet Ballarpur Bamni Rd
Bhagirathi Nallah Bridge, Gondpipri Road
Wardha River
Nallah Near MSW Municipal Corporation
Ballarpur Open Cast Mine Discharge
Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump
Ballarpur
Location
Suspended Solids
Chemical Oxygen Demand
Nitrate Nitrogen (as NO3)
Free Ammonia (as NH3-N)
Total Kjeldahl Nitrogen (as N)
Total Chromium (as Cr)
Iron (as Fe)
Biochemical Oxygen Demand (3 days,27oC)
Nitrite Nitrogen (as NO2)
(NO2 + NO3)-Nitrogen
Fluoride (as F)
Total Ammonia (NH4+NH3)-Nitrogen
Manganese (as Mn)


Ballarpur Surface Water
Concentration µmho/cm
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
BILT RCC Pipe Outlet Ballarpur Bamni Rd
Bhagirathi Nallah Bridge, Gondpipri Road
Wardha River
Nallah Near MSW Municipal Corporation
Ballarpur Open Cast Mine Discharge
Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump
Ballarpur
Location
Electrical Conductivity (at 25 oC)


Ballarpur Surface Water
Concentration MPN/Index
1800
1600
1400
1200
1000
800
600
400
200
0
BILT RCC Pipe Outlet Ballarpur Bamni Rd
Bhagirathi Nallah Bridge, Gondpipri Road
Wardha River
Nallah Near MSW Municipal Corporation
Ballarpur Open Cast Mine Discharge
Nallah of Municipal Council Ballarpur, Besides HP Petrol Pump
Ballarpur
Location
Total Coliforms
Faecal Coliforms


Ballarpur Surface Water
Concentration % survival
120%
100%
80%
60%
40%
20%
0%
BILT RCC Pipe Outlet Ballarpur Bamni Rd
Bhagirathi Nallah Bridge, Gondpipri Road
Wardha River
Nallah Near MSW Municipal Corporation
Ballarpur Open Cast Mine Discharge
Ballarpur
Location
Bioassay Test on fish

3.4 Ground Water Quality:

Sr.	Location	MIDC	Table No.
1.	Dug well of Tadali Village Near Primary School	Tadali	**I**
2.	Bore well of Yerur Village	Tadali	**I**
3.	Dug well near Tadali Lake & Janata School	Tadali	**I**
4.	Dug well of Yerur Village	Tadali	**II**
5.	Dug well Water Gagangiri Village	Chandrapur	**II**
6.	Bore well Water from Mhada Colony	Chandrapur	**II**
7.	Bore well Water from Datala Gram Panchayat	Chandrapur	**III**
8.	Bore well water taken of Tukdoji Nagar Ghugus Village	Ghugus	**III**
9.	Bore well Water taken from Nakoda Village	Ghugus	**III**
10.	Dug well water from Usgaon Village	Ghugus	**IV**
11.	Bore well Water taken from Bangali Camp, Near Durga Mandir Wani Road	Ghugus	**IV**
12.	Bore well water at Gramin Rugnalaya Ballarpur	Ballarpur	**IV**
13.	Bore well Water at Nagar Parishad Near New Fire Station Ballarpur	Ballarpur	**V**
14.	Bore well Water at Visapur Village	Ballarpur	**V**

Table No. I

Location				**Dug well of Tadali Village Near Primary School**	**Bore well of Yerur Village**	**Dug well near Tadali Lake & Janata School**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		BDL	BDL	BDL
2.	Smell	-	**Agreeable**	Agreeable	Agreeable	Agreeable

Location				**Dug well of Tadali Village Near Primary School**	**Bore well of Yerur Village**	**Dug well near Tadali Lake & Janata School**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
3.	pH	-	**6.5-8.5**	6.9	6.9	7.7
4.	Oil & Grease	mg/L	**100**	ND	ND	ND
5.	Suspended Solids	mg/L	**500**	BDL	BDL	7
6.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	16	12	20
7.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	4.8	3.2	4.9
8.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	1462	1432	711
9.	Nitrite Nitrogen (as NO_2)	mg/L		0.023	0.064	BDL
10.	Nitrate Nitrogen (as NO_3)	mg/L	**1.0**	7.04	7.66	0.378
11.	(NO_2 + NO_3)-Nitrogen	mg/L	**45**	7.06	7.72	0.382
12.	Free Ammonia (as NH_3-N)	mg/L	**0.5**	BDL	BDL	BDL
13.	Total Residual Chlorine	mg/L	**0.2**	ND	BDL	BDL
14.	Cyanide (as CN)	mg/L	**1.5**	ND	ND	ND
15.	Fluoride (as F)	mg/L	**1**	0.759	0.691	0.469

Location				**Dug well of Tadali Village Near Primary School**	**Bore well of Yerur Village**	**Dug well near Tadali Lake & Janata School**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
16.	Sulphide (as S^{2-})	mg/L	**0.05**	ND	ND	ND
17.	Dissolved Phosphate (as P)	mg/L		0.096	0.082	0.096
18.	Sodium Absorption Ratio	mg/L		ND	3.11	BDL
19.	Total Coliforms	MPN index/ 100 ml	**ND**	23	23	5.1
20.	Faecal Coliforms	MPN index/ 100 ml	**ND**	3.6	3.6	3.6
21.	Total Phosphorous (as P)	mg/L	**0.5**	0.121	0.103	0.121
22.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.112	0.168	0.112
23.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
24.	Phenols (as C_6H_5OH)	mg/L	**0.001**	ND	ND	ND
25.	Surface Active Agents (as MBAS)	mg/L	**0.02**	ND	ND	ND
26.	Organo Chlorine Pesticides		**0.05**			
I.	Alachlor	µg/L	**20**	BDL	BDL	BDL

Location				**Dug well of Tadali Village Near Primary School**	**Bore well of Yerur Village**	**Dug well near Tadali Lake & Janata School**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
II.	Atrazine	µg/L	**2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.03**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**0.03**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**0.04**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**125**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.04**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**1**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**1**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**1**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L	**1**	BDL	BDL	BDL
XIV.	o,p DDD	µg/L	**1**	BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**0.4**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**2.0**	BDL	BDL	BDL
27.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.0001**	BDL	BDL	BDL

Location				**Dug well of Tadali Village Near Primary School**	**Bore well of Yerur Village**	**Dug well near Tadali Lake & Janata School**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
28.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0005**	BDL	BDL	BDL
29.	Zinc (as Zn)	mg/L	**5.0**	0.072	0.478	BDL
30.	Nickel (as Ni)	mg/L	**0.02**	0.023	BDL	BDL
31.	Copper (as Cu)	mg/L	**0.05**	BDL	BDL	BDL
32.	Hexavalent Chromium (as Cr^{6+})	mg/L	**1**	ND	ND	ND
33.	Total Chromium (as Cr)	mg/L	**0.05**	ND	0.106	0.095
34.	Total Arsenic (as As)	mg/L	**0.01**	BDL	ND	ND
35.	Lead (as Pb)	mg/L	**0.01**	0.104	0.094	0.089
36.	Cadmium (as Cd)	mg/L	**0.003**	BDL	BDL	BDL
37.	Mercury (as Hg)	mg/L	**0.001**	0.104	0.094	0.089
38.	Manganese (as Mn)	mg/L	**0.1**	0.034	0.034	0.902
39.	Iron (as Fe)	mg/L	**0.3**	0.472	0.409	0.247
40.	Vanadium (as V)	mg/L		BDL	BDL	BDL
41.	Selenium (as Se)	mg/L	**0.01**	BDL	BDL	BDL
42.	Boron (as B)	mg/L		0.102	BDL	BDL

Table No. II

Location				**Dug well of Yerur Village**	**Dug well Water Gagangiri Village**	**Bore well Water from Mhada Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		BDL	BDL	BDL
2.	Smell	-	**Agreeable**	Agreeable	Agreeable	Agreeable
3.	pH	-	**6.5-8.5**	7.7	7.2	7.7
4.	Oil & Grease	mg/L	**100**	ND	ND	ND
5.	Suspended Solids	mg/L	**500**	BDL	BDL	BDL
6.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	24	8	16
7.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	6.4	1.8	4.8
8.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	1124	1006	1886
9.	Nitrite Nitrogen (as NO_2)	mg/L		0.094	BDL	0.18
10.	Nitrate Nitrogen (as NO_3)	mg/L	**1.0**	4.56	4.060	BDL
11.	(NO_2 + NO_3)-Nitrogen	mg/L	**45**	4.65	4.070	BDL
12.	Free Ammonia (as NH_3-N)	mg/L	**0.5**	BDL	BDL	ND
13.	Total Residual Chlorine	mg/L	**0.2**	BDL	0.05	BDL

Location				**Dug well of Yerur Village**	**Dug well Water Gagangiri Village**	**Bore well Water from Mhada Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
14.	Cyanide (as CN)	mg/L	**1.5**	ND	ND	ND
15.	Fluoride (as F)	mg/L	**1**	0.611	0.839	1.20
16.	Sulphide (as S^{2-})	mg/L	**0.05**	ND	ND	ND
17.	Dissolved Phosphate (as P)	mg/L		0.117	0.074	0.043
18.	Sodium Absorption Ratio	mg/L		4.70	1.84	13.8
19.	Total Coliforms	MPN index/ 100 ml	**ND**	23	23	23
20.	Faecal Coliforms	MPN index/ 100 ml	**ND**	16	5.1	1.1
21.	Total Phosphorous (as P)	mg/L	**0.5**	0.156	0.099	0.064
22.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.168	0.112	0.112
23.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
24.	Phenols (as C_6H_5OH)	mg/L	**0.001**	ND	ND	ND
25.	Surface Active Agents (as MBAS)	mg/L	**0.02**	ND	ND	ND

Location				**Dug well of Yerur Village**	**Dug well Water Gagangiri Village**	**Bore well Water from Mhada Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
26.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**20**	BDL	BDL	BDL
II.	Atrazine	µg/L	**2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.03**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**0.03**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**0.04**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**125**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.04**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**1**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**1**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**1**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L	**1**	BDL	BDL	BDL
XIV.	o,p DDD	µg/L	**1**	BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**0.4**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**2.0**	BDL	BDL	BDL

Location				**Dug well of Yerur Village**	**Dug well Water Gagangiri Village**	**Bore well Water from Mhada Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
27.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.0001**	BDL	BDL	BDL
28.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0005**	BDL	BDL	BDL
29.	Zinc (as Zn)	mg/L	**5.0**	0.054	BDL	BDL
30.	Nickel (as Ni)	mg/L	**0.02**	BDL	0.019	BDL
31.	Copper (as Cu)	mg/L	**0.05**	BDL	BDL	BDL
32.	Hexavalent Chromium (as Cr^{6+})	mg/L	**1**	ND	ND	ND
33.	Total Chromium (as Cr)	mg/L	**0.05**	0.103	0.099	0.096
34.	Total Arsenic (as As)	mg/L	**0.01**	BDL	ND	BDL
35.	Lead (as Pb)	mg/L	**0.01**	0.09	BDL	BDL
36.	Cadmium (as Cd)	mg/L	**0.003**	BDL	BDL	BDL
37.	Mercury (as Hg)	mg/L	**0.001**	ND	ND	ND
38.	Manganese (as Mn)	mg/L	**0.1**	BDL	BDL	BDL
39.	Iron (as Fe)	mg/L	**0.3**	0.267	0.169	0.246
40.	Vanadium (as V)	mg/L		BDL	BDL	BDL

Location				**Dug well of Yerur Village**	**Dug well Water Gagangiri Village**	**Bore well Water from Mhada Colony**
Date of Sampling				**04.06.2018**	**04.06.2018**	**04.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
41.	Selenium (as Se)	mg/L	**0.01**	ND	BDL	ND
42.	Boron (as B)	mg/L		0.217	BDL	BDL

Table No. III

Location				**Bore well Water from Datala Gram Panchayat**	**Bore well water taken of Tukdoji Nagar**	**Bore well Water taken from Nakoda Village**
Date of Sampling				**04.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		BDL	BDL	BDL
2.	Smell	-	**Agreeable**	Agreeable	Agreeable	Agreeable
3.	pH	-	**6.5-8.5**	7.3	7.2	6.9
4.	Oil & Grease	mg/L	**100**	ND	ND	ND
5.	Suspended Solids	mg/L	**500**	BDL	BDL	9
6.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	8	8	4
7.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	1.9	2.0	BDL

Location				**Bore well Water from Datala Gram Panchayat**	**Bore well water taken of Tukdoji Nagar**	**Bore well Water taken from Nakoda Village**
Date of Sampling				**04.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
8.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	1036	1661	658
9.	Nitrite Nitrogen (as NO_2)	mg/L		BDL	0.146	BDL
10.	Nitrate Nitrogen (as NO_3)	mg/L	**1.0**	4.74	4.16	BDL
11.	(NO_2 + NO_3)-Nitrogen	mg/L	**45**	4.48	4.31	BDL
12.	Free Ammonia (as NH_3-N)	mg/L	**0.5**	BDL	BDL	BDL
13.	Total Residual Chlorine	mg/L	**0.2**	BDL	BDL	BDL
14.	Cyanide (as CN)	mg/L	**1.5**	ND	ND	ND
15.	Fluoride (as F)	mg/L	**1**	1.23	1.01	0.864
16.	Sulphide (as S^{2-})	mg/L	**0.05**	ND	BDL	BDL
17.	Dissolved Phosphate (as P)	mg/L		BDL	0.042	0.039
18.	Sodium Absorption Ratio	mg/L		3.13	6.66	1.11
19.	Total Coliforms	MPN index/ 100 ml	**ND**	BDL	BDL	BDL

Location				**Bore well Water from Datala Gram Panchayat**	**Bore well water taken of Tukdoji Nagar**	**Bore well Water taken from Nakoda Village**
Date of Sampling				**04.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
20.	Faecal Coliforms	MPN index/ 100 ml	**ND**	BDL	BDL	BDL
21.	Total Phosphorous (as P)	mg/L	**0.5**	0.074	0.046	0.046
22.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.168	0.168	0.168
23.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
24.	Phenols (as C_6H_5OH)	mg/L	**0.001**	ND	ND	ND
25.	Surface Active Agents (as MBAS)	mg/L	**0.02**	ND	ND	ND
26.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**20**	BDL	BDL	BDL
II.	Atrazine	µg/L	**2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.03**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**0.03**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**0.04**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**125**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.04**	BDL	BDL	BDL

Location				**Bore well Water from Datala Gram Panchayat**	**Bore well water taken of Tukdoji Nagar**	**Bore well Water taken from Nakoda Village**
Date of Sampling				**04.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
IX.	p,p DDT	µg/L	**1**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**1**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**1**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L	**1**	BDL	BDL	BDL
XIV.	o,p DDD	µg/L	**1**	BDL	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**0.4**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**2.0**	BDL	BDL	BDL
27.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.0001**	BDL	BDL	BDL
28.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0005**	BDL	BDL	BDL
29.	Zinc (as Zn)	mg/L	**5.0**	0.056	1.5	0.346
30.	Nickel (as Ni)	mg/L	**0.02**	0.023	0.052	0.023
31.	Copper (as Cu)	mg/L	**0.05**	BDL	BDL	BDL
32.	Hexavalent Chromium (as Cr^{6+})	mg/L	**1**	ND	ND	ND

Location				**Bore well Water from Datala Gram Panchayat**	**Bore well water taken of Tukdoji Nagar**	**Bore well Water taken from Nakoda Village**
Date of Sampling				**04.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
33.	Total Chromium (as Cr)	mg/L	**0.05**	0.117	0.105	0.115
34.	Total Arsenic (as As)	mg/L	**0.01**	ND	BDL	ND
35.	Lead (as Pb)	mg/L	**0.01**	0.102	0.096	0.097
36.	Cadmium (as Cd)	mg/L	**0.003**	BDL	BDL	BDL
37.	Mercury (as Hg)	mg/L	**0.001**	ND	ND	ND
38.	Manganese (as Mn)	mg/L	**0.1**	0.026	0.036	0.049
39.	Iron (as Fe)	mg/L	**0.3**	0.649	0.333	2.54
40.	Vanadium (as V)	mg/L		BDL	BDL	BDL
41.	Selenium (as Se)	mg/L	**0.01**	ND	ND	ND
42.	Boron (as B)	mg/L		0.131	BDL	0.354

Table No. IV

Location				**Dug well water from Usgaon Village**	**Borewell Water taken from Bangali Camp, Near Durga Mandir Wani Road**	**Bore well water at Gramin Rugnalaya Ballarpur**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen		BDL	BDL	BDL
2.	Smell	-	**Agreeable**	Agreeable	Agreeable	Agreeable
3.	pH	-	**6.5-8.5**	8	6.2	6.8
4.	Oil & Grease	mg/L	**100**	ND	ND	ND
5.	Suspended Solids	mg/L	**500**	6	10	BDL
6.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	12	4	4
7.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	3.2	BDL	BDL
8.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	589	729	620
9.	Nitrite Nitrogen (as NO_2)	mg/L		BDL	0.168	BDL
10.	Nitrate Nitrogen (as NO_3)	mg/L	**1.0**	1.9	0.744	5.90
11.	(NO_2 + NO_3)-Nitrogen	mg/L	**45**	1.9	0.912	5.91
12.	Free Ammonia (as NH_3-N)	mg/L	**0.5**	BDL	BDL	BDL

Location				**Dug well water from Usgaon Village**	**Borewell Water taken from Bangali Camp, Near Durga Mandir Wani Road**	**Bore well water at Gramin Rugnalaya Ballarpur**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
13.	Total Residual Chlorine	mg/L	**0.2**	0.06	BDL	BDL
14.	Cyanide (as CN)	mg/L	**1.5**	ND	ND	ND
15.	Fluoride (as F)	mg/L	**1**	0.537	0.475	0.66
16.	Sulphide (as S^{2-})	mg/L	**0.05**	BDL	BDL	ND
17.	Dissolved Phosphate (as P)	mg/L		0.06	<0.03	0.039
18.	Sodium Absorption Ratio	mg/L		1.59	1.14	1.496
19.	Total Coliforms	MPN index/ 100 ml	**ND**	23	BDL	12
20.	Faecal Coliforms	MPN index/ 100 ml	**ND**	9.2	BDL	3.6
21.	Total Phosphorous (as P)	mg/L	**0.5**	0.067	0.036	0.050
22.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.224	0.224	0.168
23.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL

Location				**Dug well water from Usgaon Village**	**Borewell Water taken from Bangali Camp, Near Durga Mandir Wani Road**	**Bore well water at Gramin Rugnalaya Ballarpur**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
24.	Phenols (as C_6H_5OH)	mg/L	**0.001**	ND	ND	ND
25.	Surface Active Agents (as MBAS)	mg/L	**0.02**	ND	ND	ND
26.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	**20**	BDL	BDL	BDL
II.	Atrazine	µg/L	**2**	BDL	BDL	BDL
III.	Aldrin	µg/L	**0.03**	BDL	BDL	BDL
IV.	Dieldrin	µg/L	**0.03**	BDL	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL	BDL
VI.	Beta HCH	µg/L	**0.04**	BDL	BDL	BDL
VII.	Delta HCH	µg/L	**125**	BDL	BDL	BDL
VIII.	Butachlor	µg/L	**0.04**	BDL	BDL	BDL
IX.	p,p DDT	µg/L	**1**	BDL	BDL	BDL
X.	o,p DDT	µg/L	**1**	BDL	BDL	BDL
XI.	p,p DDE	µg/L	**1**	BDL	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL	BDL
XIII.	p,p DDD	µg/L	**1**	BDL	BDL	BDL
XIV.	o,p DDD	µg/L	**1**	BDL	BDL	BDL

Location				**Dug well water from Usgaon Village**	**Borewell Water taken from Bangali Camp, Near Durga Mandir Wani Road**	**Bore well water at Gramin Rugnalaya Ballarpur**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XV.	Alpha Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVI.	Beta Endosulfan	µg/L	**0.4**	BDL	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**0.4**	BDL	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**2.0**	BDL	BDL	BDL
27.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.0001**	BDL	BDL	BDL
28.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0005**	BDL	BDL	BDL
29.	Zinc (as Zn)	mg/L	**5.0**	BDL	2.29	BDL
30.	Nickel (as Ni)	mg/L	**0.02**	0.02	0.026	0.022
31.	Copper (as Cu)	mg/L	**0.05**	BDL	0.029	BDL
32.	Hexavalent Chromium (as Cr^{6+})	mg/L	**1**	ND	ND	ND
33.	Total Chromium (as Cr)	mg/L	**0.05**	0.091	0.043	0.079
34.	Total Arsenic (as As)	mg/L	**0.01**	ND	BDL	ND
35.	Lead (as Pb)	mg/L	**0.01**	0.081	0.046	0.07

Location				**Dug well water from Usgaon Village**	**Borewell Water taken from Bangali Camp, Near Durga Mandir Wani Road**	**Bore well water at Gramin Rugnalaya Ballarpur**
Date of Sampling				**07.06.2018**	**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
36.	Cadmium (as Cd)	mg/L	**0.003**	BDL	BDL	BDL
37.	Mercury (as Hg)	mg/L	**0.001**	ND	ND	ND
38.	Manganese (as Mn)	mg/L	**0.1**	0.043	0.16	BDL
39.	Iron (as Fe)	mg/L	**0.3**	0.293	0.526	0.12
40.	Vanadium (as V)	mg/L		0.018	BDL	BDL
41.	Selenium (as Se)	mg/L	**0.01**	ND	ND	ND
42.	Boron (as B)	mg/L		BDL	0.164	0.186

Table No. V

Location				**Bore well Water at Nagar Parishad Near New Fire Station Ballarpur**	**Bore well Water at Visapur Vill**
Date of Sampling				**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
1.	Colour	Hazen		BDL	BDL
2.	Smell	-	**Agreeable**	Agreeable	Agreeable
3.	pH	-	**6.5-8.5**	6.9	6.5

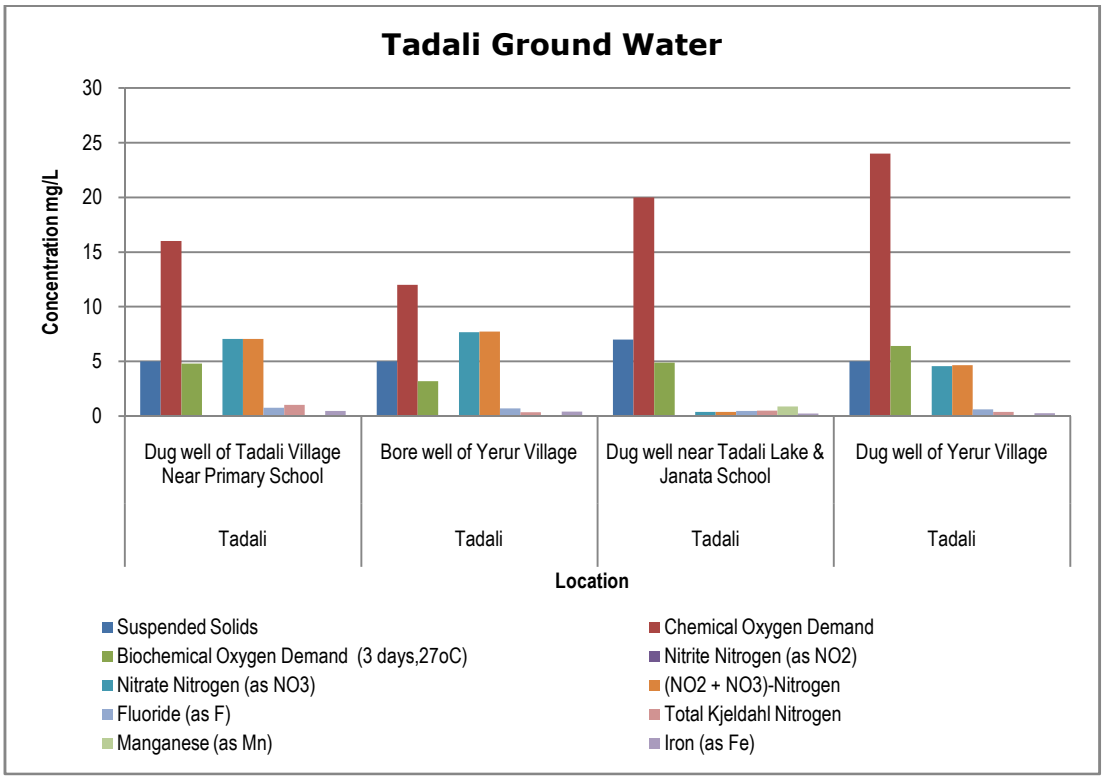
Location				**Bore well Water at Nagar Parishad Near New Fire Station Ballarpur**	**Bore well Water at Visapur Vill**
Date of Sampling				**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
4.	Oil & Grease	mg/L	**100**	ND	ND
5.	Suspended Solids	mg/L	**500**	BDL	BDL
6.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	4	4
7.	Biochemical Oxygen Demand (3 days,27°C)	mg/L	**6 (WHO, 1993)**	<1	1.1
8.	Electrical Conductivity (at 25°C)	µmho/cm	**750**	906	901
9.	Nitrite Nitrogen (as NO_2)	mg/L		BDL	BDL
10.	Nitrate Nitrogen (as NO_3)	mg/L	**1.0**	10.80	5.49
11.	(NO_2 + NO_3)-Nitrogen	mg/L	**45**	10.80	5.50
12.	Free Ammonia (as NH_3-N)	mg/L	**0.5**	BDL	BDL
13.	Total Residual Chlorine	mg/L	**0.2**	BDL	BDL
14.	Cyanide (as CN)	mg/L	**1.5**	ND	ND
15.	Fluoride (as F)	mg/L	**1**	0.605	0.704
16.	Sulphide (as S^{2-})	mg/L	**0.05**	BDL	ND

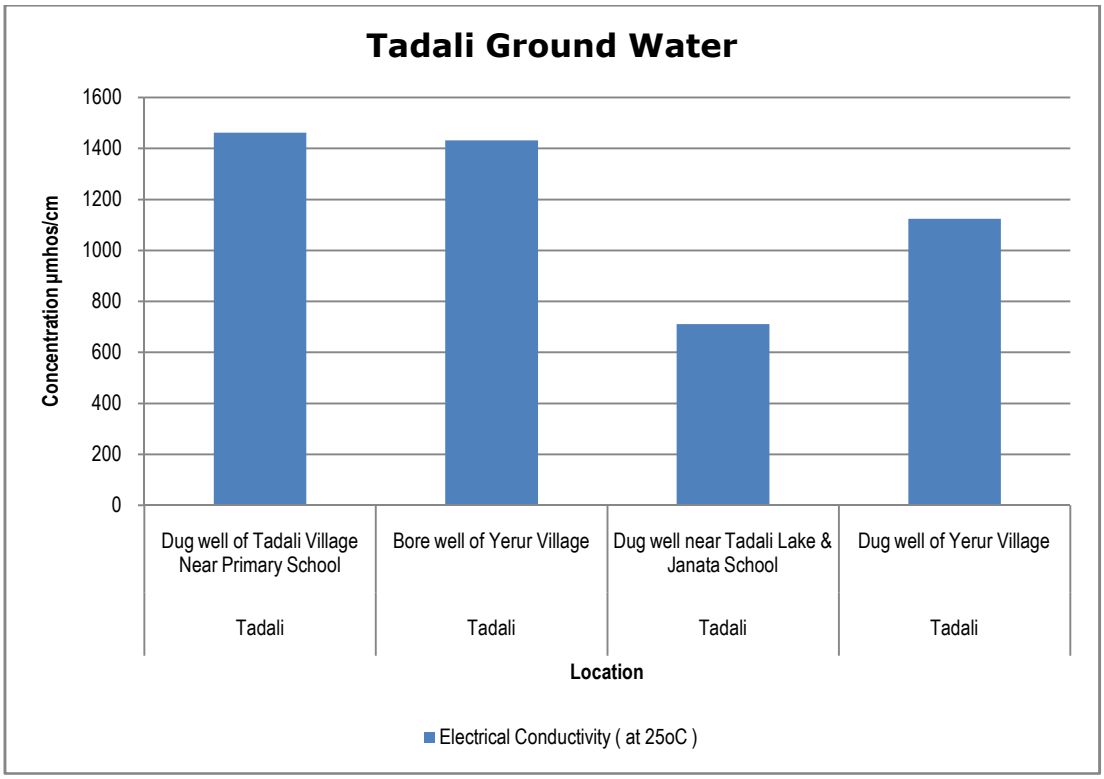
Location				**Bore well Water at Nagar Parishad Near New Fire Station Ballarpur**	**Bore well Water at Visapur Vill**
Date of Sampling				**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
17.	Dissolved Phosphate (as P)	mg/L		0.046	BDL
18.	Sodium Absorption Ratio	mg/L		1.51	2.46
19.	Total Coliforms	MPN index/ 100 ml	**ND**	5.1	BDL
20.	Faecal Coliforms	MPN index/ 100 ml	**ND**	3.6	BDL
21.	Total Phosphorous (as P)	mg/L	**0.5**	0.053	0.032
22.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.336	0.112
23.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL
24.	Phenols (as C_6H_5OH)	mg/L	**0.001**	ND	ND
25.	Surface Active Agents (as MBAS)	mg/L	**0.02**	ND	ND
26.	Organo Chlorine Pesticides				
I.	Alachlor	µg/L	**20**	BDL	BDL
II.	Atrazine	µg/L	**2**	BDL	BDL
III.	Aldrin	µg/L	**0.03**	BDL	BDL

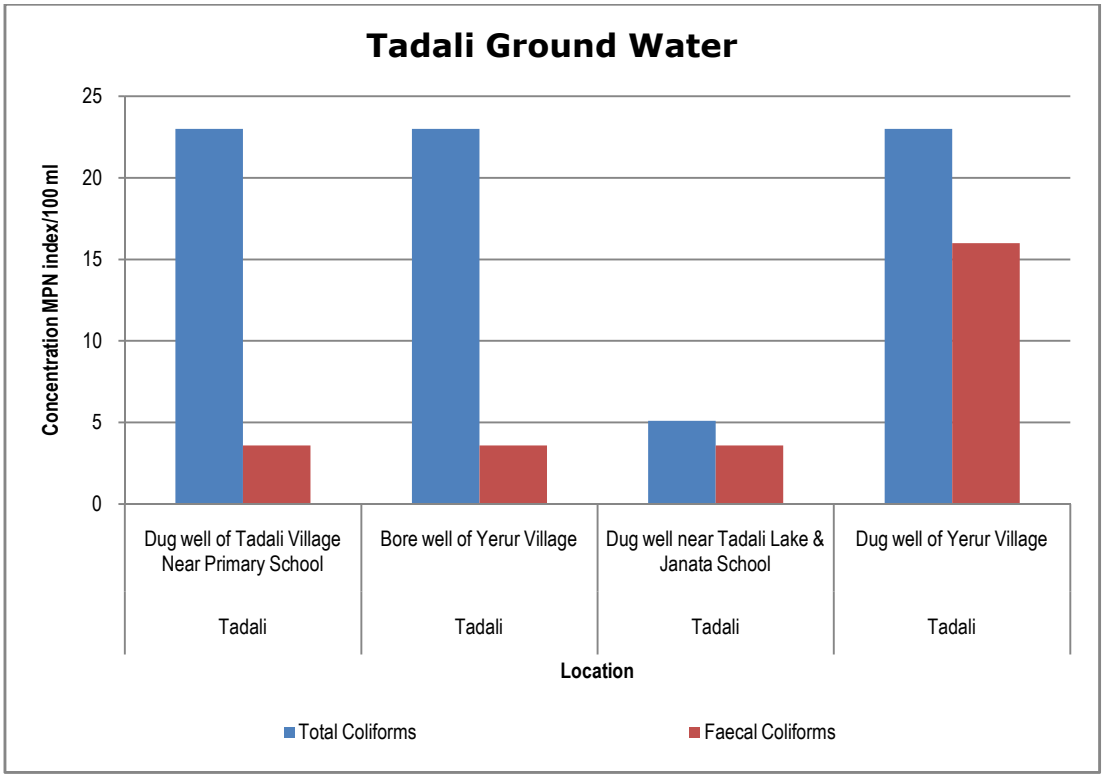
Location				**Bore well Water at Nagar Parishad Near New Fire Station Ballarpur**	**Bore well Water at Visapur Vill**
Date of Sampling				**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
IV.	Dieldrin	µg/L	**0.03**	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL
VI.	Beta HCH	µg/L	**0.04**	BDL	BDL
VII.	Delta HCH	µg/L	**125**	BDL	BDL
VIII.	Butachlor	µg/L	**0.04**	BDL	BDL
IX.	p,p DDT	µg/L	**1**	BDL	BDL
X.	o,p DDT	µg/L	**1**	BDL	BDL
XI.	p,p DDE	µg/L	**1**	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL
XIII.	p,p DDD	µg/L	**1**	BDL	BDL
XIV.	o,p DDD	µg/L	**1**	BDL	BDL
XV.	Alpha Endosulfan	µg/L	**0.4**	BDL	BDL
XVI.	Beta Endosulfan	µg/L	**0.4**	BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**0.4**	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**2.0**	BDL	BDL
27.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.0001**	BDL	BDL
28.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0005**	BDL	BDL
29.	Zinc (as Zn)	mg/L	**5.0**	0.076	0.055

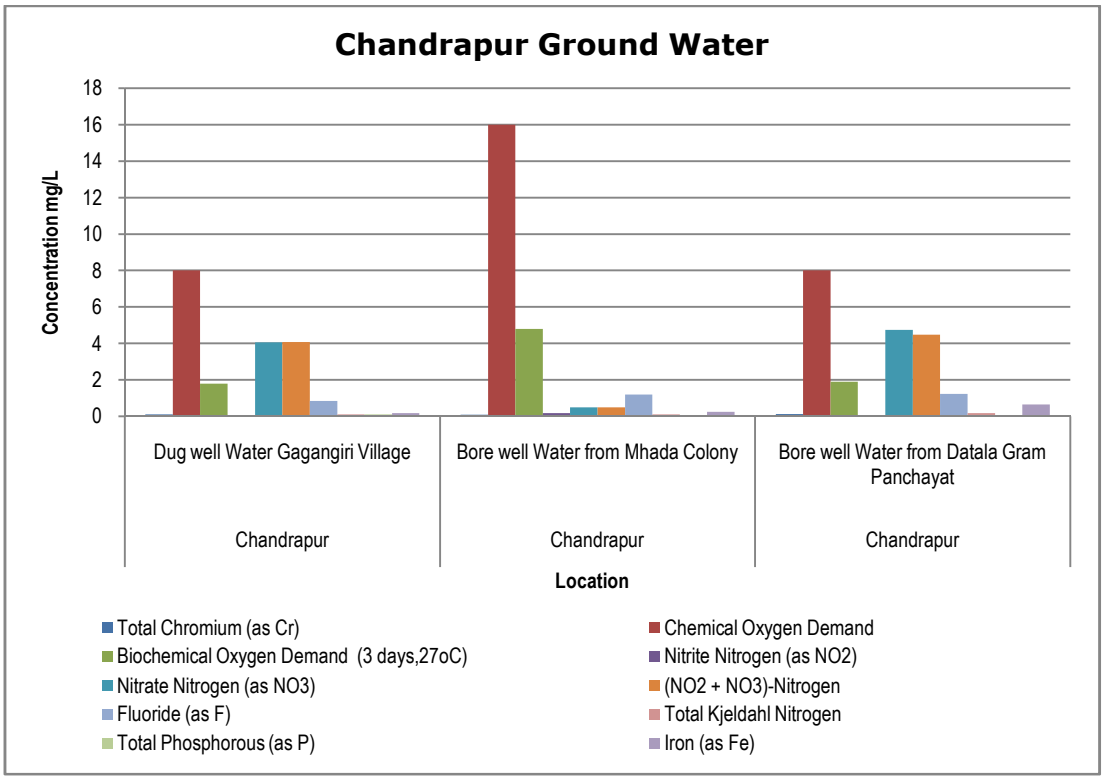
Location				**Bore well Water at Nagar Parishad Near New Fire Station Ballarpur**	**Bore well Water at Visapur Vill**
Date of Sampling				**07.06.2018**	**07.06.2018**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
30.	Nickel (as Ni)	mg/L	**0.02**	0.021	0.017
31.	Copper (as Cu)	mg/L	**0.05**	BDL	BDL
32.	Hexavalent Chromium (as Cr^{6+})	mg/L	**1**	ND	ND
33.	Total Chromium (as Cr)	mg/L	**0.05**	0.056	0.101
34.	Total Arsenic (as As)	mg/L	**0.01**	ND	ND
35.	Lead (as Pb)	mg/L	**0.01**	0.076	0.097
36.	Cadmium (as Cd)	mg/L	**0.003**	BDL	BDL
37.	Mercury (as Hg)	mg/L	**0.001**	ND	ND
38.	Manganese (as Mn)	mg/L	**0.1**	0.047	BDL
39.	Iron (as Fe)	mg/L	**0.3**	0.124	0.03
40.	Vanadium (as V)	mg/L		BDL	BDL
41.	Selenium (as Se)	mg/L	**0.01**	ND	ND
42.	Boron (as B)	mg/L		0.173	0.167

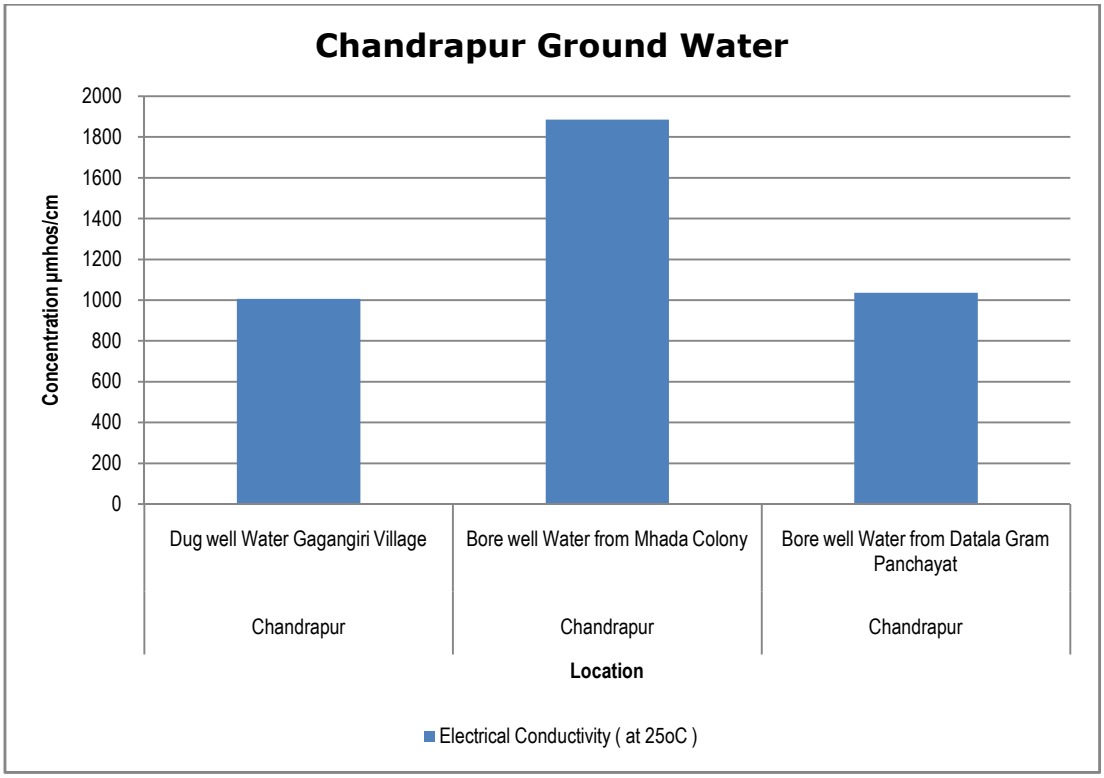
Graphs: Ground Water Quality Monitoring for Chandrapur:

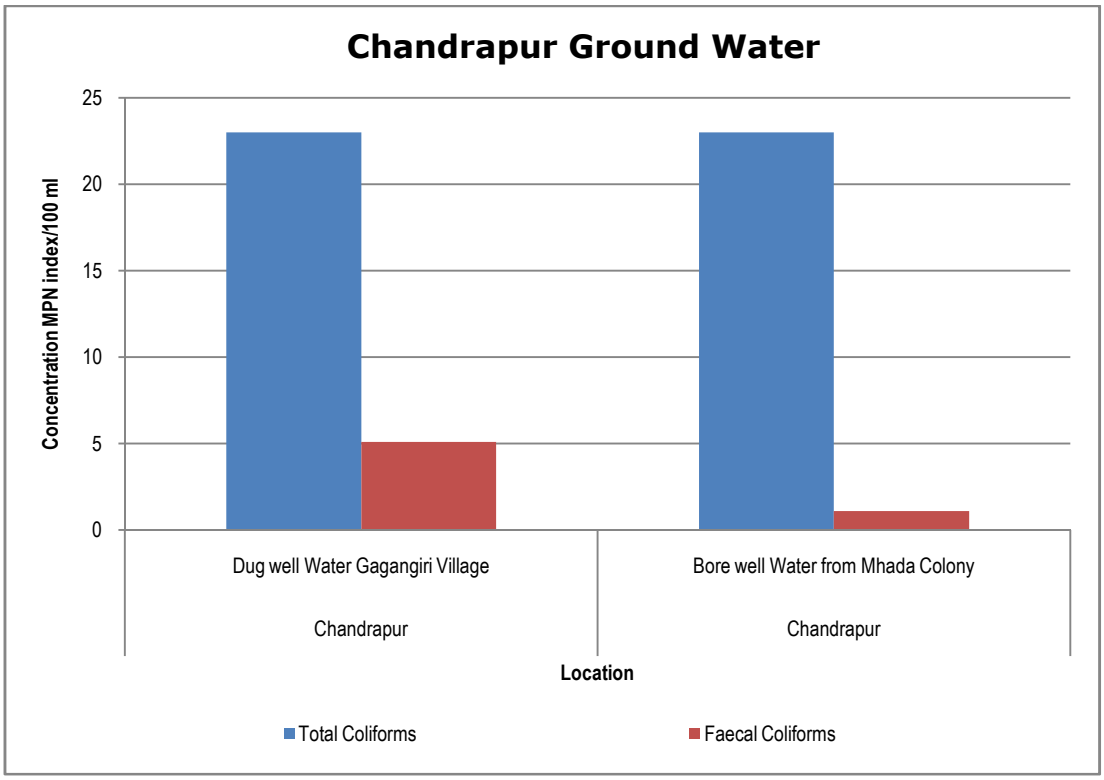


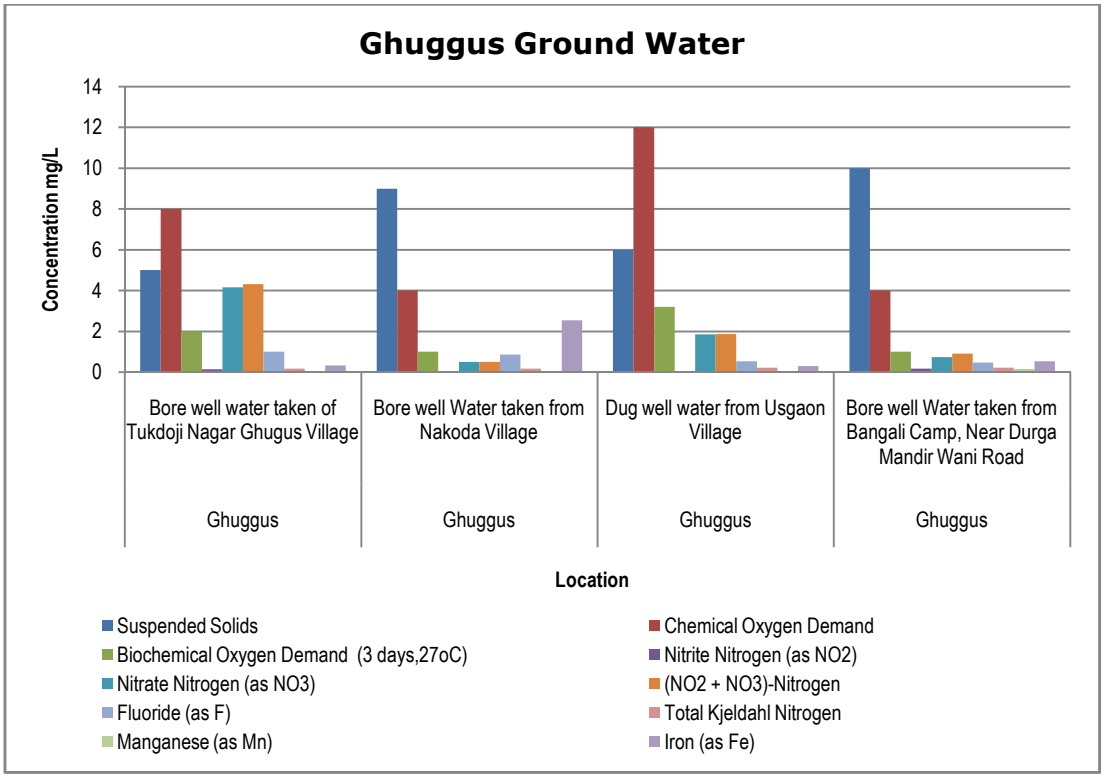


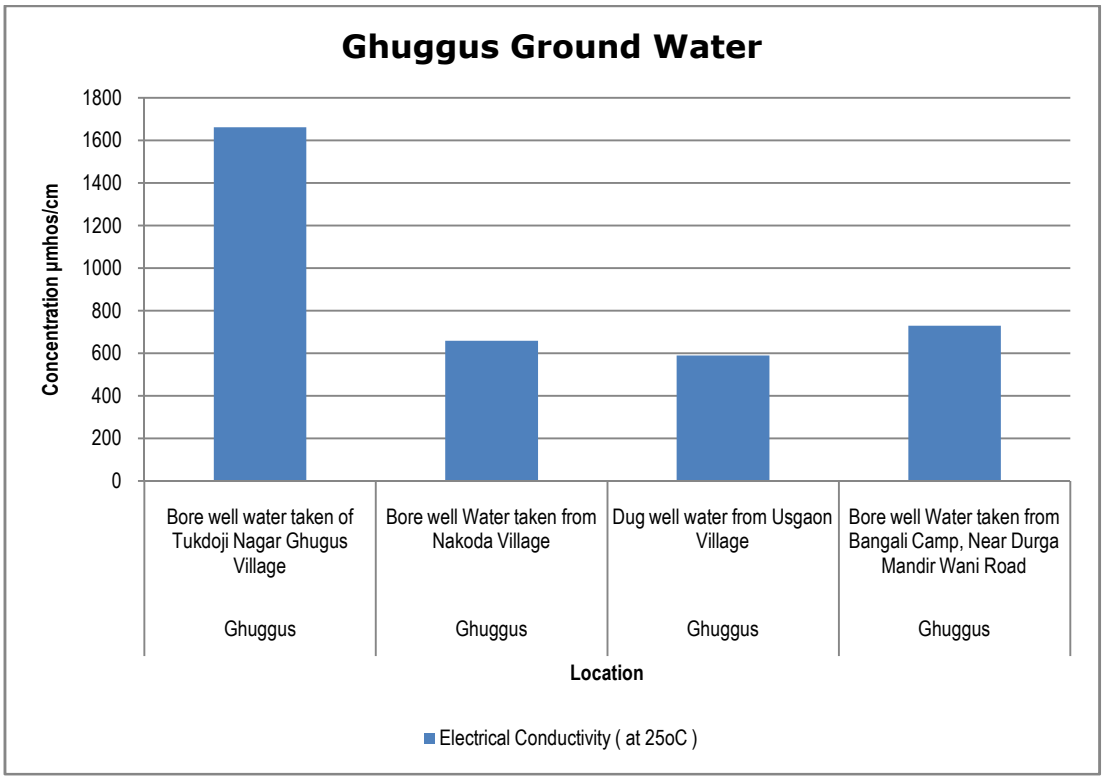

Tadali Ground Water
Concentration MPN index/100 ml
25
20
15
10
5
0
Dug well of Tadali Village Near Primary School
Bore well of Yerur Village
Dug well near Tadali Lake & Janata School
Dug well of Yerur Village
Tadali
Tadali
Tadali
Tadali
Location
Total Coliforms
Faecal Coliforms

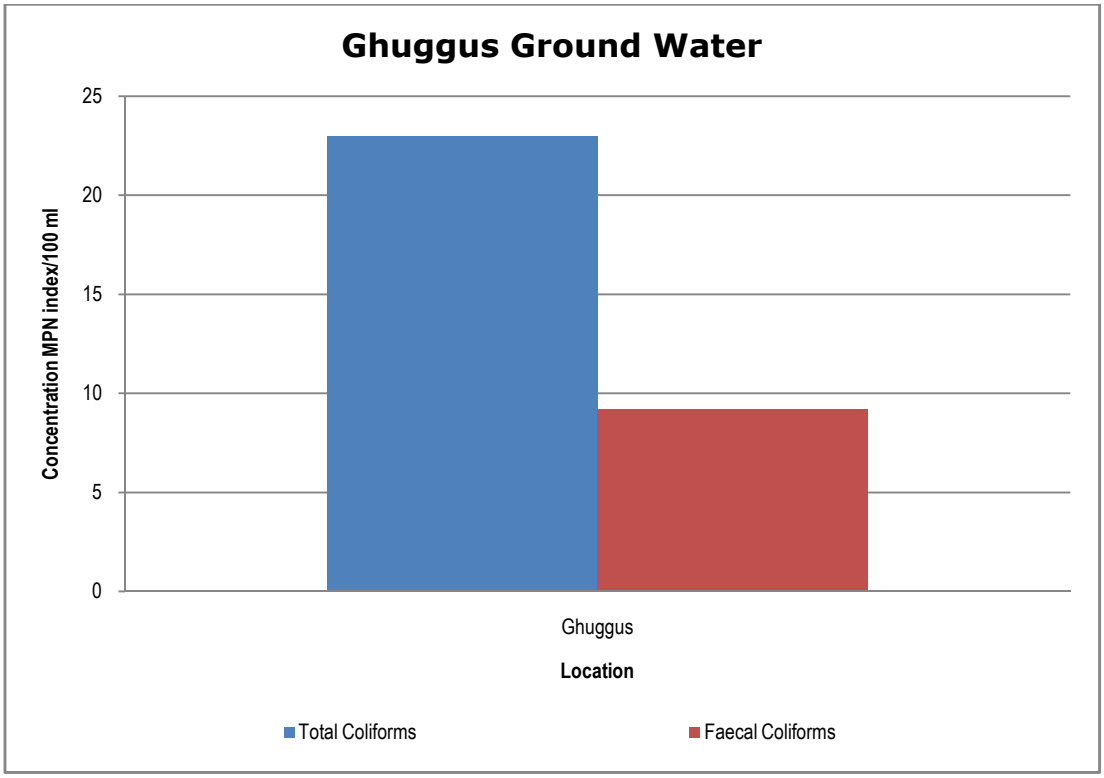

Chandrapur Ground Water
Concentration mg/L
18
16
14
12
10
8
6
4
2
0
Dug well Water Gagangiri Village
Bore well Water from Mhada Colony
Bore well Water from Datala Gram Panchayat
Chandrapur
Chandrapur
Chandrapur
Location
Total Chromium (as Cr)
Chemical Oxygen Demand
Biochemical Oxygen Demand (3 days,27oC)
Nitrite Nitrogen (as NO2)
Nitrate Nitrogen (as NO3)
(NO2 + NO3)-Nitrogen
Fluoride (as F)
Total Kjeldahl Nitrogen
Total Phosphorous (as P)
Iron (as Fe)

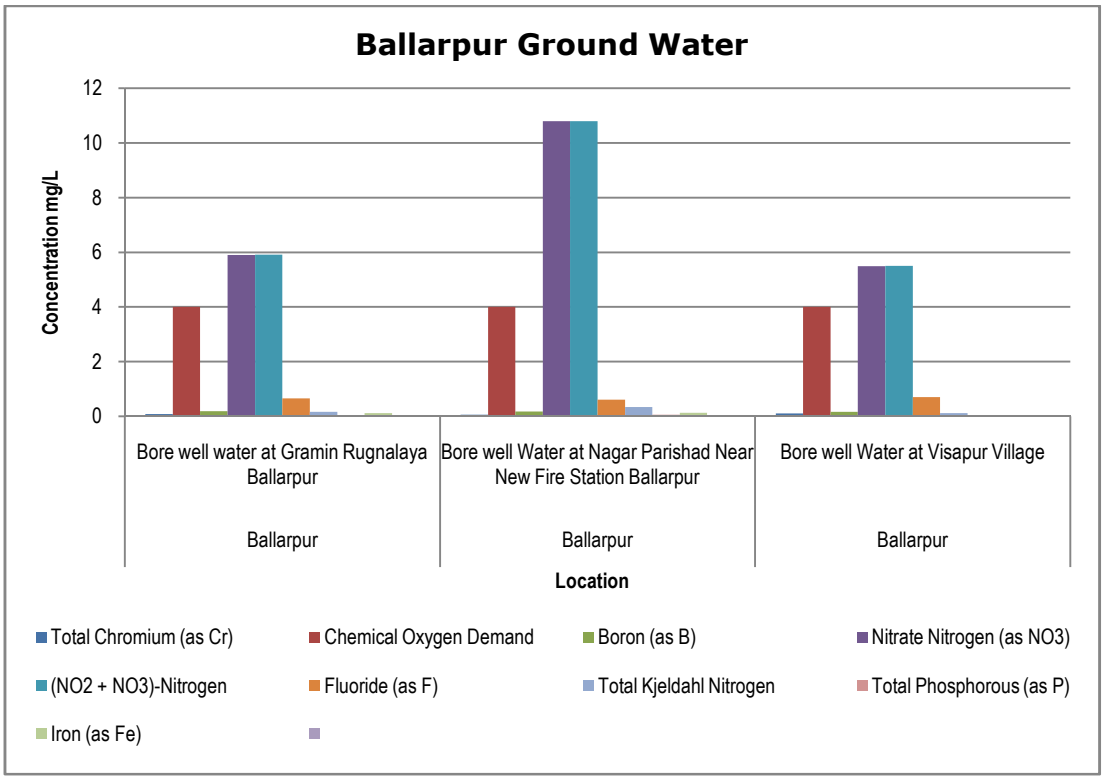

Chandrapur Ground Water
Concentration µmhos/cm
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Dug well Water Gagangiri Village
Bore well Water from Mhada Colony
Bore well Water from Datala Gram Panchayat
Chandrapur
Chandrapur
Chandrapur
Location
Electrical Conductivity (at 25oC)

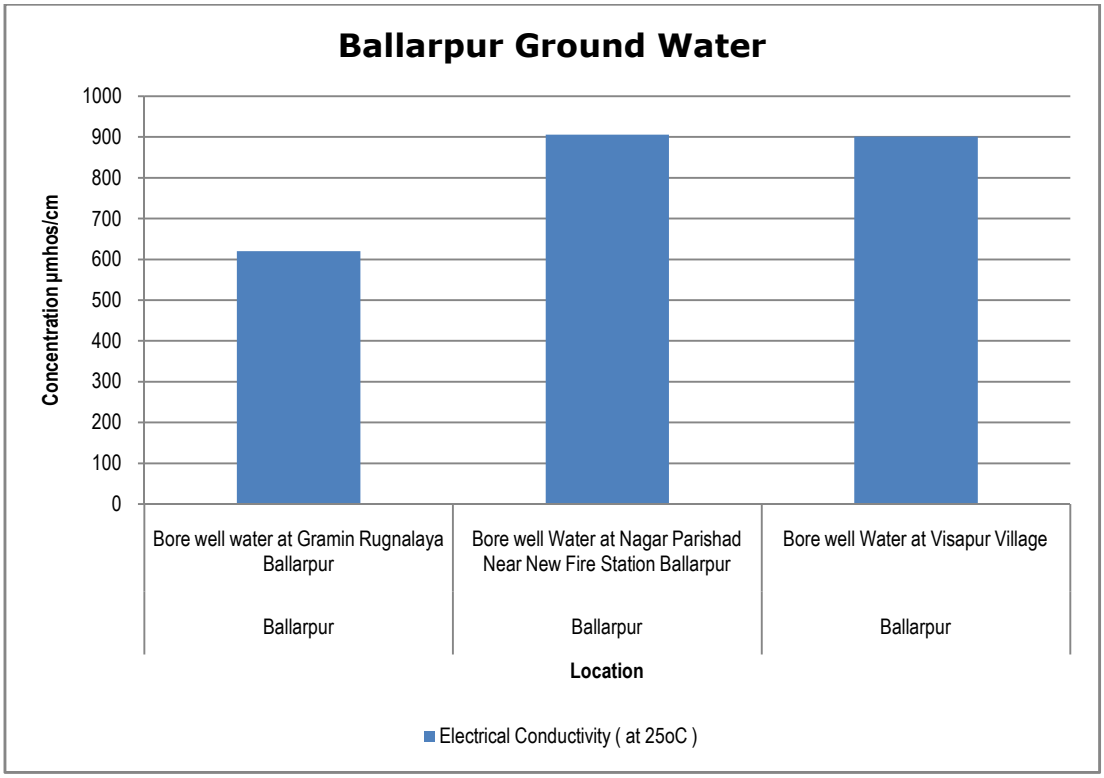

Chandrapur Ground Water
Concentration MPN index/100 ml
25
20
15
10
5
0
Dug well Water Gagangiri Village
Bore well Water from Mhada Colony
Chandrapur
Chandrapur
Location
Total Coliforms
Faecal Coliforms

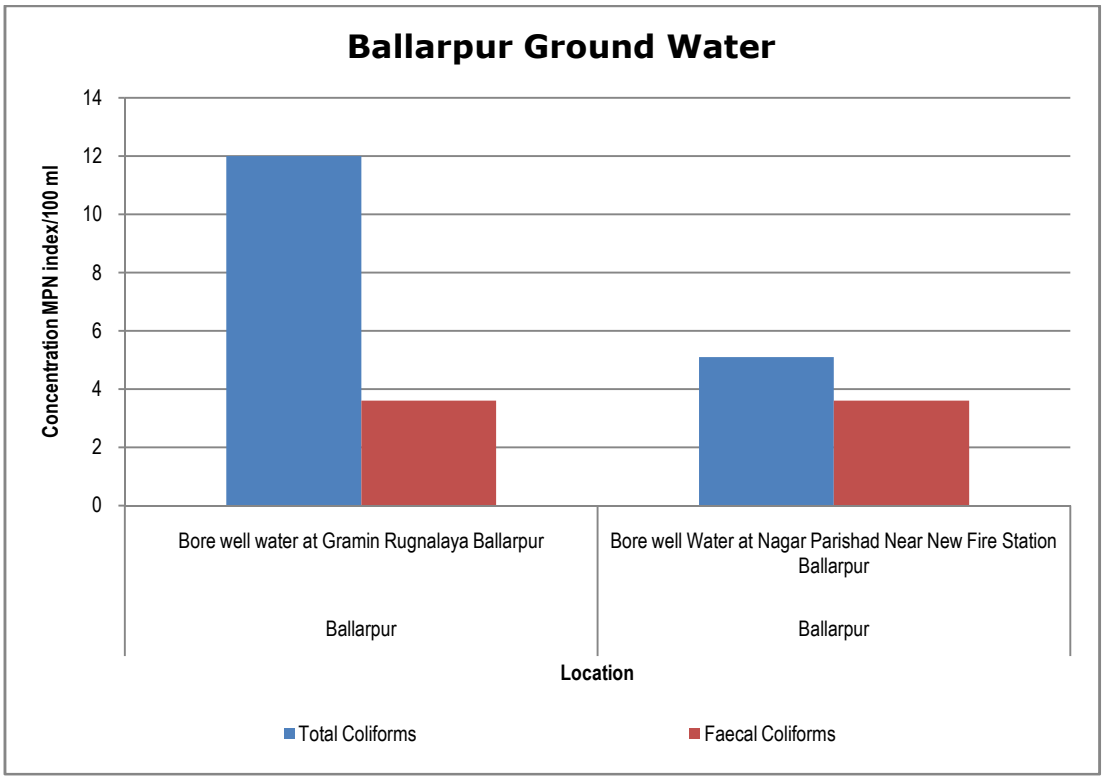

Ghuggus Ground Water
Concentration mg/L
14
12
10
8
6
4
2
0
Bore well water taken of Tukdoji Nagar Ghugus Village
Bore well Water taken from Nakoda Village
Dug well water from Usgaon Village
Bore well Water taken from Bangali Camp, Near Durga Mandir Wani Road
Ghuggus
Ghuggus
Ghuggus
Ghuggus
Location
Suspended Solids
Chemical Oxygen Demand
Biochemical Oxygen Demand (3 days,27oC)
Nitrite Nitrogen (as NO2)
Nitrate Nitrogen (as NO3)
(NO2 + NO3)-Nitrogen
Fluoride (as F)
Total Kjeldahl Nitrogen
Manganese (as Mn)
Iron (as Fe)


Ghuggus Ground Water
Concentration µmhos/cm
1800
1600
1400
1200
1000
800
600
400
200
0
Bore well water taken of Tukdoji Nagar Ghugus Village
Bore well Water taken from Nakoda Village
Dug well water from Usgaon Village
Bore well Water taken from Bangali Camp, Near Durga Mandir Wani Road
Ghuggus
Ghuggus
Ghuggus
Ghuggus
Location
Electrical Conductivity (at 25oC)


Ghuggus Ground Water
25
20
15
10
5
0
Concentration MPN index/100 ml
Ghuggus
Location
Total Coliforms
Faecal Coliforms


Ballarpur Ground Water
12
10
8
6
4
2
0
Concentration mg/L
Bore well water at Gramin Rugnalaya Ballarpur
Bore well Water at Nagar Parishad Near New Fire Station Ballarpur
Bore well Water at Visapur Village
Ballarpur
Ballarpur
Ballarpur
Location
Total Chromium (as Cr)
Chemical Oxygen Demand
Boron (as B)
Nitrate Nitrogen (as NO3)
(NO2 + NO3)-Nitrogen
Fluoride (as F)
Total Kjeldahl Nitrogen
Total Phosphorous (as P)
Iron (as Fe)


Ballarpur Ground Water
Concentration µmhos/cm
1000
900
800
700
600
500
400
300
200
100
0
Bore well water at Gramin Rugnalaya Ballarpur
Bore well Water at Nagar Parishad Near New Fire Station Ballarpur
Bore well Water at Visapur Village
Ballarpur
Ballarpur
Ballarpur
Location
Electrical Conductivity (at 25oC)


Ballarpur Ground Water
Concentration MPN index/100 ml
14
12
10
8
6
4
2
0
Bore well water at Gramin Rugnalaya Ballarpur
Bore well Water at Nagar Parishad Near New Fire Station Ballarpur
Ballarpur
Ballarpur
Location
Total Coliforms
Faecal Coliforms

4. Summary and Conclusion

Based on the study done, the results are summarised and concluded as follows:

4.1 Stack Emission Monitoring:

A) Tadali MIDC

At Tadali MIDC, six samples were collected from different industries.

1. **Particulate Matter**: At all locations monitored, particulate matter was within the limit.

2. **Sulphur Dioxide:** The concentration of sulfur dioxide varied between minimum of 147 mg/Nm^3 to 935 mg/Nm^3. This however, will depend on the fuel used and load allotted in the consent. Maximum concentration was found at Gopani Iron & Power (India) Pvt. Ltd. Unit -2, 300MW Power Plant.

3. **Nitrogen Dioxide**: Only at Gopani Iron & Power (India) Pvt. Ltd. Unit -2, 300MW Power Plant, Nitrogen dioxide have exceeded the standard limit with 193 mg/Nm^3.

4. **Carbon Monoxide**: At Gopani Iron & Power (India) Pvt. Ltd. SMS (Furnace) 3 & 4 have the highest range of 951 mg/Nm^3 was observed.

5. **Volatile Organic Compounds:** At Tadali MIDC, VOCs were monitored in following stacks of following industries.

    a) **Gopani Iron Pvt. Ltd**. **SMS (Furnace) 1 & 2**: Only Benzene (0.002 mg/Nm^3) was observed and all other VOCs were not detected.

    b) **Grace Industries**: At Grace Industries, registered total of 0.002 mg/Nm^3 and only Benzene was the only VOCs were detected.

B) Chandrapur MIDC:

At Chandrapur MIDC, six samples were collected from different industries.

1. **Particulate Matter**: At all locations monitored, particulate matter was within the limit.

2. **Sulphur Dioxide**: Out of the 6 stacks monitored only two stack result was observed well within the limits. The highest level of SO_2 was observed at Multi Organics Ltd. boiler stack No. 2604 with 676 mg/Nm^3.

3. **Nitrogen Dioxide:** At 2 locations monitored, Nitrogen dioxide exceeded the limit of standard prescribed. The highest level of NO_2 was observed at Maharashtra Carbon Pvt. Ltd. with 114 mg/Nm^3.

4. **Carbon Monoxide:** Values varied between minimum of 1.28 mg/Nm^3 and maximum of 94 mg/Nm^3.

5. **Volatile Organic Compounds**: At Chandrapur MIDC, VOCs were monitored in following stacks of following industries.

a) **Multiorganic Industries Pvt. Ltd.:** Only Benzene (0.001 mg/Nm^3) was observed and all other VOCs were not detected.

b) **Super Hygienic Ltd.:** Only Benzene (0.005 mg/Nm^3) was observed and all other VOCs were not detected.

C) Ghugus MIDC:

At Ghugus MIDC, three samples were collected from different industries.

1. **Particulate Matter**: At all locations monitored, particulate matter was within the limit except at ACC Cement Ltd. Boiler Stack 15MW and Kiln RABH with 56 mg/Nm^3 and 51 mg/Nm^3 respectively.

2. **Sulphur Dioxide**: Emission level of Sulphur Dioxide concentration was high at all places ranging between 329 mg/Nm^3 and 618 mg/Nm^3. The emission level however may depend upon fuel and allotted load.

3. **Nitrogen Dioxide**: At all locations monitored, Nitrogen dioxide was within the limit.

4. **Carbon Monoxide**: The highest concentration CO was observed at Lloyds Metal and Energy 100 TPD Kiln 1 & 2 with 118 mg/Nm^3.

5. **Volatile Organic Compounds:** At Ghugus MIDC, VOCs were monitored in following stacks of following industries.

   a) **Lloyds Metal 100 TPD Kiln 3 & 4**: Only Benzene (0.33 mg/Nm^3) was observed and all other VOCs were not detected.

   b) **ACC Cement Kiln RABH**: Only Benzene (0.005 mg/Nm^3) was observed and all other VOCs were not detected.

D) Ballarpur MIDC:

At Ballarpur MIDC, four samples were collected from different industries.

1. **Particulate Matter:** Concentration of Particulate matter was well within the range not exceeding at any one of the stacks.

2. **Sulphur Dioxide:** Out of six stacks monitored, Ballarpur Paper Mill, 2 stacks displayed value of 819 and 1232 mg/Nm^3.

3. **Nitrogen Dioxide:** Emission level of 2 stacks from Ballarpur Paper Mill exceeded the standard limit and had values of 128 mg/Nm^3 and 144 mg/Nm^3.

4. **Carbon Monoxide:** The concentration of CO in all 4 stacks ranged between 12.5 mg/Nm^3 and 17.9 mg/Nm^3.

5. **Volatile Organic Compounds:** At Ballarpur MIDC, VOCs were monitored in following stacks of following industries.

   a) **Bamni Proteins:** Benzene (0.008 mg/Nm^3) was only observed at Bamni Proteins.

b) **BILT Graphic PPL:** Only Benzene (0.007 mg/Nm^3) was observed and all other VOCs were not detected.

4.2 Ambient Air Quality Monitoring:

A) MIDC Tadali: In this industrial cluster the following locations were monitored namely Dhariwal Infrastructure Ltd., MIDC Water Treatment Plant and Grace Industries Ltd. Each location was monitored for 12 parameters as per NAAQS.

1. **Sulphur Dioxide (SO_2):** Concentration of Sulphur dioxide in Tadali MIDC Area varied between lowest of 8 µg/m^3 to maximum of 12.1 µg/m^3. This area displaced a clear picture of Sulfur Dioxide concentration.

2. **Nitrogen Dioxide (NO_x):** Concentration varied between 13.5 µg/m^3 and 17.7 µg/m^3 which are well below the standard laid down by CPCB.

3. **Particulate Matter (PM_{10})**: Particulate matter in these area at all three locations monitored was well below the standard laid down by CPCB.

4. **Particulate Matter ($PM_{2.5}$):** Concentration of $PM_{2.5}$ also at all three locations monitored was well below the standard laid down by CPCB.

5. **Ozone (O_3)**: Ozone concentration was detected only at Grace Industries Ltd. and was within the standard limit prescribed.

6. **Lead (Pb):** Concentration of Lead was observed below the detectable limit at all three locations monitored.

7. **Carbon Monoxide (CO):** Concentration of Carbon Monoxide also at all three locations monitored was well below the standard laid down by CPCB.

8. **Ammonia (NH_3):** Concentration of Ammonia was below detectable limit in all three locations monitored.

9. **Benzene (C_6H_6):** Sampling and analysis at all three locations show, Benzene value was within the standard limit prescribed.

10. **Benzo (a) Pyrene (BaP):** BaP was not detectable at Grace Industries Ltd. and at the other two locations it was below the detectable limit.

11. **Arsenic (As):** Concentration of Arsenic was well below the standard prescribed by CPCB.

12. **Nickel (Ni):** Concentration of Nickel also was observed below the detectable limit at all three locations monitored.

B) MIDC Chandrapur: At Chandrapur MIDC, following locations were monitored namely Green Tech, MIDC Office and HPCL. Following are the findings based on the analytical values:

1. **Sulphur Dioxide (SO_2):** Values ranged between minimum of 9 µg/m^3 at HPCL and 12 µg/m^3 at MIDC office.

2. **Nitrogen Dioxide (NO_x):** The concentration of NO_X ranged from 13.7 µg/m^3 at HPCL and 18.2 µg/m^3 at MIDC office.

3. **Particulate Matter (PM_{10}):** At all locations monitored, PM_{10} was within the limit.

4. **Particulate Matter ($PM_{2.5}$):** $PM_{2.5}$ values at all locations were also well within the limit.

5. **Ozone (O_3):** Ozone was detected only at HPCL with 39.5 µg/m^3.

6. **Lead (Pb):** Lead wad below the detectable limit in all three location of Chandrapur MIDC.

7. **Carbon Monoxide (CO):** All values of Carbon monoxide were as per the standard value.

8. **Ammonia (NH_3):** Values are below the detectable limit.

9. **Benzene (C_6H_6)**: At Green Tech 8 µg/m^3 Benzene was detected which is more than the standard limit of 5 µg/m^3.

10. **Benzo (a) Pyrene** (**BaP):** BaP was not detectable at all 3 locations monitored.

11. **Arsenic (As):** Concentration of Arsenic in the ambient air at all the three locations of Chandrapur MIDC is within the stipulated limits.

12. **Nickel (Ni):** Concentration of Nickel also in the ambient air at all the three locations of Chandrapur MIDC is within the stipulated limits.

C) MIDC Ghugus: At MIDC Ghugus three locations of ambient air quality were monitored.

1. **Sulphur Dioixide (SO_2):** Values were well within the range, highest being 16.4 µg/m^3 at Lloyds Metal and lowest being at Lloyds Colony i.e. 8.6 µg/m^3.

2. **Nitrogen Dioxide (NO_x):** Values of Nitrogen dioxide ranged between 13.2 µg/m^3 and 15.8 µg/m^3 at Transit Hostel Rajiv Colony WCL and at Lloyd Metal respectively.

3. **Particulate Matter (PM_{10}):** With reference to the concentration of PM_{10} values, Lloyds Metal has the highest values with 71 µg/m^3 but was below the prescribed standard limit of 100 µg/m^3.

4. **Particulate Matter ($PM_{2.5}$):** At all three locations monitored, the values were well within the standard limit.

5. **Ozone (O_3):** Ozone was detected at Transit Hostel WCL with 7.3 µg/m^3.

6. **Lead (Pb):** Values at all three locations are below detectable level.

7. **Carbon Monoxide (CO):** Values are well within the standard limit of 4 ng/m^3.

8. **Ammonia (NH_3):** Values of all three locations are below the detectable limit.

9. **Benzene (C_6H_6):** Values at Transit Hostel WLC exceed the limit with 5.79 µg/m^3.

10. **Benzo (a) Pyrene (BaP):** BaP was not detectable at all 3 locations monitored.

11. **Arsenic (As):** Concentration of Arsenic in the ambient air at all the three locations is within the stipulated limits.

12. **Nickel (As):** Nickel is detected only at Lloyds Metal with 4.6 µg/m^3.

D) MIDC Ballarpur: MIDC Ballarpur area was monitored at three following locations (i) Ram Mandir (ii) BILT Colony and (iii) WCL.

1. **Sulphur Dioxide (SO_2)**: Values are below the standard values.
2. **Nitrogen Dioxide (NO_x)**: All the values are within limit.
3. **Particulate Matter (PM_{10}):** Values of all three locations are well within the standard limit.
4. **Particulate Matter ($PM_{2.5}$):** Values of $PM_{2.5}$ of all three locations are also well within the standard limit.
5. **Ozone (O_3):** Ozone was detected at WCL only with 5.6 µg/m^3.
6. **Lead (Pb):** Values at all three locations are below detectable level.
7. **Carbon Monoxide (CO):** Values are below the standard value ranging between 1.06 mg/$m^3$and 1.27 mg/m^3.
8. **Ammonia (NH_3)**: Values of ammonia are below the detectable limit in all three locations monitored.
9. **Benzene (C_6H_6)**: Concentration of Benzene is well within the standard limit at all three locations monitored.
10. **Benzo (a) Pyrene (BaP):** BaP was not detectable at all 3 locations monitored.
11. **Arsenic (As)**: Values are below the standard limit.
12. **Nickel (Ni)**: Nickel was detected only at WCL with 4.2 ng/m^3.

4.3 Waste Water Quality Monitoring:

A) Tadali MIDC:5 surface water samples were monitored from MIDC Tadali

1. **pH**: Is in the range of 6.8 to 7.9.
2. **Suspended Solids**. Suspended solids are detected only at 3 water samples out of the 5 samples collected and the values observed were well within the standards prescribed.
3. **COD**: Chemical oxygen demand varies between minimum of 4 mg/L to a maximum of 52 mg/L and is well within the limit.
4. **BOD:** Values range between 2 mg/L to 14 mg/L and are within the limit.
5. **Nitrates:** Results are within the acceptable standard of limit.
6. **Surface Active Agent:** It was observed only at GIPL nallah and at all other location it was below the detectable limit.

7. **Residual Chlorine:** Residual Chlorine was below the detectable limit at all 5 locations monitored.

8. **Sulphide**: At 2 locations monitored it was below the detectable limit and at the remaining three locations it was not detectable.

9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.

10. **Cyanide and Phenol**: Cyanide and Phenol is not detected at all 5 locations monitored.

11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.

12. **PAH & PCBs:** Also below the detectable limit.

B) Chandrapur MIDC:3 surface water and 3 waste water was analysed for Chandrapur MIDC

1. **pH**: Is in the range of 6.2 to 8.3.

2. **Suspended Solids**. Values range from 9 mg/L and maximum of 61 mg/L.

3. **COD**: The concentration of Chemical oxygen demand exceed at Nallah opp. Manidhari Industry with 304 mg/L.

4. **BOD:** The concentration of Bilogical oxygen demand also exceed at Nallah opp. Manidhari Industry with 100 mg/L.

5. **Nitrates:** all the values obtained are well within the acceptable standard limit prescribed.

6. **Surface Active Agent:** It was observed only at Nallah opp. Manidhari Industry and ETP Outlet of Super Hygienic and is well within the standard limit.

7. **Residual Chlorine:** Residual Chlorine of 4 locations was below the detectable limit and at the remaining two locations are well within the standard limit.

8. **Sulphide**: It was observed only at Nallah opp. Manidhari Industry and was well within the limit.

9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.

10. **Cyanide and Phenol**: Cyanide is not detected at any location and Phenols are obtained at 3 locations and well within the limits.

11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.

12. **PAH & PCBs:** Also below the detectable limit.

C) Ghugus MIDC: 5 surface water was collected from this MIDC:

1. **pH**: Is in the range of 7.4 to 8.
2. **Suspended Solids**. Values range between 11 mg/L and maximum of 20 mg/L.
3. **COD**: The concentration of Chemical oxygen demand was well within the limit in all five locations monitored.
4. **BOD:** The concentration of Biological oxygen demand was also well within the limit in all five locations monitored.
5. **Nitrates:** Within the acceptable standard of limit.
6. **Surface Active Agent:** At all five locations the values are below the detectable limit.
7. **Residual Chlorine:** Residual Chlorine of all five locations was below the detectable limit.
8. **Sulphide**: Sulphide concentration of all five locations was also below the detectable limit.
9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.
10. **Cyanide and Phenol**: Cyanide and phenol is not detected at any location monitored.
11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.
12. **PAH & PCBs:** Also below the detectable limit.

D) Ballarpur MIDC: Six surface water was collected from MIDC Ballarpur:

1. **pH**: Is in the range of 6.3 to 7.3.
2. **Suspended Solids**. Values range between 15 mg/L and maximum of 82 mg/L.
3. **COD**: The concentration of Chemical oxygen demand was well within the limit in all six locations monitored.
4. **BOD:** The concentration of Biological oxygen demand was exceeding the limit at Bhagirathi Nallah Bridge with 80 mg/L.
5. **Nitrates:** Within the acceptable standard of limit.
6. **Surface Active Agent:** At all six locations monitored, the values were below detectable limit.
7. **Residual Chlorine:** Residual Chlorine was only observed at BILT RCC Pipe Outlet and was well within the limits.
8. **Sulphide**: It was observed only at Wardha River and Ballarpur Open Cast Mine Discharge and was well within the limit.

9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.

10. **Cyanide and Phenol**: Cyanide is not detected at any location and Phenols are detected at 3 locations and well within the limits.

11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.

12. **PAH & PCBs:** Also below the detectable limit.

4.4 Ground Water Quality Monitoring:

A) Tadali MIDC: 4 ground water samples were monitored from MIDC Tadali

1. **pH**: Is in the range of 6.9 to 7.7.

2. **Suspended Solids**. It is not detectable in all 4 samples collected.

3. **COD**: Chemical oxygen demand is exceeding the standard limit prescribed at all 4 locations monitored and varies between minimum of 24 mg/L to a maximum of 12 mg/L.

4. **BOD:** The value of BOD exceeds at Dugwell of Yerur Village with 6.4 mg/L.

5. **Nitrates:** The concentration of nitrates is high at three out of 4 locations monitored.

6. **Surface Active Agent:** It is not detectable in all 4 samples collected.

7. **Residual Chlorine:** Residual Chlorine is below the detectable limit in 3 samples monitored and at one location the value is not detectable.

8. **Sulphide**: It is not detectable in all 4 samples collected.

9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.

10. **Cyanide and Phenol**: Cyanide and phenols is not detected at any.

11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.

12. **PAH & PCBs:** Also below the detectable limit.

B) Chandrapur MIDC: 3 ground water samples was analysed for Chandrapur MIDC

1. **pH**: Is in the range of 7.2 to 7.7.

2. **Suspended Solids**. It is not detectable in all 3 samples collected.

3. **COD**: The concentration of Chemical oxygen demand at Borewell Water from Mhada Colony exceeds the standard limit with 16 mg/L.

4. **BOD:** The concentration of BOD is also well within the limits in all 3 samples collected.
5. **Nitrates:** The concentration of Nitrate exceeded the standard limit at 2 locations out of the 3 locations monitored.
6. **Surface Active Agent:** It is not detectable in all 3 samples collected.
7. **Residual Chlorine:** Residual Chlorine of all 3 locations was below the detectable limit.
8. **Sulphide**: It is not detectable in all 3 samples collected.
9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.
10. **Cyanide and Phenol**: Cyanide and phenols is not detected at any location monitored.
11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.
12. **PAH & PCBs:** Also below the detectable limit.

C) Ghugus MIDC: 3 ground water samples was collected from this MIDC:

1. **pH**: Is in the range of 6.2 to 8.
2. **Suspended Solids**. The values observed in all 3 samples collected are well within the limit.
3. **COD**: The concentration of Chemical oxygen demand exceeded at Dugwell water from Usgaon Village.
4. **BOD:** The concentration of Biological oxygen demand was well within the limit in all 3 locations monitored.
5. **Nitrates:** The concentration of Nitrates exceeded at Borewell water taken of Tukdoji Nagar and Dug well water from Usgaon Village.
6. **Surface Active Agent:** It is not detectable in all 3 samples collected.
7. **Residual Chlorine:** Residual Chlorine of 3 locations was below the detectable limit and at Dug well water from Usgaon Village is 0.06 mg/L.
8. **Sulphide**: It is below the detectable limit at all 3 samples collected.
9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, Mercury are below the prescribed limits.
10. **Cyanide and Phenol**: Cyanide and Phenols is not detected at any location.
11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.
12. **PAH & PCBs:** Also below the detectable limit.

D) Ballarpur MIDC: 3 ground water samples was collected from MIDC Ballarpur:

1. **pH**: Is in the range of 6.5 to 7.
2. **Suspended Solids**. It is not detectable in all 3 samples collected.
3. **COD**: The concentration of Chemical oxygen demand was well within the limit in all 3 locations monitored.
4. **BOD:** The concentration of Biological oxygen demand was below the detectable limit at 2 locations monitored and at Borewell Water at Visapur Village is 1.1 mg/L.
5. **Nitrates:** The concentration of nitrates exceeded at all three locations monitored. The highest concentration of 10.8 mg/L was observed at Borewell Water at Nagar Parishad.
6. **Surface Active Agent:** It is not detectable in all 3 samples collected.
7. **Residual Chlorine:** Residual Chlorine was below detectable limit in all 3 samples collected.
8. **Sulphide**: Concentration of Sulphide was below the detectable limit at 2 locations monitored and below the detectable limit at one location monitored.
9. **Metals**: All metals like Zinc, Nickel, Copper, Hexavalent Chromium, Total Chromium, Lead, Cadmium, and Mercury are below the prescribed limits.
10. **Cyanide and Phenol**: Cyanide and Phenols is not detected at any location.
11. **Pesticides:** All analysed pesticides concentration is below the detectable limit.
12. **PAH & PCBs:** Also below the detectable limit.

5. CEPI Score

Comprehensive Environmental Pollution Index (CEPI) is intended to act as early warning tool which helps in categorization of industrial clusters/areas in terms of priority of needing attention.

CPCB had evolved certain methodology to calculate CEPI, in which a score has been fixed for different environmental components based on the level of pollution. The scoring system involves an algorithm that takes into account the basic selection criteria. This approach is based on the basic hazard assessment logic that can be summarized as below.

Hazard = pollutant source, pathways, and receptor

CPCB has calculated CEPI for the identified critically polluted industrial clusters. It is calculated separately for air, water, and land. The basic framework and scoring system of the CEPI – based on three factors namely pollutant, pathway, and receptor – has been described further under this section.

To overcome the subjectivity, revised concept is proposed by eliminating the subjective factors as described in the previous section but retaining the factors which can be measured precisely.

I. Revised concept is prepared by eliminating the debatable factors but retaining the factors which can be measured precisely.

II. It is decided to develop the Comprehensive Environmental Pollution Index (CEPI) retaining the existing algorithm of Source, Pathway and Receptor.

III. Health component was also retained in the revised concept in line with the suggestions of Secretary, MoEFCC during the meeting held in MoEF.

Outlines of revised CEPI 2016 criteria

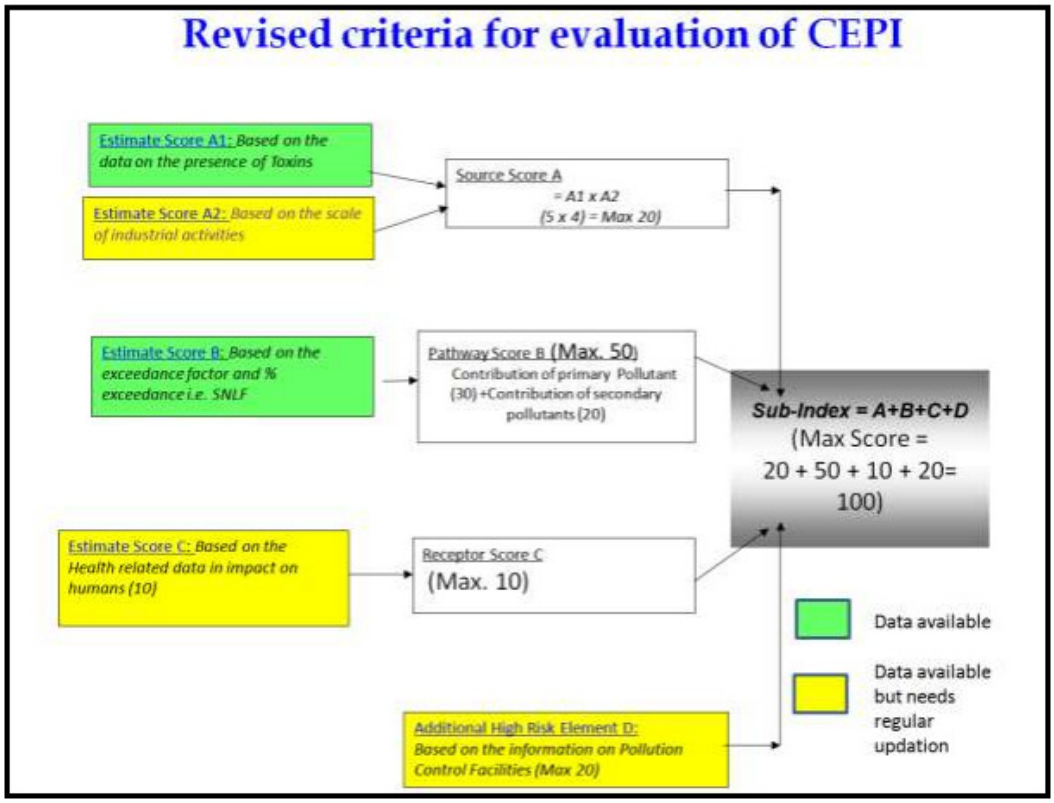
The outlines of the revised CEPI criteria are as follows:

1. It is proposed to develop the Comprehensive Environmental Pollution Index (CEPI) based on Sources of pollution, real time observed values of the pollutants in the ambient air, surface water and ground water in & around the industrial cluster and health related statistics.

2. For assessment of the environmental quality of the area i.e. CEPI score, the concept of SNLF i.e. a surrogate number which represents the level of exposure (a function of percentage sample Exceedance & Exceedance Factor) shall be used.

3. Health component to be evaluated based on the health data available from major hospitals in the area was also retained in the revised concept.

The evaluation criterion of the revised CEPI version 2016 is described in the flowchart given below:



Here, health data collected for Receptor Score C is included in **Annexure I**

Based on Sub-Index Score (score of individual environmental component like air, water etc.):

Score more than 63: A Critical Level of Pollution in the respective level of environmental component

Score between 51-63: Severe to critical level of pollution with reference to respective environmental component

Cut-off Score

Score 50: Severely Polluted Industrial Clusters/areas

Score 60: Critically Polluted Industrial Clusters/areas

Based on Aggregated CEPI Score (score includes sub-index score of all individual environmental components together):

Aggregated CEPI score >70: Critically polluted areas

Aggregated CEPI score between 60-70: Severely polluted areas

Since the inception of the programme, MPCB has also formulated Action Plans to mitigate the environmental pollution problems for each of the 8 Critically Polluted Areas (CPAs) in Maharashtra. Based on available information, parameters selected and monitored in continuation with this, CEPI has been calculated and Short-Term Action Plan (STAP) as well as Long Term Action Plan (LTAP) was prepared in 2010.

Subsequently NAAQS 2009 came in force. List of parameters to be considered increased and expanded including more critical and hazardous pollutants like benzene, BaP, Metals, etc. existing in the environment. There was revision of standards (limiting values) as well. In this present report of June 2018 prepared by MPCB, CEPI is calculated considering all these revised standards' limiting values, list of parameters and complete scope of monitoring.

5.1 Comparison of CEPI scores:

Below given Table shows aggregated CEPI of present report in comparison with:

1. CEPI score by CPCB in 2009
2. CEPI score 2013
3. CEPI score MPCB 2016
4. CEPI score MPCB February 2017
5. CEPI score MPCB June 2017

Results show that present CEPI score (51.88) of Chandrapur considering all revised standards is lesser than the CEPI Score of February 2018 (61.69) report.

Detailed results of Air, Water and Land are given below:

Air

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2018	3.2	2.1	6.72	-	-	-	14.6	-	-	-	10	10	**41.32**
CEPI score February 2018	3	3.4	10.2	-	-	-	13.6	-	-	-	8	15	**46.8**
CEPI score June 2017	2.9	3.3	9.57	-	-	-	14.36	-	-	-	5	15	**43.93**
CEPI score February 2017	3	2	6	6	0	2	8	4	3.8	0	15.2	15	**44.2**
CEPI score 2016	3	2	6	2.3	3	3	8.3	5	5	0	25	10	**49.3**

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score 2013	2	5	10	6	3	3	12	5	3	0	15	10	**47**
CPCB Report 2009	5.75	5	28.75	6	3	3	12	5	4	0	20	10	**70.75**

Water:

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2018	3.3	1.6	5.28	-	-	-	10.3	-	-	-	10	15	**40.58**
CEPI score February 2018	3	5.2	15.6	-	-	-	18.6	-	-	-	5	10	**49.2**
CEPI score June 2017	3.7	4.8	17.76	-	-	-	10.85	-	-	-	0	10	**38.16**
CEPI score February 2017	3	4.8	14.4	1.6	0	3	4.6	5	5	2.3	27.3	10	**56.3**
CEPI score 2016	3	3.8	7.6	5	0	3	8	5	2	4	14	10	**39.6**
CEPI score 2013	1	5	5	6	0	3	9	5	1.5	4	11.5	3	**28.5**
CPCB Report 2009	3	5	15	8	1.5	3	12.5	5	4	5	25	15	**67.5**

Land:

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2018	2.9	2.4	6.96	-	-	-	12.4	-	-	-	10	15	**44.36**
CEPI score February 2018	4	5.1	20.4	-	-	-	22.5	-	-	-	4	10	**56.9**

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2017	3.1	4.2	13.02	-	-	-	8.6	-	-	-	0	10	**31.62**
CEPI score February 2017	3	4.8	14.4	1.6	0	3	4.6	5	5	2.3	26.5	10	**57.5**
CEPI score 2016	4	2.9	11.6	3.8	0	3	6.8	5	5	0	25	10	**46.4**
CEPI score 2013	1	5	5	8	0	3	11	5	5	4	29	10	**55**
CPCB Report 2009	3	5	15	4	3	4.5	11.5	5	4	5	25	15	**66.5**

Aggregated CEPI:

	Air Index	Water Index	Land Index	CEPI
CEPI score June 2018	41.32	40.58	44.36	**51.88**
CEPI score February 2018	46.8	49.2	56.9	**61.69**
CEPI score June 2017	43.93	38.61	31.62	**50.77**
CEPI score February 2017	44.2	56.3	57.5	**62.3**
CEPI score 2016	49.3	39.6	46.34	**58.62**
CEPI score 2013	77	62	60	**85.56**
CPCB Report 2009	70.75	67.5	66.5	**83.88**

6. Conclusion

Chandrapur is a centre for coal mining. Other industries include cement making, paper manufacturing, and ferro alloy manufacturing. The Chandrapur Super Thermal Power Station, a 3,340 MW power station complex which is owned by the Maharashtra State Power Generation Company Limited, occupies an area of 12,212 hectares (122.12 km^2) about 6 kilometres (3.7 mi) from the city. It employs approximately 3,460 people and supplies more than 25 percent of the state's electricity. From the CEPI score of 83.88 in 2009 to the CEPI score of 51.88 in June 2018, it is perceptible that there have been great improvements in the Environment which have led to the decline in the score.

For identification of the source of pollutants, we have analysed stack emission monitoring of 22 stacks in the Chandrapur region. In the stack emissions monitored, few of them had higher concentration of SO_2 and NO_2.

Twelve locations were monitored for ambient air concentration. Only PM_{10} level was exceeding in few locations as per NAAQS. This is due to the increase in traffic and industrial activities. Dust suppression techniques have been suggested to be carried out by industries.

Out of the 22 waste water samples, few samples were detected with higher concentration of Total coliform and Faecal coliform. This will be complied as already the specified industry have been notified and asked to take necessary action.

13 Ground water samples were collected from different Dug well, well and Bore well in the region. In the ground water samples collected, Electrical Conductivity, Nitrogen, Total coliform and Faecal coliform was found in higher concentration.

The State Pollution Control Board and Regional Office of SPCB are continuously initiating action against industries for reducing and controlling the pollution caused due the industries.

	A1	A2	A	B	C	D	CEPI
Air Index	3.2	2.1	6.72	14.6	10	10	**41.32**
Water Index	3.3	1.6	5.28	10.3	10	15	**40.58**
Land Index	2.9	2.4	6.96	12.4	10	15	**44.36**
Aggregated CEPI							**51.88**

7. Efforts taken for the reduction in pollution:

The regional office of Maharashtra pollution control board has taken various initiatives in reducing the CEPI Score of 85.56 of 2013 to 61.69 of February 2017. Below mentioned are some of the efforts:

- M/s. BILT Graphics paper products Ltd., a pulp and paper mill has adopted new environmental friendly technology based on ECF i.e. Elemental Chlorine Free technology and Board has granted consent to establish Plant is under stabilization since May- 2013.

- M/s. Chandrapur Super Thermal Power Station has proposed to install coal washery within their premises for utilization of wash coal. Board has issued directions to all cement and power plants for utilization of washed coal.

- The Thermal Power plant is the single largest contributor in the air pollution in Chandrapur. The MAHAGENCO, which operates this plant, has taken steps to control air emissions from this coal based power plant and the efficiency of the air pollution control equipment is rated to be good. There is need for improvement. In spite of the air pollution prevention and control measures in place, sporadic complaints of the air emissions are received by the Board. MPCB efforts need to be further augmented to control the emission levels from the STPS. MPCB is also exploring a possibility to train its officers with the help of US-EPA on the VEOs, so as to employ this technique in the air pollution control program. MPCB is aiming to complete the actions to control air pollution due to STPS in next two years.

- MPCB is operating three stations under National Air Monitoring Programe (NAMP) at Chandrapur and nearby industrial area. Automatic Continuous ambient air quality monitoring station is also operational at Chandrapur. Board has initiated steps to set up additional ambient air quality monitoring (AAQM) stations under NAMP and State air monitoring program (SAMP) particularly at the coal mine sites. Dissemination of AAQ data in public domain, source emission monitoring, preparation of emission inventory and other related issues are areas of priority. It is expected to complete these actions in 18 months so that visible improvement in the air quality is seen by the people in Chandrapur.

- The generation of mine discharge, excavation of top soil during the mining activities is an example of degradation of natural resources. It is necessary to initiate serious attempts to conserve these natural resources while the exploitation of minerals on a sustainable basis. Generation of fly ash from the power station is also a similar example. There are incidences of air and water pollution due to improper handling of fly ash. Maximum utilization of the fly ash in brick making, construction and cement industry is considered as priority. The efforts of the Board to generate awareness about the fly ash utilization by various stake holders have yielded positive results. However, there is a more potential to utilise fly ash for the reclamation of the coal mines and also use it as a micronutrient supplement for crops.

8. Photographs

Gopani Iron & Power (I) Pvt. Ltd., MIDC Tadali

Dhariwal Infrastructure Limited, MIDC Tadali

3-AAQ-3 Grace Indusztries, MIDC Tadali

2-AAQ-2 WTP Plant, MIDC Tadali

Nallah adjacent to Grace Industreies Ltd., MIDC Tadali

Tadali Village Lake, MIDC Tadali

Earth Green Tech Pvt. Ltd., MIDC Chandrapur

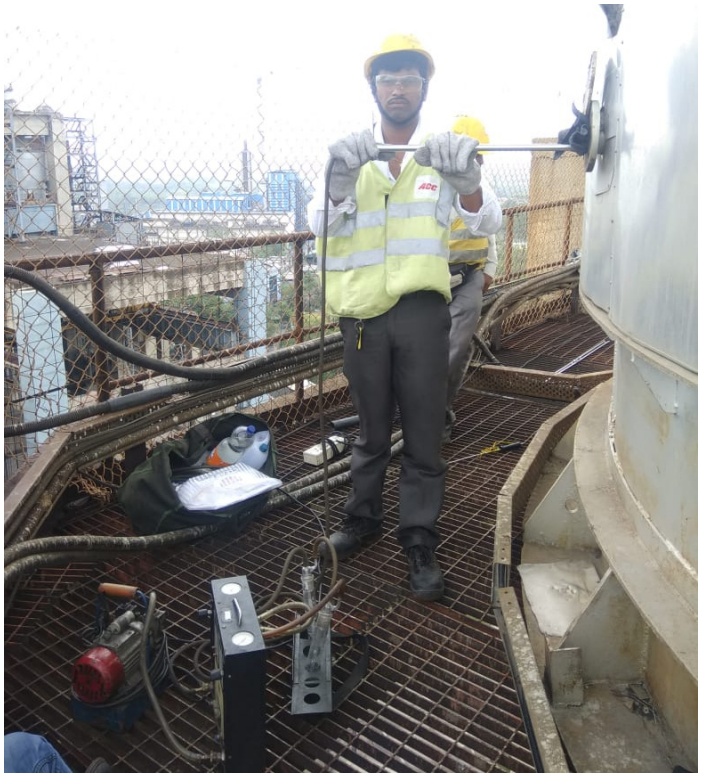
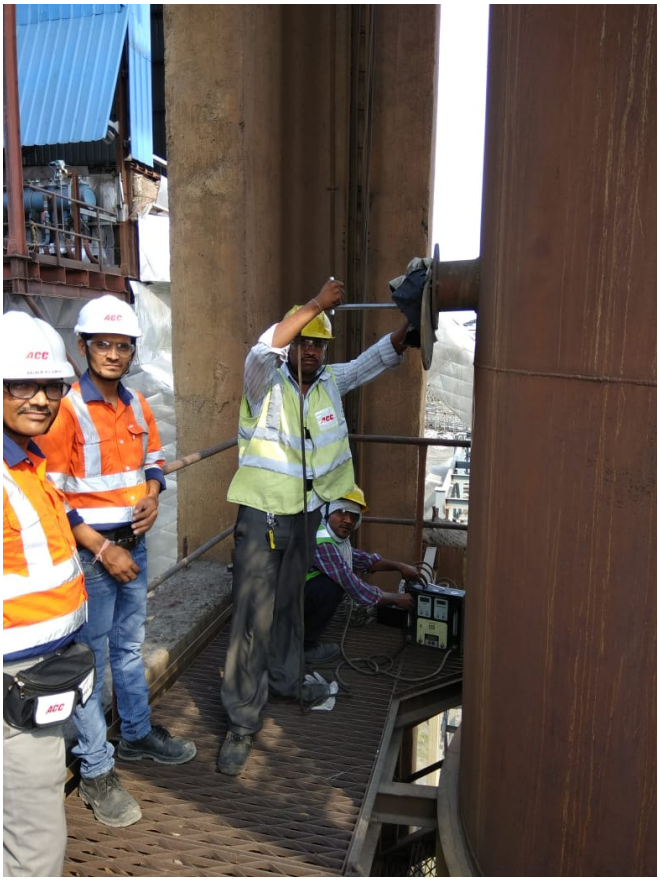
Super Hygenic Disposal Pvt. Ltd., MIDC Chandrapur

Terrace of MIDC Office, MIDC Chandrapur

Near Main Gate of HPCL, MIDC Chandrapur

Borewell Near Datala Grampanchyat, MIDC Chandrapur

Gagangiri Village Bridge, MIDC Chandrapur

ACC Limited, MIDC Ghugus

ACC Limited, MIDC Ghugus


Lloyds Metals Near CAAQMS Station, MIDC Ghugus

Terrace of Transit Hostel Rajiv colony WCL, MIDC Ghugus

Wardha river Near WTP of WCL Ghugus opencast mine, MIDC Ghugus

Borewell water taken from Bangali Camp, Near Durga Mandir, MIDC Ghugus

Bamani Proteins Ltd., MIDC Ballarpur

ILT Graphic Paper Product Ltd., MIDC Ballarpur

WCL Ballarpur OCM Office, MIDC Ballarpur

Ram Mandir, Near Mangal Karyalaya, MIDC Ballarpur

Open Cast Mine Discharge, MIDC Ballarpur

Borewell Water at Visapur Village, MIDC Ballarpur

9. References

1) Criteria for Comprehensive Environmental Assessment of Industrial Clusters, December 2009, CPCB, EIAS/4/2009-10

2) Comprehensive Environmental Assessment of Industrial Clusters, December 2009, CPCB, EIAS/5/2009-10

3) Action Plan for Industrial Cluster: Chandrapur, November 2010, MPCB

4) Action Plan for Industrial Cluster: Dombivli, November 2010, MPCB

5) Action Plan for Industrial Cluster: Aurangabad, November 2010, MPCB

6) Action Plan for Industrial Cluster: Navi Mumbai, November 2010, MPCB

7) Action Plan for Industrial Cluster: Navi Mumbai, November 2010, MPCB

8) Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22nd Edition, 2012.

9) IS 3025 (various parts)

10) www.mpcb.gov.in

11) www.cpcb.gov.in

10. Annexure

Annexure I Health related data in impact on humans

C: Receptor

Component C **(Impact on Human Health)** **10**	
Main - 10	
% increase in cases	**Marks**
<5%	**0**
5-10%	**5**
>10%	**10**

- % increase is evaluated based on the total no. of cases recorded during two consecutive years.
- For Air Environment, total no. of cases related to Asthma, Bronchitis, Cancer, Acute respiratory infections etc. are to be considered.
- For surface water/ ground water Environment, cases related to Gastroenteritis, Diarrhoea, renal (kidney) malfunction, cancer etc are to be considered.
- For the above evaluation, the previous 5 years records of 3-5 major hospitals of the area shall be considered.

Attached below health data collected for the region

आवक क्र. 356 दि. 10-7-18
वैद्यकिय अधिक्षक कार्यालय
शा.वै.म.म.स. चंद्रपुर

INFORMATION ON HEALTH STATISTICS IN PIA

1. **Name of the Polluted Industrial Area (PIA): MIDC Chandrapur & MIDC Tadali**
2. **Name of the major health centre/ organization: Medical College, Chandrapur**
3. **Name and designation of the contact person:** Dr. U.V. Munghate, Medical Superintendent
4. **Address:** Govt. Medical college & Hospital, chandrapur
5. **Year of Establishment:** 2015

Sl No.	Air Borne Diseases	No. of patients reported for the years (IPD)					
		2017-2018	2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	475	326	306	232	205	194
2.	Acute Respiratory Infection	751	664	374	356	230	183
3.	Bronchitis	171	231	137	71	64	77
4.	Cancer	143	118	122	61	79	62
	Water Borne Diseases	145	214	6	115	139	61
5.	Gastroenteritis	1297	866	1139	676	659	544
6.	Diarrhea	73	6	219	19	21	18
7.	Renal diseases	2330	2197	394	819	416	239
8.	Cancer	–	–	–	–	–	–

Health status received from the Hospital

MATRON
General Hospital
Chandrapur

Signature of the Hospital Head/Superintend
Govt. Medical College & Hospital
Chandrapur

INFORMATION ON HEALTH STATISTICS IN PIA

1. **Name of the Polluted Industrial Area (PIA): MIDC Chandrapur & MIDC Tadali**
2. **Name of the major health centre/ organization: Chandrapur Health Care and Multispecialist Hospital and Research Centre**
3. **Name and designation of the contact person:** Dr. Rohan Ainchwar 9763724723
4. **Address:** O/P Adarsh petrol pump sarkar nagar Chandrapur.
5. **Year of Establishment:** 2013

Email – corporatechlmhrc@gmail.com

Sl No.	Air Borne Diseases	No. of patients reported for the years					
		2017-2018	2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	210	288	117	-Nil-	-	-
2.	Acute Respiratory Infection	120	125	110	-Nil-	-	-
3.	Bronchitis	110	117	105	-Nil-	-	-
4.	Cancer	3	2	1	-Nil-	-	-
	Water Borne Diseases	05	10	03	-Nil-	1 -	-
5.	Gastroenteritis	30	48	15	-Nil-	-	-
6.	Diarrhea	10	28	10	-Nil-	-	-
7.	Renal diseases	15	38	05	-Nil-	-	-
8.	Cancer	3	2	1	-Nil-	-	-

Health status received from the Hospital

Signature of the Hospital Head/ Superintend

CHL MULTISPECIALITY HOSPITAL & RESEARCH CENTRE Reg.

INFORMATION ON HEALTH STATISTICS IN PIA

1. **Name of the Polluted Industrial Area (PIA): MIDC Ghuggus**
2. **Name of the major health centre/ organization: Raju Ratan Hospital, Ghuggus**
3. **Name and designation of the contact person:** Dr. Karmakar, AMO, RRH, Wani Area.
4. **Address:** R.R. Hospital; Ghuggus P.O, Chandrapur Dt, M.S.
5. **Year of Establishment:** 1992.

Sl No.	Air Borne Diseases	No. of patients reported for the years						
		01/1/18 – ~~2017~~-2018 30/6/18	2017-~~2016~~	2016-~~2015~~	2015-~~2014~~	2014-~~2013~~	2013-~~2012~~	2012
1.	Asthma	20	39.	20.	53.	30.	15.	23
2.	Acute Respiratory Infection	12	16.	9.	12.	8.	15.	12
3.	Bronchitis	5	15.	8.	8.	6.	13.	8
4.	Cancer	16	24.	13.	5.	9.	11.	17.
	Water Borne Diseases							
5.	Gastroenteritis	72	197.	194.	87.	41.	64.	8.
6.	Diarrhea	2	20.	12.	4.	8.	6.	4.
7.	Renal diseases	19	33.	36.	5.	12	14.	10.
8.	~~Cancer~~							

Health status received from the Hospital

9/8/18

क्षेत्रीय चिकित्सा अधिकारी
राजीव रतन हॉस्पीटल
वणी क्षेत्र घुग्घुस

Signature of the Hospital Head/ Superintend

INFORMATION ON HEALTH STATISTICS IN PIA

1. **Name of the Polluted Industrial Area (PIA): MIDC Ballarpur**
2. **Name of the major health centre/ organization: Bilt Hospital, Ballarpur**
3. **Name and designation of the contact person:** Dr. Vijay Wanjari C.M.O 9588679530
4. **Address:** BILT Ballarpur
5. **Year of Establishment:** 1953

Sl No.	Air Borne Diseases	No. of patients reported for the years					
		2017-2018	2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	02	02	02	02		
2.	Acute Respiratory Infection	87	96	320	260		
3.	Bronchitis	07	07	14	10		
4.	Cancer	NiL	NiL	NiL	NiL		
	Water Borne Diseases						
5.	Gastroenteritis	30	34	127	135		
6.	Diarrhea	71	77	134	120		
7.	Renal diseases						
8.	Cancer	NiL	NiL	NiL	NiL		

Health status received from the Hospital

Signature of the Hospital Head/ Superintend

Dr. Vijay V. Wanjari
M.B.B.S.
R. No. 38071
Chief Medical Officer
B.G.P.P.L., Hospital, Ballarpur

Annexure II: Stack Emission Sampling and Analysis Methodology

Sr.	Parameters	Method References	Techniques	Detection Limit
1.	Acid Mist (as Sulphuric Acid)	US EPA Method no.m-8	Barium thorine titration Method	0.6 mg/Nm^3
2.	Ammonia	IS 11255 (Part 6):1999, Reaffirmed 2003	Titration/Nessler Reagent / Spectrophotometric Method	1 mg/Nm^3
3.	Carbon Monoxide	USEPA Method 10B	GC-FID Method	0.2 mg/Nm^3
4.	Chlorine	US EPA Method 26 for sampling	Titrimetric	0.001 mg/Nm^3
5.	Fluoride (Gaseous)	US EPA Method 13 A	SPADNS Zirconium Lake Spectrophotometric Method	0.025 mg/Nm^3
6.	Fluoride (Particulate)	US EPA Method 13 A	SPADNS Zirconium Lake Spectrophotometric Method	0.005 mg/Nm^3
7.	Hydrogen Chloride	US EPA Method 26 for sampling	Titrimetric	0.25 mg/Nm^3
8.	Hydrogen Sulphide	IS 11255 (Part 4):1985	Titrimetric	1 mg/Nm^3
9.	Oxides of Nitrogen	IS 11255 (Part 7): 2005	PDSA Colorimetric Method	10 mg/Nm^3
10.	Oxygen	IS 13270 : 1992	ORSAT Apparatus	1 %
11.	Poly Aromatic Hydrocarbons (Particulate)	IS 5182 (Part 12) : 2004, Reaffirmed 2009 CPCB Guidelines, May 2011, Page No.39	GC-FID Method	0.25 mg/Nm^3
12.	Suspended Particulate Matter	IS 11255 (Part 1):1985, Reaffirmed 2003	Gravimetric Method	10 mg/Nm^3
13.	Sulphur Dioxide	IS 11255 (Part 2): 1985, Reaffirmed 2003	Titrimetric IPA thorine Method	5.0mg/Nm^3 0.02kg/day

Sr.	Parameters	Method References	Techniques	Detection Limit
14.	BTX (Benzene, Toluene, Xylene)	NIOSH (NMAM) 1501	Adsorption and Desorption followed by GC-FID analysis	0.001 mg/Nm^3
15.	VOC (Volatile Organic Compounds)	NIOSH (NMAM) 1501 for sampling	Adsorption and Desorption followed by GC-FID or GC/MS analysis	-
i	Methyl Isobutyl Ketone	-	-	0.001 mg/Nm^3
ii	Benzene	-	-	0.001 mg/Nm^3
iii	Toluene	-	-	0.001 mg/Nm^3
iv	Xylene	-	-	0.001 mg/Nm^3
v	Ethyl Benzene	-	-	0.001 mg/Nm^3
vi	Ethyl Acetate	-	-	0.001 mg/Nm^3

Annexure III: Ambient Air Sampling and Analysis Methodology

Sr.	Parameters	Method References	Techniques	Detection Limit
1.	Sulphur Dioxide (SO_2)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.1	Improved West & Gaeke Method	4 µg/m^3
2.	Nitrogen Dioxide (NO_2)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.7	Modified Jacob & Hochheiser Method	3 µg/m^3
3.	Particulate Matter (size less than 10 µm) or PM_{10}	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.11	Gravimetric Method	2 µg/m^3
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 15	Gravimetric Method	0.4 µg/m^3
5.	Ozone (O_3)	APHA, Method No. 820, Page no. 836	Chemical Method	19.6 µg/m^3
6.	Lead (Pb)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	0.02 µg/m^3
7.	Carbon Monoxide (CO)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume II, May 2011, Page No. 16	Non Dispersive Infra Red (NDIR) spectroscopy	0.05 mg/m^3
8.	Ammonia (NH_3)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 35	Indophenol Blue Method	4.0µg/m^3
9.	Benzene (C_6H_6)	IS 5182 (Part 11):2006	Adsorption and Desorption followed by GC-FID analysis	1.0 µg/m^3
10.	Benzo (a) Pyrene (BaP) – particulate phase only,	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 39	Solvent extraction followed by GC-FID analysis	0.2 ng/m^3

Sr.	Parameters	Method References	Techniques	Detection Limit
11.	Arsenic (As)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	0.3ng/m^3
12.	Nickel (Ni)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	3.0ng/m^3

Annexure IV: Water/Wastewater Sampling and Analysis Methodology

Sr.	Parameters	Methods References	Techniques	Detection Limit
1.	Sampling Procedure for Chemical Parameters	IS 3025 (Part 1): 1987, Reaffirmed 1998, Amds.1& APHA, 22nd Ed., 2012, 1060 B, 1-39	-	-
2.	Sampling Procedure for Microbiological Parameters	APHA, 22nd Ed., 2012,1060 B, 1-39, 9040, 9-17, and 9060B, 9-35	-	-
3.	Temperature	APHA, 22nd Ed., 2012, 2550-B, 2-69	By Thermometer	-
4.	Colour	APHA, 22nd Ed., 2012, 2120-B, 2-26	Visible Comparison Method	1 Hazen Unit
5.	Odour	IS 3025 (Part 5): 1983, Reaffirmed 2006	Qualitative Method	-
6.	pH	APHA, 22nd Ed., 2012, 4500-H^+- B, 4-92	By pH Meter	1
7.	Oil & Grease	APHA, 22nd Ed., 2012, 5520-B, 5-40	Liquid -liquid Partition-Gravimetric Method	1.0 mg/L
8.	Suspended Solids	IS 3025 (Part 17): 1984, Reaffirmed 2006, Amds.1	Filtration /Gravimetric Method	5.0 mg/L
9.	Dissolved Oxygen	IS 3025 (Part 38): 1989, Reaffirmed 2009	Iodometric Method-Azide modification	0.05 mg/L
10.	Chemical Oxygen Demand	APHA, 22nd Ed., 2012, 5220-B, 5-17	Open Reflux Method	5.0 mg/L
11.	Biochemical Oxygen Demand	IS 3025 (Part 44): 1993, Reaffirmed 2009, Amds.1	Iodometric Method	5.0 mg/L
12.	Electrical Conductivity	APHA, 22nd Ed., 2012, 2510- B, 2-54	By Conductivity Meter	0.1 µmho/cm
13.	Nitrite-Nitrogen	APHA, 22nd Ed., 2012, 4500-NO_2-B, 4-120	Colorimetric Method	0.006 mg/L

Sr.	Parameters	Methods References	Techniques	Detection Limit
14.	Nitrate-Nitrogen	APHA,22nd Ed., 2012, 4500-NO_3, B-4-122	UV Spectrophotometer Screening Method	0.2 mg/L
15.	(NO_2 + NO_3)-Nitrogen	APHA, 22nd Ed., 2012, 4500-NO_2-B, 4-120 APHA, 22nd Ed., 2012, 4500-NO_3, B-4-122	Colorimetric Method V Spectrophotometer Screening Method	0.2 mg/L
16.	Free Ammonia	APHA, 22nd Ed., 2012 , 4500 NH_3, F, 4 -115	Colorimetric Method	0.006 mg/L
17.	Total Residual Chlorine	IS 3025 (Part 26) :1986 , Reaffirmed 2009, Ed. 2.1 (2004-02)	Iodometric Method	0.1 mg/L
18.	Cyanide (CN)	APHA, 22nd Ed., 2012 ,4500-CN, C & E, 4-41 & 4-43	Colorimetric Method	0.001 mg/L
19.	Fluoride (F)	APHA, 22nd Ed., 2012, 4500-F^-, D, 4-87	SPADNS Method	0.05 mg/L
20.	Sulphide (S^{2-})	APHA, 22nd Ed., 2012, 4500 –S^2 , C-4-175, F-4-178	IodometricMethod	0.08 mg/L
21.	Dissolved Phosphate (P)	APHA,22nd Ed., 2012 , 4500 P,E, 4-155	Ascorbic Acid Method	0.03 mg/L
22.	Sodium Absorption Ratio	IS11624 :1986, Reaffirmed 2006	By Calculation	0.3
23.	Total Phosphorous (P)	APHA,22nd Ed., 2012 , 4500 P,E, 4-155	Ascorbic Acid Method	0.03 mg/L
24.	Total Kjeldahl Nitrogen	APHA, 22nd Ed., 2012, 4500 NH_3, B & C, 4 -110, 4-112	Titrimetric Method	0.1 mg/L
25.	Total Ammonia (NH_4 +NH_3)-Nitrogen	APHA,22d Ed., 2012 , 4500 NH_3, F, 4 -115	Colorimetric Method	0.001 mg/L
26.	Phenols (C_6H_5OH)	APHA,22nd Ed., 2012 , 5530- B & C, 5-44 & 5-47	Chloroform Extraction Method	0.001 mg/L

Sr.	Parameters	Methods References	Techniques	Detection Limit
27.	Surface Active Agents	APHA,22nd Ed., 2012, 5540-B & C,5-50	Methylene Blue Extraction Method	0.1 mg/L
28.	Organo Chlorine Pesticides	APHA, 22nd Ed., 2012,6410B,6-74	GC MS-MS Method	0.01 µg/L
29.	Polynuclear aromatic hydrocarbons (PAH)	APHA, 22nd Ed., 2012,6410B,6-74	GC MS-MS Method	0.01 µg/L
30.	Polychlorinated Biphenyls (PCB)	APHA, 22nd Ed., 2012,6410B,6-74	GC MS-MS Method	0.01 µg/L
31.	Zinc (Zn)	IS 3025(Part 2): 2004	ICP Method	0.1 mg/L
32.	Nickel (Ni)	IS 3025(Part 2): 2004	ICP Method	0.05 mg/L
33.	Copper (Cu)	IS 3025(Part 2): 2004	ICP Method	0.03 mg/L
34.	Hexavalent Chromium (Cr^{6+})	APHA, 22ndEd., 2012,3500-Cr,B,3-69	Colorimetric Method	0.02 mg/L
35.	Total Chromium (Cr)	IS 3025(Part 2): 2004	ICP Method	0.02 mg/L
36.	Total Arsenic (As)	IS 3025(Part 2): 2004	ICP Method	0.005 mg/L
37.	Lead (Pb)	IS 3025(Part 2): 2004	ICP Method	0.008 mg/L
38.	Cadmium (Cd)	IS 3025(Part 2): 2004	ICP Method	0.002 mg/L
39.	Mercury (Hg)	IS 3025(Part 2): 2004	ICP Method	0.0008 mg/L
40.	Manganese (Mn)	IS 3025(Part 2): 2004	ICP Method	0.02 mg/L
41.	Iron (Fe)	IS 3025(Part 2): 2004	ICP Method	0.06 mg/L
42.	Vanadium (V)	IS 3025(Part 2): 2004	ICP Method	0.05 mg/L

Sr.	Parameters	Methods References	Techniques	Detection Limit
43.	Selenium (Se)	IS 3025(Part 2): 2004	ICP Method	0.005 mg/L
44.	Boron (B)	IS 3025(Part 2): 2004	ICP Method	0.1 mg/L
45.	Total Coliforms	APHA, 22nd Ed., 2012,9221-B, 9-66	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
46.	Faecal Coliforms	APHA, 22nd Ed., 2012,9221-E, 9-74	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
47.	Bioassay (Zebra Fish) Test	IS 6582, 1971, Reaffirmed 1987	Static Technique	-

Annexure V: National Ambient Air Quality Standards, 2009

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National Ambient Air Quality Standards: Central Pollution Control Board

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevntion and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in suppression of the Notification No(s). S.O.384(E), dated 11th April, 1994 and S.O.935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards **with immediate effect**, namely:

Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Areas (Notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2) µg/m³	Annual *	50	20	– Improved West and Gaeke – Ultraviolet fluorescence
		24 hours **	80	80	
2	Nitrogen Dioxide (NO_2) µg/m³	Annual *	40	30	– Modified Jacob & Hochheiser (Na-Arsenite) – Chemilminescence
		24 hours **	80	80	
3	Particulate Matter (size less than 10 µm) or PM_{10} µg/m³	Annual *	60	60	– Gravimetric – TOEM – Beta attenuation
		24 hours **	100	100	
4	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m³	Annual *	40	40	– Gravimetric – TOEM – Beta attenuation
		24 hours **	60	60	
5	Ozone (O_3) µg/m³	8 hours **	100	100	– UV photometric – Chemiluminescence – Chemical Method
		1 hour **	180	180	
6	Lead (Pb) µg/m³	Annual *	0.50	0.50	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper – EDXRF using Teflon filter
		24 hours **	1.0	1.0	
7	Carbon Monoxide (CO) mg/m³	8 hours **	02	02	– Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour **	04	04	
8	Ammonia (NH_3) µg/m³	Annual *	100	100	– Chemiluminescence – Indophenol blue method
		24 hours **	400	400	
9	Benzene (C_6H_6) µg/m³	Annual *	05	05	– Gas Chromatography based continuous analyzer – Adsorption and Desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only, ng/m³	Annual *	01	01	– Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As) ng/m³	Annual *	06	06	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper.
12	Nickel (Ni) ng/m³	Annual *	20	20	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper.

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2 % of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman, Central Pollution Control Board [ADVT-III/4/184/09/Exty.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India. Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October,1998.

µg/m³: micro-gram/m³ i.e. 10^{-6}gm/m³ ng/m³ : nano-gram/m³ i.e. 10^{-9}gm/m³

Annexure VI: General Standards for Discharge of Environmental Pollutants, Part A: Effluents (The Environment (Protection) Rules, 1986, Schedule VI)

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
1.	Colour and Odour	See Note 1	--	See Note I	See Note 1
2.	Suspended solids, mg/L, Max.	100	600	200	a. For process waste water - 100 b. For cooling water effluent- 10 percent above total suspended mailer of influent cooling water.
3.	Particle size of suspended solids	Shall pass 850 micron IS Sieve			a. Floatable solids, Max 3 mm b. Settleable solids Max 850 microns
4.	Dissolved solids (Inorganic), mg/L, Max.	2100	2100	2100	--
5.	pH value	5.5 -9.0	5.5 -9.0	5.5 -9.0	5.5-9.0

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
6.	Temperature °C, Max	Shall not exceed 40 in any section of the stream within 15 mts. Downstream from the effluent outlet	45 at the point of discharge	--	45 at the point of discharge
7.	Oil and Grease, mg/L, Max	10	20	10	20
8.,	Total Residual chlorine, mg/L, Max	1.0	--	--	1.0
9.	Ammonical Nitrogen (as N), mg/L, Max	50	50	--	50
10.	Total Kjeldahl Nitrogen (as N), mg/L, Max.	100	--	--	100
11.	Free Ammonia (as NH_3), mg/L, Max	5.0	--	--	5.0
12.	Biochemical oxygen demand (5 days, at 20° c) mg/L, Max	30	350	100	100
13.	Chemical oxygen demand, mg/L, Max	250	--	--	250
14.	Arsenic (as As), mg/l, Max	0.2	0.2	0.2	0.2
15.	Mercury (as Hg). Mg/L, Max	0.01	0.01	--	0.01
16.	Lead (as Pb), mg/L, Max	0.1	1.0	-	1.0

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
17.	Cadmium (as Cd), mg/L,	2.0	1.0	--	2.0
18.	Hexavalent Chromium (as Cr^{+6}) mg/L, Max	.1	2.0	--	1.0
19.	Total Chromium (as Cr), mg/L, Max	2.0	2.0	--	2.0
20.	Copper (as Cu), mg/L, Max.	3.0	3.0	--	3.0
21.	Zinc (as Zn), mg/L, Max.	5.0	15	0--	15
22	Selenium (as Se), mg/l, Max.	0.05	0.05	--	0.05
23	Nickel (as Ni), mg/l, Max.	3.0	3.0	--	5.0
24	Boron (as B), mg/l, Max.	2.0	2.0	2.0	--
25.	Percent Sodium, Max.	--	60	60	--
26.	Residual Sodium carbonate, mg/l, Max.	--	--	5.0	--
27.	Cyanide (as Cn), mg/L, Max.	0.2	2.0	0.2	0.2
28.	Chloride (as Cl), mg/L, Max.	1000	1000	600	--
29.	Fluoride (as F), mg/IL, Max.	2.0	15	--	15
30.	Dissolved Phosphate (as P), mg/L, Max.	5.0	--	--	--

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
31.	Sulphate (as SO_4), mg/L, Max.	1000	1000	1000	--
32.	Sulphide (as S), mg/L, Max.	2.0	--	--	5.0
33.	Pesticides	Absent	Absent	Absent	Absent
34.	Phenolic compounds (as C_6H_5OH), mg/L, Max.	1.0	5.0	--	5.0
35.	Radioactive materials:				
	a. Alpha emitters MC/ml., Max.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
	b. Beta emitters µc/ml., Max	10^{-6}	10^{-6}	10^{-7}	10^{-6}

Annexure VII: Drinking Water Specification-IS 10500:2012

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
Table 1	**Organoleptic and Physical Parameters**			
1.	Colour	Hazen units	Max 5	Max 15
2.	Odour	-	Agreeable	Agreeable
3.	pH value	-	6.5-8.5	No relaxation
4.	Taste	-	Agreeable	Agreeable
5.	Turbidity	NTU	Max 1	Max 5
6.	Total dissolved solids	mg/L	Max 500	Max 2000
Table 2	**General parameters concerning substances undesirable in excessive amounts**			
7.	Aluminium (as Al)	mg/L	Max 0.03	Max 0.2
8.	Ammonia (as total ammonia- N)	mg/L	Max 0.5	No relaxation
9.	Anionic detergents (as MBAS)	mg/L	Max 0.2	Max 1.0
10.	Barium (as Ba)	mg/L	Max 0.7	No relaxation
11.	Boron (as B)	mg/L	Max 0.5	Max 1.0
12.	Calcium (as Ca)	mg/L	Max 75	Max 200
13.	Chloramines (as $C1_2$)	mg/L	Max 4.0	No relaxation
14.	Chlorides (as Cl)	mg/L	Max 250	Max 1000
15.	Copper (as Cu)	mg/L	Max 0.05	Max 1.5
16.	Fluoride (as F)	mg/L	Max 1.0	Max 1.5
17.	Free residual chlorine	mg/L	Min 0.2	Min 1

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
18.	Iron (as Fe)	mg/L	Max 0.3	No relaxation
19.	Magnesium (as Mg)	mg/L	Max 30	Max100
20.	Manganese (as Mn)	mg/L	Max 0.1	Max 0.3
21.	Mineral Oil	mg/L	Max 0.5	No relaxation
22.	Nitrate (as NO_3)	mg/L	Max 45	No relaxation
23.	Phenolic compounds (as C_6H_5OH)	mg/L	Max 0.001	Max 0.002
24.	Selenium (as Se)	mg/L	Max 0.01	No relaxation
25.	Silver (as Ag)	mg/L	Max 0.1	No relaxation
26.	Sulphate (as SO_4)	mg/L	Max 200	Max 400
27.	Sulphide (as H_2S)	mg/L	Max 0.05	No relaxation
28.	Total Alkalinity as calcium carbonate	mg/L	Max 200	Max600
29.	Total hardness (as $CaCO_3$)	mg/L	Max 200	Max 600
30.	Zinc (as Zn)	mg/L	Max 5	Max15
Table 3	**Parameters Concerning Toxic Substances**			
31.	Cadmium (as Cd)	mg/L	Max 0.003	No relaxation
32.	Cyanide (as CN)	mg/L	Max 0.05	No relaxation
33.	Lead (as Pb)	mg/L	Max 0.01	No relaxation
34.	Mercury (as Hg)	mg/L	Max 0.001	No relaxation
35.	Molybdenum (as Mo)	mg/L	Max 0.07	No relaxation
36.	Nickel (as Ni)	mg/L	Max 0.02	No relaxation
37.	Pesticides	mg/L	See Table 5	No relaxation
38.	Polychlorinatedbiphenyls	mg/L	Max 0.0005	No relaxation

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
39.	Poly nuclear aromatic Hydrocarbons (as PAH)	mg/L	Max 0.0001	No relaxation
40.	Total Arsenic(as As)	mg/L	Max 0.01	Max0.05
41.	Total Chromium (as Cr)	mg/L	Max 0.05	No relaxation
42.	Trihalomethanes			
a)	Bromoform	mg/L	Max 0.1	No relaxation
b)	DibromochloroMethane	mg/L	Max 0.1	No relaxation
c)	Bromodichloromethane	mg/L	Max 0.06	No relaxation
d)	Chloroform	mg/L	Max 0.2	No relaxation
Table 4	**Parameters Concerning Radioactive Substances**			
43.	Radioactive Materials			
a)	Alpha emitters	Bq/L	Max 0.1	No relaxation
b)	Beta emitters	Bq/L	Max 1.0	No relaxation
Table 5	**Pesticide Residues Limits and Test Method**			
i)	Alachor	µg/L	20	No relaxation
ii)	Atrazine	µg/L	2	No relaxation
iii)	Aldrin/ Dieldrin	µg/L	0.03	No relaxation
iv)	Alpha HCH	µg/L	0.01	No relaxation
v)	Beta HCH	µg/L	0.04	No relaxation
vi)	Butachlor	µg/L	125	No relaxation
vii)	Chlorpyriphos	µg/L	30	No relaxation
viii)	Delta HCH	µg/L	0.04	No relaxation
ix)	2,4- Dichlorophenoxyacetic acid	µg/L	30	No relaxation

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
x)	DDT (o,p&p,p — Isomers of DDT, DDE and DDD)	µg/L	1	No relaxation
xi)	Endosulfan (α,β & sulphate)	µg/L	0.4	No relaxation
xii)	Ethion	µg/L	3	No relaxation
xiii)	Gamma - HCH (Lindane)	µg/L	2	No relaxation
xiv)	Isoproturon	µg/L	9	No relaxation
xv)	Malathion	µg/L	190	No relaxation
xvi)	Methyl parathion	µg/L	0.3	No relaxation
xvii)	Monocrotophos	µg/L	1	No relaxation
xviii)	Phorate	µg/L	2	No relaxation
Table 6	**Bacteriological Quality of Drinking Water**			
44.	E.coli or thermotolerant coliform bacteria	/100	Not detectable	-
45.	Total coliform bacteria	/100 mL	Not detectable	-
	Virological Requirements			
46.	MS2 phage	/1 L	Absent	-
	Biological Requirements			
47.	Cryptosporidium	/10 L	Absent	-
48.	Giardia	/10 L	Absent	-
49.	Microscopic organisms such as algae, zooplanktons, flagellates, parasites and toxin producing organisms		Free from microscopic organisms	-

Annexure VIII: CPCB Water Quality Criteria:

Designated best use	Quality Class	Primary Water Quality Criteria
Drinking water source without conventional treatment but with chlorination	A	➢ Total coliform organisms (MPN*/100 ml) shall be 50 or less ➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 6 mg/L or more, and ➢ Biochemical Oxygen Demand 2 mg/L or less
Outdoor bathing (organized)	B	➢ Total coliform organisms (MPN/100 ml) shall be 500 or less ➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 5 mg/L or more, and ➢ Biochemical Oxygen Demand 3 mg/L or less
Drinking water source with conventional treatment	C	➢ Total coliform organisms (MPN/100ml) shall be 5000 or less ➢ pH between 6 and 9 ➢ Dissolved Oxygen 4 mg/L or more, and ➢ Biochemical Oxygen Demand 3 mg/L or less
Propagation of wildlife and fisheries	D	➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 4 mg/L or more, and ➢ Free ammonia (as N) 1.2 mg/L or less
Irrigation, industrial cooling, and controlled disposal	E	➢ pH between 6.0 and 8.5 ➢ Electrical conductivity less than 2250 micro mhos/cm, ➢ Sodium Absorption Ratio less than 26, ➢ and Boron less than 2 mg/l.
	Below E	➢ Not Meeting A, B, C, D & E Criteria

Annexure IX: Water Quality Parameters Requirements and Classification

Water quality parameters are classified into three categories, given in Table (i), (ii) and (iii) (Source: CPCB, 2002, "Water Quality Criteria and Goals", Monitoring of Indian National aquatic Resources Series: MINARS/17/2001-2002).

Table: Basic Water Quality Requirement and Classification (Surface Water + Ground Water)

i) Simple Parameters:

Sr.	Parameters	Requirement for Waters of Class		
		A-Excellent	**B-Desirable**	**C-Acceptable**
(i)	Sanitary Survey	Very Clean neighborhood and catchment	Reasonably clean neighborhood	Generally clean neighborhood
(ii)	General Appearance	No floating matter	No floating matter	No floating matter
(iii)	Colour	Absolutely Colourless	Almost colourless, very light shade if any	No colour of anthropogenic origin
(iv)	Smell	Odourless	Almost odourless	No unpleasant odour
(v)	Transparency	>1.0 depth	>0.5 to 0.1m depth	>0.2 to 0.5 m depth
(vi)	Ecological* (Presence of Animals)	Fish & Insects	Fish & Insects	Fish & Insects

* Applicable to only surface water

ii) Regular Monitoring Parameters:

Sr.	Parameters	Requirement for Waters of Class		
		A Excellent	**B-Desirable**	**C-Acceptable**
(i)	pH	7.0 to 8.5	6.5 to 9.0	6.5 to 9.0
(ii)	DO (% Saturation)	90-110	80-120	60-140
(iii)	BOD, mg/l	Below 2	Below 5	Below 8
(iv)	EC, µmhos/cm	<1000	<2250	<4000
(v)	(NO_2+NO_3)-Nitrogen, mg/l	<5	<10	<15
(vi)	Suspended solid, mg/l	<25	<50	<100

Sr.	Parameters	Requirement for Waters of Class		
		A Excellent	B-Desirable	C-Acceptable
(vii)	Fecal Coliform, MPN/ 100 ml	<20 per 100 ml	<200 per 100 ml	<2000 per 100 ml
(viii)	Bio-assay (Zebra Fish)	No death in 5 days	No death in 3 days	No death in 2 days

Note:

1. Dissolved Oxygen (DO) not applicable for ground waters.
2. Dissolved Oxygen in eutrophicated waters should include measurement for diurnal variation.
3. Suspended solid limit is applicable only during non-monsoon period.
4. Faecal Coliform values should meet for 90% times.
5. Static Bio-Assay method may be adopted.

iii) Specific Parameters: (Only in case of need/apprehensions)

Sr.	Parameters	Requirement for Waters of Class		
		A- Excellent	B-Desirable	C-Acceptable
(i)	Total Phosphorous	<0.1 mg/l	< 0.2 mg/l	< 0.3 mg/l
(ii)	T.K.N	< 1.0 mg/l	<2.0 mg/l	<3.0 mg/l
(iii)	Total Ammonia (NH4 + NH3)-Nitrogen	< 0.5 mg/l	< 1.0 mg/l	< 1.5 mg/l
(iv)	Phenols	< 2µg/l	< 5µg/l	<10 µg/l
(v)	Surface Active Agents	<20 µg/l	<100µg/l	< 200µg/l
(vi)	Organo Chlorine Pesticides	< 0.05µg/l	< 0.1µg/l	< 0.2µg/l
(vii)	PAH	< 0.05µg/l	<0.1 µg/l	<0.2 µg/l
(viii)	PCB and PCT	< 0.01µg/l	< 0.01µg/l	< 0.02µg/l
(ix)	Zinc	< 100µg/l	< 200µg/l	<300 µg/l
(x)	Nickel	< 50µg/l	< 100µg/l	< 200µg/l
(xi)	Copper	< 20µg/l	< 50µg/l	<100µg/l

Sr.	Parameters	Requirement for Waters of Class		
		A- Excellent	B-Desirable	C-Acceptable
(xii)	Chromium (Total)	< 20µg/l	< 50µg/l	< 100µg/l
(xiii)	Arsenic (Total)	< 20µg/l	<50 µg/l	<100 µg/l
(xiv)	Lead	< 20µg/l	< 50µg/l	< 100µg/l
(xv)	Cadmium	< 1.0µg/l	<2.5 µg/l	< 5.0µg/l
(xvi)	Mercury	< 0.2µg/l	< 0.5µg/l	< 1.0µg/l