ACTION PLAN FOR INDUSTRIAL CLUSTER IN SEVERLY POLLUTED AREA

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

नासिक Nashik

Maharashtra Pollution Control Board

Kalptaru Point, Sion East, Mumbai - 400022

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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.

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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.

Nashik is a city in the northwest region of Maharashtra in India, and is the administrative headquarter of the Nashik District and Nashik Division. There is a Hindustan Aeronautics Limited aircraft manufacturing plant located 16 km from Nashik. The Currency Note Press and India Security Press are on Nashik Road, where Indian currency and government stamp papers are printed respectively. Nashik also has textile industry, e.g., carpet weaving in remote areas like Surgana Block, National Bank for Agriculture and Rural Development has selected Yeola Block for development of Paithani Cluster. To facilitate the export a container freight station was started at MIDC Ambad by the Central Government. Nashik has been described as "The Wine Capital of India" by Alok Chandra of Business Standard due to the numerous wineries located within the district.

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 Nashik:

- The sampling was carried out in 7 days i.e. on 2nd to 9th June for Nashik region.
- In MIDC Ambad, total of 6 Stack Monitoring Samples, 5 Ambient Air Quality Monitoring Samples, 6 Ground Water Samples and 2 VOC Samples from Stack were collected and analyzed.
- In MIDC Satpur, total of 7 Stack Monitoring Samples, 6 Ambient Air Quality Monitoring Samples, 2 waste water samples, 6 Ground Water Samples and 1 VOC Samples from Stack 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 Industry	Stack Identity	MIDC	Table No.
1.	Lube Tech Oil Company	Boiler	Ambad	**I**
2.	Vir Electro Engg. Pvt. Ltd.	Zinc Bath Furnace	Ambad	**I**
3.	Sudal Industries Ltd.	Aluminium Melting Furnace	Ambad	**I**
4.	Isovolta India Pvt. Ltd.	Boiler	Ambad	**II**
5.	Glenmark Pharma Ltd.	Boiler	Satpur	**II**
6.	Graphite India Ltd.	Boiler	Satpur	**II**
7.	Caprihans India Pvt. Ltd.	Boiler	Satpur	**III**
8.	AATCO Food India Pvt. Ltd.	Boiler	Satpur	**III**
9.	Ceat Ltd.	Boiler	Satpur	**III**
10.	MSL Drive Line System Pvt. Ltd.	Process Stack	Satpur	**IV**
11.	Rainbow Deco Plus Pvt. Ltd.	Process Stack	Ambad	**IV**
12.	Kirloskar Engine Oil Ltd.	Process Stack	Ambad	**IV**
13.	Mahindra & Mahindra	Stack	Satpur	**IV**

*** The VOC result of stack emission is provided in Table No. IV**

Table No. I

Name of Industry			**Lube Tech Oil Company**	**Vir Electro Engg. Pvt. Ltd.**	**Sudal Industries Ltd.**
Date of Sampling			**05.06.18**	**06.06.18**	**06.06.18**
Sr.	**Parameter**	**Unit**	**Results**		
1.	Particulate Matter (as PM)	mg/Nm^3	188	84	166
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	8.88	8.88	14.6
		kg/day	0.11	0.47	2.27
	Std. Limit	**mg/Nm^3**	**100**	**100**	**100**

Name of Industry			**Lube Tech Oil Company**	**Vir Electro Engg. Pvt. Ltd.**	**Sudal Industries Ltd.**
Date of Sampling			**05.06.18**	**06.06.18**	**06.06.18**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	17.6	12.9	20.9
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**

Table No. II

Name of Industry			**Isovolta India Pvt. Ltd.**	**Glenmark Pharma Ltd.**	**Graphite India Ltd.**
Date of Sampling			**08.06.18**	**05.06.18**	**07.06.18**
Sr.	**Parameter**	**Unit**	**Results**		
1.	Particulate Matter (as PM)	mg/Nm^3	59	64	90
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	9.23	11.8	18.1
		kg/day	1.17	0.078	5.37
	Std. Limit	**mg/Nm^3**	**100**	**100**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	21.8	10.5	31.8
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**

Table No. III

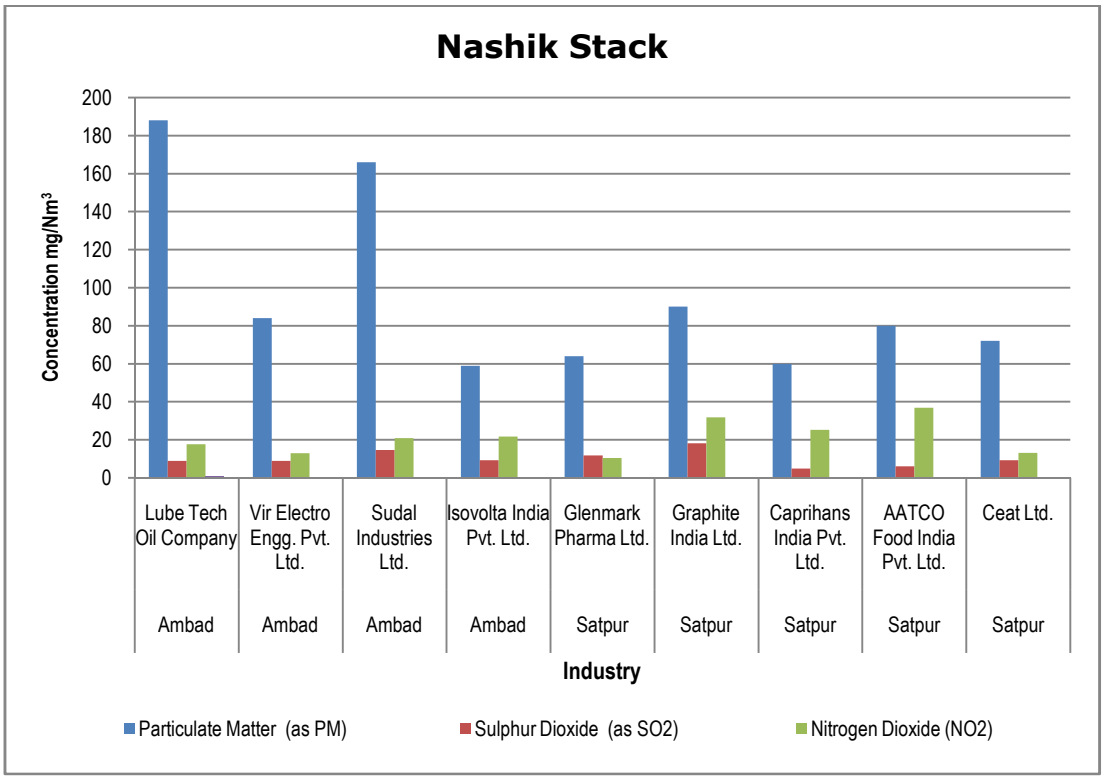
Name of Industry			**Caprihans India Pvt. Ltd.**	**AATCO Food India Pvt. Ltd.**	**Ceat Ltd.**
Date of Sampling			**08.06.18**	**08.06.18**	**07.06.18**
Sr.	**Parameter**	**Unit**	**Results**		
1.	Particulate Matter (as PM)	mg/Nm^3	60	80	72
	Std. Limit	**mg/Nm^3**	**150**	**150**	**150**
2.	Sulphur Dioxide (as SO_2)	mg/Nm^3	4.82	6.1	9.23
		kg/day	1.89	0.042	9.54

Name of Industry			**Caprihans India Pvt. Ltd.**	**AATCO Food India Pvt. Ltd.**	**Ceat Ltd.**
Date of Sampling			**08.06.18**	**08.06.18**	**07.06.18**
Sr.	**Parameter**	**Unit**	**Results**		
	Std. Limit	**mg/Nm^3**	**100**	**100**	**100**
3.	Nitrogen Dioxide (NO_2)	mg/Nm^3	25.3	36.8	13.1
	Std. Limit	**mg/Nm^3**	**50**	**50**	**50**

Table No. IV

Name of Industry			**MSL Drive Line System Pvt. Ltd.**	**Rainbow Deco Plus Pvt. Ltd.**	**Kirloskar Engine Oil Ltd.**	**Mahindra & Mahindra**
Date of Sampling			**06.06.18**	**06.06.18**	**07.06.18**	**09.06.18**
Sr.	**Parameter**	**Unit**	**Results**			
1.	VOC					
I.	Methyl Isobutyl Ketone	mg/Nm^3	ND	ND	ND	ND
II.	Benzene	mg/Nm^3	ND	ND	ND	ND
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 Nashik:



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.	Lub Tech Oil Company	Near Main Gate	Ambad	**I**
2.	Mahindra CIE Automotive Ltd.	Near Main Gate	Ambad	**I**
3.	Sudal Industries Ltd.	Near Temple	Ambad	**I**
4.	Vir Electro Engg. Pvt. Ltd.	Near Main Gate	Ambad	**II**
5.	Isovolta India Pvt. Ltd.	Near Main Gate	Ambad	**II**
6.	Graphite India Ltd.	Near Main Gate	Satpur	**II**
7.	MSL Drive Line System Pvt. Ltd.	Near Main Gate	Satpur	**III**
8.	AATCO Foods India Pvt. Ltd.	Near Admin Building	Satpur	**III**
9.	VIP Industries Ltd.	Near ETP	Satpur	**III**
10.	Mahindra & Mahindra	Near MQS Gate	Satpur	**IV**
11.	Ceat Ltd.	Near STP	Satpur	**IV**

Table No. I

Location				**Lub Tech Oil Company**	**Mahindra CIE Automotive Ltd.**	**Sudal Industries Ltd.**
Date of Sampling				**05.06.18**	**05.06.18**	**06.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	7.31	6.88	6.55
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	6.67	6.9	6.67
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	72	193	424
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	17.9	48	105
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL	BDL
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	1.26	1.55	3.9
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	BDL	BDL	BDL
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL	BDL
11.	Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	BDL

Table No. II

Location				**Vir Electro Engg. Pvt. Ltd.**	**Isovolta India Pvt. Ltd.**	**Graphite India Ltd.**
Date of Sampling				**06.06.18**	**07.06.18**	**07.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	7.09	6.39	7
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	6.89	6.89	6.45
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	117	111	751
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	29.1	27	187
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL	BDL
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	2.45	1.21	2.01
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	BDL	BDL	BDL
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL	BDL
11.	Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	BDL

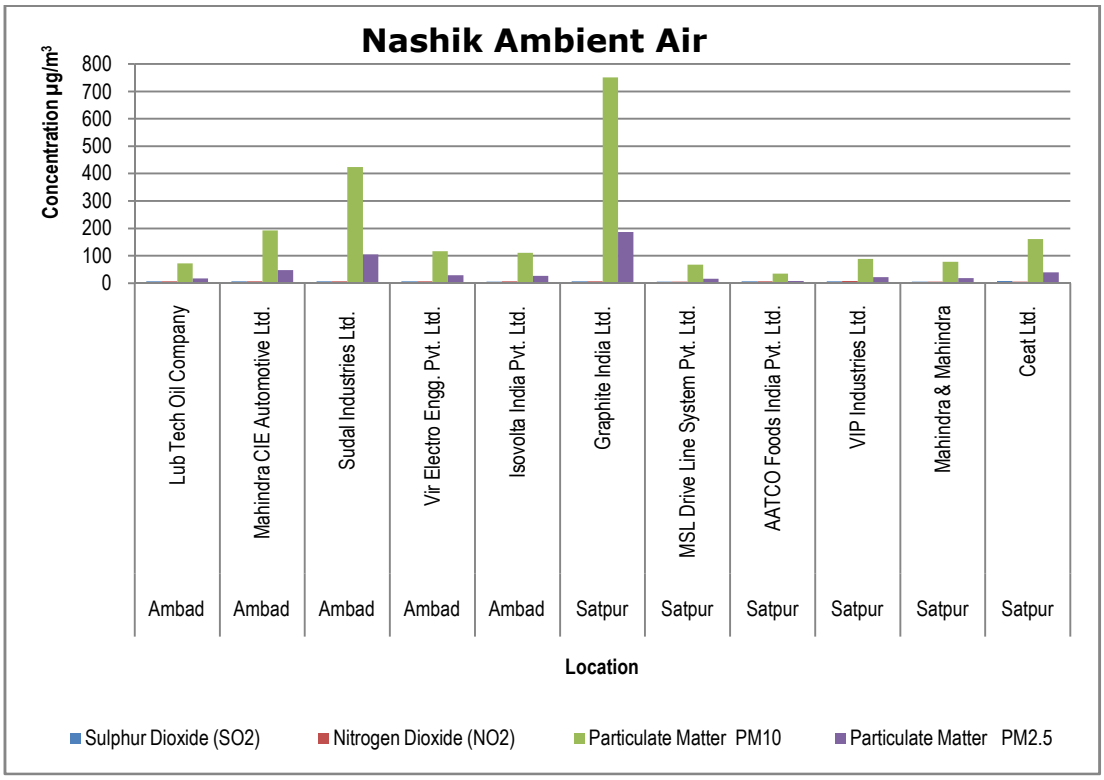
Table No. III

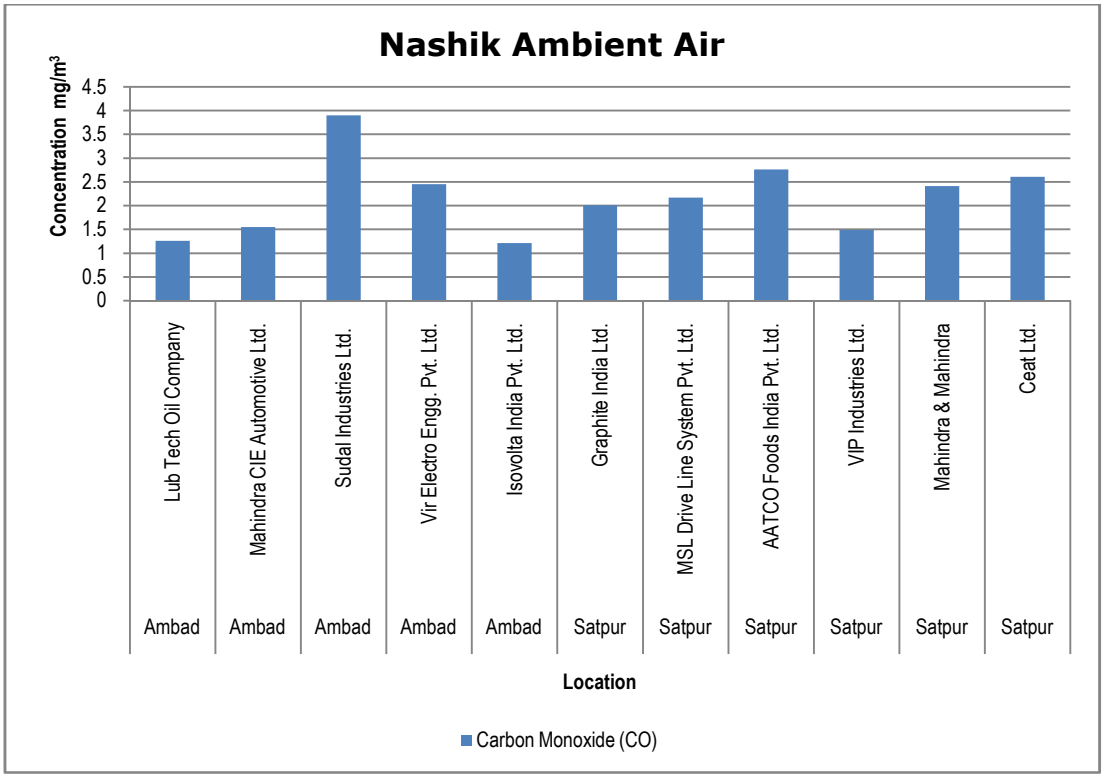
Location				**MSL Drive Line System Pvt. Ltd.**	**AATCO Foods India Pvt. Ltd.**	**VIP Industries Ltd.**
Date of Sampling				**07.06.18**	**07.06.18**	**07.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**		
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	6.29	6.59	6.7
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	6	7.34	8.44
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	67.3	34.6	88.6
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	16.6	8.65	22
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL	BDL
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	2.17	2.76	1.49
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	BDL	BDL	BDL
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL	BDL
11.	Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL	BDL

Table No. IV

Location				**Mahindra & Mahindra**	**Ceat Ltd.**
Date of Sampling				**09.06.18**	**07.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit (NAAQS 2009)**	**Results**	
1.	Sulphur Dioxide (SO_2)	$\mu g/m^3$	**80**	6.19	8.23
2.	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	**80**	6.23	5.57
3.	Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	**100**	78	161
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	**60**	19	40
5.	Ozone (O_3)	$\mu g/m^3$	**180**	BDL	BDL
6.	Lead (Pb)	$\mu g/m^3$	**1**	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m^3	**4**	2.41	2.61
8.	Ammonia (NH_3)	$\mu g/m^3$	**400**	BDL	BDL
9.	Benzene (C_6H_6)	$\mu g/m^3$	**5**	BDL	BDL
10.	Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL
11.	Arsenic (As)	ng/m^3	**6**	BDL	BDL
12.	Nickel (Ni)	ng/m^3	**20**	BDL	BDL

Graphs: Ambient Air Quality Monitoring for Nashik:





3.3 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.	Nasardi Bridge Near NIMA Bhavan	Nasardi Bridge water	Satpur	**I**
2.	Chitte Pool Gangapur Road	Waste water	Satpur	**I**

Table No. I

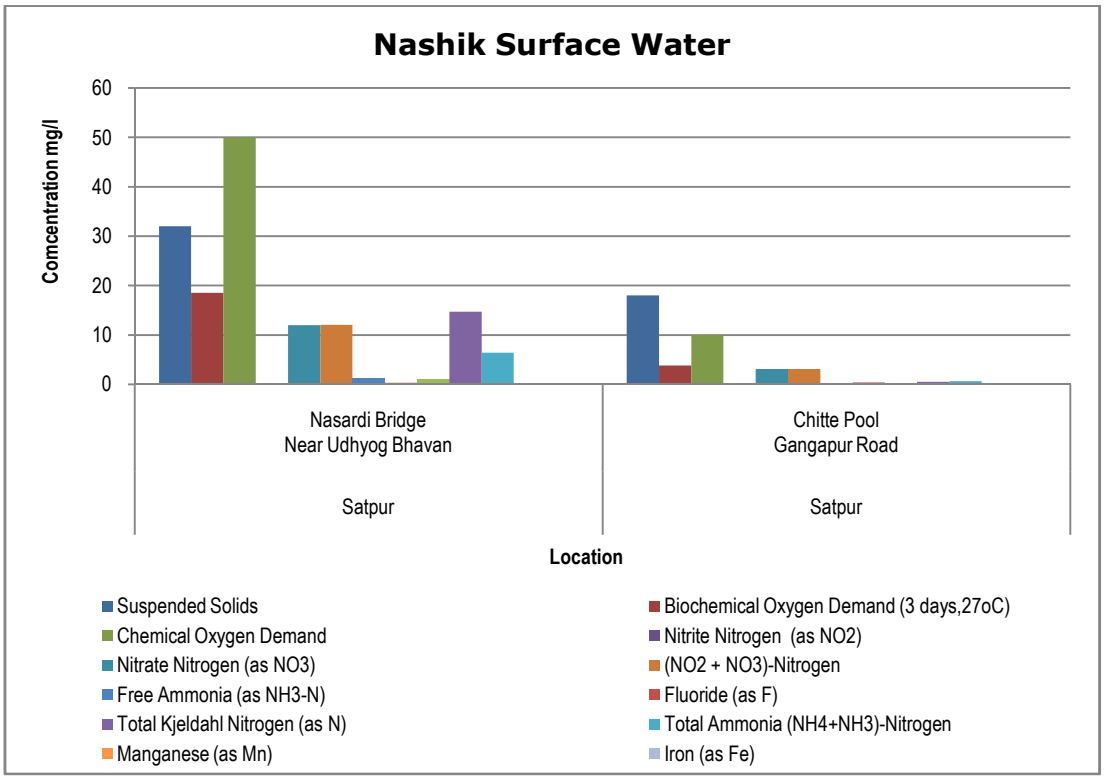
Location				**Nasardi Bridge Near NIMA Bhavan**	**Chitte Pool Gangapur Road**
Date of Sampling				**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
1.	Colour	Hazen		2	2
2.	Smell	-		Agreeable	Disagreeable
3.	pH	-	**5.5 -9.0**	7.54	7.39
4.	Oil & Grease	mg/L	**10.0**	BDL	BDL
5.	Suspended Solids	mg/L	**100.0**	32	18
6.	Dissolved Oxygen (% Saturation)	%		2	25
7.	Chemical Oxygen Demand	mg/L	**250.0**	50	10
8.	Biochemical Oxygen Demand (3 days,27^{o} C)	mg/L	**30.0**	18.5	3.8
9.	Electrical Conductivity (at 25^{o} C)	µmho/cm		707	707
10.	Nitrite Nitrogen (as NO_2)	mg/L		0.03	0.04

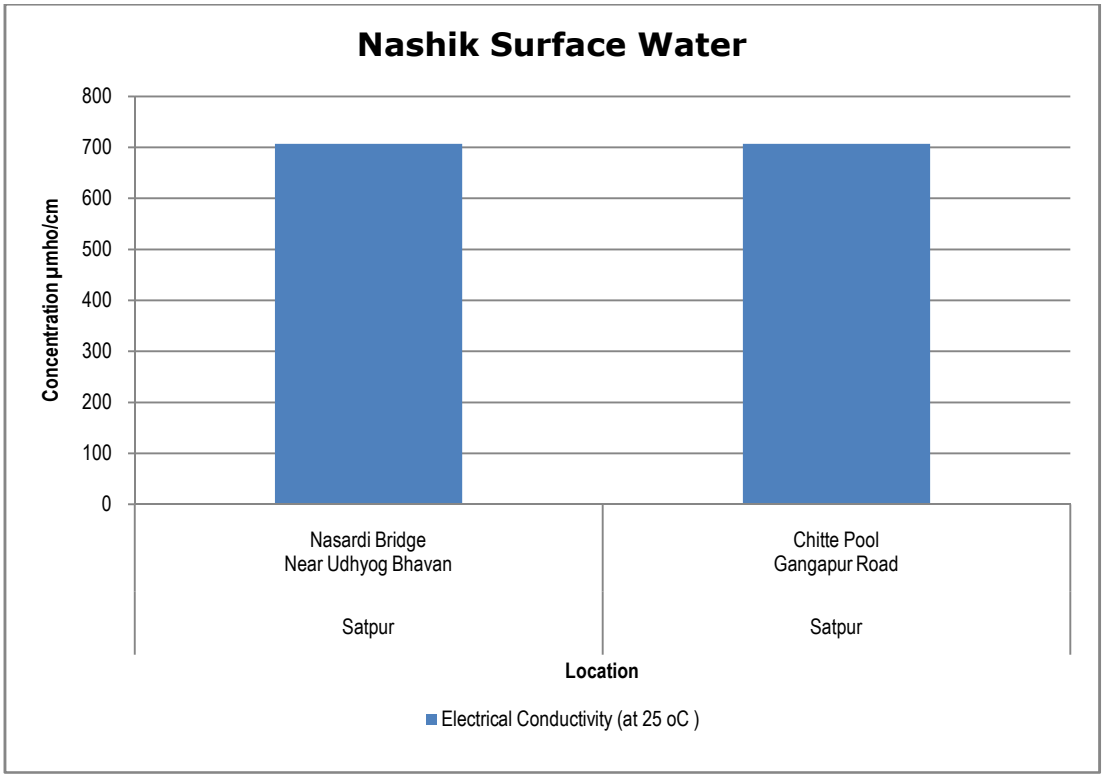
Location				**Nasardi Bridge Near NIMA Bhavan**	**Chitte Pool Gangapur Road**
Date of Sampling				**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
11.	Nitrate Nitrogen (as NO_3)	mg/L	**10.0**	12	3.08
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**5.0**	12.03	3.12
13.	Free Ammonia (as NH_3-N)	mg/L	**5.0**	1.2	BDL
14.	Total Residual Chlorine	mg/L	**1.0**	BDL	BDL
15.	Cyanide (as CN)	mg/L	**0.2**	BDL	BDL
16.	Fluoride (as F)	mg/L	**2.0**	0.3	0.36
17.	Sulphide (as S^{2-})	mg/L	**2.0**	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	**5.0**	0.58	1.65
19.	Sodium Absorption Ratio	mg/L		BDL	BDL
20.	Total Coliforms	MPN index/ 100 ml	**100.0**	32	280
21.	Faecal Coliforms	MPN index/ 100 ml	**1000.0**	20	47
22.	Total Phosphorous (as P)	mg/L	**1.0**	1.28	2.35
23.	Total Kjeldahl Nitrogen (as TKN)	mg/L	**100.0**	14.7	0.5
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**5.0**	6.44	0.65
25.	Phenols (as C_6H_5OH)	mg/L	**3.0**	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**3.0**	BDL	BDL

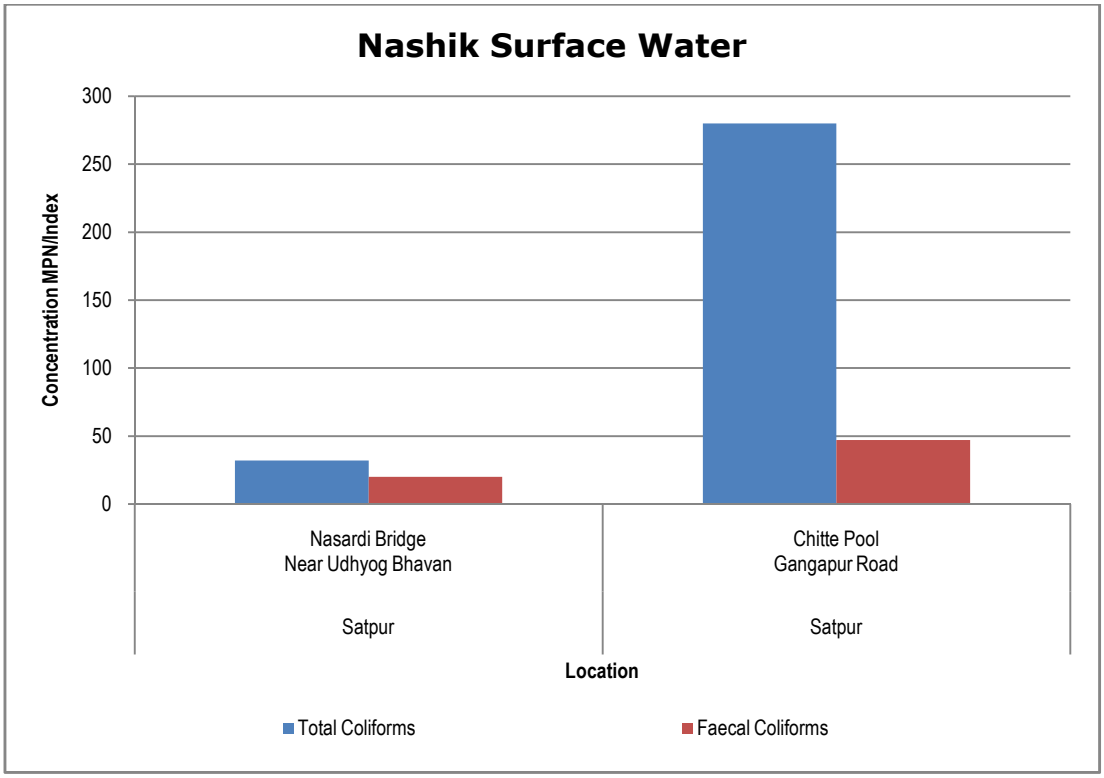
Location				**Nasardi Bridge Near NIMA Bhavan**	**Chitte Pool Gangapur Road**
Date of Sampling				**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
27.	Organo Chlorine Pesticides				
I.	Alachlor	µg/L	**2.0**	BDL	BDL
II.	Atrazine	µg/L	**0.2**	BDL	BDL
III.	Aldrin	µg/L	**0.1**	BDL	BDL
IV.	Dieldrin	µg/L	**2.0**	BDL	BDL
V.	Alpha HCH	µg/L	**0.01**	BDL	BDL
VI.	Beta HCH	µg/L	**2.0**	BDL	BDL
VII.	Delta HCH	µg/L	**3.0**	BDL	BDL
VIII.	Butachlor	µg/L	**0.2**	BDL	BDL
IX.	p,p DDT	µg/L	**0.05**	BDL	BDL
X.	o,p DDT	µg/L	**100.0**	BDL	BDL
XI.	p,p DDE	µg/L	**250.0**	BDL	BDL
XII.	o,p DDE	µg/L	**30.0**	BDL	BDL
XIII.	p,p DDD	µg/L		BDL	BDL
XIV.	o,p DDD	µg/L		BDL	BDL
XV.	Alpha Endosulfan	µg/L	**10.0**	BDL	BDL
XVI.	Beta Endosulfan	µg/L		BDL	BDL
XVII.	Endosulfan Sulphate	µg/L	**5.0**	BDL	BDL
XVIII.	Y HCH (Lindane)	µg/L	**1.0**	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**0.2**	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**2.0**	BDL	BDL

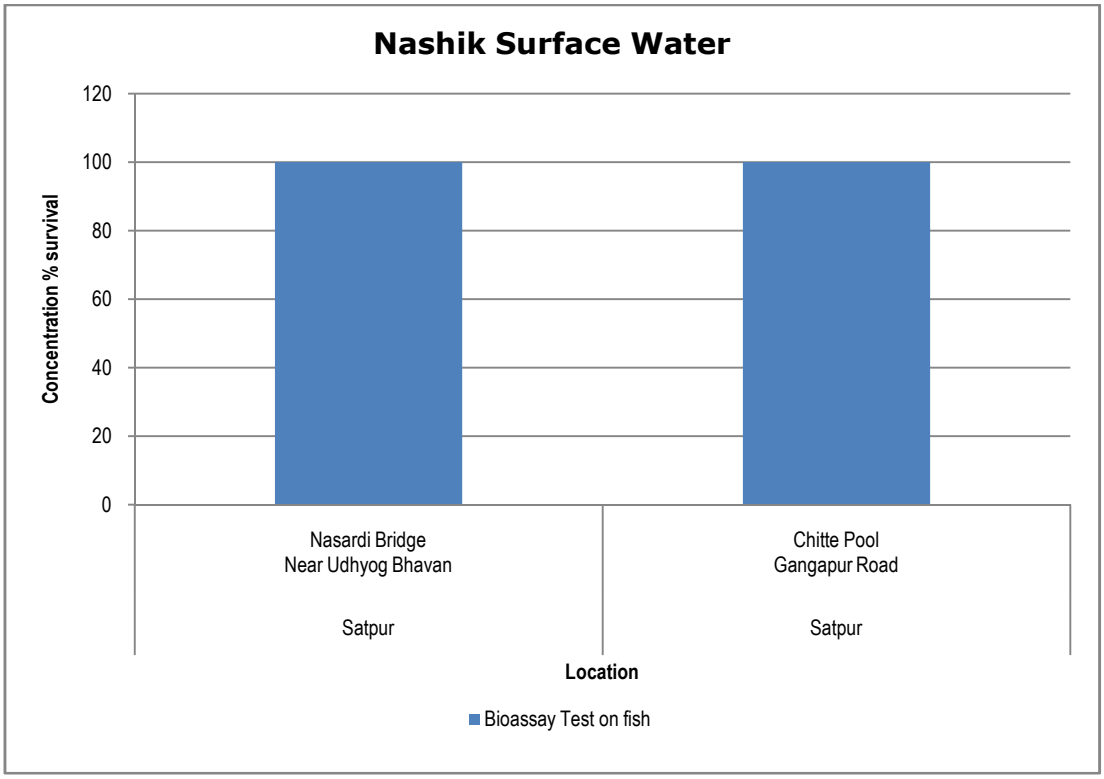
Location				**Nasardi Bridge Near NIMA Bhavan**	**Chitte Pool Gangapur Road**
Date of Sampling				**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**	
30.	Zinc (as Zn)	mg/L	**5.0**	BDL	BDL
31.	Nickel (as Ni)	mg/L	**3.0**	BDL	BDL
32.	Copper (as Cu)	mg/L		BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.1**	BDL	BDL
34.	Total Chromium (as Cr)	mg/L	**2.0**	BDL	BDL
35.	Total Arsenic (as As)	mg/L	**0.2**	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.1**	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**2.0**	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.01**	BDL	BDL
39.	Manganese (as Mn)	mg/L	**2.0**	0.143	BDL
40.	Iron (as Fe)	mg/L	**3.0**	0.198	BDL
41.	Vanadium (as V)	mg/L	**0.2**	BDL	BDL
42.	Selenium (as Se)	mg/L	**0.05**	BDL	BDL
43.	Boron (as B)	mg/L		BDL	BDL
44.	Bioassay Test on fish	% survival	**90% survival after 96h in 100%effluent**	100	100

Graphs: Water/Waste Water Quality Monitoring for Nashik:






Nashik Surface Water
Concentration MPN/Index
300
250
200
150
100
50
0
Nasardi Bridge
Near Udhyog Bhavan
Satpur
Chitte Pool
Gangapur Road
Satpur
Location
Total Coliforms
Faecal Coliforms


Nashik Surface Water
Concentration % survival
120
100
80
60
40
20
0
Nasardi Bridge
Near Udhyog Bhavan
Satpur
Chitte Pool
Gangapur Road
Satpur
Location
Bioassay Test on fish

3.4 Ground Water Quality:

Sr.	Location	Source	MIDC	Table No.
1.	Dashrath Pandit Nikam Plot no. 4, Mauli Chowk, Dattanagar, Chunchale	Borewell Water	Ambad	**I**
2.	Satish Sukhlal Lad Sai Ekta park, near indoline furniture	Borewell Water	Ambad	**I**
3.	Pancharatna Farm, Maruti sankal, Dattanagar, Back side Kirloskar Industries	Well Water	Ambad	**I**
4.	Shivaji Kacharu Chavan Gat no. 154/3, vilholi	Well Water	Ambad	**II**
5.	Govind Vithoba Shirsat	Well Water	Ambad	**II**
6.	Hotel Tapovan NH-3, Highway, Near garware point	Borewell Water	Ambad	**II**
7.	Ramesh Ramchandra Kale, Near ESI Hospital	Borewell Water	Satpur	**III**
8.	Seva Developers Pvt. Ltd.	Borewell Water	Satpur	**III**
9.	Shivaji Nagar 55/6	Borewell Water	Satpur	**III**
10.	Shradha Farm House	Well Water	Satpur	**IV**
11.	Amit Dilip Yadav P. no. 50, Ganesh nagar	Borewell Water	Satpur	**IV**
12.	Vrushab Industry Vanvihar Colony	Borewell Water	Satpur	**IV**

Table No. I

Location				**Dashrath Pandit Nikam Plot no. 4**	**Satish Sukhlal Lad Sai Ekta park**	**Pancharatna Farm, Maruti sankal**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen	**5**	1	1	1
2.	Smell	-	**Agreeable**	Agreeable	Agreeable	Disagreeable
3.	pH	-	**6.5-8.5**	6.71	7.09	7.1
4.	Oil & Grease	mg/L	**100**	BDL	BDL	BDL
5.	Suspended Solids	mg/L	**500**	9	6	20
6.	Dissolved Oxygen (%Saturation)	%		0	65	65
7.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	14	5	10
8.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	5.2	1.8	3.8
9.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	1116	664	1109
10.	Nitrite Nitrogen (as NO_2)	mg/L	**1.0**	0.15	0.03	0.11
11.	Nitrate Nitrogen (as NO_3)	mg/L	**45**	27.8	39.5	18.9
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**0.5**	27.9	39.5	19
13.	Free Ammonia (as NH_3-N)	mg/L	**0.2**	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.5**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**1.0**	BDL	BDL	BDL

Location				**Dashrath Pandit Nikam Plot no. 4**	**Satish Sukhlal Lad Sai Ekta park**	**Pancharatna Farm, Maruti sankal**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
16.	Fluoride (as F)	mg/L	**1**	1.28	0.05	0.26
17.	Sulphide (as S_{2-})	mg/L	**0.05**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		BDL	BDL	BDL
20.	Total Coliforms	MPN index/ 100 ml	**ND**	47	220	220
21.	Faecal Coliforms	MPN index/ 100 ml	**ND**	39	40	47
22.	Total Phosphorous (as P)	mg/L	**0.5**	0.41	0.6	0.35
23.	Total Kjeldahl Nitrogen	mg/L	**0.001**	1.2	2	0.28
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
25.	Phenols (as C_6H_5OH)	mg/L	**0.001**	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**0.02**	BDL	BDL	BDL
27.	Organo Chlorine Pesticides		**0.05**			
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

Location				**Dashrath Pandit Nikam Plot no. 4**	**Satish Sukhlal Lad Sai Ekta park**	**Pancharatna Farm, Maruti sankal**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
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		BDL	BDL	BDL
IX.	p,p DDT	µg/L		BDL	BDL	BDL
X.	o,p DDT	µg/L		BDL	BDL	BDL
XI.	p,p DDE	µg/L		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	**1**	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	**0.4**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**2.0**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0001**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**0.0005**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**5.0**	BDL	BDL	BDL
32.	Copper (as Cu)	mg/L	**0.02**	BDL	BDL	BDL

Location				**Dashrath Pandit Nikam Plot no. 4**	**Satish Sukhlal Lad Sai Ekta park**	**Pancharatna Farm, Maruti sankal**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.05**	BDL	BDL	BDL
34.	Total Chromium (as Cr)	mg/L	**1**	BDL	BDL	BDL
35.	Total Arsenic (as As)	mg/L	**0.05**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.01**	BDL	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**0.01**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.003**	BDL	BDL	BDL
39.	Manganese (as Mn)	mg/L	**0.001**	BDL	BDL	BDL
40.	Iron (as Fe)	mg/L	**0.1**	0.108	0.127	BDL
41.	Vanadium (as V)	mg/L	**0.3**	BDL	BDL	BDL
42.	Selenium (as Se)	mg/L		BDL	BDL	BDL
43.	Boron (as B)	mg/L	**0.01**	BDL	BDL	BDL
44.	Bioassay Test on fish	% survival		100	100	100

Table No. II

Location				**Shivaji Kacharu Chavan Gat no. 154/3, vilholi**	**Govind Vithoba Shirsat**	**Hotel Tapovan NH-3, Highway, Near garware point**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen	**5**	1	1	1
2.	Smell	-	**Agreeable**	Disagreeable	Disagreeable	Agreeable
3.	pH	-	**6.5-8.5**	7.13	7.16	6.88
4.	Oil & Grease	mg/L	**100**	BDL	BDL	BDL
5.	Suspended Solids	mg/L	**500**	6	16	BDL
6.	Dissolved Oxygen (%Saturation)	%		45	85	0
7.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	11	6	BDL
8.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	3.75	2.9	BDL
9.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	1082	866	978
10.	Nitrite Nitrogen (as NO_2)	mg/L	**1.0**	0.1	0.13	0.01
11.	Nitrate Nitrogen (as NO_3)	mg/L	**45**	18.6	32.1	41.7
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**0.5**	18.7	32.2	41.7
13.	Free Ammonia (as NH_3-N)	mg/L	**0.2**	BDL	BDL	BDL

Location				**Shivaji Kacharu Chavan Gat no. 154/3, vilholi**	**Govind Vithoba Shirsat**	**Hotel Tapovan NH-3, Highway, Near garware point**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
14.	Total Residual Chlorine	mg/L	**1.5**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**1.0**	BDL	BDL	BDL
16.	Fluoride (as F)	mg/L	**1**	BDL	BDL	0.26
17.	Sulphide (as S_{2-})	mg/L	**0.05**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		BDL	BDL	BDL
20.	Total Coliforms	MPN index/ 100 ml	**ND**	34	32	Absent
21.	Faecal Coliforms	MPN index/ 100 ml	**ND**	14	22	BDL
22.	Total Phosphorous (as P)	mg/L	**0.5**	0.35	0.4	0.4
23.	Total Kjeldahl Nitrogen	mg/L	**0.001**	0.33	1	1.9
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
25.	Phenols (as C_6H_5OH)	mg/L	**0.001**	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**0.02**	BDL	BDL	BDL

Location				**Shivaji Kacharu Chavan Gat no. 154/3, vilholi**	**Govind Vithoba Shirsat**	**Hotel Tapovan NH-3, Highway, Near garware point**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
27.	Organo Chlorine Pesticides		**0.05**			
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		BDL	BDL	BDL
IX.	p,p DDT	µg/L		BDL	BDL	BDL
X.	o,p DDT	µg/L		BDL	BDL	BDL
XI.	p,p DDE	µg/L		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	**1**	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	**0.4**	BDL	BDL	BDL

Location				**Shivaji Kacharu Chavan Gat no. 154/3, vilholi**	**Govind Vithoba Shirsat**	**Hotel Tapovan NH-3, Highway, Near garware point**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**2.0**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0001**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**0.0005**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**5.0**	BDL	BDL	BDL
32.	Copper (as Cu)	mg/L	**0.02**	BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.05**	BDL	BDL	BDL
34.	Total Chromium (as Cr)	mg/L	**1**	BDL	BDL	BDL
35.	Total Arsenic (as As)	mg/L	**0.05**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.01**	BDL	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**0.01**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.003**	BDL	BDL	BDL
39.	Manganese (as Mn)	mg/L	**0.001**	BDL	BDL	BDL
40.	Iron (as Fe)	mg/L	**0.1**	BDL	BDL	BDL
41.	Vanadium (as V)	mg/L	**0.3**	BDL	BDL	BDL
42.	Selenium (as Se)	mg/L		BDL	BDL	BDL
43.	Boron (as B)	mg/L	**0.01**	BDL	BDL	BDL

Location				**Shivaji Kacharu Chavan Gat no. 154/3, vilholi**	**Govind Vithoba Shirsat**	**Hotel Tapovan NH-3, Highway, Near garware point**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
44.	Bioassay Test on fish	% survival		100	100	100

Table No. III

Location				**Ramesh Ramchandra Kale, Near ESI Hospital**	**Seva Developers Pvt. Ltd.**	**Shivaji Nagar 55/6**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen	**5**	1	1	1
2.	Smell	-	**Agreeable**	Disagreeable	Disagreeable	Agreeable
3.	pH	-	**6.5-8.5**	7.03	6.9	7.45
4.	Oil & Grease	mg/L	**100**	BDL	BDL	BDL
5.	Suspended Solids	mg/L	**500**	8	6	12
6.	Dissolved Oxygen (%Saturation)	%		45	27	85
7.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	BDL	BDL	8
8.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	BDL	BDL	2.7

Location				**Ramesh Ramchandra Kale, Near ESI Hospital**	**Seva Developers Pvt. Ltd.**	**Shivaji Nagar 55/6**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
9.	Electrical Conductivity (at 25°C)	µmho/cm	**750**	786	825	834
10.	Nitrite Nitrogen (as NO_2)	mg/L	**1.0**	0.36	3.1	0.07
11.	Nitrate Nitrogen (as NO_3)	mg/L	**45**	5.54	17.4	19.6
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**0.5**	5.9	20.5	19.6
13.	Free Ammonia (as NH_3-N)	mg/L	**0.2**	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.5**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**1.0**	BDL	BDL	BDL
16.	Fluoride (as F)	mg/L	**1**	0.15	0.2	0.44
17.	Sulphide (as S_{2-})	mg/L	**0.05**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		BDL	BDL	BDL
20.	Total Coliforms	MPN index/ 100 ml	**ND**	Absent	39	47
21.	Faecal Coliforms	MPN index/ 100 ml	**ND**	BDL	11	22
22.	Total Phosphorous (as P)	mg/L	**0.5**	0.44	0.4	0.4

Location				**Ramesh Ramchandra Kale, Near ESI Hospital**	**Seva Developers Pvt. Ltd.**	**Shivaji Nagar 55/6**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
23.	Total Kjeldahl Nitrogen	mg/L	**0.001**	BDL	0.56	0.5
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
25.	Phenols (as C_6H_5OH)	mg/L	**0.001**	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**0.02**	BDL	BDL	BDL
27.	Organo Chlorine Pesticides		**0.05**			
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		BDL	BDL	BDL
IX.	p,p DDT	µg/L		BDL	BDL	BDL
X.	o,p DDT	µg/L		BDL	BDL	BDL
XI.	p,p DDE	µg/L		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				**Ramesh Ramchandra Kale, Near ESI Hospital**	**Seva Developers Pvt. Ltd.**	**Shivaji Nagar 55/6**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
XV.	Alpha Endosulfan	µg/L	**1**	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	**0.4**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**2.0**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0001**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**0.0005**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**5.0**	BDL	BDL	BDL
32.	Copper (as Cu)	mg/L	**0.02**	BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.05**	BDL	BDL	BDL
34.	Total Chromium (as Cr)	mg/L	**1**	BDL	BDL	BDL
35.	Total Arsenic (as As)	mg/L	**0.05**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.01**	BDL	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**0.01**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.003**	BDL	BDL	BDL
39.	Manganese (as Mn)	mg/L	**0.001**	BDL	BDL	BDL
40.	Iron (as Fe)	mg/L	**0.1**	0.199	BDL	BDL

Location				**Ramesh Ramchandra Kale, Near ESI Hospital**	**Seva Developers Pvt. Ltd.**	**Shivaji Nagar 55/6**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
41.	Vanadium (as V)	mg/L	**0.3**	BDL	BDL	BDL
42.	Selenium (as Se)	mg/L		BDL	BDL	BDL
43.	Boron (as B)	mg/L	**0.01**	BDL	BDL	BDL
44.	Bioassay Test on fish	% survival		100	100	50

Table No. II

Location				**Shradha Farm House**	**Amit Dilip Yadav P. no. 50, Ganesh nagar**	**Vrushab Industry Vanvihar Colony**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
1.	Colour	Hazen	**5**	1	1	1
2.	Smell	-	**Agreeable**	Disagreeable	Disagreeable	Disagreeable
3.	pH	-	**6.5-8.5**	7.09	7.1	7.6
4.	Oil & Grease	mg/L	**100**	BDL	BDL	BDL
5.	Suspended Solids	mg/L	**500**	8	10	10
6.	Dissolved Oxygen (%Saturation)	%		46	43	16
7.	Chemical Oxygen Demand	mg/L	**10 (WHO, 1993)**	BDL	BDL	BDL

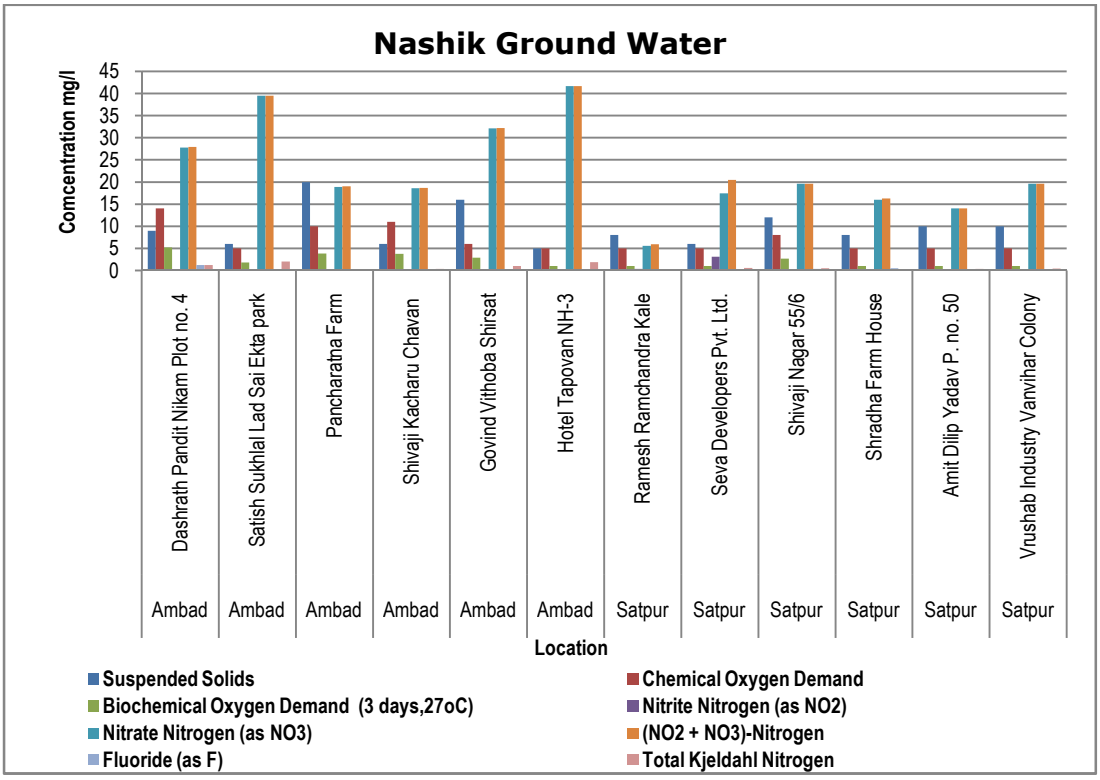
Location				**Shradha Farm House**	**Amit Dilip Yadav P. no. 50, Ganesh nagar**	**Vrushab Industry Vanvihar Colony**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
8.	Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L	**6 (WHO, 1993)**	BDL	BDL	BDL
9.	Electrical Conductivity (at 25^{o}C)	µmho/cm	**750**	738	578	819
10.	Nitrite Nitrogen (as NO_2)	mg/L	**1.0**	0.3	BDL	0.03
11.	Nitrate Nitrogen (as NO_3)	mg/L	**45**	16	14	19.6
12.	(NO_2 + NO_3)-Nitrogen	mg/L	**0.5**	16.3	14	19.6
13.	Free Ammonia (as NH_3-N)	mg/L	**0.2**	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	**1.5**	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	**1.0**	BDL	BDL	BDL
16.	Fluoride (as F)	mg/L	**1**	0.55	BDL	BDL
17.	Sulphide (as S_{2-})	mg/L	**0.05**	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		BDL	BDL	BDL
20.	Total Coliforms	MPN index/ 100 ml	**ND**	39	47	40
21.	Faecal Coliforms	MPN index/ 100 ml	**ND**	6.8	39	26

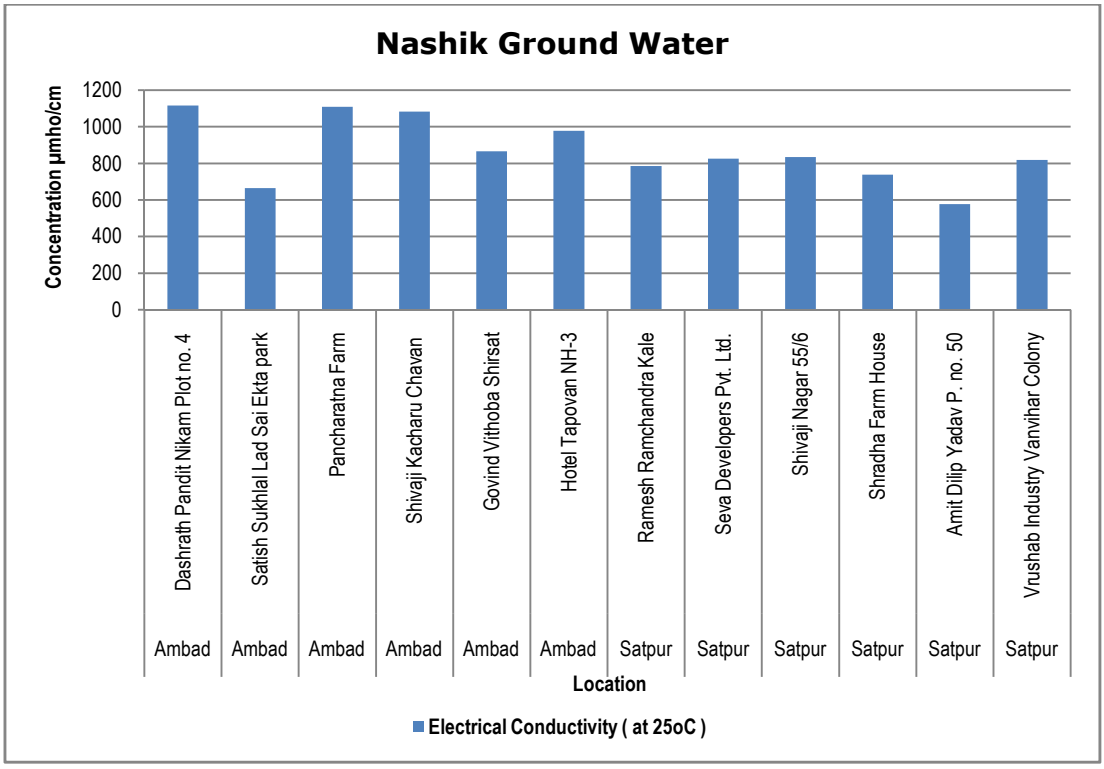
Location				**Shradha Farm House**	**Amit Dilip Yadav P. no. 50, Ganesh nagar**	**Vrushab Industry Vanvihar Colony**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
22.	Total Phosphorous (as P)	mg/L	**0.5**	0.37	0.46	0.4
23.	Total Kjeldahl Nitrogen	mg/L	**0.001**	BDL	0.34	0.44
24.	Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**0.5**	BDL	BDL	BDL
25.	Phenols (as C_6H_5OH)	mg/L	**0.001**	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	**0.02**	BDL	BDL	BDL
27.	Organo Chlorine Pesticides		**0.05**			
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		BDL	BDL	BDL
IX.	p,p DDT	µg/L		BDL	BDL	BDL
X.	o,p DDT	µg/L		BDL	BDL	BDL
XI.	p,p DDE	µg/L		BDL	BDL	BDL
XII.	o,p DDE	µg/L	**1**	BDL	BDL	BDL

Location				**Shradha Farm House**	**Amit Dilip Yadav P. no. 50, Ganesh nagar**	**Vrushab Industry Vanvihar Colony**
Date of Sampling				**02.06.18**	**02.06.18**	**02.06.18**
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
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	**1**	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	**0.4**	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	**2.0**	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (PCB)	mg/L	**0.0001**	BDL	BDL	BDL
30.	Zinc (as Zn)	mg/L	**0.0005**	BDL	BDL	BDL
31.	Nickel (as Ni)	mg/L	**5.0**	BDL	BDL	BDL
32.	Copper (as Cu)	mg/L	**0.02**	BDL	BDL	BDL
33.	Hexavalent Chromium (as Cr^{6+})	mg/L	**0.05**	BDL	BDL	BDL
34.	Total Chromium (as Cr)	mg/L	**1**	BDL	BDL	0.067
35.	Total Arsenic (as As)	mg/L	**0.05**	BDL	BDL	BDL
36.	Lead (as Pb)	mg/L	**0.01**	BDL	BDL	BDL
37.	Cadmium (as Cd)	mg/L	**0.01**	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	**0.003**	BDL	BDL	BDL

Location				Shradha Farm House	Amit Dilip Yadav P. no. 50, Ganesh nagar	Vrushab Industry Vanvihar Colony
Date of Sampling				02.06.18	02.06.18	02.06.18
Sr.	**Parameters**	**Unit**	**Std. Limit**	**Results**		
39.	Manganese (as Mn)	mg/L	**0.001**	BDL	BDL	BDL
40.	Iron (as Fe)	mg/L	**0.1**	0.199	BDL	BDL
41.	Vanadium (as V)	mg/L	**0.3**	BDL	BDL	BDL
42.	Selenium (as Se)	mg/L		BDL	BDL	BDL
43.	Boron (as B)	mg/L	**0.01**	BDL	BDL	0.147
44.	Bioassay Test on fish	% survival		50	100	0

Graphs: Ground Water Quality Monitoring for Nashik:




Nashik Ground Water
Concentration µmho/cm
1200
1000
800
600
400
200
0
Dashrath Pandit Nikam Plot no. 4
Satish Sukhlal Lad Sai Ekta park
Pancharatna Farm
Shivaji Kacharu Chavan
Govind Vithoba Shirsat
Hotel Tapovan NH-3
Ramesh Ramchandra Kale
Seva Developers Pvt. Ltd.
Shivaji Nagar 55/6
Shradha Farm House
Amit Dilip Yadav P. no. 50
Vrushab Industry Vanvihar Colony
Ambad
Ambad
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Satpur
Satpur
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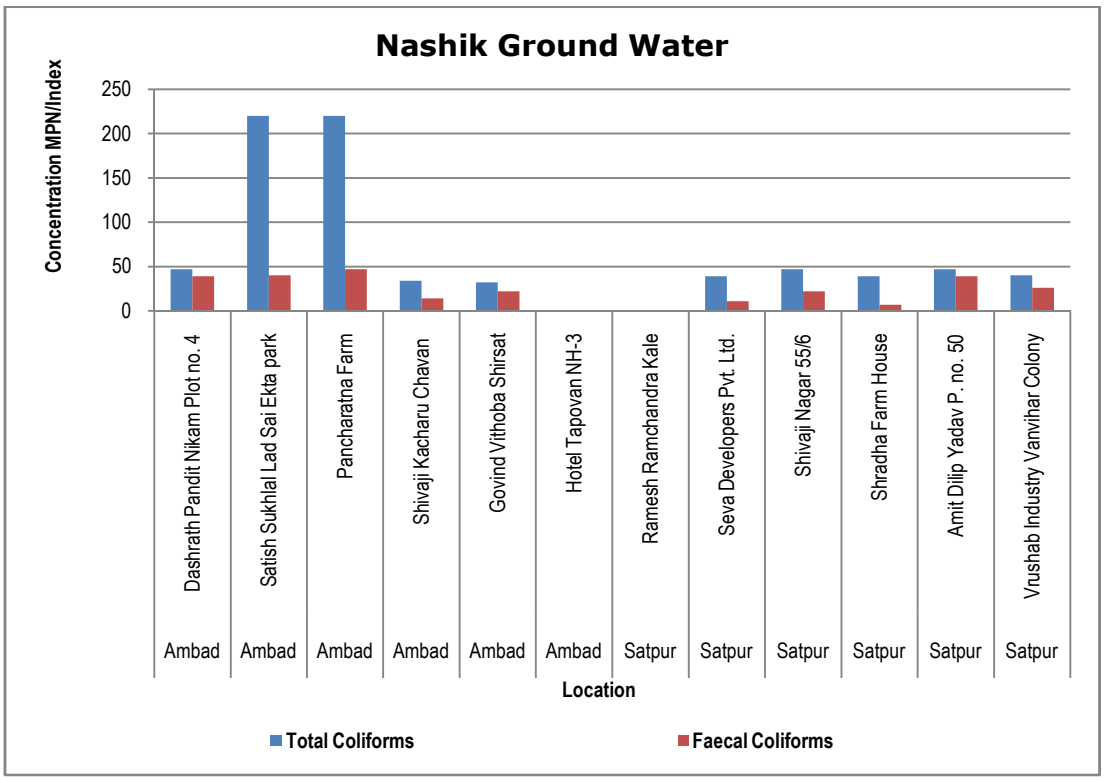
Satpur
Location
Electrical Conductivity (at 25oC)


Nashik Ground Water
Concentration MPN/Index
250
200
150
100
50
0
Dashrath Pandit Nikam Plot no. 4
Satish Sukhlal Lad Sai Ekta park
Pancharatna Farm
Shivaji Kacharu Chavan
Govind Vithoba Shirsat
Hotel Tapovan NH-3
Ramesh Ramchandra Kale
Seva Developers Pvt. Ltd.
Shivaji Nagar 55/6
Shradha Farm House
Amit Dilip Yadav P. no. 50
Vrushab Industry Vanvihar Colony
Ambad
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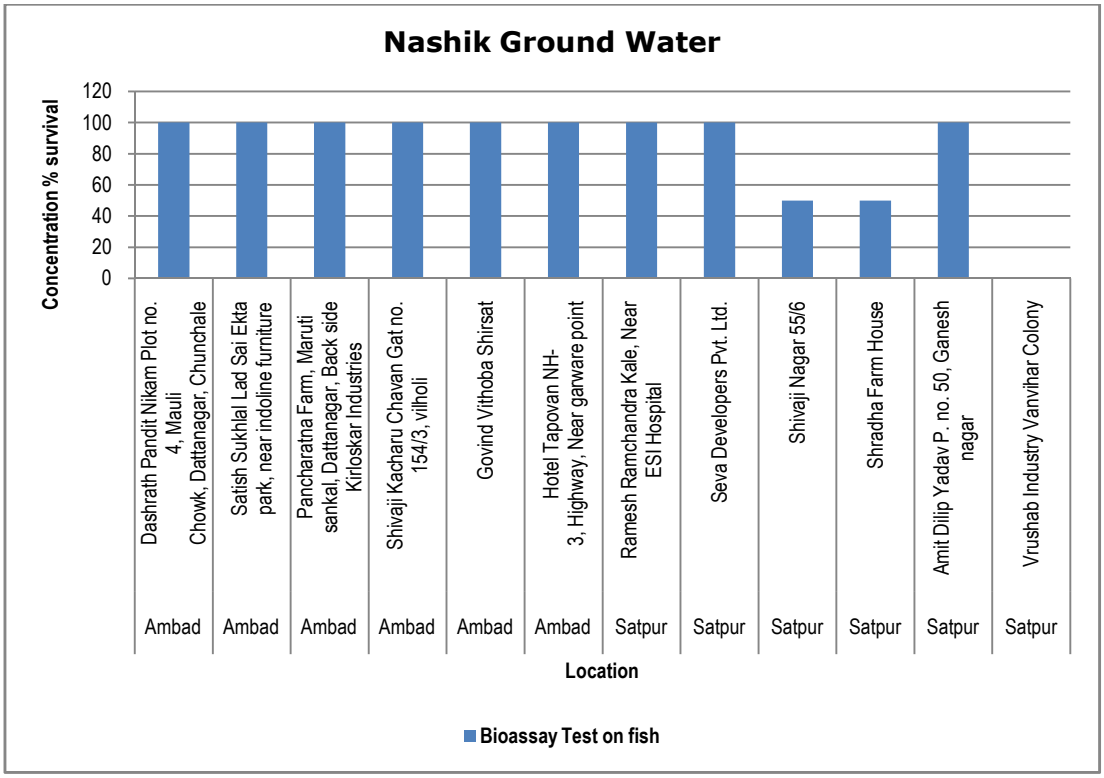
Location
Total Coliforms
Faecal Coliforms



4. Summary and Conclusion

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

4.1 Stack Emission Monitoring:

Thirteen industries from Nashik were selected for Stack emission monitoring, out of which 9 stacks are monitored for parameters Particulate Matter, Nitrogen Dioxide and Sulphur dioxide and 4 stacks have been monitored for VOC.

1. **Particulate matter (PM):** Out the 9 stacks, the result of 2 stacks was had higher concentration of particulate matter than the specified standards.

2. **Sulphur dioxide (SO_2):** Emission of SO_2.was well within the limit at all 9 stacks samples monitored.

3. **Nitrogen dioxide (NO_2):** Emission of NO_2.also was well within the limit at all 9 stacks samples monitored.

4. **Volatile Organic Compounds (VOC):** VOC was collected from 4 stacks, and the result was not detectable in any of the samples.

4.2 Ambient Air Quality Monitoring:

Eleven ambient air samples were collected from Nashik monitored were studied as per the NAAQ standards. The variations of each parameter within the area under study are discussed below:

1. **Sulphur dioxide (SO_2):** All the locations are observed with very low concentrations of SO_2. The highest level of SO_2 was observed at CEAT Ltd. with 8.23 µg/m^3 which is very much lower than the standard limit of NAAQS i.e. 80 µg/m^3.

2. **Nitrogen dioxide (NO_2):** Values of nitrogen dioxide are also observed below the standard limit of 80 µg/m^3 at all the 11 locations. The highest level of NO_2 was observed at VIP Industries Ltd. with a result of 8.44 µg/m^3.

3. **Particulate Matter (PM_{10}):** PM_{10} concentration of 6 locations was higher than the standard limit of 100 µg/m^3. The highest concentration of PM_{10} was observed at Graphite India Ltd. with 751 µg/m^3

4. **Particulate Matter ($PM_{2.5}$):** The highest level of $PM_{2.5}$ was also observed at Graphite India Ltd. with a result of 187 µg/m^3.

5. **Ozone (O_3):** Ozone was found below detectable limit at all 11 locations monitored.

6. **Lead (Pb):** All 11 locations monitored had concentration of lead below detectable limit.

7. **Carbon Monoxide (CO):** Concentration of carbon monoxide was well within the standard limit of NAAQS i.e. 4 µg/m^3.

8. **Ammonia (NH_3), Benzene (C_6H_6), Benzo(a)pyrene (BaP), Arsenic (As) and Nickel (Ni)::** All these parameters was observed below detectable limit at all 11 locations monitored.

4.3 Surface or waste Water Quality Monitoring:

To understand the Surface or waste Water Quality, samples were collected from 2 industries of Nashik. Considering the general parameters of all the industries mentioned, following are the conclusions:

1. **pH**: it is observed in between 7.39 and 7.54 which is well within the range.

2. **Suspended Solids**: Suspended solids of both water samples are well within the limits.

3. **Chemical Oxygen Demand**: Both samples collected, were well within the limit required as per standard. The highest COD was observed at Nasardi Bridge Near NIMA Bhavan with 50 mg/L concentration.

4. **Biochemical Oxygen Demand**: The highest BOD was observed at Nasardi Bridge Near NIMA Bhavan with 18.5 mg/L concentration.

5. **Sulphide**: Sulphide concentration was below the detectable limit in all 2 locations monitored.

6. **Total Ammoia**: The high range of Total ammonia exceeding of 6.44 mg/L which is exceeding the standard limit of 5 mg/L was observed at Nasardi Bridge Near NIMA Bhavan

7. **Total Kjeldahl Nitrogen**: All samples collected, were well within the limit required as per standard.

8. **Fish Bioassay**: 100% Survival was observed at both the samples collected.

9. **Heavy metals**: All the heavy metals are found below the standard limits in all the samples.

4.4 Ground Water Quality Monitoring:

Twelve ground water samples were collected from Nashik region.

1) **Chemical Oxygen Demand:** The COD of all 12 samples was found in the range between 5 mg/L to 14 mg/L.

2) **Biological Oxygen Demand:** BOD of all 12 samples was found in the range between 1.8 mg/L to 5.2 mg/L.

Following are the parameters which are compared with ISO 10500:2012 Drinking water specifications.

1) **Nitrite**: Values of Nitrite at all 12 locations was well within the standard.

2) **Nitrate:** Results of Nitrate are also observed below standard limit (45 mg/L). The highest value of Nitrate was observed at Hotel Tapovan NH-3 with 41.7

3) **Residual Free Chlorine**: Values are below the detectable limit in all 12 samples collected.

4) **Total Ammonia**: Values are below the detectable limit in all samples collected.

5) **Fluoride:** Values are below detectable limit in 4 samples selected. Only at Dashrath Pandit Nikam, Plot No-4 borewell water sample the result with 1.28 mg/L exceeded the standard limit of 1 mg/L

6) **Sulphide:** All the readings of sulphide are below detectable limit in all 12 samples collected.

7) **Sodium Absorption Ratio:** All the readings of Sodium absorption ratio are also below detectable limit in all 12 samples collected.

8) **Total Kjeldahl nitrogen:** In all 12 samples collected the level of TKN ranged in between 0.28 mg/L to 2 mg/L concentration.

9) **Fish Bioassay**: All location obtained 100% survival was observed at 9 out of 12 samples collected.

10) **Boron:** Boron was detected only at Vrusabh Industry with 0.147 mg/L concentration.

11) **Surface Active Agents:** All 12 samples showed below detectable limit.

12) **Metals:** All the metals are below the detectable limit except Iron at few locations are observed within the acceptable limits of drinking water standards.

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

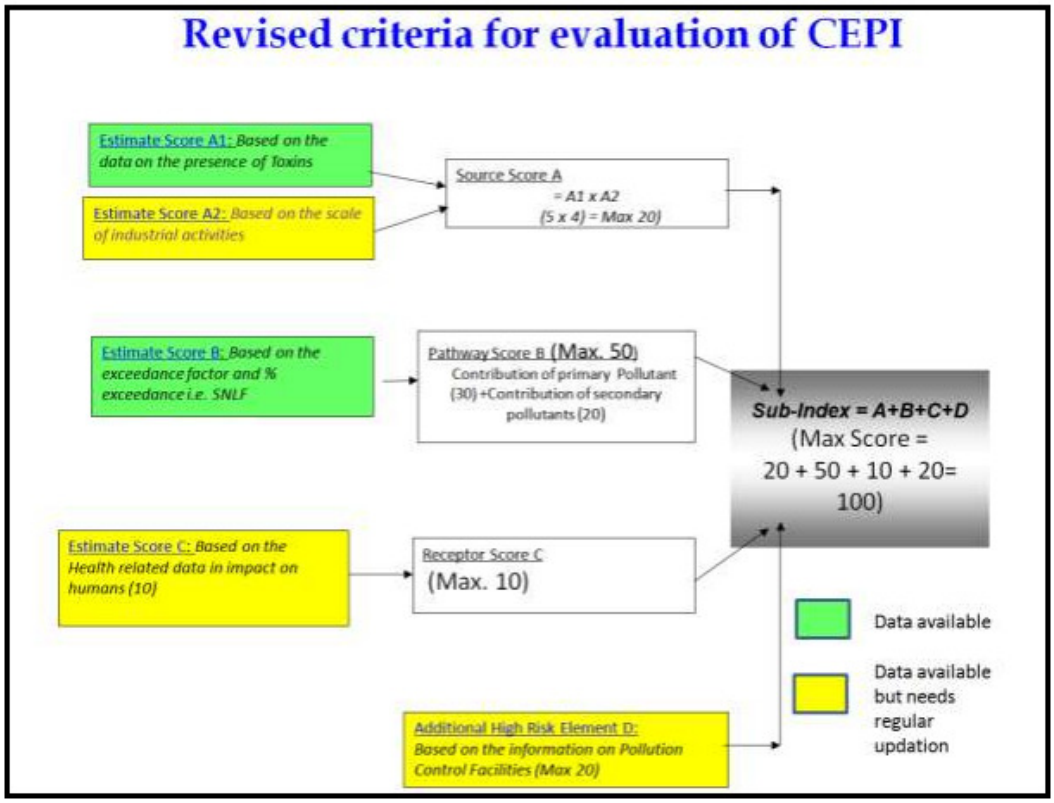
The outlines of the revised CEPI criteria are as follows:

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 (46.8) of Nashik considering all revised standards is greater than the CEPI Score of February 2018 (33.96) report. The increase in the score is mainly due to the increase in the pollution content of Air and ground water.

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	1.8	5	9	-	-	-	20	-	-	-	0	10	**39**
CEPI score February 2018	2.2	2.58	5.68	-	-	-	7.3	-	-	-	4	10	**26.98**
CEPI score June 2017	2.9	5	14.5	-	-	-	9.3	-	-	-	5	10	**38.8**
CEPI score February 2017	4	5	20	6	0	0	6	3	4	0	12	10	**48**
CPCB Report 2009	5.75	5	28.75	6	0	0	6	3	3.5	0	10.5	10	**55.25**

Water:

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2018	1	5	5	-	-	-	16	-	-	-	0	10	**31**
CEPI score February 2018	2.6	3.8	9.88	-	-	-	6.93	-	-	-	5	10	**31.81**
CEPI score June 2017	2.2	3	6.6	-	-	-	9.8	-	-	-	5	10	**31.4**
CEPI score February 2017	2	5	10	6	0	2	8	5	3.1	0	15.5	10	**43.5**
CPCB Report 2009	3	5	15	7	0	3	10	5	3.5	0	17.5	10	**52.5**

Land:

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
CEPI score June 2018	2	5	10	-	-	-	21.3	-	-	-	0	10	**41.3**
CEPI score February 2018	1.5	4.8	7.2	-	-	-	7.9	-	-	-	5	10	**30.1**
CEPI score June 2017	1.9	4.1	7.79	-	-	-	8.36	-	-	-	5	10	**31.15**
CEPI score February 2017	2.3	5	5	8	0	3	11	4	4	0	16	10	**42**
CPCB Report 2009	3	5	15	6	0	3	9	3	4	0	12	10	**46**

Aggregated CEPI:

	Air Index	Water Index	Land Index	CEPI
CEPI score June 2018	39	31	41.3	**46.8**
CEPI score February 2018	26.98	31.81	30.1	**33.96**
CEPI score June 2017	38.8	31.4	31.15	**44.78**
CEPI score February 2017	48	43.5	42	**57.5**
CPCB Report 2009	55.25	52.5	46	**66.06**

6. Conclusion

Nashik is a defense and aerospace manufacturing hub with Hindustan Aeronautics Limited aircraft manufacturing plant located at Ozar. The Currency Note Press and India Security Press are on Nashik Road, where Indian currency and government stamp papers are printed respectively. Nasik is fast growing city in industrial sector. It is having its own vast history about industries. MIDC (Maharashtra Industrial Development Co-operation) have developed industrial zone in different area like Ambad, Satpur, Gonde, Igatpuri, Sinnar.

For identification of the source of pollutants, we have analysed stack emission monitoring of 13 stacks in the Nashik region. All parameters monitored except Particulate matter were well within the standard limit and VOCs was not detectable in any samples monitored.

For the study of Air Environment, 12 ambient air samples were collected from different locations in the region. The concentration of PM_{10} was high at 6 locations sampled. The main reason for the increase in the concentration of Particulate matter is the increase in traffic and industrial activities. Dust suppression techniques have been suggested to be carried out by industries. All other parameters were well within the limit in all locations monitored.

To understand the quality of treated effluent, samples were collected from 2 ETP outlet of Nashik region. Parameters like Nitrate Nitrogen, Nitrogen, Total coliform, Total Phosphate and Total Ammonia was found to have exceeded the limit of surface water characteristics.

For carrying out a study on the Land Environment, twelve ground water samples are collected. Chemical Oxygen Demand, Nitrate, Total Ammonia, Fluoride and Total Kjeldahl Nitrogen was found in higher concentration in many of the samples collected. The ground water collected is from Borewell and is not used for drinking purpose.

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. Many industries were issued with closure direction and show cause notice for emission control. Regular compliance of industries is monitored by Board officials for maintain the pollution reduced due to the implementation of action plan.

	A1	A2	A	B	C	D	CEPI
Air Index	1.8	5	9	20	0	10	**39**
Water Index	1	5	5	16	0	10	**31**
Land Index	2	5	10	21.3	0	10	**41.3**
						Aggregated CEPI	**46.8**

7. Photographs

Isovolta India Pvt. Ltd. Stack Emission Monitoring


Caprihans India Pvt. Ltd. Stack Emission Monitoring

Vir Electro Engg. Pvt. Ltd. Stack Emission Monitoring

Vir Electro Engg. Pvt. Ltd. Ambient Air Monitoring

Lub Tech Oil Company Ambient Air Monitoring

AATCO Food India Pvt. Ltd. Ambient Air Monitoring

MSL Drive Line System Pvt. Ltd. Ambient Air Monitoring

Dashrath Pandit Nikam Plot no. 4 Borewell Water Sample

Vrushab Industry Vanvihar Colony Borewell Water sample

Shivaji Nagar 55/6 Borewell Water sample

8. 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

9. 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

		Diseases caused by Air pollution					Diseases caused by Water pollution				
	Year	Asthma	Bronchitis	Pulmonary cancer	Mesothelioma (lung cancer)	Acute respiratory infections	Gastroenteritis	Typhoid	Diarrhea	Liver damage and even cancer (due to presence of chlorinated solvents in the polluted water)	Kidney damage (because of various harmful chemicals present in the polluted water)
Civil Hospital NASHIK	2012	205	280	0	0	532	0	352	665	0	0
	2013	198	289	0	0	504	0	349	492	0	0
	2014	239	394	0	0	562	0	189	197	0	0
	2015	228	294	0	0	649	0	108	249	0	0
	2016	185	265	0	0	493	0	74	222	0	0
	2017	207	235	0	0	515	0	97	227	0	0
	2018	220	238	0	0	535	0	82	198	0	0
Indira Gandhi Rugnalaya	2012	104	213	0	0	489	0	257	606	0	0
	2013	187	263	0	0	486	0	212	911	0	0
	2014	214	335	0	0	497	0	162	774	0	0
	2015	210	276	0	0	733	0	83	344	0	0
	2016	138	283	0	0	478	0	134	759	0	0
	2017	195	275	0	0	445	0	227	512	0	0
	2018	90	167	0	0	4790	0	22	306	0	0
Sudarshan Hospital	2012	60	75	1	0	120	65	175	160	3	10
	2013	65	60	0	0	100	68	160	110	0	2
	2014	80	65	1	0	105	75	110	130	2	0
	2015	75	70	0	0	80	60	120	100	1	0
	2016	70	68	0	0	75	65	140	95	0	0
	2017	73	69	0	0	98	62	130	85	0	0
	2018	70	90	0	0	192	0	26	145	0	0

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