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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
PM₁₀	Particulate Matter (size less than 10 µm)
PM_{2.5}	Particulate Matter (size less than 2.5 µm)
SO₂	Sulphur Dioxide
STAP	Short Term Action Plan
WHO	World Health Organization

1. Introduction:

Rapid modernization and industrialization worldwide has not only uprooted to the economic development, but has increased pollution of land, air and water. This has also destroyed our habitat and environment too. Pollutants discharged from the industries have widespread implications and one of the unpleasant effects on water bodies and air. Long term exposure to the polluted air and water causes chronic health problems, making the issue industrial pollution into severe one. So, scientists are exploring the quantum of pollution load as well as to devise 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.

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. 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. A total of 88 industrial areas or clusters have been selected by the Central Pollution Control Board (CPCB) in consultation with the Ministry of Environment & Forests Government of India for the study. 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.

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. As of 2013, the Nashik region reportedly produces 10,000 tonnes of grapes per year. There are 22 wineries in Nashik, out of 46 wineries throughout India total. Nashik is home to several wine festivals, such as Sula Fest in the harvest season.

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

Severely Polluted Areas: Monitoring, sampling, analysis of Stack, Ambient Air Quality, Surface Water, Ground Water, Waste Water

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 11 days i.e. on 28th May to & 8th June 2017 for Nashik region.
- In MIDC Ambad, total of 7 Stack Monitoring Samples, 6 Ambient Air Quality Monitoring Samples, 6 Ground Water Samples and 2 VOC Samples from Stack were collected and analyzed.
- In MIDC Satpur, total of 8 Stack Monitoring Samples, 6 Ambient Air Quality Monitoring Samples, 2 waste water samples, 6 Ground Water Samples were collected and 2 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 (SO₂)
2. Nitrogen Dioxide (NO₂)
3. Particulate Matter (PM10)
4. Particulate Matter (PM2.5)
5. Ozone (O₃)
6. Lead (Pb)
7. Carbon Monoxide (CO)
8. Ammonia (NH₃)
9. Benzene (C₆H₆)
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. (NO₂ + NO₃)-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 ($\text{NH}_4 + \text{NH}_3$)-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.

2.3 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 I**
2. Ambient Air Sampling and Analysis Methodology - **Annexure II**
3. Water/Wastewater Sampling and Analysis Methodology - **Annexure III**

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 detection limit.

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.	Shakti Synergic Pvt. Ltd.	Boiler	Ambad	I
2.	Sudal Industries	Boiler	Ambad	I
3.	Isovolta India Pvt. Ltd.	Boiler	Ambad	I
4.	Vir Electro EnggPvt. Ltd.	Furnace Stack	Ambad	II
5.	Rainbow Decoplus Pvt Ltd.	Process Stack	Ambad	II
6.	Lube Tech oil co.	Boiler	Ambad	II
7.	Kirloskat Engine Oil Ltd.	Process Stack	Ambad	III
8.	Graphite India Ltd.	Stack no. 10	Satpur	III
9.	Glenmark Pharmaceutical Ltd.	Boiler	Satpur	III

Sr.	Name of Industry	Stack Identity	MIDC	Table No.
10.	Ceat Ltd.	Boiler	Satpur	IV
11.	Jyoti Structure Ltd.	Furnace Stack	Satpur	IV
12.	Caprihans India Ltd	Boiler	Satpur	IV
13.	MSL Oriveline System Ltd.	Process Stack	Satpur	V
14.	AATCO Food India Pvt. Ltd	Boiler Stack	Satpur	V
15.	Mahindra & Mahindra (Plant -I)	Oven Stack No. I	Satpur	V

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

TableNo.I

Name of Industry			Shakti Synergic Pvt. Ltd.	Sudal Industries	Isovolta India Pvt. Ltd.
Date of Sampling			01.06.17	01.06.17	04.06.17
Sr.	Parameter	Unit	Results		
1.	Particulate Matter (as PM)	mg/Nm ³	270	246	250
	Std. Limit	mg/Nm³	150	150	150
2.	Sulphur Dioxide (as SO ₂)	mg/Nm ³	103	12.1	BDL
		kg/day	16.7	1.81	BDL
	Std. Limit	mg/Nm³	100	100	100
3.	Nitrogen Dioxide (NO ₂)	mg/Nm ³	515	457	98
	Std. Limit	mg/Nm³	250	250	250

TableNo.II

Name of Industry			Vir Electro Engg Pvt. Ltd.	Rainbow Deco plus Pvt. Ltd	Lube Tech oil co
Date of Sampling			05.06.17	05.06.17	06.06.17
Sr.	Parameter	Unit	Results		
1.	Particulate Matter (as PM)	mg/Nm ³	336	NA	357
	Std. Limit	mg/Nm³	150	150	150

Name of Industry			Vir Electro Engg Pvt. Ltd.	Rainbow Deco plus Pvt. Ltd	Lube Tech oil co
Date of Sampling			05.06.17	05.06.17	06.06.17
Sr.	Parameter	Unit	Results		
2.	Sulphur Dioxide (as SO ₂)	mg/Nm ³	BDL	NA	BDL
		kg/day	BDL	NA	BDL
	Std. Limit	mg/Nm³	-	-	-
3.	Nitrogen Dioxide (NO ₂)	mg/Nm ³	197	NA	211
	Std. Limit	mg/Nm³	250	-	250

TableNo.III

Name of Industry			Graphite India Ltd.	Glenmark Pharmaceutical Ltd.	Ceat Ltd.
Date of Sampling			02.06.17	02.06.17	03.06.17
Sr.	Parameter	Unit	Results		
1.	Particulate Matter (as PM)	mg/Nm ³	192	267	75
	Std. Limit	mg/Nm³	150	150	150
2.	Sulphur Dioxide (as SO ₂)	mg/Nm ³	1481	BDL	BDL
		kg/day	584	BDL	BDL
	Std. Limit	mg/Nm³	100	-	-
3.	Nitrogen Dioxide (NO ₂)	mg/Nm ³	448	227	68
	Std. Limit	mg/Nm³	250	250	250

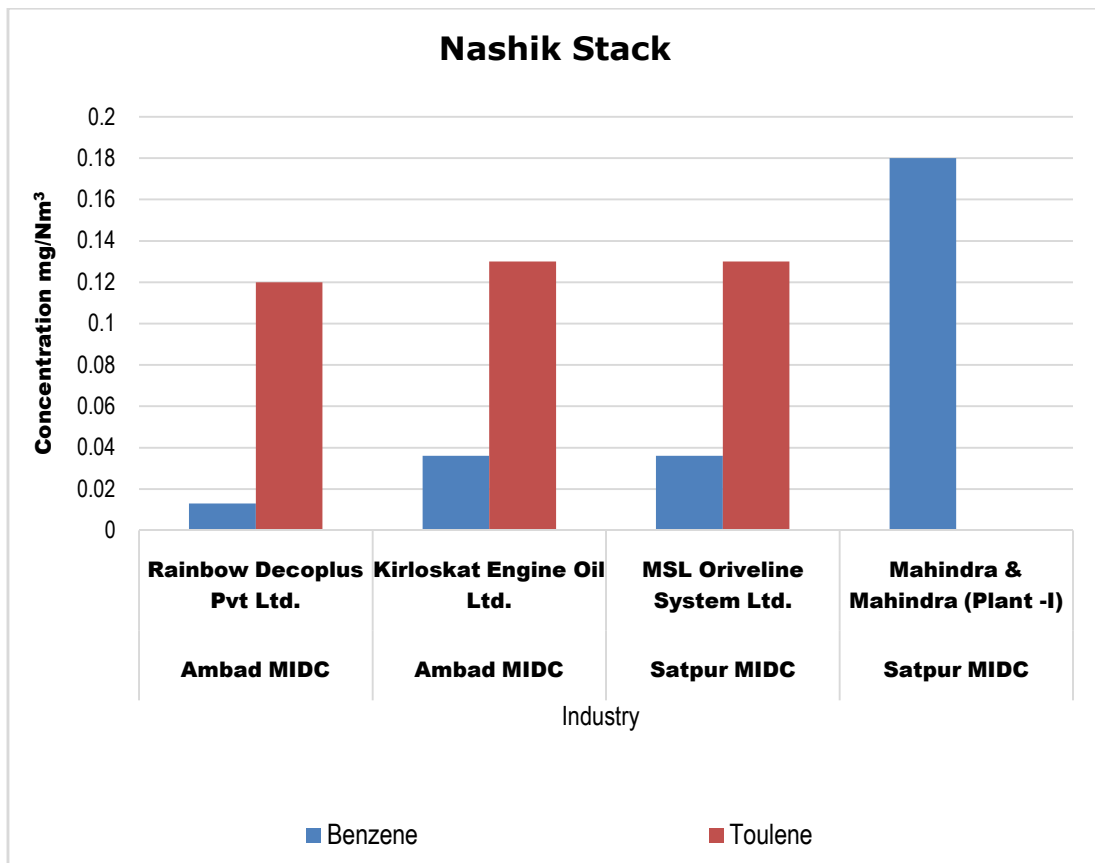
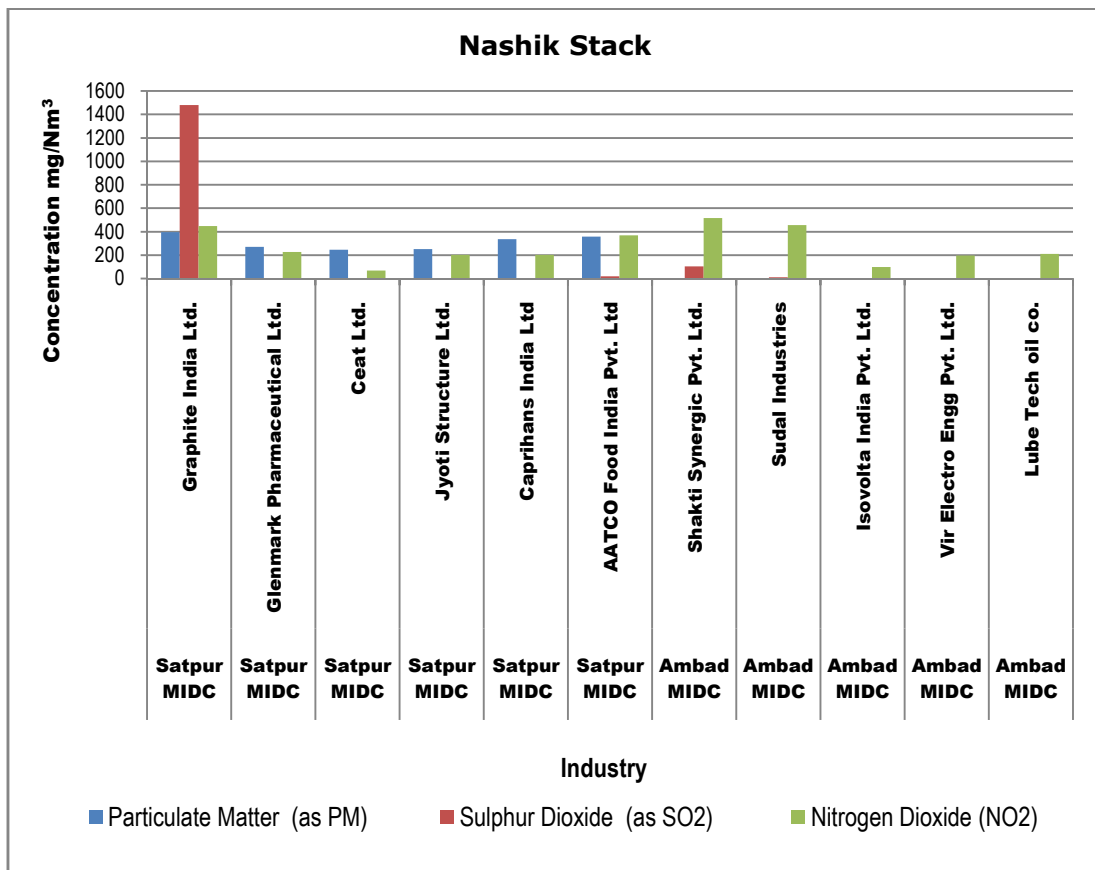
TableNo.IV

Name of Industry			Jyoti Structure Ltd.	Caprihans India Ltd.	AATCO Food India Pvt. Ltd.
Date of Sampling			07.06.17	07.06.17	31.05.17
Sr.	Parameter	Unit	Results		
1.	Particulate Matter (as PM)	mg/Nm ³	176	41	396
	Std. Limit	mg/Nm³	150	150	150
2.	Sulphur Dioxide (as SO ₂)	mg/Nm ³	BDL	BDL	19.2
		kg/day	BDL	BDL	0.13
	Std. Limit	mg/Nm³	-	-	100
3.	Nitrogen Dioxide (NO ₂)	mg/Nm ³	203	203	368
	Std. Limit	mg/Nm³	250	250	250

TableNo. V

Name of Industry			Rainbow Decoplus Pvt Ltd.	Kirloskat Engine Oil Ltd.	MSL Oriveline System Ltd.	Mahindra & Mahindra (Plant -I)
Date of Sampling			05.06.17	06.06.17	31.05.17	08.06.17
Sr.	Parameter	Unit	Results			
1.	VOC					
I.	Methyl Isobutyl Ketone	mg/Nm ³	ND	ND	ND	ND
II.	Benzene	mg/Nm ³	0.013	0.036	0.036	0.18
III.	Toulene	mg/Nm ³	0.12	0.13	0.13	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 IV**).

Sr.	Location	MIDC	Location detail	Table No.
1.	Sudal Industries Ltd.	Ambad	Near Temple	I
2.	Shakti Synergetics Pvt. Ltd.	Ambad	Near Main Gate	I
3.	Vir Electro Engg. Pvt. Ltd.	Ambad	Near Main Gate	I
4.	Isovolta India Pvt. Ltd.	Ambad	Near Main Gate	II
5.	Lub Tech Oil Company	Ambad	Near Main Gate	II
6.	Mahindra CIE Automotive Ltd.	Ambad	Near Main Gate	II
7.	Mahindra Sona Ltd.	Satpur	Near Main Gate	III
8.	Atco Foods India Pvt. Ltd.	Satpur	Near Main Gate	III
9.	VIP Industries Ltd.	Satpur	Near ETP	III
10.	Graphite India Ltd.	Satpur	Near Main Gate	IV
11.	Ceat Ltd.	Satpur	Near STP	IV
12.	M & M (Plant I)	Satpur	Near MQS Gate	IV

TableNo.I

Location				Sudhal Industries	Shakti Synergetics Pvt. Ltd.	Vir Electro Engg. Pvt. Ltd.
DateofSampling				02.06.17	02.06.17	05.06.17
Sr.	Parameters	Unit	Std.Limit (NAAQS 2009)	Results		
1.	Sulphur Dioxide (SO ₂)	µg/m ³	80	BDL	BDL	BDL
2.	Nitrogen Dioxide (NO ₂)	µg/m ³	80	BDL	BDL	4.86
3.	Particulate Matter (size less than 10 µm) or PM ₁₀	µg/m ³	100	233	91	140

Location				Sudhal Industries	Shakti Synergetics Pvt. Ltd.	Vir Electro Engg. Pvt. Ltd.
Date of Sampling				02.06.17	02.06.17	05.06.17
Sr.	Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
4.	Particulate Matter (size less than 2.5 µm) or PM _{2.5}	µg/m ³	60	87	13	38
5.	Ozone (O ₃)	µg/m ³	180	BDL	BDL	BDL
6.	Lead (Pb)	µg/m ³	1	0.028	0.0204	BDL
7.	Carbon Monoxide (CO)	mg/m ³	4	8.24	6.29	BDL
8.	Ammonia (NH ₃)	µg/m ³	400	BDL	70	BDL
9.	Benzene (C ₆ H ₆)	µg/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				Isovolta India Pvt. Ltd.	Lub Tech Oil Company	Mahindra CIE Automotive Ltd.
Date of Sampling				05.06.17	06.06.17	07.06.17
Sr.	Parameter	Unit	Std. Limit (NAAQS 2009)	Results		
1.	Sulphur Dioxide (SO ₂)	µg/m ³	80	BDL	BDL	BDL
2.	Nitrogen Dioxide (NO ₂)	µg/m ³	80	3.03	BDL	5.67

Location				Isovolta India Pvt. Ltd.	Lub Tech Oil Company	Mahindra CIE Automotive Ltd.
Date of Sampling				05.06.17	06.06.17	07.06.17
Sr.	Parameter	Unit	Std. Limit (NAAQS 2009)	Results		
3.	Particulate Matter (size less than 10 μm) or PM_{10}	$\mu\text{g}/\text{m}^3$	100	435	504	352
4.	Particulate Matter (size less than 2.5 μm) or $\text{PM}_{2.5}$	$\mu\text{g}/\text{m}^3$	60	105	124	31
5.	Ozone (O_3)	$\mu\text{g}/\text{m}^3$	180	BDL	BDL	BDL
6.	Lead (Pb)	$\mu\text{g}/\text{m}^3$	1	BDL	0.021	0.022
7.	Carbon Monoxide (CO)	mg/m^3	4	BDL	0.68	BDL
8.	Ammonia (NH_3)	$\mu\text{g}/\text{m}^3$	400	BDL	BDL	BDL
9.	Benzene (C_6H_6)	$\mu\text{g}/\text{m}^3$	5	BDL	8	23
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	3.09

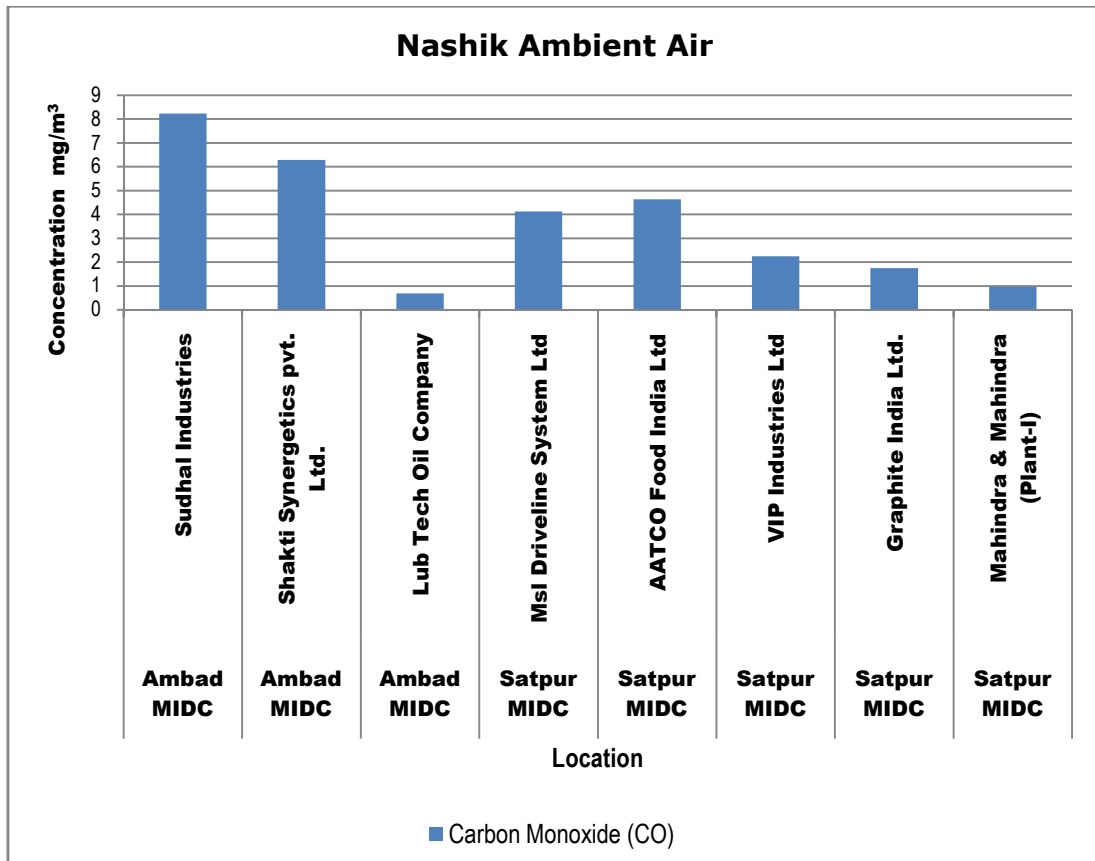
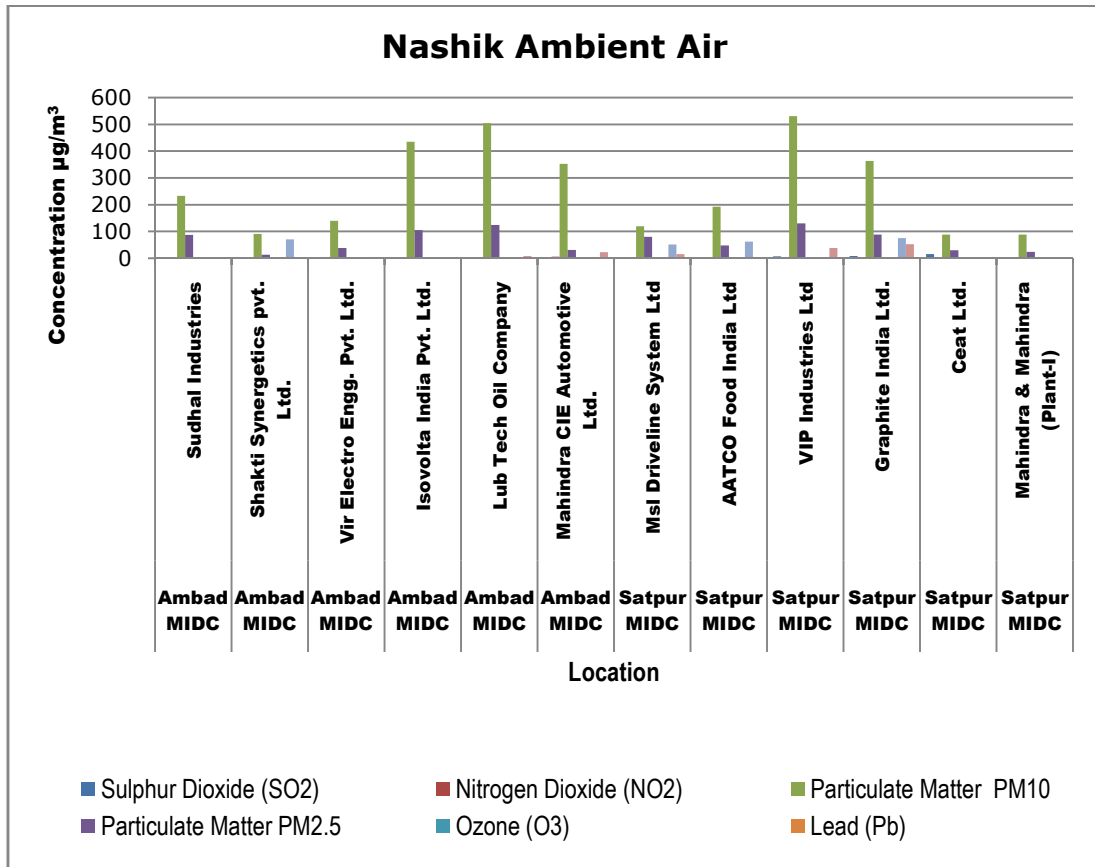
TableNo.III

Location				Msl Driveline System Ltd	AATCO Food India Ltd	VIP Industries Ltd
DateofSampling				01.06.17	01.06.17	03.06.17
Sr.	Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
1.	Sulphur Dioxide (SO ₂)	µg/m ³	80	BDL	BDL	7
2.	Nitrogen Dioxide (NO ₂)	µg/m ³	80	BDL	BDL	4.25
3.	Particulate Matter (size less than 10 µm) or PM ₁₀	µg/m ³	100	120	193	531
4.	Particulate Matter (size less than 2.5 µm) or PM _{2.5}	µg/m ³	60	80	48	130
5.	Ozone (O ₃)	µg/m ³	180	BDL	BDL	BDL
6.	Lead (Pb)	µg/m ³	1	BDL	BDL	0.021
7.	Carbon Monoxide (CO)	mg/m ³	4	4.13	4.64	2.24
8.	Ammonia (NH ₃)	µg/m ³	400	51	62.1	BDL
9.	Benzene (C ₆ H ₆)	µg/m ³	5	16.1	4.97	38
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

TableNo.IV

Location				Graphite India Ltd.	Ceat Ltd.	Mahindra & Mahindra (Plant-I)
DateofSampling				03.06.17	04.06.17	09.06.17
Sr.	Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
1.	Sulphur Dioxide (SO ₂)	µg/m ³	80	8.76	15.1	BDL
2.	Nitrogen Dioxide (NO ₂)	µg/m ³	80	3.44	3.43	BDL
3.	Particulate Matter (size less than 10 µm) or PM ₁₀	µg/m ³	100	363	89	88
4.	Particulate Matter (size less than 2.5 µm) or PM _{2.5}	µg/m ³	60	89	30	24
5.	Ozone (O ₃)	µg/m ³	180	BDL	BDL	BDL
6.	Lead (Pb)	µg/m ³	1	0.02	BDL	BDL
7.	Carbon Monoxide (CO)	mg/m ³	4	1.75	BDL	0.95
8.	Ammonia (NH ₃)	µg/m ³	400	75.4	BDL	BDL
9.	Benzene (C ₆ H ₆)	µg/m ³	5	52	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

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 VI), CPCB Water Quality Criteria (Annexure V) and Drinking Water Specification, IS 10500:2012 (Annexure IV), 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	TableNo.
1.	Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Chitte Pool,	I
2.	Nasardi Bridge Near NIMA Bhavan, Satpur	Nasardi Bridge water	I

TableNo.I

Location				Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Nasardi Bridge Near NIMA Bhavan, Satpur
Date of Sampling				07.06.17	08.06.17
Sr.	Parameters	Unit	Std. Limit	Results	
1.	Colour	Hazen		1	50
2.	Smell	-		Agreeable	Disagreeable
3.	pH	-	5.5-9.0	7.7	7.3
4.	Oil &Grease	mg/L	10.0	BDL	BDL
5.	Suspended Solids	mg/L	100.0	28	51
6.	Dissolved Oxygen (%Saturation)	%		65	57
7.	Chemical Oxygen Demand	mg/L	250.0	30	20
8.	Biochemical Oxygen Demand (3days,27°C)	mg/L	30.0	9.7	7.04

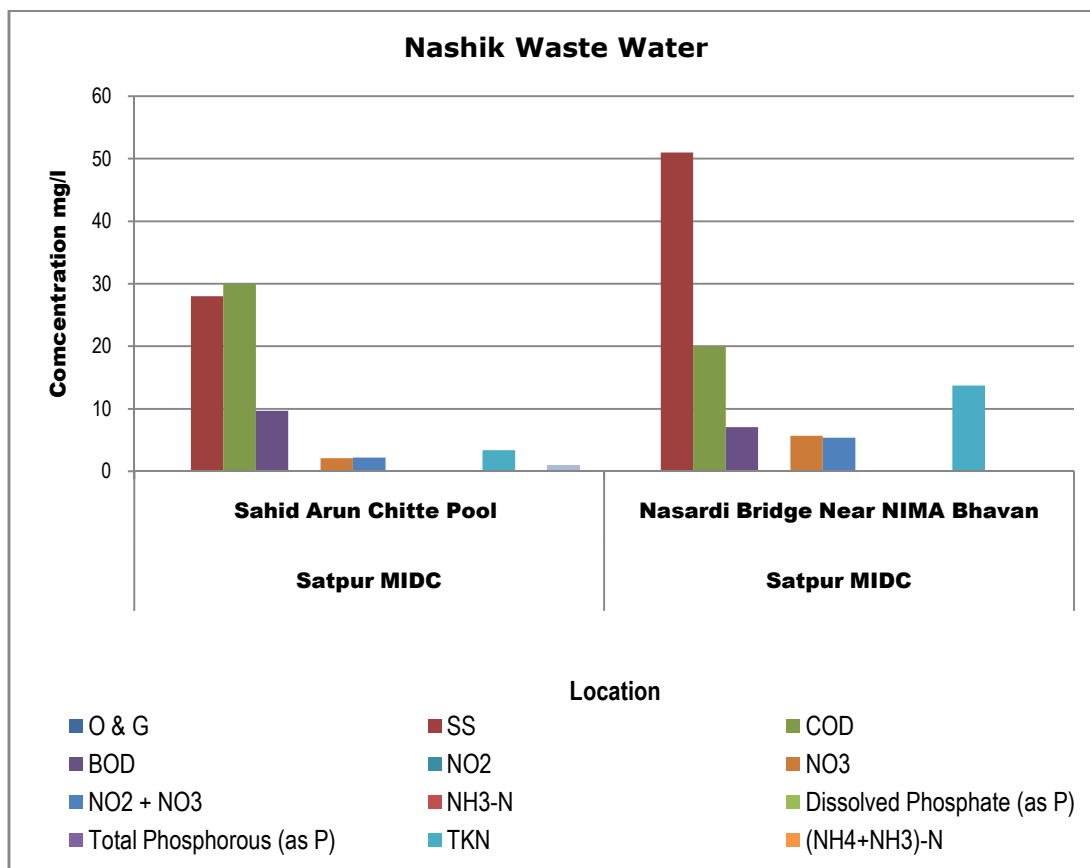
Location				Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Nasardi Bridge Near NIMA Bhavan, Satpur
Date of Sampling				07.06.17	08.06.17
Sr.	Parameters	Unit	Std. Limit	Results	
9.	Electrical Conductivity (at25°C)	µmho/cm		373	743
10.	Nitrite Nitrogen (asNO ₂)	mg/L		0.06	BDL
11.	Nitrate Nitrogen (asNO ₃)	mg/L	10.0	2.12	5.7
12.	(NO ₂ +NO ₃)-Nitrogen	mg/L	5.0	2.18	5.37
13.	Free Ammonia (asNH ₃ -N)	mg/L	5.0	BDL	BDL
14.	Total Residual Chlorine	mg/L	1.0	0.52	BDL
15.	Cyanide (as CN)	mg/L	0.2	BDL	BDL
16.	Fluoride(as F)	mg/L	2.0	0.44	0.52
17.	Sulphide (as S ₂ -)	mg/L	2.0	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	5.0	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		0.48	0.64
20.	Total Coliforms	MPN index/100ml	100.0	170	1600
21.	Faecal Coliforms	MPN index/100ml	1000.0	49	350

Location				Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Nasardi Bridge Near NIMA Bhavan, Satpur
Date of Sampling				07.06.17	08.06.17
Sr.	Parameters	Unit	Std. Limit	Results	
22.	Total Phosphorous (as P)	mg/L	1.0	BDL	0.15
23.	Total Kjeldahl Nitrogen	mg/L	100.0	3.36	13.7
24.	Total Ammonia (NH ₄ +NH ₃)-	mg/L	5.0	BDL	0.17
25.	Phenols (as C ₆ H ₅ OH)	mg/L	3.0	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	3.0	BDL	BDL
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,pDDT	µg/L	0.05	BDL	BDL
X.	o,pDDT	µg/L	100.0	BDL	BDL
XI.	p,pDDE	µg/L	250.0	BDL	BDL
XII.	o,pDDE	µg/L	30.0	BDL	BDL

Location				Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Nasardi Bridge Near NIMA Bhavan, Satpur
Date of Sampling				07.06.17	08.06.17
Sr.	Parameters	Unit	Std. Limit	Results	
XIII.	p,pDDD	µg/L		BDL	BDL
XIV.	o,pDDD	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
VIII.	YHCH (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
30.	Zinc(as Zn)	mg/L	5.0	0.055	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	0.014
37.	Cadmium (as Cd)	mg/L	2.0	BDL	BDL

Location				Sahid Arun Chitte Pool, Gangapur Rd, Anandvali, Satpur	Nasardi Bridge Near NIMA Bhavan, Satpur
Date of Sampling				07.06.17	08.06.17
Sr.	Parameters	Unit	Std. Limit	Results	
38.	Mercury (as Hg)	mg/L	0.01	BDL	BDL
39.	Manganese (as Mn)	mg/L	2.0	0.188	0.232
40.	Iron(as Fe)	mg/L	3.0	3.87	0.323
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		50	0

Graphs: Water/Waste Water Quality Monitoring for Nashik:



3.4 Ground Water Quality:

Sr.	Location	Source	MIDC	TableNo.
1.	Hotel Tapovan, Ambad MIDC, Near Garware Point	Borewell Water	Ambad	I
2.	ShivajiKacharu Chavan, Gat No. 154/3, Vilholi	Well Water	Ambad	I
3.	Mr. Dashrat Pandit Nikam, Plot No. 4, Mauli Chowk, Dattanagar, Chunchule	Borewell Water	Ambad	I
4.	Pancharatna Farm, Maruti Sankul, Dattanagar, back side Kirloskar Industries	Well Water	Ambad	II
5.	Mr. GovindVithobaShirsat	Well Water	Ambad	II
6.	Mr. Satish Sukhlal Lad, (Sai Ekta Park), Ambad Village, in front of Indoline furniture	Borewell Water	Ambad	II
7.	Ramesh Ramchandra Kale	Borewell Water	Satpur	III

Sr.	Location	Source	MIDC	TableNo.
8.	Seva Developers Pvt. Ltd.	Borewell Water	Satpur	III
9.	Shivaji Nagar 55/6	Well 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				Hotel Tapovan	Shivaji Kacharu Chavan	Mr. Dashrat Pandit Nikam
Date of Sampling				01.06.17	01.06.17	01.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
1.	Colour	Hazen		1	1	1
2.	Smell	-	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH	-	6.5-8.5	6.83	7.75	6.64
4.	Oil & Grease	mg/L		BDL	BDL	BDL
5.	Suspended Solids	mg/L	100	BDL	5	BDL
6.	Dissolved Oxygen (% Saturation)	%		85	85	60
7.	Chemical Oxygen Demand	mg/L	500	BDL	BDL	13
8.	Biochemical Oxygen Demand (3days, 27°C)	mg/L	10 (WHO, 1993)	BDL	BDL	3.8

Location				Hotel Tapovan	Shivaji Kacharu Chavan	Mr. Dashrat Pandit Nikam
Date of Sampling				01.06.17	01.06.17	01.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
9.	Electrical Conductivity (at25°C)	µmho/cm	6 (WHO,1993)	1794	801	1846
10.	Nitrite Nitrogen (asNO ₂)	mg/L	0.3 (WHO,1993)	0.01	0.73	0.27
11.	Nitrate Nitrogen (asNO ₃)	mg/L		45.7	41.1	40.7
12.	(NO ₂ +NO ₃)-Nitrogen	mg/L	45	45.7	41.8	41
13.	Free Ammonia (asNH ₃ -N)	mg/L	1.0	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	0.5	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	0.2	BDL	BDL	BDL
16.	Fluoride(as F)	mg/L		0.28	0.28	1.04
17.	Sulphide (as S ₂ -)	mg/L	1	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	0.05	BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		0.3	0.39	0.28
20.	Total Coliforms	MPNindex/100ml		23	11	BDL
21.	Faecal Coliforms	MPNindex/100ml	ND	4.5	7.8	BDL

Location				Hotel Tapovan	Shivaji Kacharu Chavan	Mr. Dashrat Pandit Nikam
Date of Sampling				01.06.17	01.06.17	01.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
22.	Total Phosphorous (as P)	mg/L	ND	BDL	BDL	BDL
23.	Total Kjeldahl Nitrogen	mg/L	0.5	0.56	BDL	0.22
24.	Total Ammonia (NH ₄ +NH ₃)-	mg/L	0.001	BDL	BDL	BDL
25.	Phenols (as C ₆ H ₅ OH)	mg/L	0.5	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	0.001	BDL	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	0.05	BDL	BDL	BDL
II.	Atrazine	µg/L	20	BDL	BDL	BDL
III.	Aldrin	µg/L	2	BDL	BDL	BDL
IV.	Dieldrin	µg/L	0.03	BDL	BDL	BDL
V.	Alpha HCH	µg/L	0.03	BDL	BDL	BDL
VI.	Beta HCH	µg/L	0.01	BDL	BDL	BDL
VII.	Delta HCH	µg/L	0.04	BDL	BDL	BDL
VIII.	Butachlor	µg/L	125	BDL	BDL	BDL
IX.	p,pDDT	µg/L	0.04	BDL	BDL	BDL
X.	o,pDDT	µg/L	1	BDL	BDL	BDL
XI.	p,pDDE	µg/L	1	BDL	BDL	BDL
XII.	o,pDDE	µg/L	1	BDL	BDL	BDL

Location				Hotel Tapovan	Shivaji Kacharu Chavan	Mr. Dashrat Pandit Nikam
Date of Sampling				01.06.17	01.06.17	01.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
XIII.	p,pDDD	µg/L	1	BDL	BDL	BDL
XIV.	o,pDDD	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
VIII.	YHCH (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

Location				Hotel Tapovan	Shivaji Kacharu Chavan	Mr. Dashrat Pandit Nikam
Date of Sampling				01.06.17	01.06.17	01.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
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	0.038	BDL	0.27
40.	Iron(as Fe)	mg/L	0.1	0.694	0.083	1.09
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	0.115	BDL	0.161
44.	Bioassay Test on fish	%survival		100	100	100

TableNo.II

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
1.	Colour	Hazen		1	1	1
2.	Smell	-	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH	-	6.5-8.5	7.51	7.4	7.38

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
4.	Oil & Grease	mg/L		BDL	BDL	BDL
5.	Suspended Solids	mg/L	100	BDL	12	8
6.	Dissolved Oxygen (% Saturation)	%		75	65	65
7.	Chemical Oxygen Demand	mg/L	500	6	6	6
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	10 (WHO, 1993)	1.8	1.8	1.8
9.	Electrical Conductivity (at 25°C)	µmho/cm	6 (WHO, 1993)	1155	1545	451
10.	Nitrite Nitrogen (as NO ₂)	mg/L	0.3 (WHO, 1993)	0.14	0.11	BDL
11.	Nitrate Nitrogen (as NO ₃)	mg/L		23.9	6.03	31.6
12.	(NO ₂ +NO ₃)-Nitrogen	mg/L	45	24	6.44	31.6
13.	Free Ammonia (as NH ₃ -N)	mg/L	1.0	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	0.5	0.06	BDL	BDL
15.	Cyanide (as CN)	mg/L	0.2	BDL	BDL	BDL

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
16.	Fluoride(as F)	mg/L		0.24	0.54	0.2
17.	Sulphide (as S ₂ -)	mg/L	1	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	0.05	BDL	BDL	0.1
19.	Sodium Absorption Ratio	mg/L		0.41	0.31	0.46
20.	Total Coliforms	MPNindex/100ml		280	350	49
21.	Faecal Coliforms	MPNindex/100ml	ND	140	39	BDL
22.	Total Phosphorous (as P)	mg/L	ND	BDL	BDL	0.15
23.	Total Kjeldahl Nitrogen	mg/L	0.5	BDL	0.34	3.4
24.	Total Ammonia (NH ₄ +NH ₃)-	mg/L	0.001	BDL	BDL	BDL
25.	Phenols (as C ₆ H ₅ OH)	mg/L	0.5	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	0.001	BDL	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	0.05	BDL	BDL	BDL

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
II.	Atrazine	µg/L	20	BDL	BDL	BDL
III.	Aldrin	µg/L	2	BDL	BDL	BDL
IV.	Dieldrin	µg/L	0.03	BDL	BDL	BDL
V.	Alpha HCH	µg/L	0.03	BDL	BDL	BDL
VI.	Beta HCH	µg/L	0.01	BDL	BDL	BDL
VII.	Delta HCH	µg/L	0.04	BDL	BDL	BDL
VIII.	Butachlor	µg/L	125	BDL	BDL	BDL
IX.	p,pDDT	µg/L	0.04	BDL	BDL	BDL
X.	o,pDDT	µg/L	1	BDL	BDL	BDL
XI.	p,pDDE	µg/L	1	BDL	BDL	BDL
XII.	o,pDDE	µg/L	1	BDL	BDL	BDL
XIII.	p,pDDD	µg/L	1	BDL	BDL	BDL
XIV.	o,pDDD	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.	YHCH (Lindane)	µg/L	0.4	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	2.0	BDL	BDL	BDL

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
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	0.557	0.078	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	5.7	BDL	BDL

Location				Pancharatna Farm	Mr. Govind Vithoba Shirsat	Mr. Satish Sukhlal Lad
Date of Sampling				01.06.17	01.06.17	06.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
44.	Bioassay Test on fish	%survival		100	100	100

TableNo.III

Location				Ramesh Ram chandra Kale, Satpur	Seva Developers Pvt. Ltd. Satpur	Shivaji Nagar 55/6, Satpur
Date of Sampling				02.06.17	02.06.17	02.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
1.	Colour	Hazen		1	1	1
2.	Smell	-	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH	-	6.5-8.5	7.76	7.7	7.95
4.	Oil &Grease	mg/L		BDL	BDL	BDL
5.	Suspended Solids	mg/L	100	7	BDL	5
6.	Dissolved Oxygen (%Saturation)	%		70	75	80
7.	Chemical Oxygen Demand	mg/L	500	198	99	30
8.	Biochemical Oxygen Demand (3days,27°C)	mg/L	10 (WHO, 1993)	64	32	9.7

Location				Ramesh Ram chandra Kale, Satpur	Seva Developers Pvt. Ltd. Satpur	Shivaji Nagar 55/6, Satpur
Date of Sampling				02.06.17	02.06.17	02.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
9.	Electrical Conductivity (at25°C)	µmho/cm	6 (WHO, 1993)	1051	598	1027
10.	Nitrite Nitrogen (asNO ₂)	mg/L	0.3 (WHO, 1993)	0.45	BDL	0.07
11.	Nitrate Nitrogen (asNO ₃)	mg/L		6.83	33.6	11
12.	(NO ₂ +NO ₃)-Nitrogen	mg/L	45	7.28	33.7	11.1
13.	Free Ammonia (asNH ₃ -N)	mg/L	1.0	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	0.5	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	0.2	BDL	BDL	BDL
16.	Fluoride(as F)	mg/L		0.2	0.08	0.86
17.	Sulphide (as S ₂ -)	mg/L	1	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	0.05	BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		0.53	0.47	0.36
20.	Total Coliforms	MPNindex/100ml		BDL	BDL	110

Location				Ramesh Ram chandra Kale, Satpur	Seva Developers Pvt. Ltd. Satpur	Shivaji Nagar 55/6, Satpur
Date of Sampling				02.06.17	02.06.17	02.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
21.	Faecal Coliforms	MPNindex/100ml	ND	BDL	BDL	110
22.	Total Phosphorous (as P)	mg/L	ND	BDL	BDL	BDL
23.	Total Kjeldahl Nitrogen	mg/L	0.5	0.34	0.78	0.56
24.	Total Ammonia (NH ₄ +NH ₃)-	mg/L	0.001	BDL	BDL	0.05
25.	Phenols (as C ₆ H ₅ OH)	mg/L	0.5	BDL	BDL	BDL
26.	Surface Active Agents (as MBAS)	mg/L	0.001	BDL	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	0.05	BDL	BDL	BDL
II.	Atrazine	µg/L	20	BDL	BDL	BDL
III.	Aldrin	µg/L	2	BDL	BDL	BDL
IV.	Dieldrin	µg/L	0.03	BDL	BDL	BDL
V.	Alpha HCH	µg/L	0.03	BDL	BDL	BDL
VI.	Beta HCH	µg/L	0.01	BDL	BDL	BDL
VII.	Delta HCH	µg/L	0.04	BDL	BDL	BDL
VIII.	Butachlor	µg/L	125	BDL	BDL	BDL
IX.	p,pDDT	µg/L	0.04	BDL	BDL	BDL

Location				Ramesh Ram chandra Kale, Satpur	Seva Developers Pvt. Ltd. Satpur	Shivaji Nagar 55/6, Satpur
Date of Sampling				02.06.17	02.06.17	02.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
X.	o,pDDT	µg/L	1	BDL	BDL	BDL
XI.	p,pDDE	µg/L	1	BDL	BDL	BDL
XII.	o,pDDE	µg/L	1	BDL	BDL	BDL
XIII.	p,pDDD	µg/L	1	BDL	BDL	BDL
XIV.	o,pDDD	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.	YHCH (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

Location				Ramesh Ram chandra Kale, Satpur	Seva Developers Pvt. Ltd. Satpur	Shivaji Nagar 55/6, Satpur
Date of Sampling				02.06.17	02.06.17	02.06.17
Sr.	Parameters	Unit	Std. Limit	Results		
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	0.084
44.	Bioassay Test on fish	%survival		100	100	80

TableNo.IV

Location				Shradha Farm House Satpur	Amit Dilip Yadav P.	Vrushab Industry
Date of Sampling				01.06.17	28.05.17	28.05.17
Sr.	Parameters	Unit	Std. Limit	Results		
1.	Colour	Hazen		1	1	1
2.	Smell	-	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH	-	6.5-8.5	7.87	7.89	7.7
4.	Oil &Grease	mg/L		BDL	BDL	BDL
5.	Suspended Solids	mg/L	100	6	BDL	5
6.	Dissolved Oxygen (%Saturation)	%		65	60	60
7.	Chemical Oxygen Demand	mg/L	500	179	179	238
8.	Biochemical Oxygen Demand (3days,27°C)	mg/L	10 (WHO, 1993)	62	62	77
9.	Electrical Conductivity (at25°C)	µmho/cm	6 (WHO, 1993)	1127	667	725
10.	Nitrite Nitrogen (asNO ₂)	mg/L	0.3 (WHO, 1993)	0.07	BDL	BDL
11.	Nitrate Nitrogen (asNO ₃)	mg/L		11.1	8.76	21.7
12.	(NO ₂ +NO ₃)-Nitrogen	mg/L	45	11.2	8.77	21.7

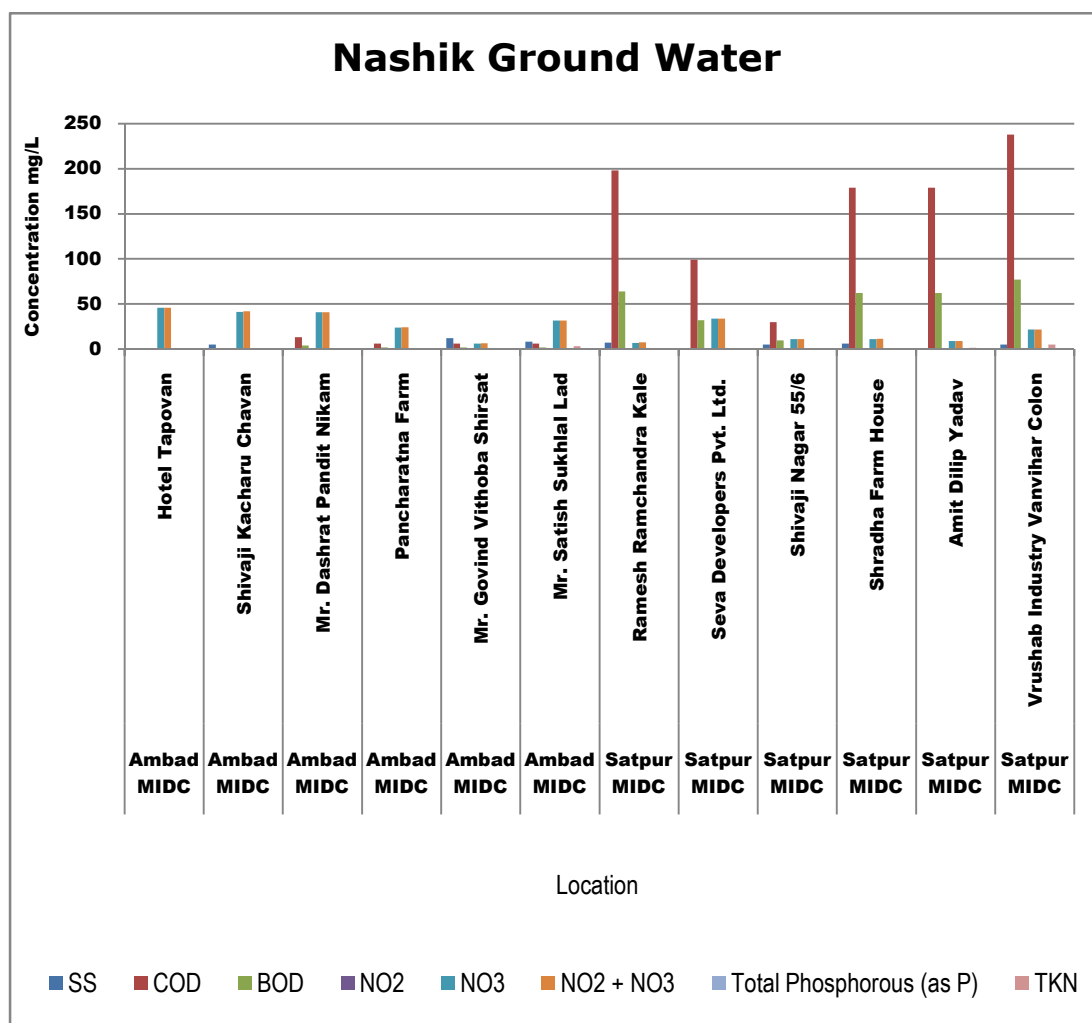
Location				Shradha Farm House Satpur	Amit Dilip Yadav P.	Vrushab Industry
Date of Sampling				01.06.17	28.05.17	28.05.17
Sr.	Parameters	Unit	Std. Limit	Results		
13.	Free Ammonia (asNH ₃ -N)	mg/L	1.0	BDL	BDL	BDL
14.	Total Residual Chlorine	mg/L	0.5	BDL	BDL	BDL
15.	Cyanide (as CN)	mg/L	0.2	BDL	BDL	BDL
16.	Fluoride(as F)	mg/L		0.46	0.4	0.4
17.	Sulphide (as S ₂ -)	mg/L	1	BDL	BDL	BDL
18.	Dissolved Phosphate (as P)	mg/L	0.05	BDL	BDL	BDL
19.	Sodium Absorption Ratio	mg/L		0.58	0.38	0.42
20.	Total Coliforms	MPNindex/100ml		920	13	BDL
21.	Faecal Coliforms	MPNindex/100ml	ND	220	13	BDL
22.	Total Phosphorous (as P)	mg/L	ND	BDL	BDL	BDL
23.	Total Kjeldahl Nitrogen	mg/L	0.5	1.46	1.68	5.26
24.	Total Ammonia (NH ₄ +NH ₃)-	mg/L	0.001	BDL	BDL	BDL
25.	Phenols (as C ₆ H ₅ OH)	mg/L	0.5	BDL	BDL	BDL

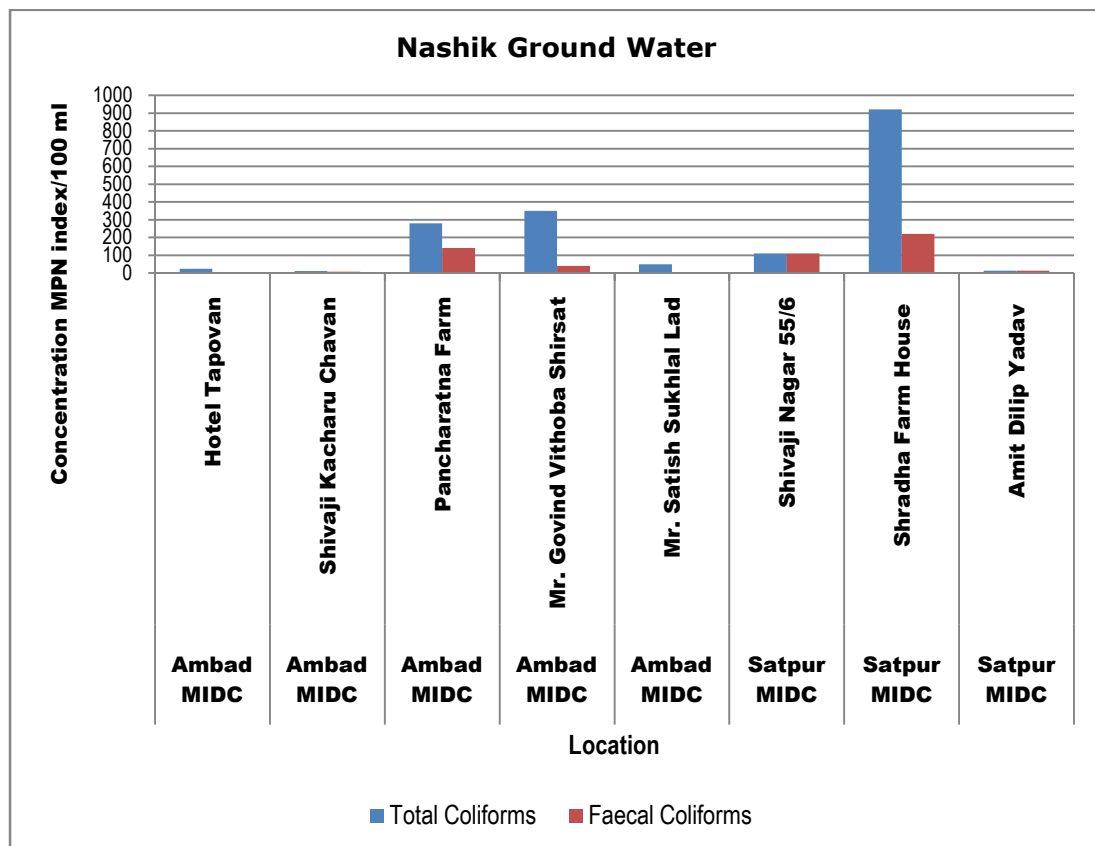
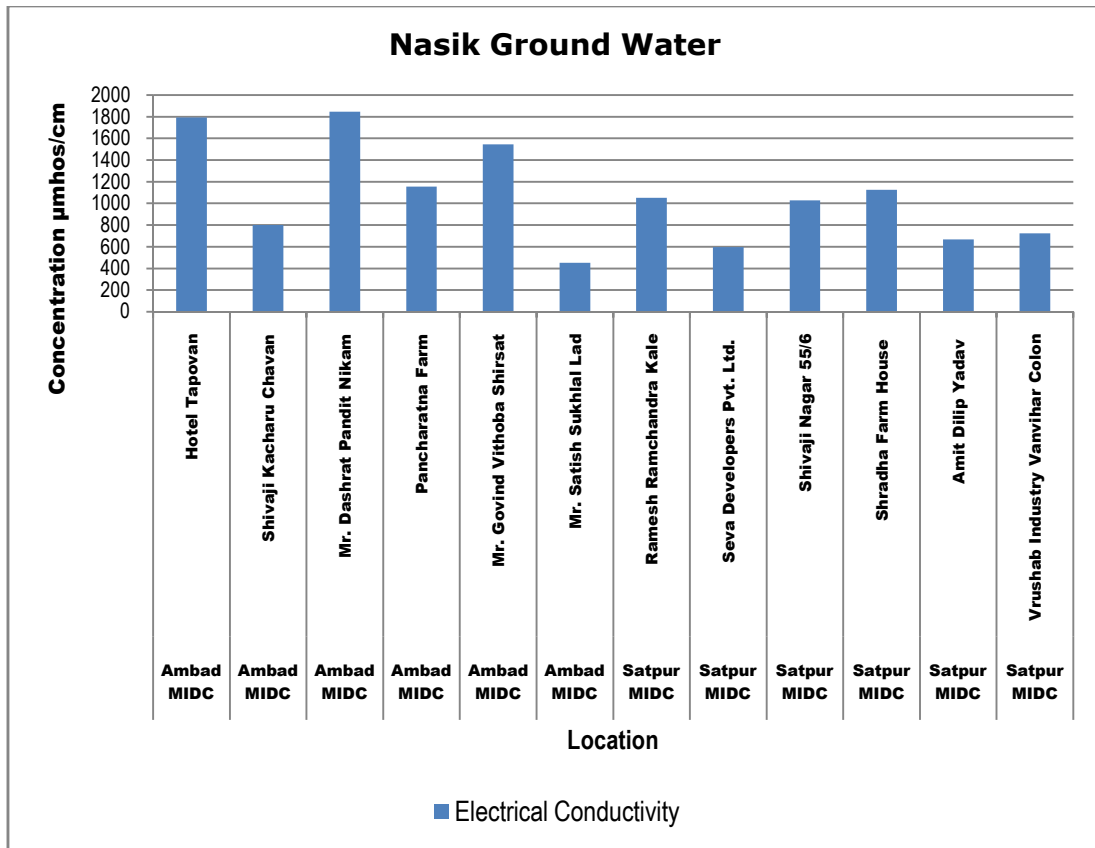
Location				Shradha Farm House Satpur	Amit Dilip Yadav P.	Vrushab Industry
Date of Sampling				01.06.17	28.05.17	28.05.17
Sr.	Parameters	Unit	Std. Limit	Results		
26.	Surface Active Agents (as MBAS)	mg/L	0.001	BDL	BDL	BDL
27.	Organo Chlorine Pesticides					
I.	Alachlor	µg/L	0.05	BDL	BDL	BDL
II.	Atrazine	µg/L	20	BDL	BDL	BDL
III.	Aldrin	µg/L	2	BDL	BDL	BDL
IV.	Dieldrin	µg/L	0.03	BDL	BDL	BDL
V.	Alpha HCH	µg/L	0.03	BDL	BDL	BDL
VI.	Beta HCH	µg/L	0.01	BDL	BDL	BDL
VII.	Delta HCH	µg/L	0.04	BDL	BDL	BDL
VIII.	Butachlor	µg/L	125	BDL	BDL	BDL
IX.	p,pDDT	µg/L	0.04	BDL	BDL	BDL
X.	o,pDDT	µg/L	1	BDL	BDL	BDL
XI.	p,pDDE	µg/L	1	BDL	BDL	BDL
XII.	o,pDDE	µg/L	1	BDL	BDL	BDL
XIII.	p,pDDD	µg/L	1	BDL	BDL	BDL
XIV.	o,pDDD	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

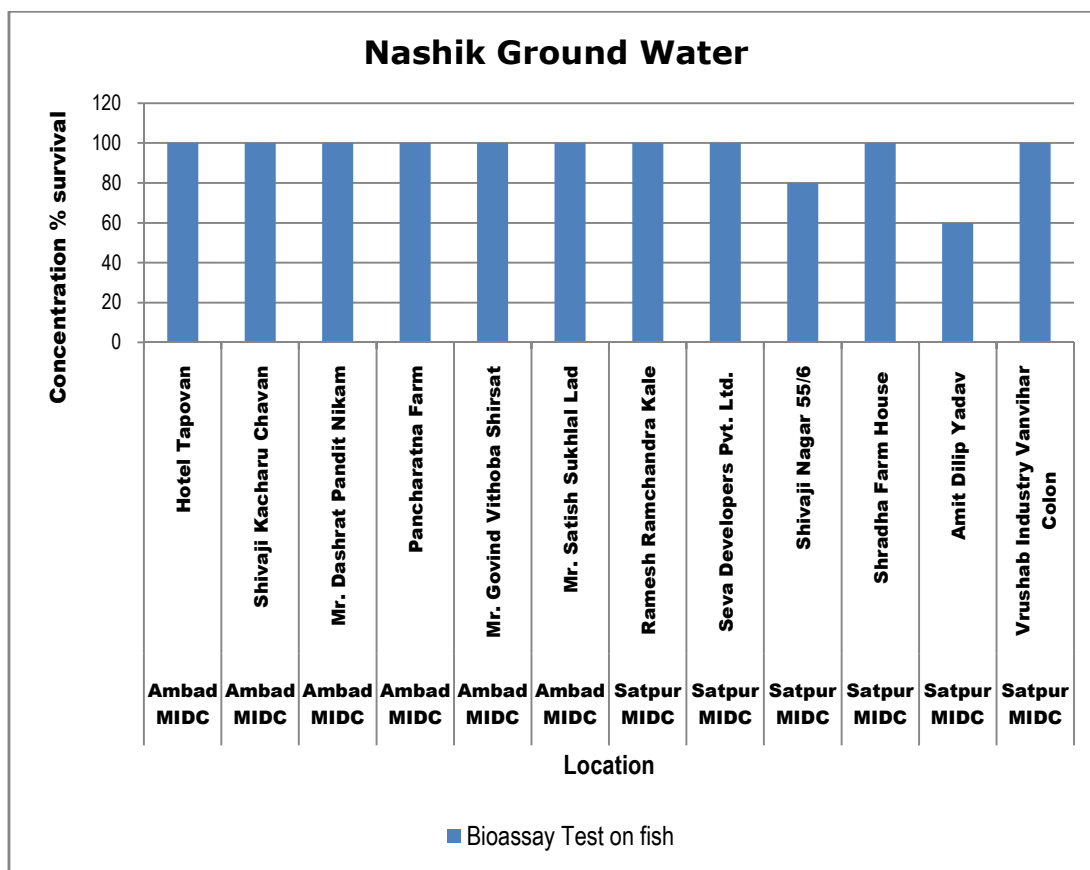
Location				Shradha Farm House Satpur	Amit Dilip Yadav P.	Vrushab Industry
Date of Sampling				01.06.17	28.05.17	28.05.17
Sr.	Parameters	Unit	Std. Limit	Results		
KVIII.	YHCH (Lindane)	µg/L	0.4	BDL	BDL	BDL
28.	Polynuclear aromatic hydrocarbons (as PAH)	mg/L	2.0	BDL	BDL	BDL
29.	Polychlorinated Biphenyls (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	BDL	BDL	BDL

Location				Shradha Farm House Satpur	Amit Dilip Yadav P.	Vrushab Industry
Date of Sampling				01.06.17	28.05.17	28.05.17
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	60	100

Graphs: Ground Water Quality Monitoring for Nashik:







4. Summary and Conclusion

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

4.1 Stack Emission Monitoring:

Fifteen industries from Nashik were selected for Stack emission monitoring.

- 1. Particulate matter (PM):** Out of the 15 stacks, the result of 4 stacks was found to be below the detectable limit. Remaining all the results obtained is within the standard emission for the specified industry.
- 2. Sulphur dioxide (SO₂):** Emission of SO₂ was higher than the permissible limit only at Ceat Ltd. with 993 mg/Nm³ emission.
- 3. Nitrogen dioxide (NO₂):** Emission of NO₂ was higher than the permissible limit in 4 stacks sampled. The highest level of NO₂ was observed at Graphite India Ltd. stack with 118 mg/Nm³ emission.

4.2 Ambient Air Quality Monitoring:

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

- 1. Sulphur dioxide (SO₂):** All the locations are observed with very low concentrations of SO₂, with 6 stacks out of the 12 showed results below the detection limit. The highest level of SO₂ was observed at Mahindra UGINE Steel Co with 5.56 µg/m³ which is very much lower than the standard limit of NAAQS i.e. 80 µg/m³.

2. **Nitrogen dioxide (NO₂):** Values of nitrogen dioxide are also observed below the standard limit of 80 µg/m³ at all the 12 locations. The highest level of NO₂ was observed at Lub Tech Oil Company with a result of 7.17µg/m³.
3. **Particulate Matter (PM₁₀):** PM₁₀ concentration of 10 locations was higher than the standard limit of 100 µg/m³. The highest concentration of PM₁₀ was observed at Graphite India Ltd. with 658µg/m³.
4. **Particulate Matter (PM_{2.5}):** The highest level of PM_{2.5} was also observed at Graphite India Ltd. with a result of 161µg/m³.
5. **Ozone (O₃):** Ozone was found at only two locations out of the 12 locations monitored and was below detectable limit.
6. **Lead (Pb):** All 12 locations monitored had concentration of lead below permissible limit.
7. **Carbon Monoxide (CO):** Concentration of carbon monoxide was higher than the permissible limit in 6 out of 12 locations monitored. The highest level of CO was observed at Sudal Industries Ltd. with 19.1 mg/m³.
8. **Ammonia(NH₃):** Ammonia was observed at only 2 locations out of the 12 locations monitored, and was well within the permissible limit.
9. **Benzene(C₆H₆):** All 12 locations monitored had Benzene concentration higher than 5 µg/m³ which is the standard limit as per NAAQS. The highest level of was observed at Sudal Industries Ltd. with 2.97 ng/m³.
10. **Benzo(a)pyrene (BaP):** BaP was below detectable limit in all 6 locations monitored.
11. **Arsenic(As):** As was detected on in 7 locations out of the 12 locations monitored and was well within the standard limit of 6 ng/m³.
12. **Nickel(Ni):** Ni was detected on in 5 locations out of the 12 locations monitored and was well within the standard limit of 20 ng/m³.

4.3 Waste Water Quality Monitoring:

To understand the quality of treated effluent, 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 6.97 and 7.67 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 100 mg/L concentration.
4. **Biochemical Oxygen Demand:** The highest BOD was observed at Nasardi Bridge Near NIMA Bhavan with 30 mg/L concentration.

5. **Sulphide:** Sulphide concentration was high at Nasardi Bridge near NIMA Bhavan with 13.6 mg/L.
6. **Total Ammonia:** 2 water samples collected was well within the permissible limit of Ammonia.
7. **Total Kjeldahl Nitrogen:** All samples collected, were well within the limit required as per standard.
8. **Fish Bioassay:** 20% Survival was only attained in Nasardi Bridge Near NIMA Bhavan.
9. **Heavy metals:** All the heavy metals are found below the standard limits in all the samples.

4.3 Ground Water Quality Monitoring:

Four ground water samples were collected from Nashik region.

- 1) **Chemical Oxygen Demand:** The COD of all 12 samples was found in the range between 9 mg/L to 82 mg/L.
- 2) **Biological Oxygen Demand:** BOD of all 6 samples was found in the range between 1.83 mg/L to 3.35 mg/L.

Following are the parameters which are compared with ISO10500:2012 Drinking water specifications.

- 1) **Nitrite:** Values of Nitrite at all location was well within the standard.
- 2) **Nitrate:** Results of Nitrate are also observed below standard limit (42 mg/L).
- 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 the acceptable standards, below <0.05mg/L.
- 6) **Sulphide:** All the readings of sulphide are below detectable limit in all 12 samples collected.
- 7) **Sodium Absorption Ratio:** These values fit within range of water quality criteria of CPCB.
- 8) **Total Kjeldahl nitrogen:** All 12 water sample collected exceeded the standard limit of TKN and ranged in between 0.69 mg/L to 1.14 mg/L concentration.
- 9) **Fish Bioassay:** All location obtained 100% survival was observed.
- 10) **Boron:** 5 out of the 12 water samples collected had Boron concentration higher than the prescribed value of 0.01 mg/L.
- 11) **Surface Active Agents:** All 4 samples showed below detectable limit.

- 12) Metals:** All the metals except Copper, Lead and Total Chromium 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.

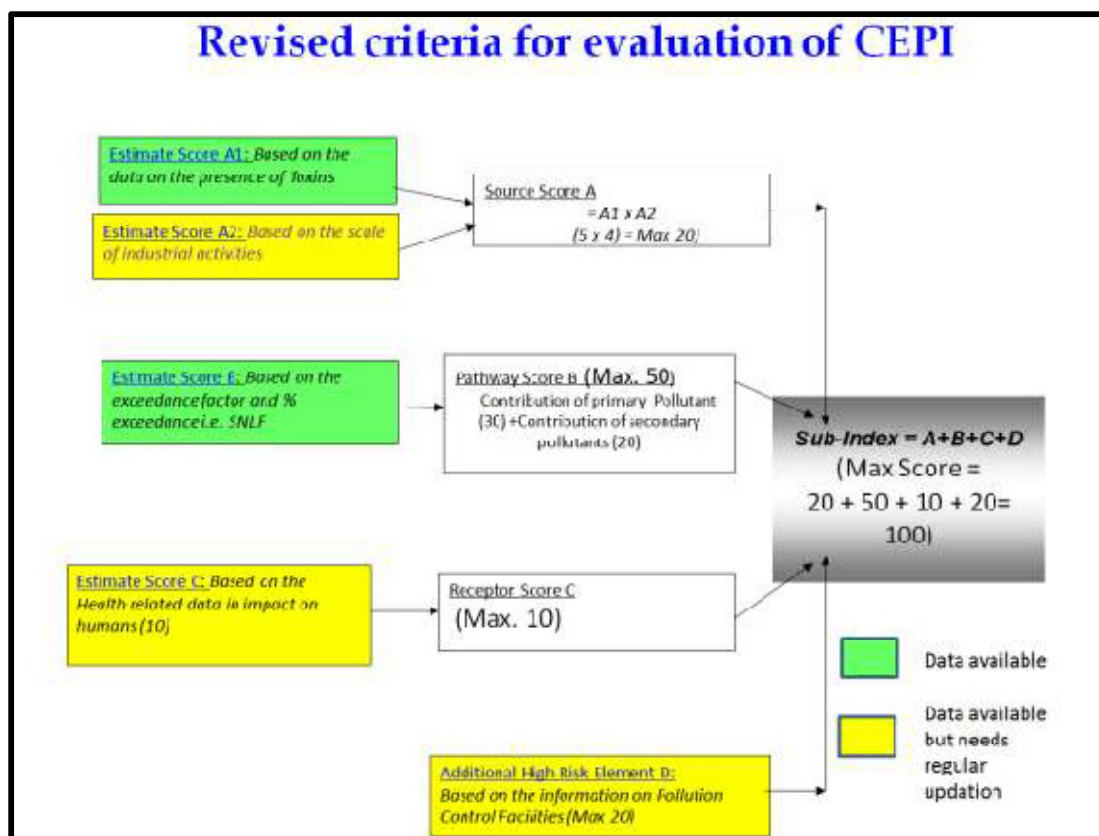
To overcome the subjectivity, revised concept is proposed by eliminating the subjective factors as described in the previous section, but retaining the factors which can be measured precisely.

- 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.
4. 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 2016 prepared by MPCB, CEPI is calculated considering all these revised standards' limiting values, list of parameters and complete scope of monitoring.

The result shows that CEPI score of present report is 44.78. The present study is the compilation of pre-monsoon season, which also affects the score value. It should be noticed here that MPCB's efforts through the formulation of action plans decreased the overall concentration of pollutants in all aspects i.e. air, land and water in Chembur area in past three years. This has also resulted in decreased score of CEPI.

5.1 Comparison of CEPI scores:

Results show that present CEPI score (44.78) of Nashik considering all revised standards is less than the CEPI Score of February 2017 (57.05) report.

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

Air

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
Present Report June 2017 (Revised CEPI 2016)	2.9	5	14.5	-	-	-	9.3	-	-	-	5	10	38.8
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	3.50	0	10.50	10	55.25

Water:

	A1	A2	A	B1	B2	B3	B	C1	C2	C3	C	D	CEPI
Present Report June 2017 (Revised CEPI 2016)	2.2	3	6.6	-	-	-	9.8	-	-	-	5	10	31.4
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
Present Report June 2017 (Revised CEPI 2016)	1.9	4.1	7.79	-	-	-	8.36	-	-	-	5	10	31.15
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	46.0

AggregatedCEPI:

	Air Index	Water Index	Land Index	CEPI
Present Report June 2017 (Revised CEPI 2016)	38.8	31.4	31.15	44.78
February, 2017	48	43.5	42	57.5
CPCB Report 2009	55.25	52.50	46.00	66.06

6. Conclusion

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. HAL (Hindustan Aeronautics Ltd.), Mahindra & Mahindra, Bosch (MICO), V.I.P., CEAT, ABB, Crompton Greaves, SIEMENCE, Kirloskar Oil Engine, Glaxo, are major industries in Nasik. About 10,000 industries are working in Nasik including Large, Medium and Small Scale.

A total of 15 stacks where monitored for the project. Out of which 2 stacks showed higher concentration of SO₂ and three stacks showed higher concentration of NO₂.

In the 12 ambient air samples collected only PM₁₀, PM_{2.5} and CO was exceeding the limit prescribed as per NAAQS. This is mainly due to the vehicle emissions in the region.

Only two waste water samples have been collected for testing. All parameters except total coliforms and Faecal coliforms have higher concentration and the reason behind it is that the waste waters are collected from nallah which are dried due to summer season.

In the ground water samples collected, only Electrical Conductivity was found in higher concentration. The ground water collected is from Borewell and well water and is not used for drinking purpose.

The overall pollution load in the region is reduced and continuous efforts have been inputted by the Regional pollution control board and state pollution control board inbrining the pollution lesser.

	A1	A2	A	B	C	D	CEPI
Air Index	2.9	5	14.5	9.3	5	10	38.8
Water Index	2.2	3	6.6	9.8	5	10	31.4
Land Index	1.9	4.1	7.79	8.36	5	10	31.15
Aggregated CEPI							44.78

7. 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: Chembur, 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

8. 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 Nashik region

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

Sr.	Parameters	Method References	Techniques	Detection Limit
				0.02kg/day
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 ₆ H 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, 22 nd Ed., 2012, 1060 B, 1-39	-	-
2.	Sampling Procedure for Microbiological Parameters	APHA, 22 nd Ed., 2012,1060 B, 1-39, 9040, 9-17, and 9060B, 9-35	-	-
3.	Temperature	APHA, 22 nd Ed., 2012, 2550-B, 2-69	By Thermometer	-
4.	Colour	APHA, 22 nd 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, 22 nd Ed., 2012, 4500-H ⁺ - B, 4-92	By pH Meter	1
7.	Oil & Grease	APHA, 22 nd 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,22 nd 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, 22 nd Ed., 2012, 2510- B, 2-54	By Conductivity Meter	0.1 μ mho/cm
13.	Nitrite-Nitrogen	APHA, 22 nd 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, 22 nd Ed., 2012, 4500-NO ₃ , B-4-122	UV Spectrophotometer Screening Method	0.2 mg/L
15.	(NO ₂ + NO ₃)-Nitrogen	APHA, 22 nd Ed., 2012, 4500-NO ₂ -B, 4-120 APHA, 22 nd Ed., 2012, 4500-NO ₃ , B-4-122	Colorimetric Method V Spectrophotometer Screening Method	0.2 mg/L
16.	Free Ammonia	APHA, 22 nd 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, 22 nd Ed., 2012, 4500-CN, C & E, 4-41 & 4-43	Colorimetric Method	0.001 mg/L
19.	Fluoride (F)	APHA, 22 nd Ed., 2012, 4500-F, D, 4-87	SPADNS Method	0.05 mg/L
20.	Sulphide (S ²⁻)	APHA, 22 nd Ed., 2012, 4500 -S ²⁻ , C-4-175, F-4-178	Iodometric Method	0.08 mg/L
21.	Dissolved Phosphate (P)	APHA, 22 nd Ed., 2012, 4500 P, E, 4-155	Ascorbic Acid Method	0.03 mg/L
22.	Sodium Absorption Ratio	IS 11624 :1986, Reaffirmed 2006	By Calculation	0.3
23.	Total Phosphorous (P)	APHA, 22 nd Ed., 2012, 4500 P, E, 4-155	Ascorbic Acid Method	0.03 mg/L
24.	Total Kjeldahl Nitrogen	APHA, 22 nd 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, 22 ^d Ed., 2012, 4500 NH ₃ , F, 4 -115	Colorimetric Method	0.001 mg/L
26.	Phenols (C ₆ H ₅ OH)	APHA, 22 nd 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, 22 nd Ed., 2012,5540-B & C,5-50	Methylene Blue Extraction Method	0.1 mg/L
28.	Organo Chlorine Pesticides	APHA, 22 nd Ed., 2012,6410B,6-74	GC MS-MS Method	0.01 µg/L
29.	Polynuclear aromatic hydrocarbons (PAH)	APHA, 22 nd Ed., 2012,6410B,6-74	GC MS-MS Method	0.01 µg/L
30.	Polychlorinated Biphenyls (PCB)	APHA, 22 nd 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, 22 nd Ed., 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, 22 nd Ed., 2012,9221-B, 9-66	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
46.	Faecal Coliforms	APHA, 22 nd Ed., 2012,9221-E, 9-74	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
47.	Bioassay Test (Zebra Fish)	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 (Prevention 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) $\mu\text{g}/\text{m}^3$	Annual *	50	20	– Improved West and Gaeke – Ultraviolet fluorescence
		24 hours **	80	80	
2	Nitrogen Dioxide (NO ₂) $\mu\text{g}/\text{m}^3$	Annual *	40	30	– Modified Jacob & Hochheiser (Na-Arsenite) – Chemiluminescence
		24 hours **	80	80	
3	Particulate Matter (size less than 10 μm) or PM ₁₀ $\mu\text{g}/\text{m}^3$	Annual *	60	60	– Gravimetric – TOEM – Beta attenuation
		24 hours **	100	100	
4	Particulate Matter (size less than 2.5 μm) or PM _{2.5} $\mu\text{g}/\text{m}^3$	Annual *	40	40	– Gravimetric – TOEM – Beta attenuation
		24 hours **	60	60	
5	Ozone (O ₃) $\mu\text{g}/\text{m}^3$	8 hours **	100	100	– UV photometric – Chemiluminescence – Chemical Method
		1 hour **	180	180	
6	Lead (Pb) $\mu\text{g}/\text{m}^3$	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/m^3	8 hours **	02	02	– Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour **	04	04	
8	Ammonia (NH ₃) $\mu\text{g}/\text{m}^3$	Annual *	100	100	– Chemiluminescence – Indophenol blue method
		24 hours **	400	400	
9	Benzene (C ₆ H ₆) $\mu\text{g}/\text{m}^3$	Annual *	05	05	– Gas Chromatography based continuous analyzer – Adsorption and Desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only, ng/m^3	Annual *	01	01	– Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As) ng/m^3	Annual *	06	06	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper.
12	Nickel (Ni) ng/m^3	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.

$\mu\text{g}/\text{m}^3$: micro-gram/ m^3 i.e. $10^{-6}\text{gm}/\text{m}^3$

ng/m^3 : nano-gram/ m^3 i.e. $10^{-9}\text{gm}/\text{m}^3$

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 matter 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
17.	Cadmium (as Cd), mg/L,	2.0	1.0	--	2.0

Sr.	Parameter	Standards			
		Inland surface Water	Public Sewers	Land for Irrigation	Marine Coastal Areas
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 ₆ H ₅ OH), 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 Cl 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 ₆ H ₅ OH)	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 ₂ S)	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 (asCd)	mg/L	Max 0.003	No relaxation
32.	Cyanide (asCN)	mg/L	Max 0.05	No relaxation
33.	Lead (as Pb)	mg/L	Max 0.01	No relaxation
34.	Mercury (asHg)	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,flagellate s,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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> ➤ 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, μ mhos/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 (NH ₄ + NH ₃)-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