

**REPORT ON
ENVIRONMENTAL QUALITY MONITORING
FOR ASSESSMENT OF
COMPREHENSIVE ENVIRONMENTAL
POLLUTION INDEX (CEPI)
FOR
CRITICALLY POLLUTED AREA-VAPI
IN GUJARAT**

REPORT PREPARED BY



**CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forests and Climate Change)
Zonal Office (West), Vadodara
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**REPORT ON ENVIRONMENTAL QUALITY MONITORING FOR ASSESSMENT OF
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1.0 BACKGROUND:

A total of 88 industrial clusters/areas were studied to calculate Comprehensive Environmental Pollution Index (CEPI) by the Central Pollution Control Board (CPCB) in consultation with the Ministry of Environment & Forests (MoEF). The CEPI is calculated by CPCB with the help of Indian Institute of Technology (IIT), Delhi using information/data provided by State Pollution Control Boards/ Pollution Control Committees, Zonal Offices of CPCB published information etc. The main objective of the study was to identify polluted industrial clusters/areas in order to take concreted action and to monitor them at national level to improve the current status of environmental components.

Based on CEPI, it is suggested that areas having aggregated CEPI scores of 70 and above should be considered as Critically Polluted Areas (CPAs), whereas the areas having CEPI between 60-70 should be considered as Severally Polluted Areas (SPAs). It was suggested to keep SPAs under surveillance and pollution control measures should be efficiently implemented whereas the CPAs need formulation of appropriate remedial action plan.

The Ministry of Environment & Forests, New Delhi vide office memorandum dated 13.01.2010 had imposed a temporary moratorium on consideration of development projects for Environmental Clearance (EC) for the period of 08 months up to August, 2010 in 43 Critically Polluted Areas (CPAs)/industrial clusters all over India including **06 in Gujarat: Ankleshwar, Vapi, Ahmedabad, Vatva, Bhavnagar & Junagadh**, identified by Central Pollution Control Board (CPCB). Further, it was asked to CPCB along with the respective State Pollution Control Boards/Pollution Control Committees to finalize the time bound action plan for improving the environmental quality in these identified industrial clusters/areas.

Subsequently, time bound action plans were prepared by the respective SPCBs/PCCs for improving the environmental quality in these industrial clusters/areas. The action plans so prepared were finalized by CPCB and appraised to MoEF. Further, the period of moratorium was extended beyond 31.8.2010 from time to time by MoEF.

Thereafter, the status of action plans were reviewed by a Technical Committee constituted at CPCB Delhi. In accordance with the information received from CPCB that the respective SPCBs/PCCs and the local stakeholders initiated some work on implementation of the submitted action plans in respect of the industrial areas the MoEF lifted the moratorium on consideration of projects for environmental clearance in some areas.

Moratorium lifted for the CPAs-Vapi, Bhavnagar in February, 2011, Junagadh in March, 2011 and Ahmedabad in Sept 2013. Further, moratorium re-imposed for CPA-Vapi in vide OM dated 17.09.2013 and subsequently, this OM kept in abeyance until further orders with some stipulations vide OM dated 10.06.2014.

Presently, moratorium exists at two CPAs-Ankleshwar, Vatva and moratorium kept in abeyance with stipulations at Vapi.

The CEPI scores are given at following table:

CEPI SCORE –GUJARAT

Year	Ankleshwar	Vapi	Ahmedabad	Vatva	Bhavnagar	Junagarh
2009	88.50	88.09	75.28	74.77	70.99	70.82
2011	85.75	90.75	78.09	87.46	69.73	67.85
2013	80.93	85.31	69.54	83.44	62.79	52.75

CPCB issued (dated 26.04.2016) direction u/s 18 (1) (b) of the Water (P & CP) Act & the Air (P & CP) Act to undertake environmental quality monitoring and for installations of CAAQMS and real time WQMS in critically polluted areas. Accordingly, GPCB got carried out monitoring in all three CPAs (Ankleshwar, Vatva and Vapi) as pre-monsoon sampling in June 2016 and submitted reports to CPCB, Delhi.

CPCB, West Zone Office, Vadodara received a letter from the Member Secretary, CPCB vide no. MSCB/05/2016, dated 17.09.2016. This was in response to communication received from Joint Secretary, MoEF & CC, New Delhi for undertaking Environment Quality monitoring in the three critically polluted areas-Ankleshwar, Vatva and Vapi in Gujarat.

Accordingly, monitoring carried out in these areas. The report of monitoring in CPA- Vapi is given in following sections.

2.0 MONITORING-CPA-VAPI:

2.1 Monitoring Period & Team:

Monitoring for assessment of CEPI carried out at critically polluted area- Vapi as detailed below:

Area	Date(s)	Team(s)
Vapi	20.10.2016- 25.10.2016	Shri Pratik Bharne-Sc D, Dr. Arvind Kr Jha-ScD, Shri S Pradeep Raj-Sc C, Shri Satendra kumar-JRF, Shri Sushil Kumar-JRF

2.2 Parameters:

Sampling and analysis for most of the water parameters are carried out by CPCB, West Zone office. EPA approved and NABL accredited laboratory M/s Pollucon Laboratories Pvt Ltd, Surat was engaged for ambient air quality monitoring and sampling & analysis of some specific water parameters.

The air and water parameter as directed by CPCB HO for which the sampling is carried out in three rounds is given in table:

	Parameter(s)
Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO, Lead(Pb), Nickel (Ni), Arsenic (As), Ozone (O ₃), Ammonia (NH ₃), Benzene (C ₆ H ₆), Benzo-a-Pyrene) (12 parameters)
Water Quality (Ground & Surface)	<p>Simple Parameter- General Appearance (Turbidity), Color,</p> <p>Regular parameters- pH, O & G, TSS, DO, COD, BOD, Electrical Conductivity, TDS, Nitrite-Nitrogen, Nitrate-Nitrogen, Total Nitrogen (NO₂+NO₃), Free Ammonia, Total Residual Chlorine, Cyanide, Fluoride, Chloride, Sulphate, Sulphide, Total hardness, dissolved phosphate, SAR, TC, FC (MPN/100 ml)</p> <p>Special Parameters: Total Phosphorous, TKN, Total Ammonia (NH₄+NH₃) Nitrogen, Phenols, Surface Active Reagent, Anionic Detergents, Organo-chlorine pesticide, PAH, PCB,</p> <p>Zinc, Nickel, Copper, Hexavalent chromium, chromium total, , Lead, Cadmium, Manganese, Iron, Boron ,Vanadium, Selenium, Arsenic total, Mercury</p> <p>Bio-Assay test (not for ground water)</p>

2.3 Monitoring Locations and period:

The details of number of monitoring locations are given in following table:

Critically Polluted Area	No of location(s)		
	AAQM	Surface water	Ground water
Vapi	6	7	6

Three rounds of sampling at each location carried out for ambient air, surface water and ground water. Monitoring locations –CPA- Vapi along with longitude & latitude and period is given in following tables:

AAQ Monitoring:

(First Round: 20.10.2016 to 21.10.2016, Second Round: 22.10.2016 to 23.10.2016, Third Round: 24.10.2016 to 25.10.2016)

Sr. No.	Location Code	Name of location(s)	Longitude	Latitude
1	VPAQ-1	CETP, GIDC, Vapi	E 072°54'26"	N 20°20'43"
2	VPAQ-2	Shreeji wafers, Vapi	E 072°55'41.0"	N 20°22'24.8"
3	VPAQ-3	Micro Inks Limited, Vapi	E 072°57'01.1"	N 20°22'08.6"
4	VPAQ-4	Exim Pharma (formerly UCB chemicals pvt. Ltd.), GIDC, Silvassa road, Vapi	E 072°55'25.11"	N 20°21'46.56"
5	VPAQ-5	Kundar chemicals pvt. Ltd., phase II, GIDC estate, Vapi	E 072°56'0.26"	N 20°21'50.5"
6	VPAQ-6	Hightech inks pvt. Ltd., Vapi	E 072°56'15.9"	N 20°20'54.6"

Surface water sampling:

(First Round: 20-21.10.2016, Second Round: 22-23.10.2016 Third Round: 24-25.10.2016)

Sr. No.	Location Code	Name of the location(s)	Longitude	Latitude
1	VPSW-1	River Damanganga, Lavachha, after Silvassa	E 072°58'34.8"	N 20°17'53.9"
2	VPSW-2	Bhilkhadi D/s of Pumping Station-1, GIDC, Vapi	E 072°55'51.7"	N 20°22'29.4"
3	VPSW-3	Bhilkhadi on NH-8, near Suzuki -Khataria Automobiles, Selvav, vapi	E 072°54'53.9"	N 20°24'23.1"
4	VPSW-4	River Kolak, Nr. Koteswar Mandir	E 072°54'04.7"	N 20°26'16.8"
5	VPSW-5	River Damanganga at Zari Causeway	E 072°52'50.8"	N 20°22'17.9"
6	VPSW-6	Outlet of CETP, Vapi	E 072°54'23.4"	N 20°20'35.9"
7	VPSW-7	Chhiri Lake, Kocharva Village	E 072°57'19.2"	N 20°22'3.6"

Ground water sampling:

(First Round: 20-21.10.2016, Second Round: 22-23.10.2016 Third Round: 24-25.10.2016)

Sr. No.	Location Code	Name of the location(s)	Longitude	Latitude
1	VPGW-1	Bore well Rajasthan Bhawan, Near Sameer Apartments, Chanod village	E 072°56'18.3"	N 20°20'44.4"
2	VPGW-2	Open well, Girishbhai Farm, Dungara faliya, Dehgam Road,	E 072°56'38.1"	N 20°21'7.5"
3	VPGW-3	Bore well, TSDF Site, GIDC Vapi	E 072°56'46.7"	N 20°21'28.8"
4	VPGW-4	Handpump, Residence of Shri S.D.Shinde, Kanchana nagar, Chhiri Village	E 072°56'34.4"	N 20°22'43.0"
5	VPGW-5	Bore well, Swaminarayan Gurukul School, NH-8, Selvav Village	E 072°54'56.7"	N 20°24'35.2"
6	VPGW-6	Open well, Jhila Panchayat School, Kata Faliya, Namdha Village	E 072°53'11.0"	N 20°21'18.6"

CETP Inlet –Sampling date: 20.10.2016 & 24.10.2016

AMBIENT AIR QUALITY MONITORING LOCATION – CPA VAPI (MARKED ON GOOGLE IMAGE)



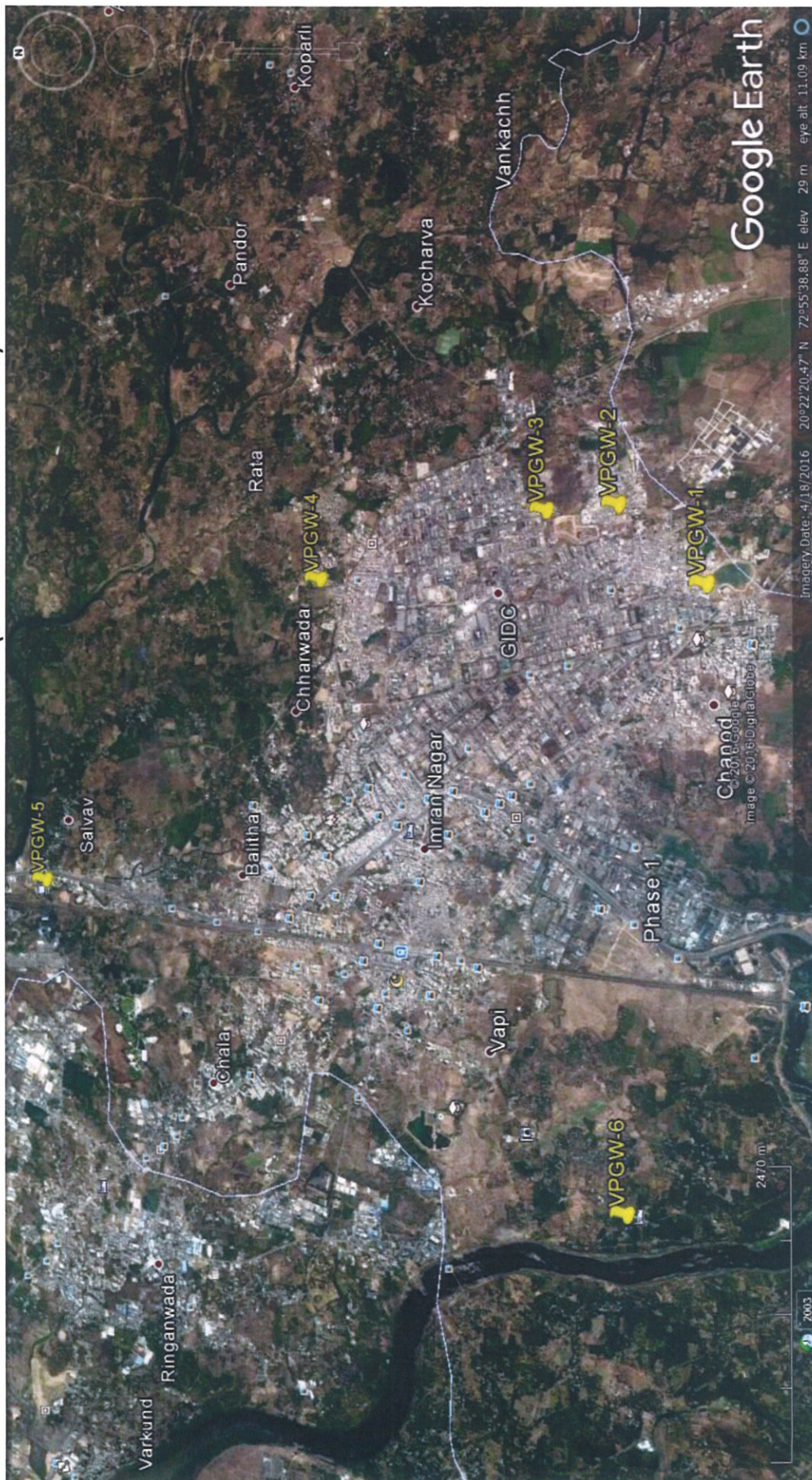
Location Code	Name of location(s)	Location Code	Name of location(s)
VPAQ-1	CETP, GIDC, Vapi	VPAQ-4	Exim Pharma (formerly UCB chemicals pvt. Ltd.), GIDC, Silvassa road, Vapi
VPAQ-2	Shreeji wafers, Vapi	VPAQ-5	Kundar chemicals pvt. Ltd., phase II, GIDC estate, Vapi
VPAQ-3	Micro Inks limited, Vapi	VPAQ-6	Hightech inks pvt. Ltd., Vapi

SURFACE WATER SAMPLING LOCATION – CPA VAPI (MARKED ON GOOGLE IMAGE)



Location Code	Name of the location(s)	Location Code	Name of the location(s)
VPSW-1	River Damanganga, Lavachha, after Silvassa	VPSW-5	River Damanganga at Zari Causeway
VPSW-2	Bhilkhadi D/s of Pumping Station-1, GIDC, Vapi	VPSW-6	Outlet of CETP, Vapi
VPSW-3	Bhilkhadi on NH-8, near Suzuki -Khataria Automobiles, Selvav, vapi	VPSW-7	Chhiri Lake, Kochharva Village
VPSW-4	River Kolak, Nr. Koteswar Mandir		

GROUND WATER SAMPLING LOCATION – CPA VAPI (MARKED ON GOOGLE IMAGE)



Location Code	Name of the location(s)	Location Code	Name of the location(s)
VPGW-1	Bore well Rajastan Bhawan, Near Sameer Apartments, Chanod village	VPGW-4	Hand pump, Residence of Shri S.D.Shinde, Kanchana nagar, Chhiri Village
VPGW-2	Open well, Girishbhai Farm, Dungara faliya, Dehgam Road,	VPGW-5	Bore well, Swaminarayan Gurukul School, NH-8, Selvav Village
VPGW-3	Bore well, TSDF Site, GIDC Vapi	VPGW-6	Open well, Jhila Panchayat School, Kata Faliya, Namdha Village

3.0 RESULTS:

The results of ambient air quality monitoring are given in **Annexure-I** and surface water and groundwater quality monitoring are given in **Annexure-II** and **III** respectively. The results of CETP Inlet quality is given in **Annexure-IV**. The Minimum Deduction Limits for the analysis of Water/ Wastewater and ambient air are given in **Annexure-IV A**.

4.0 OTHER INFORMATION:

The information related to total area falling under the critically polluted area, details of R-17 & R-54 red category industries, wind rose diagram, adequate/inadequate status of large, medium/small scale industries in the area, and health data received from GPCB are given in **Annexure-V**.

RESULTS OF AMBIENT AIR QUALITY MONITORING –CPA-VAPI

TEST PARAMETER	UNIT	CETP GIDC VAPI (VPAQ-1)				Shreeji Wafers, Vapi (VPAQ-2)				Micro Inks Limited, Vapi (VPAQ-3)			
		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016	
Particulate Matter (PM ₁₀)	µg/m ³	180	86.58	136		92.54	76.41	118		98.41	119	82.41	
Particulate Matter (PM _{2.5})	µg/m ³	68.41	42.15	57.84		43.55	35.78	56.73		58.11	58.80	43.55	
Lead as Pb	µg/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Benzo (a) Pyrene (BaP)- particulate phase only	ng/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Arsenic as As	ng/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Nickel as Ni	ng/m ³	14.43	14.27	14.47		13.53	13.21	16.17		13.37	14.57	15.40	
Carbon Monoxide as CO (TW Avg. – 8 Hrs)	mg/m ³	1.44	1.68	1.65		1.49	1.62	1.54		1.36	1.42	1.78	
Benzene as C ₆ H ₆	µg/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Ammonia (NH ₃)	µg/m ³	61.45	53.21	34.11		26.14	34.70	20.24		23.65	33.18	26.75	
Sulphur Dioxide (SO ₂)	µg/m ³	29.44	12.63	21.11		28.57	20.11	21.83		24.15	29.37	13.83	
Oxides of Nitrogen (NO ₂)	µg/m ³	42.52	28.55	39.47		32.45	44.85	51.24		36.88	39.65	29.73	
Ozone (O ₃) (TW Avg. – 1 Hr)	µg/m ³	24.27	28.77	38.32		13.40	17.33	15.80		19.87	16.21	14.20	

TEST PARAMETER	UNIT	Exim Pharma, Vapi (VPAQ-4)				Kundar Chemicals Pvt. Ltd. Vapi (VPAQ-5)				Hightech Inks Pvt. Ltd., Vapi (VPAQ-6)			
		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016		20- 21.10.2016	22- 23.10.2016	24- 25.10.2016	
Particulate Matter (PM ₁₀)	µg/m ³	157.8	88.24	144		108	130	142		179	210	165	
Particulate Matter (PM _{2.5})	µg/m ³	71.52	40.63	64.04		64.98	72.51	79.11		68.92	91.11	80.38	
Lead as Pb	µg/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Benzo (a) Pyrene (BaP)- particulate phase only	ng/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Arsenic as As	ng/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Nickel as Ni	ng/m ³	12.63	14.73	11.52		15.13	16.20	13.60		12.87	14.33	17.10	
Carbon Monoxide as CO (TW Avg. - 8 Hrs)	mg/m ³	1.62	1.77	1.38		1.66	1.74	1.56		1.83	1.71	1.23	
Benzene as C ₆ H ₆	µg/m ³	BDL	BDL	BDL		BDL	BDL	BDL		BDL	BDL	BDL	
Ammonia (NH ₃)	µg/m ³	35.21	36.41	40.30		28.00	33.63	42.13		35.73	41.77	21.73	
Sulphur Dioxide (SO ₂)	µg/m ³	30.11	19.57	18.14		28.52	33.62	21.62		34.02	27.45	16.21	
Oxides of Nitrogen (NO ₂)	µg/m ³	39.95	28.77	42.56		31.12	42.33	36.30		31.25	45.49	34.23	
Ozone (O ₃) (TW Avg. - 1 Hr)	µg/m ³	19.63	21.36	13.50		27.20	20.60	16.87		26.33	19.47	15.00	

RESULTS OF SURFACE WATER QUALITY MONITORING- CPA- VAPI

Location-VPSW-1: River Damanganga, Lavachha, after Silvassa

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	24.10.2016
1	pH	-	8.68	8.57	8.63
2	Cond	$\mu\text{S}/\text{cm}$	253	236	234
3	Turbidity	N.T.U.	3.4	3.2	3.2
4	Colour	Hazen	10	BDL	20
5	TSS	mg/L	8.0	4.0	1.0
6	TDS	mg/L	166	117	123
7	D.O.	mg/L	12.1	11.3	9.9
8	COD	mg/L	8.16	9.96	6.05
9	BOD	mg/L	3.3	4.9	1.2
10	NH ₃ -N	mg/L	0.136	0.21	0.151
11	T. Ammonia	mg/L	0.273	0.422	0.303
12	Free NH ₃	mg/L	0.080	0.097	0.079
13	TKN	mg/L	0.272	0.82	0.27
14	NO ₂ -N	mg/L	0.01	0.016	0.010
15	NO ₃ -N	mg/L	1.10	1.07	1.01
16	T. Nitrogen	mg/L	1.382	1.906	1.29
17	O-PO ₄ -P	mg/L	0.07	0.07	0.08
18	T. Phos.	mg/L	0.1	0.07	0.29
19	T. Hardness	mg/L	96	94	88
20	Cl ⁻	mg/L	11.3	10.8	11.7
21	SO ₄ ⁻²	mg/L	13.0	13	12
22	SAR	-	0.51	0.44	0.51
23	B	mg/L	0.0702	0.0901	0.0471
24	Cr ⁺⁶	mg/L	BDL	0.0019	BDL
25	F ⁻	mg/L	0.16	0.13	0.15
26	S ⁻²	mg/L	0.70	0.52	0.57
27	CN ⁻	mg/L	BDL	BDL	0.028
28	Phenols	mg/L	0.015	BDL	0.080
29	Res.Cl ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	1.14	1.63	7.03
31	Chromium (Cr)	mg/L	BDL	BDL	BDL
32	Manganese (Mn)	mg/L	0.222	0.030	0.041
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	BDL	BDL	BDL
35	Copper (Cu)	mg/L	BDL	BDL	BDL
36	Zinc (Zn)	mg/L	BDL	0.043	BDL
37	Cadmium (Cd)	mg/L	BDL	BDL	BDL
38	Lead (Pb)	mg/L	BDL	BDL	BDL
39	Vanadium as V	mg/L	0.146	0.18	0.2

40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	0.276	0.24	0.25
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	1600	>1600	1600
48	Fecal Coliform	MPN/100 ml	540	170	150
49	Bio-assay Test	%	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location- VPSW-2: Bill Khadi, D/s Pumping Station no.1, GIDC, Vapi

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	23.10.2016	24.10.2016
1	pH	-	7.09	7.38	6.75
2	Cond	µS/cm	3671	574	3206
3	Turbidity	N.T.U.	28.2	24.2	17.3
4	Colour	Hazen	100	30	150
5	TSS	mg/L	80	30	117
6	TDS	mg/L	2061	282	1805
7	D.O.	mg/L	0.08	5.1	BDL
8	COD	mg/L	333	69	236
9	BOD	mg/L	156	32.1	74.2
10	NH ₃ -N	mg/L	11.44	1.9	37.4
11	T. Ammonia	mg/L	22.972	3.815	75.099
12	Free NH ₃	mg/L	0.197	0.068	0.306
13	TKN	mg/L	17.4	2.58	56.1
14	NO ₂ -N	mg/L	BDL	BDL	BDL
15	NO ₃ -N	mg/L	0.20	1.47	1.38
16	T. Nitrogen	mg/L	17.6	4.05	57.48
17	O-PO ₄ -P	mg/L	0.16	0.034	0.18
18	T. Phos.	mg/L	0.52	0.41	0.56
19	T. Hardness	mg/L	712	168	730
20	Cl ⁻	mg/L	855	116	818
21	SO ₄ ⁻²	mg/L	414	405	468
22	SAR	-	5.92	1.39	5.70
23	B	mg/L	0.8622	0.2956	0.3320
24	Cr ⁺⁶	mg/L	BDL	0.0096	BDL
25	F ⁻	mg/L	0.34	0.13	0.84
26	S ⁻²	mg/L	0.85	1.0	1.71
27	CN ⁻	mg/L	0.077	0.042	0.035
28	Phenols	mg/L	1.16	0.17	2.11
29	Res.CL ₂	mg/L	BDL	BDL	BDL

30	O&G	mg/L	6.14	2.68	8.48
31	Chromium (Cr)	mg/L	0.081	0.059	1.529
32	Manganese (Mn)	mg/L	0.793	0.141	0.502
33	Iron (Fe)	mg/L	0.044	0.021	0.063
34	Nickel (Ni)	mg/L	0.074	0.026	0.254
35	Copper (Cu)	mg/L	0.214	0.115	2.541
36	Zinc (Zn)	mg/L	0.345	0.137	0.753
37	Cadmium (Cd)	mg/L	BDL	BDL	BDL
38	Lead (Pb)	mg/L	BDL	BDL	0.047
39	Vanadium as V	mg/L	0.162	0.12	0.14
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	2.5	2.3	2.2
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	>1600	920	540
48	Fecal Coliform	MPN/100 ml	920	240	220
49	Bio-assay Test	%	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location- VPSW-3: Bill Khadi, Near NH-8, Selvav, Vapi

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	22.10.2016	24.10.2016
1	pH	-	7.26	7.25	7.07
2	Cond	µS/cm	1997	1989	1088
3	Turbidity	N.T.U.	18.1	13.8	24.1
4	Colour	Hazen	150	100	75
5	TSS	mg/L	50	36	14
6	TDS	mg/L	1102	919	882
7	D.O.	mg/L	BDL	BDL	BDL
8	COD	mg/L	195	138	113
9	BOD	mg/L	84	64.1	40.3
10	NH ₃ -N	mg/L	17.2	21.81	19.4
11	T. Ammonia	mg/L	34.538	43.794	38.955
12	Free NH ₃	mg/L	0.466	0.618	0.353
13	TKN	mg/L	22.34	25.0	24.6
14	NO ₂ -N	mg/L	0.062	0.161	BDL
15	NO ₃ -N	mg/L	0.052	0.182	0.258
16	T. Nitrogen	mg/L	22.454	25.343	24.858
17	O-PO ₄ -P	mg/L	0.54	0.41	0.57
18	T. Phos.	mg/L	1.08	0.60	1.01
19	T. Hardness	mg/L	456	432	368

20	Cl ⁻	mg/L	283	336	324
21	SO ₄ ⁻²	mg/L	323	254	208
22	SAR	-	3.93	1.86	3.74
23	B	mg/L	0.4480	0.3817	0.3099
24	Cr ⁺⁶	mg/L	BDL	0.0224	BDL
25	F ⁻	mg/L	0.63	0.61	0.54
26	S ⁻²	mg/L	5.13	2.39	2.1
27	CN ⁻	mg/L	0.11	0.07	0.014
28	Phenols	mg/L	0.57	0.27	0.76
29	Res.CL ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	6.02	5.05	5.09
31	Chromium (Cr)	mg/L	0.037	BDL	0.024
32	Manganese (Mn)	mg/L	0.517	0.399	0.377
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	0.043	0.048	0.048
35	Copper (Cu)	mg/L	0.117	0.083	0.049
36	Zinc (Zn)	mg/L	0.299	0.420	0.033
37	Cadmium (Cd)	mg/L	0.056	0.029	0.125
38	Lead (Pb)	mg/L	BDL	BDL	0.163
39	Vanadium as V	mg/L	0.165	0.14	0.16
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	2.56	2.2	2.1
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	540	>1600	920
48	Fecal Coliform	MPN/100 ml	48	110	240
49	Bio-assay Test	%	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location-VPSW-4: River Kolak, Near Koteswar Mandir

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	23.10.2016	24.10.2016
1	pH	-	7.81	7.74	7.49
2	Cond	μS/cm	605	643	413
3	Turbidity	N.T.U.	4.7	6.5	7.2
4	Colour	Hazen	20	10	BDL
5	TSS	mg/L	10	11	15
6	TDS	mg/L	358	332	365
7	D.O.	mg/L	2.7	3.3	BDL
8	COD	mg/L	18.40	23.12	22.51
9	BOD	mg/L	2.3	5.9	8.4

10	NH ₃ -N	mg/L	1.33	0.272	0.272
11	T. Ammonia	mg/L	2.671	0.546	0.546
12	Free NH ₃	mg/L	0.141	0.023	0.0137
13	TKN	mg/L	2.72	0.41	0.41
14	NO ₂ -N	mg/L	BDL	BDL	BDL
15	NO ₃ -N	mg/L	0.764	0.255	0.089
16	T. Nitrogen	mg/L	3.484	0.665	0.499
17	O-PO ₄ -P	mg/L	0.08	0.08	0.09
18	T. Phos.	mg/L	0.23	0.18	0.24
19	T. Hardness	mg/L	180	188	204
20	Cl ⁻	mg/L	107	89.4	64
21	SO ₄ ⁻²	mg/L	55	51	60
22	SAR	-	1.50	1.59	1.35
23	B	mg/L	0.1001	0.1928	0.1332
24	Cr ⁺⁶	mg/L	0.0174	0.0174	BDL
25	F ⁻	mg/L	0.57	0.32	0.28
26	S ⁻²	mg/L	0.55	0.54	0.58
27	CN ⁻	mg/L	0.035	0.035	0.056
28	Phenols	mg/L	0.015	BDL	0.096
29	Res.CL ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	4.94	3.48	4.78
31	Chromium (Cr)	mg/L	BDL	BDL	BDL
32	Manganese (Mn)	mg/L	0.248	0.087	0.129
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	BDL	BDL	BDL
35	Copper (Cu)	mg/L	BDL	BDL	BDL
36	Zinc (Zn)	mg/L	0.098	0.300	0.166
37	Cadmium (Cd)	mg/L	BDL	0.030	BDL
38	Lead (Pb)	mg/L	BDL	0.023	BDL
39	Vanadium as V	mg/L	0.168	0.11	0.10
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	0.183	0.16	0.9
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	920	540	920
48	Fecal Coliform	MPN/100 ml	120	110	79
49	Bio-assay Test	%	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location-VPSW-5: River Damanganga, Zari Causeway

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	23.10.2016	24.10.2016
1	pH	-	8.13	7.98	8.03
2	Cond	μS/cm	1456	879	430
3	Turbidity	N.T.U.	10.2	4.5	6.9
4	Colour	Hazen	75	50	75
5	TSS	mg/L	16	7.0	11
6	TDS	mg/L	765	431	361
7	D.O.	mg/L	7.2	6.5	6.3
8	COD	mg/L	11.42	12.0	9.10
9	BOD	mg/L	2.8	5.3	1.9
10	NH ₃ -N	mg/L	1.33	0.272	0.68
11	T. Ammonia	mg/L	2.671	0.546	1.365
12	Free NH ₃	mg/L	0.254	0.037	0.008
13	TKN	mg/L	1.49	0.54	1.0
14	NO ₂ -N	mg/L	0.215	0.422	0.536
15	NO ₃ -N	mg/L	5.238	4.15	3.96
16	T. Nitrogen	mg/L	6.943	5.112	5.496
17	O-PO ₄ -P	mg/L	0.03	0.02	0.02
18	T. Phos.	mg/L	0.08	0.09	0.10
19	T. Hardness	mg/L	212	176	144
20	Cl ⁻	mg/L	427	143	118
21	SO ₄ ⁻²	mg/L	100	80	80
22	SAR	-	5.00	3.13	5.64
23	B	mg/L	0.3188	0.1862	0.1630
24	Cr ⁺⁶	mg/L	BDL	0.0081	BDL
25	F ⁻	mg/L	0.17	0.21	0.27
26	S ⁻²	mg/L	0.56	0.65	0.51
27	CN ⁻	mg/L	0.049	0.07	0.028
28	Phenols	mg/L	0.064	BDL	0.064
29	Res.CL ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	2.81	2.16	4.3
31	Chromium (Cr)	mg/L	BDL	BDL	BDL
32	Manganese (Mn)	mg/L	0.065	0.028	0.058
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	BDL	BDL	BDL
35	Copper (Cu)	mg/L	BDL	BDL	BDL
36	Zinc (Zn)	mg/L	0.027	0.021	BDL
37	Cadmium (Cd)	mg/L	BDL	BDL	BDL
38	Lead (Pb)	mg/L	BDL	BDL	BDL
39	Vanadium as V	mg/L	0.182	0.19	0.14
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	0.0013	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	0.517	0.44	0.64
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001

45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	430	540	1600
48	Fecal Coliform	MPN/100 ml	220	79	150
49	Bio-assay Test	%	80 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location- VPSW-6: Outlet of CETP, Vapi

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	24.10.2016
1	pH	-	6.90	6.79	6.91
2	Cond	µS/cm	17045	12367	9044
3	Turbidity	N.T.U.	11.2	6.8	5.60
4	Colour	Hazen	750	750	1000
5	TSS	mg/L	82	46	71
6	TDS	mg/L	8799 ⁹	7431 ⁹	7422 ⁹
7	D.O.	mg/L	6.96	6	4.7
8	COD	mg/L	138	121	143
9	BOD	mg/L	37 ⁹	49.5 ⁹	11
10	NH ₃ -N	mg/L	10.24	5.32	12.1
11	T. Ammonia	mg/L	20.562	10.683	24.297
12	Free NH ₃	mg/L	0.114	0.057	0.153
13	TKN	mg/L	13.83	9.04	18.20
14	NO ₂ -N	mg/L	BDL	BDL	BDL
15	NO ₃ -N	mg/L	2.69	1.22	3.66
16	T. Nitrogen	mg/L	16.52	10.26	21.86
17	O-PO ₄ -P	mg/L	0.06	0.17	0.20
18	T. Phos.	mg/L	0.29	0.65	0.52
19	T. Hardness	mg/L	2880	3160	3060
20	Cl ⁻	mg/L	2237	2017	1992
21	SO ₄ ⁻²	mg/L	1618	1871	1993
22	SAR	-	11.15	10.26	10.46
23	B	mg/L	0.7860	0.5176	0.6070
24	Cr ⁺⁶	mg/L	BDL	0.0143	BDL
25	F ⁻	mg/L	0.57	0.50	0.34
26	S ⁻²	mg/L	1.27	0.85	0.29
27	CN ⁻	mg/L	0.091	0.11	0.077
28	Phenols	mg/L	0.17	0.056	0.28
29	Res.Cl ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	3.74	3.75	1.19
31	Chromium (Cr)	mg/L	0.036	0.033	0.042
32	Manganese (Mn)	mg/L	0.425	0.472	0.339
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	0.070	0.076	0.058
35	Copper (Cu)	mg/L	0.084	0.090	0.064
36	Zinc (Zn)	mg/L	0.110	0.260	BDL

37	Cadmium (Cd)	mg/L	BDL	BDL	BDL
38	Lead (Pb)	mg/L	BDL	BDL	BDL
39	Vanadium as V	mg/L	0.25	0.21	0.18
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	0.03	0.02	< 0.01
43	Surfactants as MBAS	mg/L	2.77	2.5	2.3
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	>1600	>1600	1600
48	Fecal Coliform	MPN/100 ml	350	63	540
49	Bio-assay Test	%	80 % Survival of fish after 96 hours in 100 % Sample	80 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

Location- VPSW-7: Chhiri lake, Kocharva Village

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	23.10.2016	25.10.2016
1	pH	-	8.39	8.49	8.39
2	Cond	µS/cm	256	260	310
3	Turbidity	N.T.U.	6.6	11.2	17.6
4	Colour	Hazen	25	40	30
5	TSS	mg/L	17	29	34
6	TDS	mg/L	211	167	202
7	D.O.	mg/L	4.47	7.8	6.9
8	COD	mg/L	22.03	19.20	18.31
9	BOD	mg/L	7.9	7.3	3.7
10	NH ₃ -N	mg/L	0.543	0.17	0.27
11	T. Ammonia	mg/L	1.090	0.341	0.542
12	Free NH ₃	mg/L	0.180	0.127	0.095
13	TKN	mg/L	2.72	0.27	0.41
14	NO ₂ -N	mg/L	0.009	BDL	0.002
15	NO ₃ -N	mg/L	0.231	0.116	0.207
16	T. Nitrogen	mg/L	2.96	0.386	0.619
17	O-PO ₄ -P	mg/L	0.08	BDL	BDL
18	T. Phos.	mg/L	0.05	0.10	0.08
19	T. Hardness	mg/L	100	104	104
20	Cl ⁻	mg/L	10.6	8.9	7.8
21	SO ₄ ⁻²	mg/L	25	22.4	22
22	SAR	-	0.43	0.37	0.4311
23	B	mg/L	0.1133	0.1133	BDL
24	Cr ⁺⁶	mg/L	BDL	0.005	BDL
25	F ⁻	mg/L	0.42	0.36	0.38
26	S ⁻²	mg/L	0.58	0.59	0.59

27	CN ⁻	mg/L	0.035	0.028	0.042
28	Phenols	mg/L	BDL	BDL	0.096
29	Res.CL ₂	mg/L	BDL	BDL	BDL
30	O&G	mg/L	3.6	3.5	2.02
31	Chromium (Cr)	mg/L	BDL	0.022	BDL
32	Manganese (Mn)	mg/L	0.398	0.121	0.082
33	Iron (Fe)	mg/L	BDL	BDL	BDL
34	Nickel (Ni)	mg/L	BDL	BDL	BDL
35	Copper (Cu)	mg/L	BDL	BDL	BDL
36	Zinc (Zn)	mg/L	0.112	BDL	BDL
37	Cadmium (Cd)	mg/L	BDL	BDL	BDL
38	Lead (Pb)	mg/L	BDL	0.066	BDL
39	Vanadium as V	mg/L	0.18	0.23	0.2
40	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
41	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
42	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
43	Surfactants as MBAS	mg/L	0.355	0.32	0.28
44	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
45	PAH	mg/L	< 0.001	< 0.001	< 0.001
46	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
47	Total Coliform	MPN/100 ml	1600	540	920
48	Fecal Coliform	MPN/100 ml	540	280	94
49	Bio-assay Test	%	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample	100 % Survival of fish after 96 hours in 100 % Sample

RESULTS OF GROUND WATER QUALITY MONITORING- CPA- VAPI

Location- VPGW-1: Bore well, Rajasthan Bhawan, Chanod Village

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	25.10.2016
1	pH	-	7.37	6.92	7.15
2	Cond	µS/cm	1083	1144	1117
3	Turbidity	N.T.U.	4.3	17.0	2.6
4	Colour	Hazen	BDL	BDL	BDL
5	TSS	mg/L	8.0	39	7.0
6	TDS	mg/L	640	665	570
7	COD	mg/L	2.04	5.50	7.39
8	BOD	mg/L	BDL	BDL	0.3
9	NH ₃ -N	mg/L	BDL	BDL	BDL
10	T. Ammonia	mg/L	BDL	BDL	BDL
11	Free NH ₃	mg/L	BDL	BDL	BDL
12	TKN	mg/L	0.272	0.27	0.27
13	NO ₂ -N	mg/L	BDL	BDL	BDL
14	NO ₃ -N	mg/L	4.09	4.03	4.01
15	T. Nitrogen	mg/L	4.362	4.3	4.28
16	O-PO ₄ -P	mg/L	BDL	BDL	BDL
17	T. Phos.	mg/L	0.03	0.03	0.04
18	T. Hardness	mg/L	384	400	380
19	Cl ⁻	mg/L	154	150	153
20	SO ₄ ⁻²	mg/L	120	144	126
21	SAR		1.44	1.44	1.47
22	B	mg/L	0.2094	0.2624	0.2525
23	Cr ⁺⁶	mg/L	BDL	BDL	BDL
24	F ⁻	mg/L	0.53	0.52	0.49
25	S ⁻²	mg/L	1.08	0.58	0.52
26	CN ⁻	mg/L	BDL	BDL	BDL
27	Phenols	mg/L	0.04	BDL	BDL
28	Res.CL ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	BDL	0.078	0.061
31	Iron (Fe)	mg/L	BDL	0.039	0.022
32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	BDL	BDL
34	Zinc (Zn)	mg/L	0.195	0.338	0.080
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL
36	Lead (Pb)	mg/L	BDL	BDL	BDL
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001

40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	0.09	0.11	0.07
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	>1600	>1600	540
46	Fecal Coliform	MPN/100 ml	350	340	7.8

Location-VPGW-2: Open well, Girishbhai farm, Dungari Faliya, Dehgam Road

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	25.10.2016
1	pH	-	7.38	7.26	7.27
2	Cond	µS/cm	1928	2006	1728
3	Turb	N.T.U.	0.60	0.8	1.2
4	Colour	Hazen	150	125	125
5	TSS	mg/L	8.0	4.0	5.0
6	TDS	mg/L	1201	1216	1084
7	COD	mg/L	40.8	45.31	42.0
8	BOD	mg/L	7.2	12.4	13.2
9	NH ₃ -N	mg/L	0.623	BDL	0.136
10	T. Ammonia	mg/L	1.251	BDL	0.273
11	Free NH ₃	mg/L	0.021	BDL	0.004
12	TKN	mg/L	0.815	0.68	0.54
13	NO ₂ -N	mg/L	BDL	BDL	BDL
14	NO ₃ -N	mg/L	21.26	20.54	20.26
15	T. Nitrogen	mg/L	22.075	21.22	20.8
16	O-PO ₄ -P	mg/L	BDL	BDL	BDL
17	T. Phos.	mg/L	0.02	0.02	0.03
18	T. Hardness	mg/L	640	596	604
19	Cl ⁻	mg/L	391	384	369
20	SO ₄ ⁻²	mg/L	262	252	247
21	SAR		3.32	3.48	3.45
22	B	mg/L	0.2956	0.3353	0.3519
23	Cr ⁺⁶	mg/L	BDL	BDL	BDL
24	F ⁻	mg/L	0.32	0.36	0.47
25	S ⁻²	mg/L	1.06	0.49	0.54
26	CN ⁻	mg/L	0.07	0.07	0.056
27	Phenols	mg/L	0.015	BDL	0.048
28	Res.Cl ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	0.303	0.058	0.034
31	Iron (Fe)	mg/L	BDL	BDL	BDL
32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	BDL	BDL
34	Zinc (Zn)	mg/L	BDL	0.061	BDL
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL

36	Lead (Pb)	mg/L	0.037	BDL	BDL
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	< 0.05	< 0.05	< 0.05
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	920	920	220
46	Fecal Coliform	MPN/100 ml	350	220	10

Location-VPGW-3: Hand pump, TSDF Site, GIDC, Vapi

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	25.10.2016
1	pH	-	6.88	6.87	6.82
2	Cond	µS/cm	6028	6687	4290
3	Turbidity	N.T.U.	5.2	9.4	4.8
4	Colour	Hazen	15	20	20
5	TSS	mg/L	23	29	13
6	TDS	mg/L	4320	3868	2456
7	COD	mg/L	51.2	48.7	43.68
8	BOD	mg/L	1.0	2.5	1.1
9	NH ₃ -N	mg/L	BDL	BDL	BDL
10	T. Ammonia	mg/L	BDL	BDL	BDL
11	Free NH ₃	mg/L	BDL	BDL	BDL
12	TKN	mg/L	BDL	0.27	0.14
13	NO ₂ -N	mg/L	BDL	BDL	0.746
14	NO ₃ -N	mg/L	59.75	55.62	42.15
15	T. Nitrogen	mg/L	59.75	55.89	43.036
16	O-PO ₄ -P	mg/L	BDL	BDL	BDL
17	T. Phos.	mg/L	0.05	0.05	0.06
18	T. Hardness	mg/L	1720	1740	1740
19	Cl ⁻	mg/L	1870	1724	1299
20	SO ₄ ⁻²	mg/L	623	617	593
21	SAR		6.15	6.06	6.04
22	B	mg/L	0.4248	0.5341	0.3519
23	Cr ⁺⁶	mg/L	BDL	0.0096	BDL
24	F ⁻	mg/L	0.27	0.26	0.28
25	S ⁻²	mg/L	1.35	0.57	1.07
26	CN ⁻	mg/L	0.105	0.084	0.063
27	Phenols	mg/L	BDL	BDL	0.040
28	Res.CL ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	BDL	0.528	0.311
31	Iron (Fe)	mg/L	BDL	BDL	BDL

32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	0.044	BDL
34	Zinc (Zn)	mg/L	BDL	4.271	1.963
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL
36	Lead (Pb)	mg/L	BDL	BDL	BDL
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	0.07	0.09	0.11
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	4.5	1600	17
46	Fecal Coliform	MPN/100 ml	< 1.8	350	< 1.8

Location-VPGW-4: Hand Pump, Residence of Shri S. D. Shinde, Kanchan nagar, Chhiri Village

Sr. No.	Test Parameters	Unit of Measurement	Results		
			20.10.2016	22.10.2016	25.10.2016
1	pH	-	7.83	7.64	7.88
2	Cond	µS/cm	1117	1221	1201
3	Turbidity	N.T.U.	0.4	1.0	0.9
4	Colour	Hazen	BDL	BDL	BDL
5	TSS	mg/L	2.0	BDL	BDL
6	TDS	mg/L	728	703	648
7	COD	mg/L	5.1	6.20	6.55
8	BOD	mg/L	BDL	1.5	0.6
9	NH ₃ -N	mg/L	BDL	0.097	0.068
10	T. Ammonia	mg/L	BDL	0.195	0.137
11	Free NH ₃	mg/L	BDL	0.0066	0.008
12	TKN	mg/L	BDL	0.14	0.14
13	NO ₂ -N	mg/L	BDL	BDL	0.004
14	NO ₃ -N	mg/L	21.47	21.07	20.49
15	T. Nitrogen	mg/L	21.47	21.21	20.634
16	O-PO ₄ -P	mg/L	BDL	BDL	BDL
17	T. Phos.	mg/L	0.03	0.03	0.04
18	T. Hardness	mg/L	104	104	108
19	Cl ⁻	mg/L	113	112	90.7
20	SO ₄ ⁻²	mg/L	123	108	104
21	SAR		8.37	8.32	8.15
22	B	mg/L	0.4645	0.4612	0.4645
23	Cr ⁺⁶	mg/L	BDL	BDL	BDL
24	F ⁻	mg/L	1.15	1.01	1.03
25	S ⁻²	mg/L	0.54	0.54	0.55
26	CN ⁻	mg/L	BDL	BDL	BDL
27	Phenols	mg/L	BDL	BDL	0.040

28	Res.CL ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	0.538	BDL	0.041
31	Iron (Fe)	mg/L	BDL	BDL	BDL
32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	BDL	BDL
34	Zinc (Zn)	mg/L	0.022	BDL	BDL
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL
36	Lead (Pb)	mg/L	0.312	BDL	BDL
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	< 0.05	< 0.05	< 0.05
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	94	920	63
46	Fecal Coliform	MPN/100 ml	33	79	5.6

Location-VPGW-5: Bore well, Swaminarayan Gurukul, NH-8, Selvav

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	22.10.2016	25.10.2016
1	pH	-	6.82	6.75	6.78
2	Cond	µS/cm	1092	1099	1084
3	Turbidity	N.T.U.	1.4	3	2.8
4	Colour	Hazen	BDL	BDL	BDL
5	TSS	mg/L	4.0	6.0	BDL
6	TDS	mg/L	652	596	579
7	COD	mg/L	4.08	7.14	8.9
8	BOD	mg/L	BDL	0.7	BDL
9	NH ₃ -N	mg/L	BDL	0.198	BDL
10	T. Ammonia	mg/L	BDL	0.398	BDL
11	Free NH ₃	mg/L	BDL	0.0018	BDL
12	TKN	mg/L	0.272	0.27	0.14
13	NO ₂ -N	mg/L	BDL	BDL	BDL
14	NO ₃ -N	mg/L	15.07	14.27	12.38
15	T. Nitrogen	mg/L	15.342	14.54	12.52
16	O-PO ₄ -P	mg/L	BDL	BDL	BDL
17	T. Phos.	mg/L	0.04	0.04	0.05
18	T. Hardness	mg/L	404	396	392
19	Cl ⁻	mg/L	122	118	109
20	SO ₄ ⁻²	mg/L	141	138	110
21	SAR		1.29	1.33	1.33
22	B	mg/L	0.1928	0.2657	0.1829
23	Cr ⁺⁶	mg/L	BDL	0.0019	BDL

24	F ⁻	mg/L	0.45	0.48	0.49
25	S ⁻²	mg/L	0.52	0.55	0.38
26	CN ⁻	mg/L	0.028	0.035	0.042
27	Phenols	mg/L	0.015	BDL	0.007
28	Res.CL ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	0.278	0.194	0.203
31	Iron (Fe)	mg/L	BDL	BDL	BDL
32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	BDL	BDL
34	Zinc (Zn)	mg/L	0.285	0.492	0.063
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL
36	Lead (Pb)	mg/L	BDL	BDL	0.024
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	< 0.05	< 0.05	< 0.05
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	>1600	>1600	1600
46	Fecal Coliform	MPN/100 ml	920	350	79

Location-VPGW-6: Open well, Jilha Panchayat School, Kata Faliya, Namdha Village

Sr. No.	Test Parameters	Unit of Measurement	Results		
			21.10.2016	23.10.2016	25.10.2016
1	pH	-	6.87	6.76	6.86
2	Cond	μS/cm	506	525	526
3	Turbidity	N.T.U.	1.0	1.5	0.4
4	Colour	Hazen	BDL	BDL	BDL
5	TSS	mg/L	2.0	4.0	BDL
6	TDS	mg/L	327	285	290
7	COD	mg/L	6.53	7.52	5.38
8	BOD	mg/L	BDL	1.6	0.3
9	NH ₃ -N	mg/L	0.086	0.086	BDL
10	T. Ammonia	mg/L	0.173	0.173	BDL
11	Free NH ₃	mg/L	0.001	0.0008	BDL
12	TKN	mg/L	0.136	0.175	BDL
13	NO ₂ -N	mg/L	0.001	BDL	BDL
14	NO ₃ -N	mg/L	18.10	18.03	18.20
15	T. Nitrogen	mg/L	18.237	18.205	18.20
16	O-PO ₄ -P	mg/L	0.01	BDL	0.02
17	T. Phos.	mg/L	0.10	0.10	0.11
18	T. Hardness	mg/L	176	168	164
19	Cl ⁻	mg/L	31.1	30.8	30.3

20	SO ₄ ⁻²	mg/L	81	56	29
21	SAR		0.90	0.94	0.95
22	B	mg/L	0.0702	0.1299	0.0868
23	Cr ⁺⁶	mg/L	BDL	BDL	BDL
24	F ⁻	mg/L	0.29	0.30	0.31
25	S ⁻²	mg/L	0.64	0.37	0.49
26	CN ⁻	mg/L	0.042	BDL	0.035
27	Phenols	mg/L	0.007	BDL	0.031
28	Res.CL ₂	mg/L	BDL	BDL	BDL
29	Chromium (Cr)	mg/L	BDL	BDL	BDL
30	Manganese (Mn)	mg/L	0.037	BDL	0.028
31	Iron (Fe)	mg/L	BDL	BDL	BDL
32	Nickel (Ni)	mg/L	BDL	BDL	BDL
33	Copper (Cu)	mg/L	BDL	BDL	BDL
34	Zinc (Zn)	mg/L	0.436	BDL	0.168
35	Cadmium (Cd)	mg/L	BDL	BDL	BDL
36	Lead (Pb)	mg/L	BDL	BDL	BDL
37	Vanadium as V	mg/L	< 0.01	< 0.01	< 0.01
38	Selenium as Se	mg/L	< 0.01	< 0.01	< 0.01
39	Mercury as Hg	mg/L	< 0.001	< 0.001	< 0.001
40	Total Arsenic as As	mg/L	< 0.01	< 0.01	< 0.01
41	Surfactants as MBAS	mg/L	< 0.05	< 0.05	< 0.05
42	Organo Chlorine Pesticide	mg/L	< 0.0001	< 0.0001	< 0.0001
43	PAH	mg/L	< 0.001	< 0.001	< 0.001
44	PCB	mg/L	< 0.0001	< 0.0001	< 0.0001
45	Total Coliform	MPN/100 ml	110	1600	38
46	Fecal Coliform	MPN/100 ml	70	540	6.1

ANALYSIS RESULTS OF CETP, VAPI- INLET QUALITY

Location- Inlet of CETP, Vapi (Equalization Tank)

Sr. No.	Test Parameters	Unit of Measurement	Results	
			20.10.2016	24.10.2016
1	pH	-	8.33	8.40
2	Cond	$\mu\text{S}/\text{cm}$	12942	7605
3	TSS	mg/L	326	445
4	TDS	mg/L	5678	6066
5	COD	mg/L	795	1095
6	BOD	mg/L	216	285
7	NH ₃ -N	mg/L	43.2	65.7
8	T. Ammonia	mg/L	86.746	131.926
9	TKN	mg/L	63.84	94.4
10	Phenols	mg/L	0.61	5.31

— 300
1000
400

WATER & WASTEWATER ANALYSIS BDL VALUES (Minimum Detection Limit)

Sr. No.	Test Parameters	Unit of Measurement	BDL
1	pH	-	0.2
2	Cond	$\mu\text{S}/\text{cm}$	0.5
3	Turbidity	N.T.U.	0.5
4	Colour	Hazen	5.0
5	TSS	mg/L	10
6	TDS	mg/L	10
7	D.O.	mg/L	0.5
8	COD	mg/L	2.0
9	BOD	mg/L	0.5
10	NH ₃ -N	mg/L	0.04
11	T. Ammonia	mg/L	0.04
12	Free NH ₃	mg/L	--
13	TKN	mg/L	0.5
14	NO ₂ -N	mg/L	0.01
15	NO ₃ -N	mg/L	0.01
16	T. Nitrogen	mg/L	--
17	O-PO ₄ -P	mg/L	0.005
18	T. Phos.	mg/L	0.005
19	T. Hardness	mg/L	1.0
20	Cl ⁻	mg/L	1.0
21	SO ₄ ⁻²	mg/L	1.0
22	SAR	-	--
23	B	mg/L	0.05
24	Cr ⁺⁶	mg/L	0.005
25	F ⁻	mg/L	0.02
26	S ⁻²	mg/L	0.10
27	CN ⁻	mg/L	0.05
28	Phenols	mg/L	0.001
29	Res.CL ₂	mg/L	0.04
30	O&G	mg/L	10
31	Chromium (Cr)	mg/L	0.02 (20 ppb)
32	Manganese (Mn)	mg/L	0.02 (20 ppb)
33	Iron (Fe)	mg/L	0.02 (20 ppb)
34	Nickel (Ni)	mg/L	0.02 (20 ppb)
35	Copper (Cu)	mg/L	0.02 (20 ppb)
36	Zinc (Zn)	mg/L	0.02 (20 ppb)
37	Cadmium (Cd)	mg/L	0.02 (20 ppb)
38	Lead (Pb)	mg/L	0.02 (20 ppb)
39	Vanadium as V	mg/L	<0.01
40	Selenium as Se	mg/L	<0.01
41	Mercury as Hg	mg/L	<0.001
42	Total Arsenic as As	mg/L	<0.01
43	Surfactants as MBAS	mg/L	<0.05
44	Organo Chlorine Pesticide	mg/L	<0.0001
45	PAH	mg/L	<0.001
46	PCB	mg/L	<0.0001
47	Total Coliform	MPN/100 ml	<1.8
48	Fecal Coliform	MPN/100 ml	<1.8

**AMBIENT AIR QUALITY MONITORING–BDL VALUES
MINIMUM DETECTION LIMIT**

SR. NO.	PARAMETER	UNIT	MINIMUM DETECTION LIMIT
1	Particulate Matter (PM ₁₀)	µg/m ³	10
2	Particulate Matter (PM _{2.5})	µg/m ³	10
3	Lead as Pb	µg/m ³	0.5
4	Benzo (a) Pyrene (BaP)- particulate phase only	ng/m ³	0.5
5	Arsenic as As	ng/m ³	2.0
6	Nickel as Ni	ng/m ³	10
7	Carbon Monoxide as CO	mg/m ³	0.1
8	Benzene as C ₆ H ₆	µg/m ³	2.0
9	Ammonia (NH ₃)	µg/m ³	10
10	Sulphur Dioxide (SO ₂)	µg/m ³	10
11	Oxides of Nitrogen (NO ₂)	µg/m ³	10
12	Ozone (O ₃)	µg/m ³	10

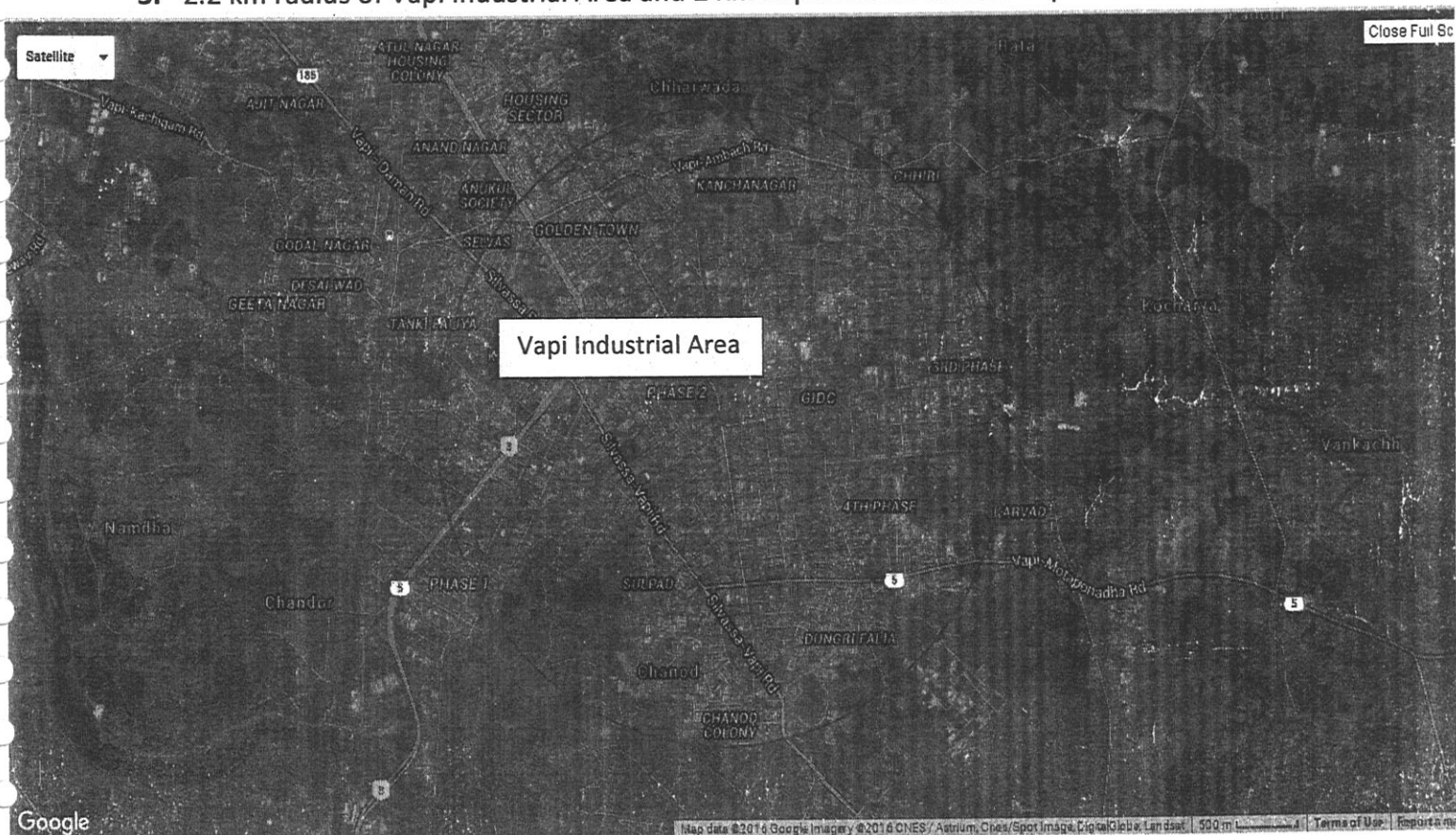
Updated Environmental data in respect of 'Vapi' Critically Polluted Area

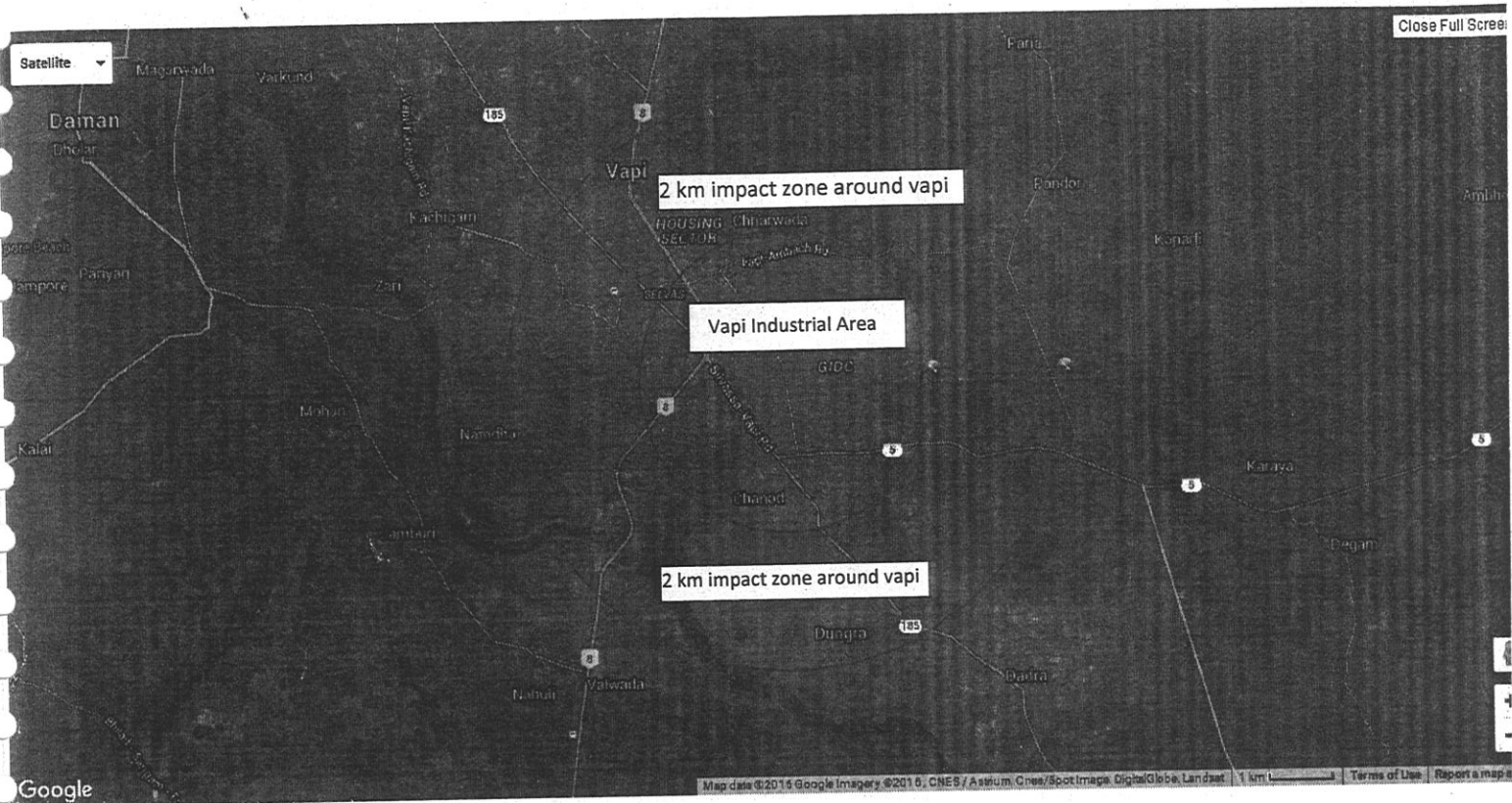
(1&2) Digitalized map / Toposheet through BISAG & Details of potential impact zones are included in this digitalized map / Toposheet.

✓ Please refer Annexure - B

(3) Details of total area (in sq.km) falling under the critically polluted industrial cluster

1. Total area of CPA, Vapi : 1106.57 Ha
2. Exact boundaries: Map as shown below : **Latitude:** 20.3617 ° N,
Longitude: 72.9330° E
3. 2.2 km radius of Vapi Industrial Area and 2 Km impact zone around Vapi Industrial area.





(4) Details of R17 & R54 red categories of industries operating in Vapi.

Part - 1:- Numbers of 17 and 54 Red categories of Industries in CPA, Vapi (Source:- GPCB Xgn)

17 categories of highly polluting unit	54 Red categories of industries
Number of unit 58	Number of unit 587

Part - 2:- Break up of Total Red categories i.e. 587 industries in CPA –Vapi (Source:- GPCB Xgn)

Sr. No	Sectors	Number of Units
1	Chemical & Allied	231
2	Dyes & Dye Intermediates	110
3	Pulp & Paper (waste paper based)	32
4	Pharmaceuticals	28
5	Pesticides	08
6	Textile processing & yarn dyeing	40
7	Metal surface treatment	34
8	Any Other (Miscellaneous red units)	104
	TOTAL	587

(5) Wind Rose Diagram:

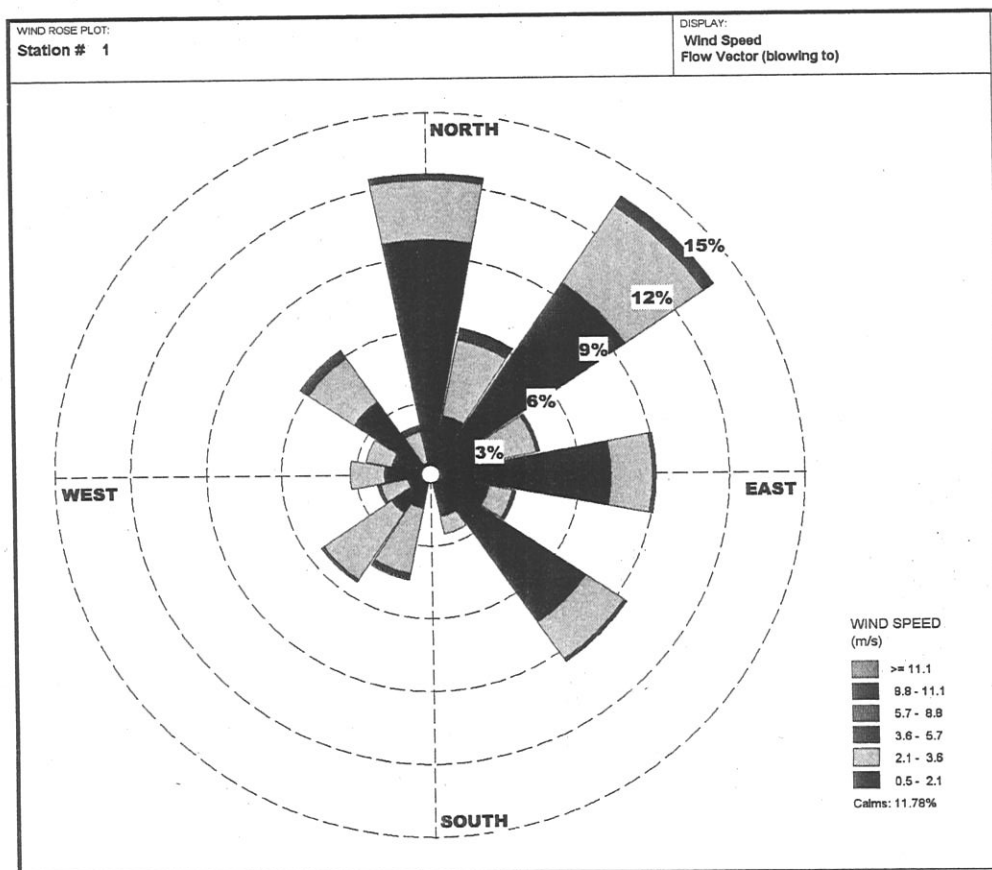
a. Time Period: March – 2014 to May -2014

METEOROLOGICAL DATA

(Data Source EIA report of M/s. Ganesh Polychem Vapi)

Month	--	Temp. (°C)	Relative Humidity (%)	Wind Speed km/hr	Rainfall mm
March-14	Min	12.8	24	0	0.0
	Max	33.6	85	15	
	Average	23.2	54.5	7.5	
Apr-14	Min	19.2	33	0	0.0
	Max	40	84	27.8	
	Average	29.6	58.5	13.8	
May-14	Min	19.2	39	0	0.0
	Max	36.6	81	16.7	
	Average	27.9	60	8.35	

WIND ROSE DIAGARM (MARCH - 2014 TO MAY - 2014)

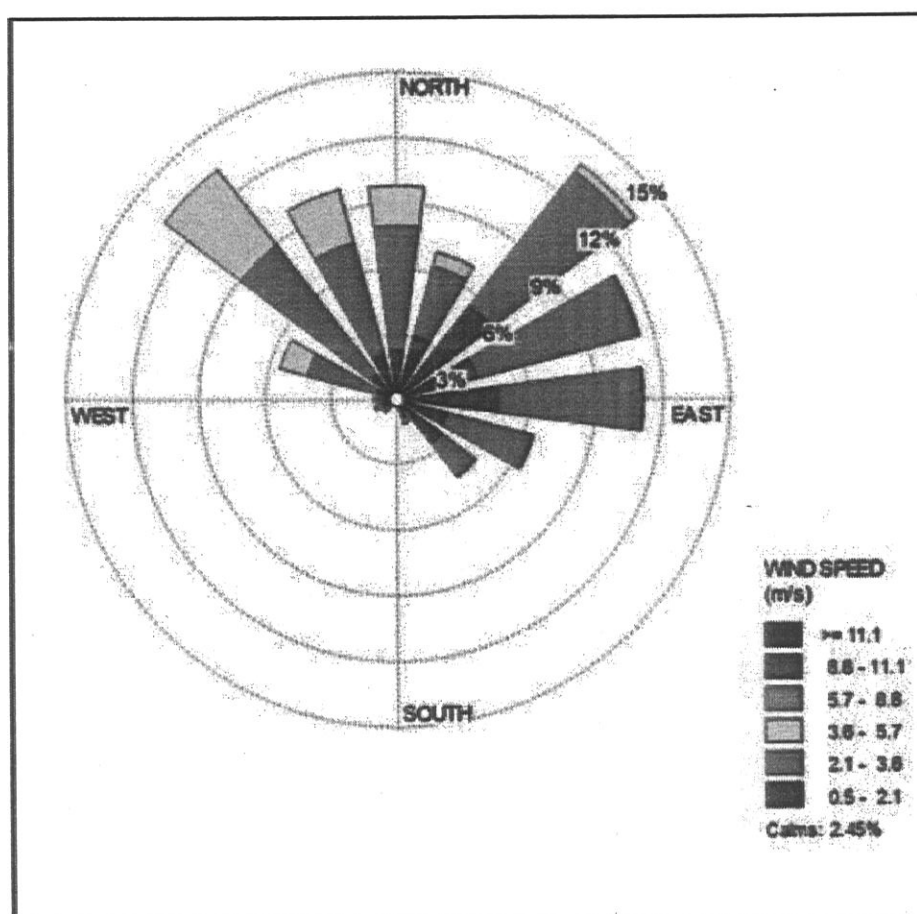


b. Time Period: Oct – 2014 to Dec -2014

(Data source: EIA report of M/s. Reliance Gas Pipeline at Vapi)

Parameter	Observation
Wind Direction	North-West
Wind Speed Range	0-5 m/s
Average Wind Speed	2 m/s
Temperature Range	23-41 ⁰ C
Relative Humidity	17-88%
Average Precipitation	0.02mm
Average Pressure	1012 hPA

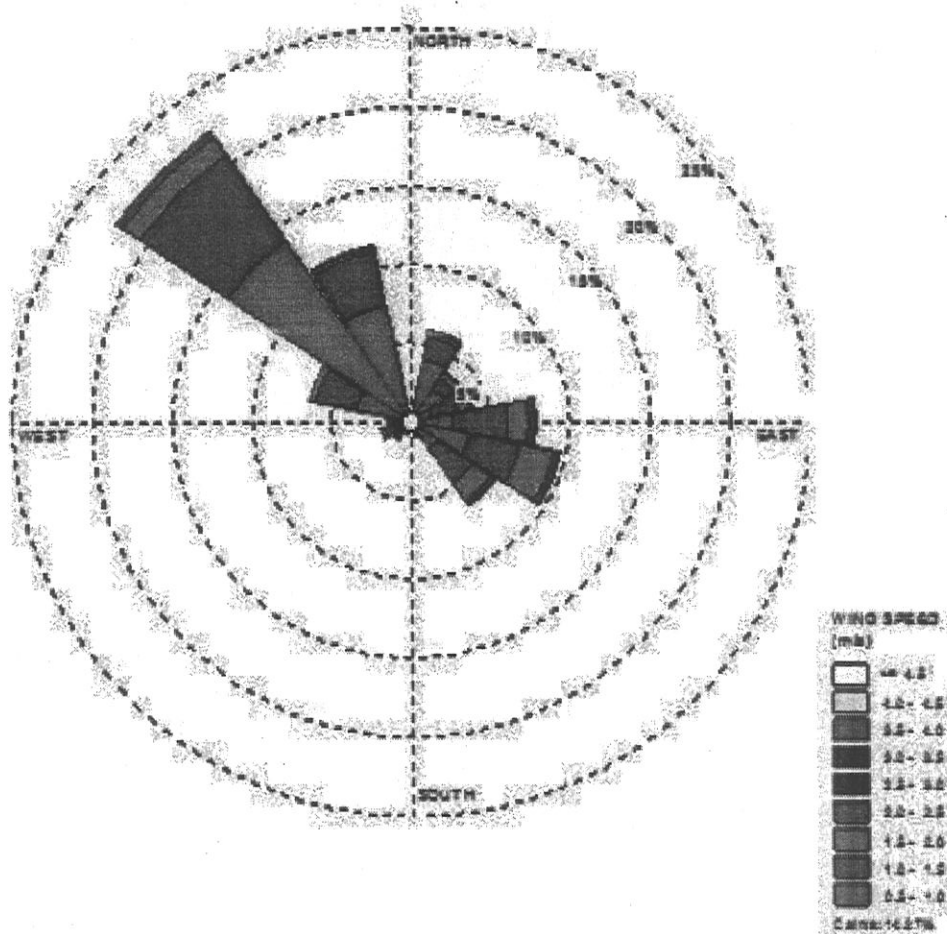
Wind Rose Diagram: 24 hourly data at Vapi.



c. Time Period: Oct – 2015 to Dec -2015

Data source: EIA report of M/s. Jay Bharat Metcast at Vapi

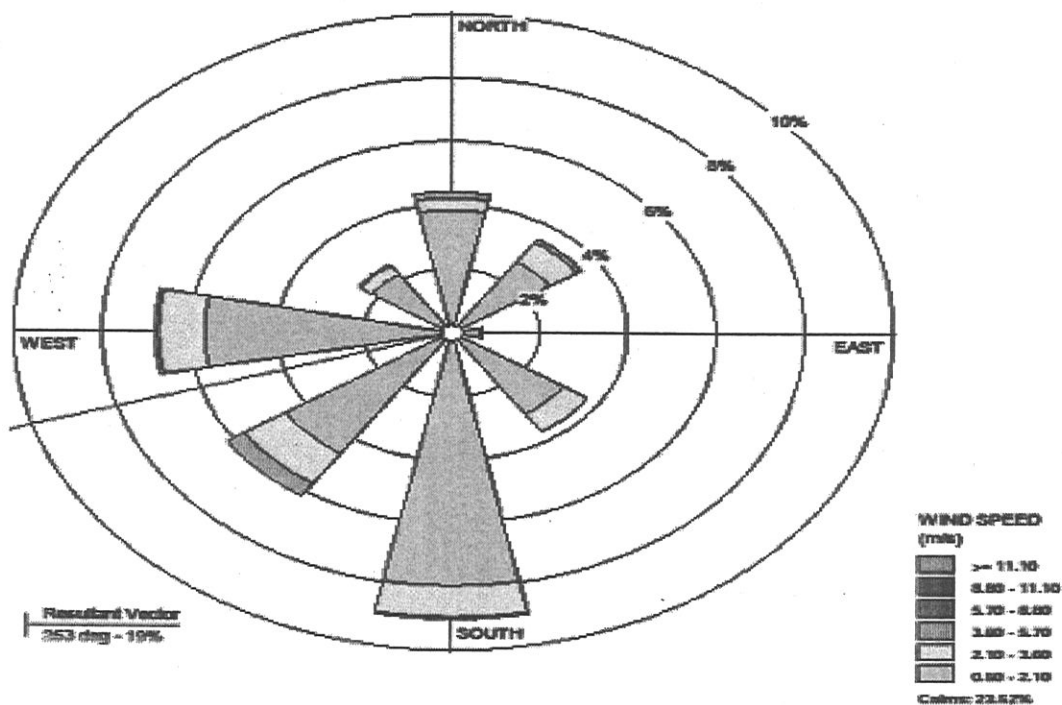
	Oct - 2015	Nov - 2015	Dec – 2015
Average Wind Speed	3.16	3.33	3.14



d. Time Period: February - 16 to May -16

WIND ROSE PLOT:
Windrose
Feb'16 to May'16

DISPLAY:
Wind Speed
Direction (blowing from)



(6) Updated Compliance status of large scale, medium/small scale industries in the area

Scale of the Industry	Air	Surface Water	Land (Ground Water)
Large	Adequate	Adequate	Adequate
Small / Medium	Adequate	Adequate	Adequate
Common Facilities	Adequate	Adequate	Adequate

(7) To facilitate the evaluation of health component of CEPI, the previous 5 years records of 3-5 major hospitals of the area w.e.f following is also desired.

- For Air environment, total nos of cases related to Asthma, Bronchitis, Cancer, Acute respiratory infections etc.
- For surface water/ground water Environment, case related to gastroenteritis, Diarrhea, renal(kidney)malfuction, Cancer etc

(1) **Hospital Name:** G.M.R.S. Medical Collage & Hospital, Valsad.
Address: Halar Road, Nanakwada, Dist: Valsad.

Sr. No.	Diseases	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
By Air Act						
1.	Asthma	29	40	61	73	76
2.	Bronchitis	50	31	34	41	41
3.	Cancer	16	10	36	51	46
4.	Acute respiratory infections	0	0	0	0	0
	Total	95	81	131	165	163
By water Act						
1.	Gastroenteritis	---	---	---	---	---
2.	Diarrhea	119	161	146	166	178
3.	Renal (Kidney)Malf unction	---	---	---	---	---
4.	Cancer	---	---	---	---	---
	Total	119	161	146	166	178

(2) Hospital Name: ESIS – Dispensary 1.

Address: GIDC Char Rasta Vapi.

Sr. No	Diseases	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
By Air Act						
1.	Asthma	89	78	146	108	33
2.	Bronchitis	838	752	803	732	305
3.	Cancer	0	2	3	3	2
4.	Acute respiratory infections	6754	6830	7528	9169	2535
	Total	7681	7662	8480	10012	2875
By water Act						
1.	Gastroenteritis	885	932	1131	1420	427
2.	Diarrhea					
3.	Renal (Kidney) Malfunction	1	0	6	6	4
4.	Cancer	0	0	0	0	0
	Total	886	932	1137	1426	431

(3) Name of the Hospital: Jeevandeep Surgical Hospital, Vapi

Diseases	No. of cases in the year 2012	No. of cases in the year 2013	No. of cases in the year 2014	No. of cases in the year 2015	No. of cases in the year up to May -2016	Total Patient
Asthmatic Bronchitis	120	120	120	120	120	600
Cancer	0	0	0	0	0	0
Acute respiratory infections	0	0	0	0	0	0
Gastroenteritis	120	120	120	120	120	600
Diarrhea	0	0	0	0	0	0
Renal (kidney) malfunction	0	0	0	0	0	0
Malignancy	25	25	25	25	25	125

(4) Name of the Hospital: L G Haria Rotary Hospital, Vapi

Disease	No. of cases in the year 2011	No. of cases in the year 2012	No. of cases in the year 2013	No. of cases in the year 2014	No. of cases in the year 2015	Total Patient
Asthmatic	110	102	97	88	83	480
Bronchitis	40	37	36	34	33	180
Cancer	23	22	19	19	17	100
Acute respiratory infections	759	738	724	709	670	3600
Gastroenteritis	387	369	358	349	337	1800
Diarrhea	261	249	237	229	224	1200
Renal (kidney) malfunction	45	41	34	31	29	180

