



**MAHARASHTRA
ENGINEERING
RESEARCH
INSTITUTE
NASHIK-422 004**

T. M. No. ENV/374

**Water Quality of bore Wells
Nashik Municipal Corporation
Area a case study.**

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**ENVIRONMENT ENGINEERING RESEARCH
DIVISION. M. E. R. I. NASHIK - 422 004**



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**ENVIRONMENTAL ENGINEERING RESEARCH DIVISION
M.E.R.I., NASHIK-422 004**

TECHNICAL MEMORANDUM NO.ENV/374

**ASSESSMENT OF WATER QUALITY OF
PUBLIC BOREWELLS IN
NASHIK MUNICIPAL CORPORATION**

A CASE STUDY

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**IRRIGATION DEPARTMENT
GOVERNMENT OF MAHARASHTRA**

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ENVIRONMENTAL ENGINEERING RESEARCH DIVISION

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WATER QUALITY OF PUBLIC BORE-WELLS

NASHIK MUNICIPAL CORPORATION

CASE STUDY

1.0 SYNOPSIS :

Various organisations like, World Health Organisation (W.H.O.), Bureau of India Standards, Government of India, Water Technology Mission etc. have laid down standards of guide lines for water quality being supplied to the consumers, for their domestic use. Studies conducted by MERI Nashik, in Nashik Municipal Corporation area reveal that in absence of adequate quantity of treated water supply, from treatment works, people do use the bore-well water for drinking, washing and other domestic uses. The chemical and bacteriological analysis of the water sample revealed that the limits for most of constituents, are exceeded and water is not safe for domestic use. The study conducted by MERI Nashik highlights the substandard quality of ground water in Nashik Municipal Corporation area and the possibility of health Hazard.

2.0 INTRODUCTION :

Water is most essential commodity and water quality is widely used expression which has extremely broad spectrum of meanings. The desirable characteristics of water, vary with intended use. Whether one regards a



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body of water as polluted depends on the actual or potential use one has for it. Furthermore, water resources are restricted and urbanization and population growth are exerting constant and increasing pressure on supply of water. The financial and other constraints of local bodies are unable to meet the growing demand of treated water to the consumers and thus alternative arrangements such as use of ground water by digging bore-wells is sought. The bore well water is comparatively cheap and easily available. Further the maintenance cost of bore-well and power pump or hand-pump installed, is less. Local people can form Mohalla Committee and operation and maintenance could be done effectively. Local body has to incur the initial cost of execution and further maintenance cost is very less. People also like to have at least one bore well in their area so that in case of failure of public water supply system, bore water can be used. In Nashik city thereafter elected body tookover the charge, mass programme of digging of bore-wells were undertaken and about 500 bore wells were dug, out of which 90% bore wells were provided with hand pump and about 45 high yield bore wells were provided power pump of jet pump.

2.0 WATER WORKS CAPACITIES AND DEMAND :

Nashik Municipal Corporation is supplying water form following three water works.



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i) Nashik Water Works	-	80 MLD.
ii) Panchavati Water Works	-	27 MLD.
iii) Nashik Road Water Works	-	25 MLD.
Total...		----- 132 MLD. -----

The present projected population of Nashik Municipal Corporation area based on 1991 census, is around 8 lakhs, out of which 6.5 lakhs population is residing in the city area namely Nashik, Panchavati, Nashik Road and CIDCO. The rest of about 1.5 lakhs population is residing in the near-by fourteen villages and adjoining the area included in the corporation limit during the formation of the corporation. The present rate of treated water supply is 150 LPCD. which is as per norms. However considering the commercial and industrial demand and habits of urban elite, the above rate of water supply is inadequate in some part of the area, especially in slum areas. The people go for bore-well water to cater the day to day requirement of water and thus there is a continuous demand for digging up the bore wells as the locality develops. The bore-wells are dug considering the availability of ground water, however the quality aspect of water, is totally neglected. The survey conducted at Delh, Ahmadabad and other metropolitan cities in Northern India, reveals that out break of epidemics such as Cholera, typhoid



fewer, paratyphoid fever, dysentery, Infections Jundice etc. are due to the use of contaminated bore well water, either public or private, by the people. Thus it is essential to carryout the case study of big metropolitan cities in Maharashtra where substantial population depends on the bore well water. The case study of Nashik Municipal Corporation is therefore undertaken by MERI, Nashik.

2.1 METHODOLOGY :

SPOT SELECTION :

For the assesment of ground water table following bore wells are selected for chemical and bacteriological analysis of water samples.

- 1) Panchavati area - 7 Nos.
- 2) Nashik area - 10 Nos.
- 3) Satpur area - 8 Nos.

2.2 MERI Nashik has prepared a booklet prescribing the standards recommended by Indian Standard Institutions, New Delhi, which gives the tolerance limit for use of inland surface water depending upon the purpose of use of water. The details of tolerance limit of standards are given in the statement No.1,2,3. The classification is as under :

- i) Class - A : Drinking water sources without conventional treatment but after disinfection. (Statement No.1).



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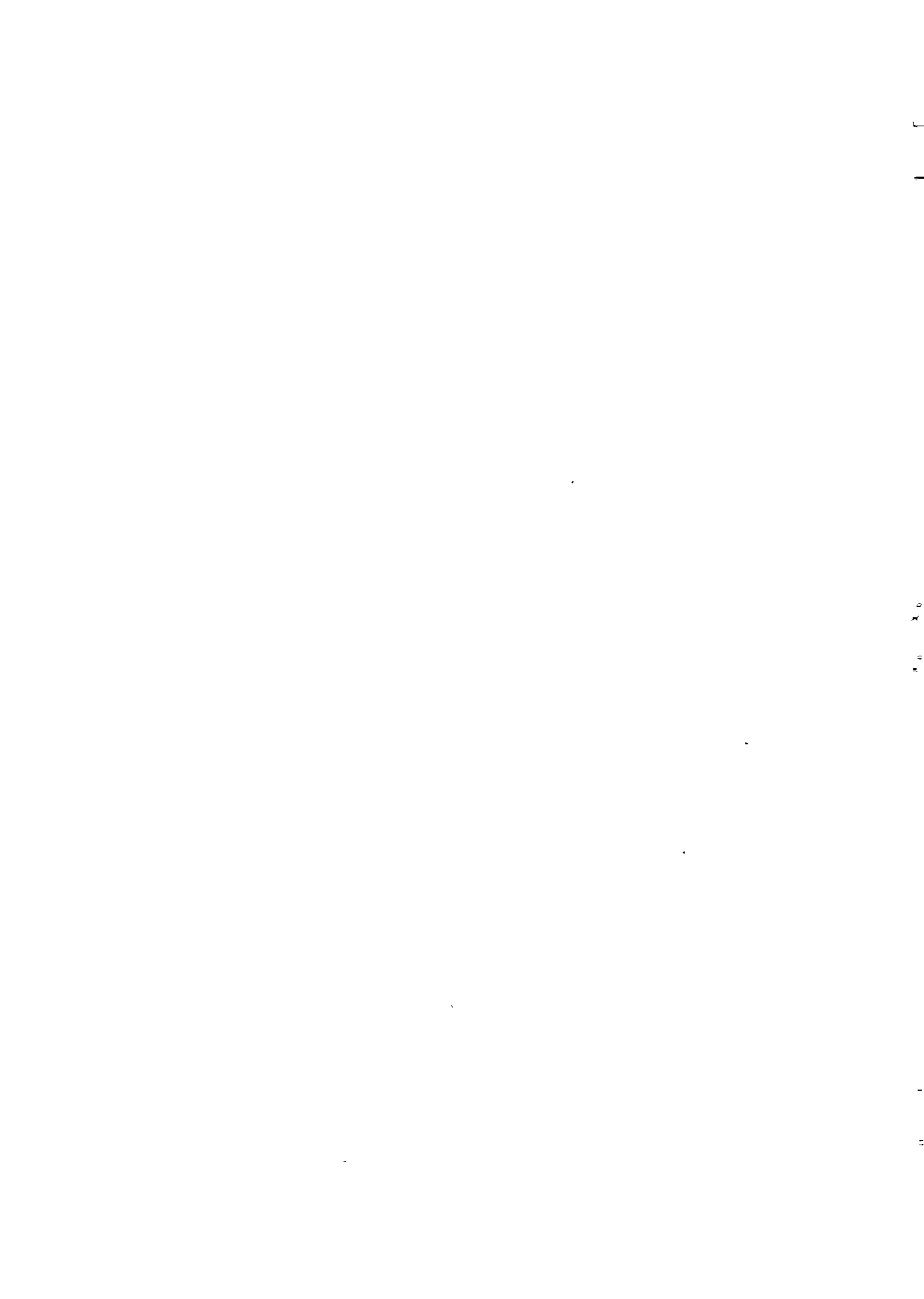
- ii) Class - B : Out dooe bathing (Statement No.2)
- iii) Class - C : Drinking water source with conventional treatment followed by disinfection. (Statement No.3).
- iv) Class - D : Fish culture and wild life propogation.
- v) Class - E : Irrigation, Industrial cooling and controlled waste disposal.

The classification of water under class D & E is not related with use of bore water for domestic purpose and hence water standards of Class A, Class B and Class C are considered for comparision purpose.

2.3 SAMPLING AND ANALYSIS :

Considering the importance of this issue, MERI has requested to pay Rs. 500 per water sample of boe wells tested for chemical as well as bacteriological test. NMC has agreed for the same. The amount has been deposited. The selection of the site has been randomly done and Panchavati, Nashik CIDCO and Satpur area has been covered under the above programme.

It is normally recommended that four to six volume of water standing in the tube should be pumped out to remove the stagnant water (or standing water) in



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the bore well pipe, in order to know the correct composition of aquifer water sample. However the above recommendation could not be followed in true sense since the water samples were collected in the month of September, when the use of bore well water is in minimum and ground water recharge is in progress. In order to have more representative sample, second-sampling was done in the month of November 1994 when people use bore water and aquifer is fully recharged. The second sampling was taken after 15 minutes of operation of the bore well so as to remove the stagnant water column before sampling. Nashik Municipal Corporation has displayed notice on each bore that water is not potable for human consumption. This case study will throw light as to whether the water is safe for other domestic purposes such as washing, cooking, bathing etc.

3.0

RESULTS :

The chemical and bacteriological analysis of water samples of bore wells are carried out in the laboratory. The observations are tabulated in Statement No.4 and 5 and same are compared with the standards recommended by ISI, New Delhi.



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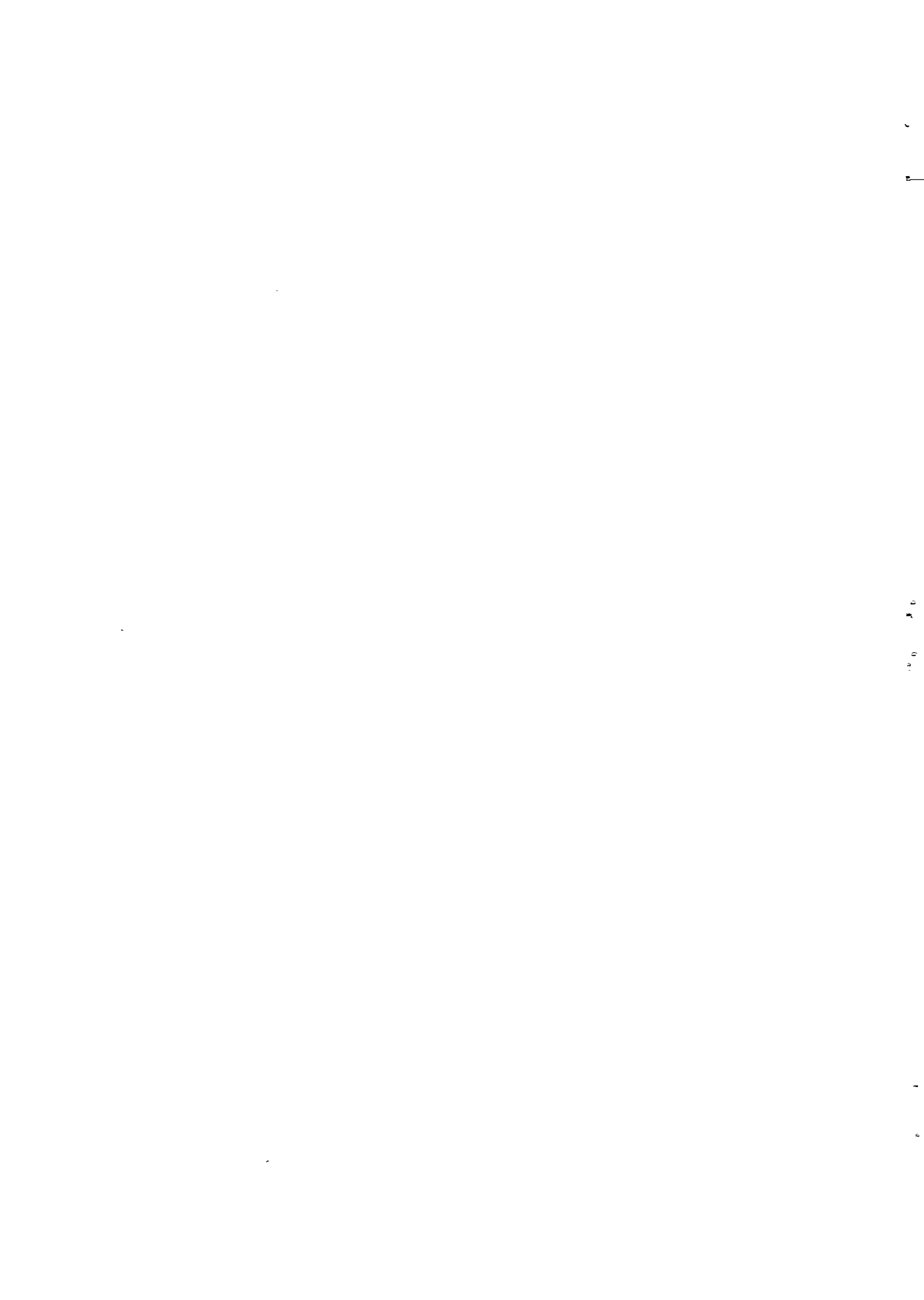
3.1 DISSOLVED OXYGEN :

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	6 ppm	15/22	68
Class B	5 ppm	20/22	91
Class C	4 ppm	22/22	100

A good level of dissolved oxygen in most of the bore well samples indicates that water is available at shallow depth and in the zone of aeration. In case of water samples of bore wells at Jaju-wadi behind Indrakunda and Someshwar colony Satpur, the dissolved oxygen level is 4 ppm which is on lower side. The 5 days B.D.O. of above water samples is also high and thus there are possibilities of contamination of bore water with sewage/ sullage.

3.2 pH :

The pH of all water, samples of the bore wells, is in the range of 6.5 to 8.5 and thus the pH of water is of acceptable quality.



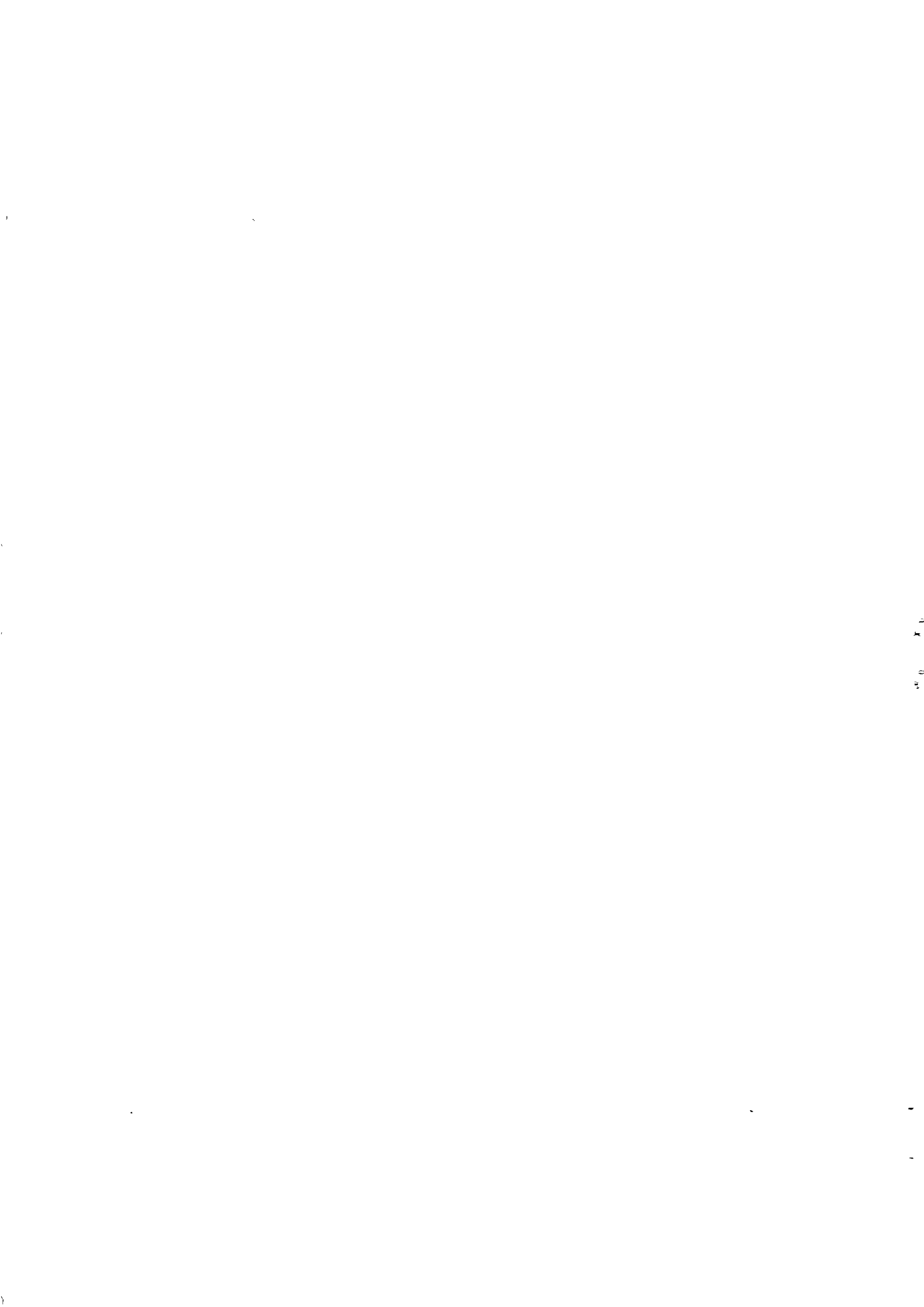
3.3 B.D.O.5 :

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	- 2 ppm	0/22	0
Class B	- 3 ppm	0/22	0
Class C	- 3 ppm	0/22	0

It is a widely used parameter to decide organic loading of water sample. This test decides the amount of oxygen used by Micro-organism for disintegration of organic loading. The range of BOD5 for various water samples is 11.2 ppm to 43 ppm. High value of BOD5 indicates that surface waste water is getting infiltrated with ground water and total water table is polluted. The river water at Nashik is having B.O.D.5 in the range of 10.00 ppm to 15 ppm, when there is no natural flow in the river. The bore water is having higher oxygen demand and thus the ground water is polluted.

3.4 Total dissolved solids :

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	500 ppm.	13/22	59
Nashik		1/10	10



Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Other area		12/12	100
Class C	1500 ppm.	19/22	86
Nashik		7/10	70
Other area		12/12	100

Water sample of bore wells in Nashik city area are having high concentration (Exceeding 500 ppm) of dissolved solids while the bore wells in Panchavati, CIDCO, Satpur area are having dissolved solids less than 500 ppm. This is mainly due to the sub soil conditions of the surrounding area.

3.5

TOTAL HARDNESS :

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	330 ppm.	13.22	59
Class B	--	--	--
Class C	--	--	--

The total hardness of water samples of the bore well is in the range of 240 ppm. to 720 ppm. Thus the water of most of the bore wells is Hard and not suitable for

drinking purposes and other domestic purposes, such as cooking, washing etc.

3.6 CHLORIDES :

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	250 ppm.	20/22	90
Class B	--	--	--
Class C	600 ppm.	22/22	100

Bore well water at Pathanpura Masjit (Nashik) and Bhadrakali Police Station are having chloride concentration of 495 ppm. and 575 ppm respectively. Presence of high concentration of chlorides indicates water sources is polluted by domestic sewage. High concentration, of chlorides, is harmful to metallic pipes and other structures.

3.7 TOTAL COLIFORM ORGANISM (MPN/100 ML)

Category	Standards (tolerance limit)	No.of bore wells fulfilling the stds (out of 22)	Percentage of bore well fulfilling the stds.
Class A	50	0/22	0
Class B	500	0/22	0
Class C	5000	0/22	0



The MPN test indicate the presence of coliform group of bacteria such as serobic and facultative, anorabic gram negative, non spore forming rod shaped bacteria, which ferment lactose with gas formation within 48 hours at 37 C. The presence of high MPN count, indicates that water is unsafe for all types of domestic purposes unless disinfected with proper dose of chlorine. This is a sensitive test for detection of potentially dangerous pollution, thereby providing hygenic assessment of water quality with sensitivity and specificity that is absent from routine chemical analysis. At present disinfection arrangement has not been provided by Nashik Municipal Corporation and people consum water without disinfection. This indicates higher chances of breaking up of epidemics of cholera, typhoid fewer, paratyphoid fewer, dysentery, infections jaundice.

4.0 SUGGESTIONS AND DISCUSSIONS :

4.1 It is observed that, pH, turabidity, iron, Nitrates, Nitriates are within the limit specified for Class A water.

4.2 Free carbon dioxide is more than 75 ppm at 10 bore well water samples. The surface water normally contains less than 10 ppm free carbon dioxide, while ground water may exceed the above concentration. The CO2 content of a water may contribute significantly to

corrossion. The higher concentration of CO₂ may lead to decrease in dissolved oxygen contents and development of anarobic condition.

4.3 B.O.D.5 of all the water samples is more than the tolerance limit specified for Class A, Class B and Class C water. This indicates heavy infiltration of surface waste water into ground water. The ground water table in Nashik Municipal area is polluted and not fit for all types of domestic uses.

4.4 Total dissolved solids may affect water quality adversely in a number of ways. Water with high dissolved solids generally is of inferior palatability and may induce unfavourable physiological reaction in the transient consumers. For this reasons, a limit of 500 mg dissolved solids per lit. is desirable for drinking water and 1500 mg/lit for other domestic purpose.

4.5 Total hardness is defined as sum of the calcium and magnesium concentration, both expressed as calcium carbonate in miligram per litre. The hardness, in drinking water upto 300 ppm. is acceptable however for higher concentration of hardness the water in unpotable. The use of hard water may lead to problems of indigestion and would affect urival system.



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4.6 Usually chloride concentration is higher in waste water than in raw water because sodium chloride is a common article of diet and passes unchanged through the digestive system. High concentration of chlorides at two spots namely Pathanpura Masjit and Bhadrakali police station indicates the possibility of contamination of bore water with waste water. All other bore well water is within the permissible limit of 250 mg/lit.

4.7 MPN is the most probable number of coliform group of organism present in 100 ml of water sample.

Experience has established that water in which the number of coliform organism is below a certain range of values will not contain pathogenic bacteria. In all bore well samples of water, the MPN limit has been exceeded there by indicating the susceptibility of presence of pathogenic organism and spreading of water borne diseases.

5.00 CONCLUSION :

From the above study of bore water samples it can be concluded, that bore well water, in Metropolitan cities/ Municipalities, is unhygienic and not fit for drinking and other domestic purposes.

5.1 The MPN count of coliform group of organism is seen very high, further the BOD5 is also beyond the



tolerance limit as such there are chances of spreading of water borne epidemic diseases such as Infective Hepatitis, Typhoid and para typhoid, Bacterial Dysentery and Cholera etc. The life of these pathogenic organism in water is short and they never multiply in treated water however they are likely to live longer in water containing organic matter i.e. high value BOD5. The outbreak of epidemics of Infective Hepatitis at Delhi and Ahmadabad was reported to be due to the use of unpotable bore well water, which has resulted in loss hundreds of human lives.

5.2 There are 500 public bore wells and Hundreds of Private bore wells in Nashik Municipal Corporation area. The water of these bore wells are used by Hotels, Restaurants and private bungalow owners probably without adequate treatment or proper disinfection arrangement. Thus it is likely that this will cause adverse effect on human health and may result in spread up of water borne diseases in adverse conditions especially in Monsoon or in very hot summer.

5.3 The chances of percolation of surface water could be minimised by construction of surface drain away from the bore well. The base of the pump should be water tight with a concrete platform. The upper part of the bore well should be constructed in concrete and sand around it. This will prevent seepage of contaminated



surface water through the upper layer of the soil. The only water than can get into such a well comes from the deeper layer of water bearing sand of gravel. The shallow well is therefore dangerous. Unless it is properly constructed it is liable to be polluted with waste water from a nearby privy or septic tanks.

5.4 Bore-well water is a cheap way of providing water to the consumer however there is risk in spreading of water borne diseases as such sufficient quality of treated and filtered water shall be supplied to the consumer for human consumption so that they will not have to rely on bore wall water.

5.5 In case, people go for bore well water, the water should be supplied with proper disinfection arrangement and the water should not be used for drinking purpose and use only for domastic purpose other than drinking.

5.6 The ground water in Nashik Corporation area is seen to be unpotable as such awareness complaign shall be taken up by local odies so that people may not go for bore well water when treated piped water supply is available. Mohalla committees may be formed to monitor the quality of bore well water, and use of disinfecting agents Continuous monitoring of Bore well water will have to be insisted at all points where it is used for public purpose or by private consumers.

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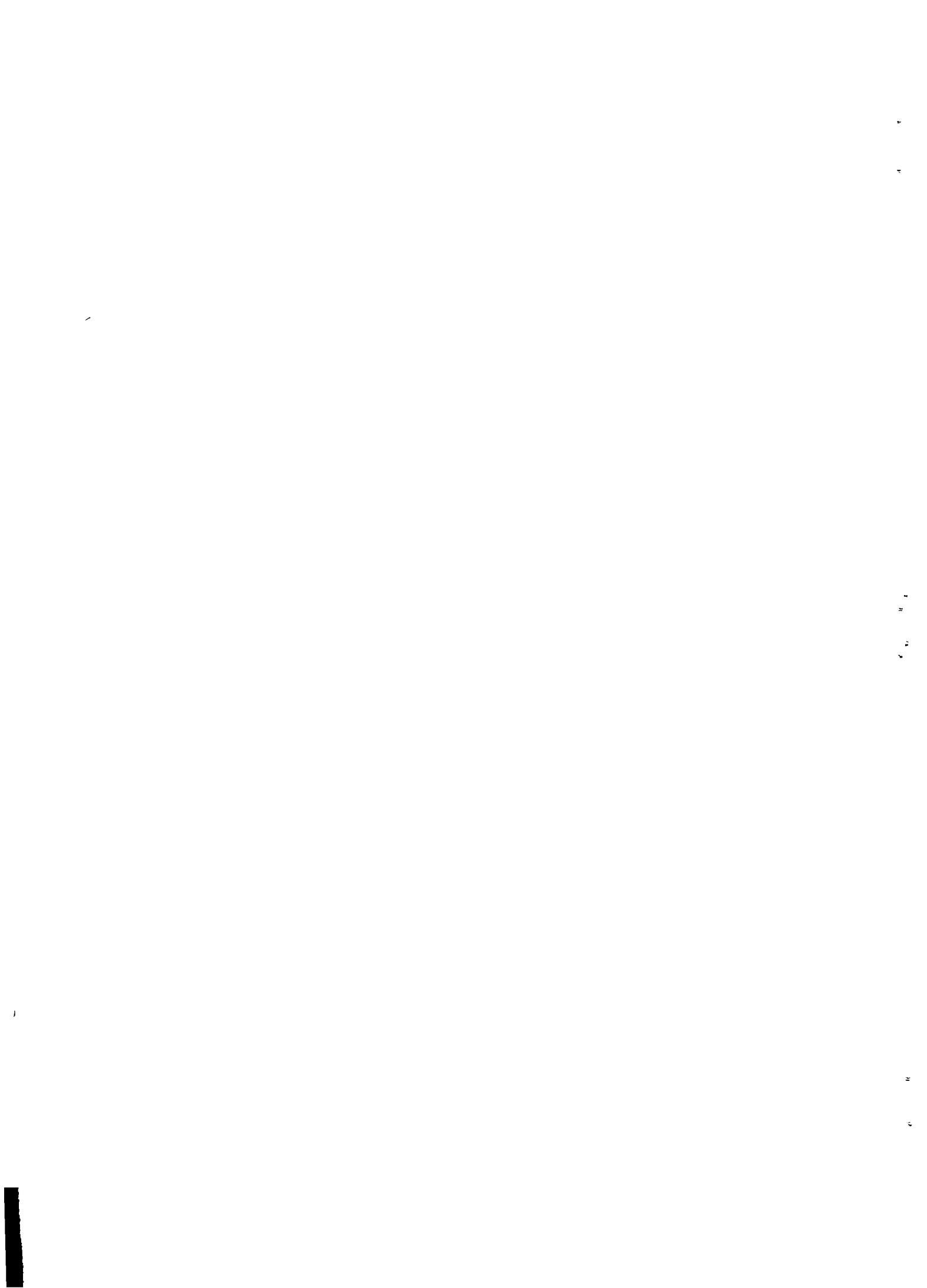
- 5.7 Public awareness campaign shall be launched by Corporation authorities so that bore well water will minimise in use for domestic purposes.

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STATEMENT NO.12.0 STANDARDS RECOMMENDED BY INDIAN STANDARD INSTITUTIONS
NEW DELHI

2.1 TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS A :

Sr. No.	Characteristic	Tolerance Limit
1.	PH Value	6.5 - 8.5
2.	Dissolved oxygen, mg/l, Min	6
3.	5 day B.O.D. 20 C mg/l, Max	2
4.	Total coliform organisms MPN/100 ml. max.	50
	If MPN count is more than 50, then regular tests should be carried out. The criteria shall be satisfied if during a period of time not more than 5% of samples show more than 200 MPN and not more than 20% of the samples show more than 50 MPS. Further, the faecal coliforms should not be more than 40% of the total coliforms.	
5.	Colour, Hazen units, Max.	10
6.	Odour unobjectionable.	
7.	Taste	Tasteless
8.	Total dissolved solids, mg/l, max.	500
9.	Total Hardness, as (CaCO ₃), mg/l Max.	300
10.	Calcium Hardness (as CaCO ₃) mg/l Max.	200
11.	Magnesium hardness (as CaCO ₃), mg/l, Max.	100
12.	Iron (as Fe), mg/l, Max.	0.3
13.	Manganese (as Mn), mg/l, Max.	0.5
14.	Copper (as Cu), mg/l. Max.	1.5

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Sr. No.	Characteristic	Tolerance Limit
15.	Chlorides (as Cl), mg/l, Max.	250
16.	Sulphates (as SO), mg/l, Max.	400
17.	Nitrates (as NO), mg/l, Max.	20
18.	Fluorides (as F), mg/l Max.	1.5
19.	Phenolic compounds (as C H OH) Mg/l. Max.	0.002
20.	Cadmium (as Cd), mg/l, Max.	0.01
21.	Mercury (as Hg), mg/l, Max.	0.001
22.	Selenium (as Se) mg/l, Max.	0.01
23.	Arsenic (as As), mg/l, Max.	0.05
24.	Cyanides (as CN), mg/l, Max.	0.05
25.	Lead (as Pb), mg/l, Max.	0.1
26.	Zinc (as Zn), Mg/l, Max.	15
27.	Chromium (as Cr) mg/l, Max.	0.05
28.	Anionic detergents (as MBAS) mg/l, Max.	0.2
29.	Polynuclear aromatic hydrocarbons. (PAH), mg/l, Max.	0.2
30.	Mineral oil, mg/l, Max.	0.01
31.	Barium (as Ba), mg/l, Max.	1
32.	Silver (as Ag), mg/l, Max.	0.05
33.	Pesticides.	Absent
34.	Alfa emitters uc/ml.Max.	10
35.	Beta emittes uc/ml. Max.	10



STATEMENT NO.2

2.2 TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS B :

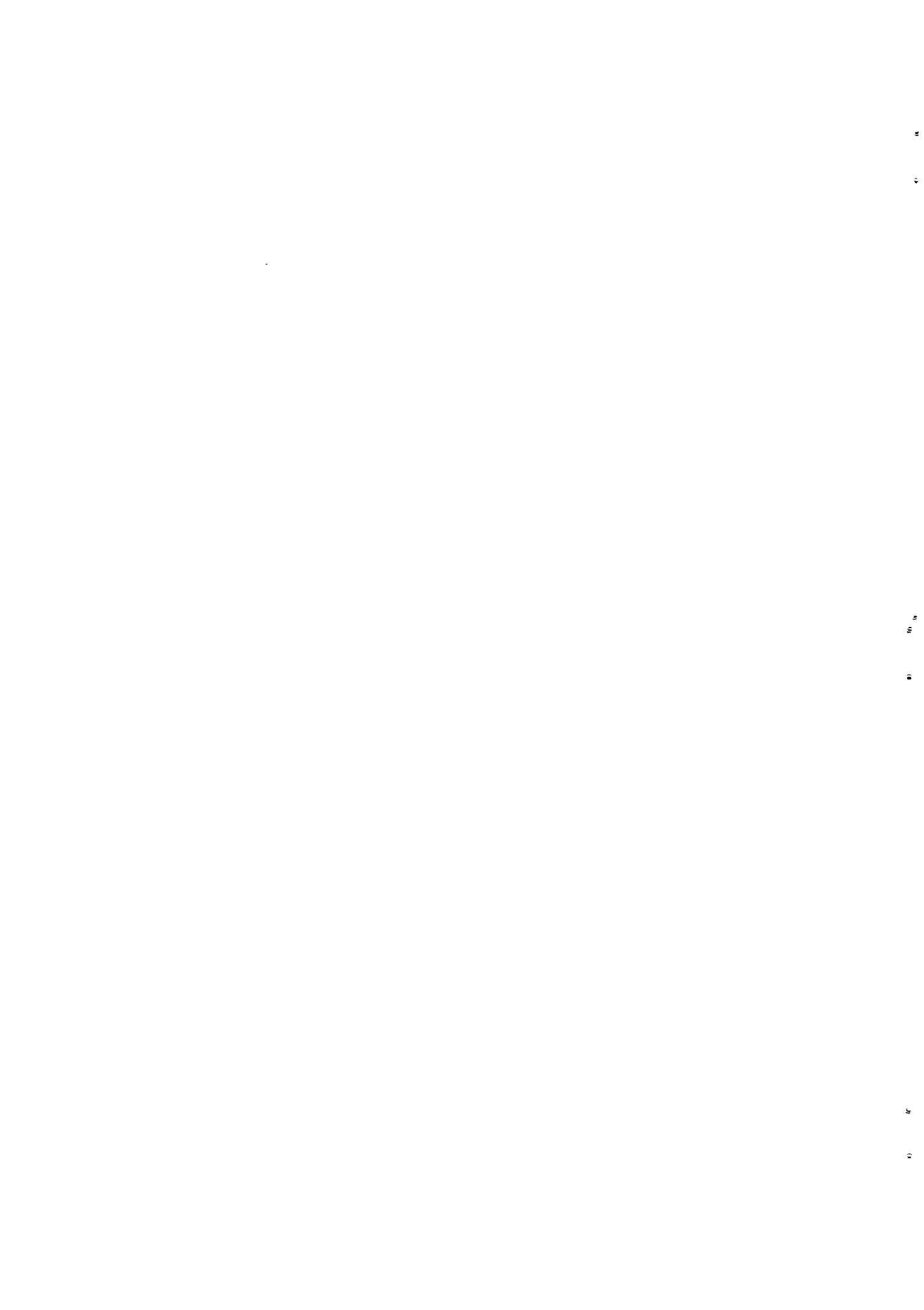
Sr. No.	Characteristic	Tolerance Limit
1.	pH Value.	6.5-8.5
2.	Dissolved oxygen, mg/l, Min.	5
3.	5 day B.O.D. at 20 C, mg/l, Max.	3
4.	Total coliform organisms. MPN/100 ml. Max.	500
	If MPN is more than 500, regular tests should be carried out. The criteria shall be satisfied if during a period of time, not more than 5 percent of the samples shown more than 2000 MPN and not more than 20 percent of samples show more than 500 MPN.	
5.	Fluorides (as F), mg/l, Max.	1.5
6.	Colour, Hazen units, Max.	300
7.	Cyanides (as CN), mg/l, Max.	0.05
8.	Arsenic (as As) mg/l, Max.	0.2
9.	Phenolic compounds (as C H OH) mg/l, Max.	0.005
10.	Chromium (as Cr), mg/l, Max.	0.05
11.	Anionic detergents (as MBAS), mg/l, Max.	1
12.	Alpha emitters, uc/ml. Max.	10
13.	Beta emitters, uc/ml, Max.	10



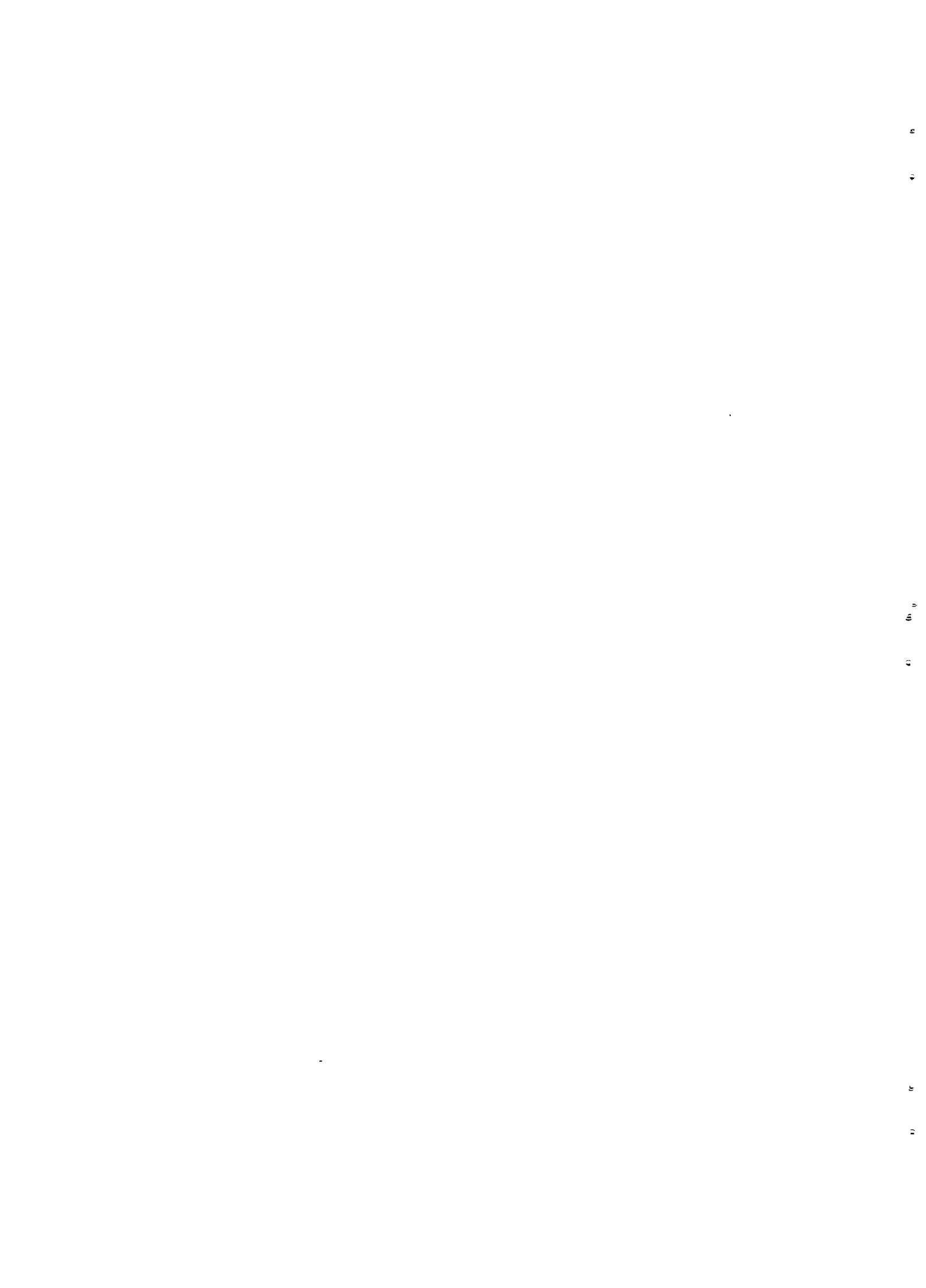
STATEMENT NO.3

2.3 TOLERANCE LIMITS FOR INLAND SURFACE WATERS, CLASS C :

Sr. No.	Characteristic	Tolerance Limit
1.	pH Value.	6.5 - 8.5
2.	Dissolved oxygen, mg/l, min.	4
3.	5 day B.D.O. 20 C mg/l, Max.	3
4.	Total coliforms organisms, MPN per 100 ml, Max.	5000
	It MPN count is more than 5000 MPN, regular tests shall be carried out. The criteria shall be satisfied if during a period of time not more than 5 percent of the samples show more than 5000 MPN. Further, the feacal coliforms should not be more than 40 percent of the total coliforms.	
5.	Colour, Hazen units, Max.	300
6.	Fluorides (as F), mg/l, Max.	1.5
7.	Cadmium (as Cd), mg/l, Max.	0.01
8.	Chlorides (as Cl), mg/l Max.	600
9.	Chromium (as Cr), mg/l, Max.	0.05
10.	Cyanides (as CN), mg/l, Max.	0.05
11.	Total dissolved solids, mg/l, Max.	1500
12.	Selenium (as Se), mg/l, Max.	0.05
13.	Sulphates (as SO), mg/l, Max.	400
14.	Lead (as Pb), mg/l, Max.	0.1
15.	Copper (as Cu), mg/l, Max.	1.5
16.	Arsenic (as As), mg/l, Max.	0.2
17.	Iron (as Fe), mg/l, max.	50
18.	Phenolic compounds (as C H OH) mg/l, Max.	0.005



Sr. No.	Characteristic	Tolerance Limit
19.	Zinc (as Zn), mg/l, Max.	15
20.	Insecticides.	Absent
21.	Anionic detergents. (as MBAS), mg/l, Max.	1
22.	Oils and grease, mg/l, Max.	0.1
23.	Nitrates (as NO), mg/l, Max.	50
24.	Alpha emitters, uc/ml. Max.	10
25.	Beta emitters, uc/ml, Max.	10



2.4 TOLERANCE LIMIT FOR INLAND SURFACE WATES, CLASS D :

Sr. No.	Characteristic	Tolerance Limit
1.	pH value	6.5-8
2.	Dissolved oxygen, mg/l, Min.	4
3.	free ammonia (as N), mg/l, Max.	1.2
4.	Electrical conductanca at 25 C, mhos, Max.	1000 x 10
5	Free carbon dioxide. (as CO) mg/l, Max.	6
6.	Oils and grease, mg/l, Max.	0.1
7.	Alpha emitters, uc/ml. Max.	10
8.	Beta emitters, u/c, ml, Max.	10

When tested for 36 hours, not more than 10 percent of animals shall die and not less than 90 percent of test animals shall be found in apparently healthy state.



2.5 TOLERANCE LIMITS FOR INLAND SURFACE WATERS CLASS E :

Sr. No.	Characteristic	Tolerance Limit
1.	pH Value	6 - 8.5
2.	Electrical conductance at 25 C, mhos, Max.	2250 x 10
3.	Sodium absorption ratio Max.	26
4.	Boron (as B), mg/l, Max.	2
5.	Total dissolved solids (inorganic mg/l, max.	2100
6.	Suplhate (as SO), mg/l, Max.	1000
7.	Chlorides (as Cl) mg/l, Max.	600
8.	Percent sodium, Max.	60
9.	Alpha emitters, uc/ml. Max.	10
10.	Beta emitters uc/ml. Max.	10

NOTES :

- 1) The irrigation water is classified on the basis of electrical conductance and sodium absorption ratio as follows

Electrical Conductance. Micro mhos/ cm 25 C.	CLASS
100 - 250	C
250 - 750	C
750 - 2250	C
2250 - 5000	C
5000 - 20000	C
Sodium Absorption Ratio	Class
Less than 10	S
10 - 18	S
18 - 26	S
More than 26	S



STATEMENT NO.4

QUALITY OF HIGH YEILDING 'BOREWELLS' IN WASHIK MUNICIPAL CORPORATION AREA
(WASHIK AREA)

Sr. No.	Date	Token No.	Name of the Spot	D.O. in PPM	Temp in C	Co2 ppm	pH	BOD. ppm	Turbidity ppm	Total solids in ppm	Dissolved solids in ppm	Suspended solids in ppm	Total Alkali city ppm	Phenol in Alkalinity ppm.	Total Hardness Ca+ Mg+ ppm	Iron ppm	Chlorides in ppm	Sulphates in ppm	Nitrate in ppm	Nitrite in ppm	Fluorides in ppm	Free salina Ammonia	Albuminoid Ammonia	MPM		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	28.
1.	27.9.94	35	Pathanpura Masjid	5.6	30	8	8.4	18.6	5	2000	1750	250	80	NIL	560	96	76.8	0.08	495	55	17.72	0.329	NIL	0.08376	0.04467	150x10 ²
2.	--	102	Bagwanpura Maruti Mandir	5.4	31	75	8.4	20.4	5	2430	2000	439	360	NIL	720	96	117.2	0.10	250	160	17.72	Traces	NIL	0.07259	0.04467	28x10 ²
3.	--	98	Bhadrakali Police Station.	8.0	31	6	8.2	13.4	5	2000	1700	300	192	8	240	64	19.2	0.07	575	95	17.72	Traces	NIL	0.11168	0.05584	150x10 ²
4.	--	47	Mimani Chauk Behind Hemlata Talkies	8.4	30	24	8.4	17.4	5	1000	700	300	268	12	440	64	67.2	0.04	90	350	17.72	Traces	NIL	0.06700	0.05025	150x10 ²
5.	--	114	Collector Office compus	8.4	30	75	8.6	13.0	5	1570	1200	370	340	NIL	560	64	96	0.06	175	150	17.72	Traces	NIL	0.05584	0.037084	35x10 ²
6.	--	117	District Court Campus	8.2	31.2	75	8.2	15.2	5	1500	1300	200	240	NIL	400	48	67.2	0.06	225	88	13.25	Traces	NIL	0.06700	0.05584	15x10 ²
7.	--	97	Lokmanya Nagar (Behind Medical College Old Bldg).	8.2	31	26	8.4	13.2	5	1000	800	200	320	NIL	560	48	105.6	0.04	175	45	17.72	Traces	NIL	0.08376	0.06142	150x10 ²
8.	--	28	Krishni Nagar H.P.T. College Road	8.2	32	75	8.2	15	5	830	660	170	252	12	400	48	67.2	0.03	65	60	17.72	0.658	NIL	0.07259	0.03908	150x10 ²
9.	--	100	Gharpure Ghat	8.2	31	10	8.4	11.2	6	700	500	200	192	NIL	280	40	43.2	0.03	50	25	8.86	Traces	NIL	0.10051	0.06700	210x10 ²
10.	--	82	Ekmukhi Datta Victoria Bridge	8.2	30	8	8.2	13.2	5	1100	900	200	304	NIL	360	48	57.6	0.05	175	50	13.29	Traces	NIL	0.03376	0.05025	120x10 ²

STATEMENT NO.5

WATER QUALITY OF HIGH YIELD BOREWELLS IN NASHIK MUNICIPAL CORPORATION
(PANCHAVATI-SATPUR AREA)

Sr. No.	Date Taken	Name of the Spot	D.O. in PPM	Temp in C	Co2 ppm	pH	BOD. ppm	Turbi- dity ppm	Total solids in ppm	Diss-olved solids in ppm	Suspe-nded solids in ppm	Total Alkali city ppm	Pheno lpthal- ein Al- kalini- ty ppm.	Total Hard- ness Ca+ ppm	Magne- sium Mg++ ppm	Iron Fe ppm	Chlo- rides in ppm	Sul- phates in ppm	Nitra- te in ppm	Nitri- te in ppm	Fluo- rides in ppm	Free & saline Ammo- nia	Albumi- noid	MPH		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	28.
11.	8.8.94	121	Jadhav Colony Makhmalabad Road, Sintex Tank.	7.0	29.0	10	8.2	26	4.0	500	380	120	228	NIL	280	64	28.8	0.05	68	250	17.72	Traces	NIL	0.3904	0.3416	75x10 ² =7500
12.	---	128	Datta Mandir Samaj Mandir Peth Road, Hand Pump	9.0	29.0	27	8.2	24	5.0	330	230	100	136	NIL	240	48	28.8	0.03	45	80	4.43	Traces	NIL	0.4880	0.2958	21x10 ² =2100
13	---	100	Kranti Nagar-Makh- malabad Rd. (opp. Ambika Kirana Sto- res) Hand Pump	6.0	29.0	80	8.0	27	4.0	420	330	90	244	NIL	400	64	57.6	0.17	125	120	17.72	Traces	NIL	0.4880	0.3904	35x10 ² =3500
14.	---	97	Jaju Wadi-Opp. Vanital Society, Near Kaddappa Fact Behind Indrakund Hand Pump	4.0	33.0	33	8.0	37	4.0	450	350	100	336	NIL	560	64	86.0	0.01	170	115	8.86	0.658	NIL	5.1240	2.9280	28x10 ² =2800
15.	---	131	Hirawadi-Panchvati (Opp.Laxmi Kirana Stores) Hand Pump	10.0	30.0	46	8.0	21	4.0	500	400	100	246	NIL	760	144	96.0	0.04	175	300	8.86	Traces	NIL	4.1480	3.4460	75x10 ² =7500
16.	---	126	Vetalbaba Mandir Aurangabad Road, Sintex Tank.	9.0	28.5	26	8.2	22	4.0	380	280	100	248	NIL	320	56	43.2	0.05	85	105	17.72	Traces	NIL	0.4492	0.1220	150x10 ² =150000
17.	---	66	Kela-Vidyalaya behind (Panchavati Police station) Sintex Tank	7.0	29.0	28	8.0	26	4.0	420	300	120	292	NIL	380	80	43.2	0.03	105	85.0	8.86	Traces	NIL	0.5368	0.1220	20x10 ² =2000
18.	9.8.94	44	Pathardigaon-Raj- wada Bombay Agra Road	6.2	30.5	18	8.2	35	5.0	430	330	100	132	NIL	320	64	38.4	0.06	85	112.5	17.72	Traces	NIL	0.08296	0.06344	20x10 ² =2000
19.	---	98	N-3 L-Sector, Shi- vaji Chowk, Krishna Mandir, Bombay-Agra Road.	7.2	30.0	23	8.2	38	4.0	450	350	100	264	NIL	560	96	76.8	0.05	100	90	8.86	Traces	NIL	0.07320	0.05368	2400x10 ² =240000

Sr. No.	Date	Token No.	Name of the Spot	D.O. in PPM	Temp in C	Co2 ppm	pH	BOD. ppm	Turbidity ppm	Total solids in ppm	Dissolved solids in ppm	Suspended solids in ppm	Total Alkalinity ppm	Phenol in Alkalinity ppm.	Total Hardness Ca+ Mg++ ppm	Iron ppm	Chlorides in ppm	Sulfates in ppm	Nitrate in ppm	Nitrite in ppm	Fluorides in ppm	Free Ammonia	& Albuminoid Ammonia	MPN		
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	28.
20.	---	47	Sant Kabir-Zopadpatti, Behind Bho-sala Military Canteen Mead Canal.	6.4	31.5	35	8.2	32	4.0	400	300	100	296	NIL	400	96	48	0.07	100	85	8.86	Traces	NIL	3.4160	2.440	43x10 ² 4300
21.	---	43	Sadguru-Nagar, Satpur Behind MIDC (Extreme End) D Rd. Satpur.	5.0	30.5	50	8.2	36	4.0	400	310	90	264	NIL	360	48	57.6	0.04	120	75	8.86	Traces	NIL	0.05856	0.03328	15x10 ²
22.	---	114	Someshwar Colony Satpur Govind Colony "Vita Bhatti" Satpur.	4.0	31.5	55	8.2	43	4.0	400	300	100	296	NIL	560	64	96	0.05	95	197.5	27.72	Traces	NIL	0.06344	0.04880	14x10 ² 1400

STATEMENT NO.6

STUDY OF WATER QUALITY OF HIGH YEILDING BORE WELLS

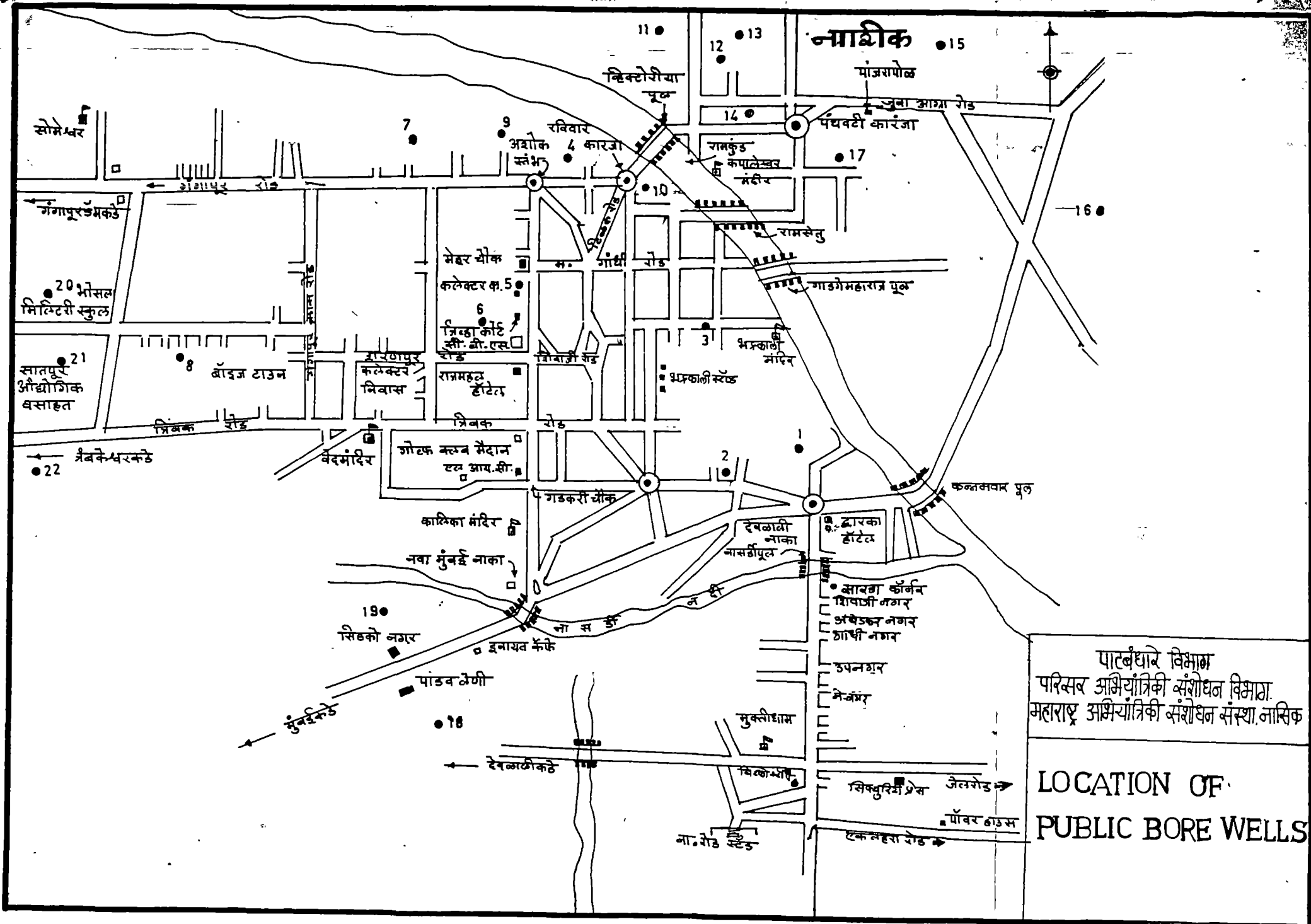
Date of

(5 Sample) Bore Wells in Nashik Municipal Corporation Area

Completing : 8.11.1994

Sr. No.	Code No.	Name of the Spot	D.O. in PPM	Temp in C	Co2 ppm	pH	BOD ppm	Turbidity ppm	Total solids in ppm	Dissolved solids in ppm	Suspended solids in ppm	Total Alkali city ppm	Phenol in Alkalinity ppm.	Total Hardness Ca+Mg++ ppm	Calcium ppm	Magnesium ppm	Iron ppm	Chlorides in ppm	Sulphates in ppm	Nitrate in ppm	Nitrite in ppm	Fluorides in ppm	Free saline Ammonia	& Albuminoid Ammonia	MPN
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	25.
1.	79	Kela Vidyalaya Panchvati, Nashik.	3	27	40	8.2	23	3	430	360	70	300	8	348	30.4	65.28	0.03	130	95	8.86	Traces	NIL	--	--	28x10 ²
2.	97	Jajuwadi Indrakund Panchavati Nashik	1.6	27.5	34	8.2	25.3	3	520	430	90	328	4	420	36.8	78.72	0.04	270	130	8.86	0.858	NIL	--	--	1100x10 ¹
3.	121	Datta-nagar Samaj Mandir Peth Road Panchvati, Nashik	1.8	28.0	8	8.3	23.8	3	350	270	80	160	NIL	120	32	9.6	0.02	70	130	8.86	Traces	NIL	--	--	460x10 ²
4.	47	Krantinagar Makhmalabad Road, Panchvati, Nashik.	4.8	28.0	25	8.2	24.8	3	400	330	70	288	NIL	340	40	57.6	0.03	170	130	17.72	Traces	NIL	--	--	1100x10 ²
5.	82	Jadhav Colony Makhmalabad Road, Panchvati, Nashik.	3.2	27.5	31	8.2	23.2	3	410	350	60	232	4	360	35	65.28	0.03	105	125	17.72	0.658	NIL	--	--	460x10 ²





पाटबंधारे विभाग
 परिसर अभियांत्रिकी संशोधन विभाग
 महाराष्ट्र अभियांत्रिकी संशोधन संस्था, नासिक

LOCATION OF
 PUBLIC BORE WELLS

