

Annexure

Water Quality of Ponds with respect to Criteria parameters during 2022 (January- December)

Sl. No	Sampling Location	No. of Obs.	Annual average values (Range of values)					Frequency of violation (Percent of violation) from designated criteria value					Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters												
			pH	DO (mg/L)	BOD (mg/L)	TC (MPN/100 ml)	FC (MPN/100 ml)	pH	DO	BOD	TC	FC			
(a) Bindusagar Pond in Bhubaneswar City															
1.	Lingaraj Temple side	12	7.3 (6.9-7.6)	6.9 (2.6-8.6)	1.6 (1.1-2.0)	14436 (330-54000)	4530 (45-22000)	0	1 (8)	0	11 (92)	4 (33)	Does not conform to Class B	DO, TC, FC	Human activities
2.	Ananta Vasudev	12	7.4 (7.1-7.7)	7.1 (4.0-8.9)	1.9 (1.2-2.3)	19548 (790-92000)	7438 (130-35000)	0	1 (8)	0	12 (100)	4 (33)		TC, FC	
3.	Gyananagar	12	7.4 (6.9-7.8)	7.1 (5.9-9.9)	1.6 (< 1.0-2.2)	24616 (490-92000)	9018 (78-54000)	0	0	0	11 (92)	3 (25)		DO, TC, FC	
4.	Near Kedarnath Research Centre	12	7.4 (7.1-7.9)	6.7 (2.2-8.5)	1.7 (1.1-2.6)	17713 (<1.8-92000)	8227 (<1.8-54000)	0	1 (8)	0	9 (75)	5 (42)		DO, TC, FC	
*Class 'B'			6.5-8.5	5 and above	3 or less	500 or less	-	Outdoor bathing							
Water quality criteria for bathing water (MOEF Notification G.S.R. No. 742(E) Dt. 25.09.2000)			6.5-8.5	5 and above	3 or less	-	2500 (Maximum Permissible)	Water use for organised outdoor bathing							

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

NB : The criteria of non-compliance with respect to TC has been calculated on the following basis:
TC values with more than 5% of samples show more than 2000 MPN/100 ml and more than 20% of the samples show more than 500 MPN/ 100 ml.
(Ref : IS 2296-1982 foot note)

Sl. No	Sampling Location	No. of Obs.	Annual average values (Range of values)					Frequency of violation (Percent of violation) from designated criteria value					Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters												
			pH	DO (mg/L)	BOD (mg/L)	TC (MPN/100 ml)	FC (MPN/100 ml)	pH	DO	BOD	TC	FC			
(b) Ponds in Puri Town															
1.	Narendra	12	8.5 (8.1-9.4)	8.0 (3.1-12.0)	5.8 (4.7-8.0)	5809 (220-35000)	2093 (78-13000)	3 (25)	3 (25)	12 (100)	10 (83)	1 (8)	Does not conform to Class B	pH, DO, BOD, TC,FC	Human activities
2.	Markanda	12	8.4 (7.6-9.4)	8.5 (2.4-12.6)	5.9 (4.3-9.5)	1738 (45-7900)	534 (20-2300)	2 (17)	4 (33)	12 (100)	7 (58)	0		pH, DO, BOD, TC	
3.	Indradyumna	12	8.3 (7.9-9.2)	7.4 (4.4-10.5)	4.6 (3.7-6.7)	8078 (130-54000)	2561 (20-17000)	3 (25)	2 (17)	12 (100)	10 (83)	3 (25)		pH, DO, BOD, TC,FC	
4.	Swetaganga	12	8.1 (7.1-9.0)	7.7 (2.8-11.1)	5.8 (4.3-9.0)	8429 (130-54000)	4566 (45-35000)	2 (17)	3 (25)	12 (100)	10 (83)	2 (17)		pH, DO, BOD, TC	
5.	Parvati sagar	12	8.2 (7.0-9.1)	7.5 (1.9-10.9)	8.4 (5.6-12.5)	6406 (490-17000)	1644 (110-4900)	2 (17)	3 (25)	12 (100)	10 (83)	2 (17)		pH, DO, BOD, TC	
*Class 'B'			6.5-8.5	5 and above	3 or less	500 or less	-						Outdoor bathing		
Water quality criteria for bathing water (MOEF Notification G.S.R. No. 742(E) Dt. 25.09.2000)			6.5-8.5	5 and above	3 or less	-	2500 (Maximum Permissible)						Water use for organised outdoor bathing		

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

NB :The criteria of non-compliance with respect to TC has been calculated on the following basis:

TC values with more than 5% of samples show more than 2000 MPN/100 ml and more than 20% of the samples show more than 500 MPN/ 100 ml.
(Ref : IS 2296-1982 foot note)

Sl. No	Sampling Location	No. of Obs.	Annual average values (Range of values)					Frequency of violation (Percent of violation) from designated criteria value					Existing Class	Parameters responsible for downgrading the water quality	Possible Reason
			Parameters												
			pH	DO (mg/L)	BOD (mg/L)	TC (MPN/ 100 ml)	FC (MPN/ 100 ml)	pH	DO	BOD	TC	FC			
(c) Pond in Jeypore town															
1.	Jagannaths agar	12	7.5 (6.8-8.2)	6.3 (6.1-6.5)	2.6 (2.0-4.5)	4552 (230-24000)	1014 (45-3300)	0	0	1 (8)	10 (83)	1 (8)	Does not conform to Class B	BOD,TC, FC	Human activities
(d) Pond in Angul Town															
1.	Raniguda Pond	12	7.6 (6.9-8.3)	7.5 (2.4-11.4)	6.0 (4.0-9.5)	4491 (170-35000)	2457 (20-24000)	0	4 (33)	12 (100)	9 (75)	1 (8)	Does not conform to Class B	DO, BOD, TC, FC	Human activities
*Class 'B'			6.5-8.5	5 and above	3 or less	500 or less	-	Outdoor bathing							
Water quality criteria for bathing water (MOEF Notification G.S.R. No. 742(E) Dt. 25.09.2000)			6.5-8.5	5 and above	3 or less	-	2500 (Maximum Permissible)	Water use for organised outdoor bathing							

*** Tolerance limit for Inland Surface water bodies (IS-2296-1982)**

NB :The criteria of non-compliance with respect to TC has been calculated on the following basis:

TC values with more than 5% of samples show more than 2000 MPN/100 ml and more than 20% of the samples show more than 500 MPN/ 100 ml.
(Ref : IS 2296-1982 foot note)

Water quality of Ponds with respect to other parameters during 2022 (January- December)

Sl. No.	Sampling Location	Physical parameters		Organic pollution Indicators					Mineral constituents							
		Annual average values (Range of values)														
		TSS	Total alkalinity	COD	NH ₄ -N	Free NH ₃ -N	TKN	EC	SAR	% Na	B	TDS	TH	Cl	SO ₄	F
		(mg/L)		(mg/L)					(μS/cm)	(mg/L)						
(a) Bindusagar Pond in Bhubaneswar City																
1.	Lingaraj Temple side	22 (<10-81)	117 (92-132)	10.5 (6.7-13.4)	0.84 (0.56-1.68)	0.011 (0-0.025)	4.34 (2.8-6.16)	381 (302-445)	1.53 (1.15-2.59)	38.41 (33.73-50.85)	<0.5 (<0.5-<0.5)	NA	93 (76-116)	49 (34-80)	18.6 (9.8-27.1)	0.46 (0.29-0.741)
2.	Ananta Vasudev	21 (12-44)	114 (80-140)	13.1 (7.3-20)	0.65 (0.56-1.12)	0.012 (0-0.034)	3.78 (1.68-6.16)	375 (286-434)	1.44 (0.91-1.97)	37.3 (29.96-44.64)	<0.5 (<0.5-<0.5)	NA	93 (80-112)	49 (33-80)	17.9 (8.7-27.1)	0.41 (0.29-0.574)
3.	Gyananagar	25 (10-95)	119 (96-144)	10.5 (6.7-14)	1.21 (0.56-6.16)	0.012 (0-0.039)	4.95 (2.24-13.44)	381 (304-433)	1.51 (1.22-2.01)	37.98 (34.63-43.76)	<0.5 (<0.5-<0.5)	NA	93 (80-108)	51 (37-90)	16.7 (7.1-26.3)	0.44 (0.29-0.74)
4.	Near Kedarnath research Centre	20 (<10-46)	115 (92-136)	11.1 (6.7-20)	0.93 (0.56-2.24)	0.018 (0.003-0.045)	4.62 (2.24-8.4)	371 (286-448)	1.49 (1.1-2.17)	37.89 (33.17-46.2)	<0.5 (<0.5-<0.5)	NA	91 (72-104)	50 (33-90)	16.2 (5.9-27.3)	0.4 (0.3-0.529)
*Class 'C'		-	-	-	-	-	-	-	-	-	-	1500	-	600	400	1.5

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

Class 'C' :Drinking water source with conventional treatment followed by disinfection

Contd..

Sl. No.	Sampling Location	Nutrients		Heavy metals								
		Annual average values (Range of values)										
		NO ₃ ⁻	PO ₄ ³⁻ -P	Cr(VI) ##	T Cr	Fe##	Ni##	Cu##	Zn##	Cd##	Hg##	Pb##
(mg/L)		(mg/L)										
(a) Bindusagar Pond in Bhubaneswar City												
1.	Lingaraj Temple side	3.603 (0.652-7.677)	0.067 (<0.05-0.469)	0.002	0.009	0.057	0.016	0.009	0.026	0.0012	NA	0.006
2.	Ananta Vasudev	2.425 (0.651-6.275)	0.061 (<0.05-0.275)	<0.002	0.009	0.095	0.013	0.016	0.075	0.0021	NA	0.005
3.	Gyananagar	2.997 (0.32-9.676)	0.091 (<0.05-0.408)	<0.002	0.009	0.023	0.012	0.006	0.015	0.0018	NA	0.004
4.	Near Kedarnath Research Centre	3.134 (0.693-6.708)	<0.05 (<0.05-0.152)	<0.002	0.017	0.035	0.015	0.021	0.105	0.0017	NA	0.004
**Class 'C'		50										
**Class 'E'		-	-	-		-	-	-	-	-	-	-

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

Data for the period April, 2022

Class 'C' :Drinking water source with conventional treatment followed by disinfection

DO : Dissolved Oxygen, BOD : Biochemical Oxygen Demand, TC : Total Coliform, TSS : Total Suspended Solids; COD : Chemical Oxygen Demand, NH₄-N : Ammonical nitrogen, TKN : Total Kjeldahl Nitrogen; FC : Fecal Coliform, EC : Electrical Conductivity, TDS : Total Dissolved Solids, B : Boron ; SAR : Sodium Absorption Ratio, TH : Total hardness; Cl : chloride, SO₄ : sulphate; F : Fluoride; PO₄³⁻ : phosphate, : Cr(VI) : Hexavalent Chromium; T.Cr : total Chromium, Fe : Iron, Ni : Nickel, Cu : Copper, Zn : Zinc; Cd : cadmium; Hg : Mercury; Pb : Lead

Sl. No.	Sampling Location	Physical parameters		Organic pollution Indicators					Mineral constituents							
		Annual average values (Range of values)														
		TSS	Total alkalinity	COD	NH ₄ -N	Free NH ₃ -N	TKN	EC	SAR	% Na	B	TDS	TH	Cl	SO ₄	F
		(mg/L)		(mg/L)					(µS/cm)	(mg/L)						
(b) Ponds in Puri town																
1.	Narendra	25 (<10-87)	166 (120-196)	28.4 (22-44)	0.79 (0.56-1.68)	0.073 (0-0.174)	4.25 (1.68-6.16)	810 (618-1231)	3.16 (1.61-6.05)	47.61 (30.66-60.91)	<0.5 (<0.5-<0.5)	NA	193 (156-312)	180 (100-500)	44.6 (15.4-90.6)	0.44 (0.285-0.842)
2.	Markanda	33 (<10-54)	130 (68-168)	29.7 (18-47.7)	1.21 (0.56-3.36)	0.093 (0-0.434)	4.9 (1.68-9.52)	625 (514-970)	2.08 (1.11-5.27)	38.02 (26.36-61.79)	<0.5 (<0.5-<0.5)	NA	164 (108-204)	106 (42-340)	42.8 (27.1-55.3)	0.42 (0.196-0.781)
3.	Indradyumna	22 (<10-61)	118 (80-144)	23.3 (18-36.7)	0.93 (0.56-1.68)	0.064 (0-0.210)	5.02 (2.24-11.2)	612 (494-1221)	3.37 (1.55-12.41)	49.97 (35.18-82.87)	<0.5 (<0.5-<0.5)	NA	119 (80-148)	134 (80-440)	30.3 (13.8-42.5)	0.35 (0.255-0.58)
4.	Swetaganga	22 (<10-54)	153 (104-208)	29.6 (19-43)	1.31 (0.56-2.8)	0.053 (0-0.182)	5.91 (1.68-15.68)	811 (418-1387)	3.6 (1.8-5.66)	52.25 (41.29-60.88)	<0.5 (<0.5-0.75)	NA	145 (84-224)	170 (80-360)	42.8 (18-148.1)	0.38 (0.238-0.74)
5.	Parvati sagar	31 (14-48)	99 (88-112)	42.9 (27-67)	1.17 (0.56-2.24)	0.070 (0-0.179)	5.6 (1.68-11.76)	437 (310-854)	2.28 (1.18-6.79)	45.96 (33.95-73.53)	<0.5 (<0.5-<0.5)	NA	96 (76-128)	87 (46-280)	17.8 (8.8-31.9)	0.35 (0.215-0.64)
*Class 'C'		-	-	-	-	-	-	-	-	-	-	1500	-	600	400	1.5

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

Class 'C' :Drinking water source with conventional treatment followed by disinfection

Contd..

Sl. No.	Sampling Location	Nutrients		Heavy metals								
		Annual average values (Range of values)										
		NO ₃ ⁻	PO ₄ ³⁻⁻ P	Cr(VI)##	T Cr	Fe##	Ni##	Cu##	Zn##	Cd##	Hg##	Pb##
(mg/L)					(mg/L)							
(b) Ponds in Puri town												
1.	Narendra	4.702 (2.863-8.603)	0.895 (0.331-1.273)	0.004	0.014	0.263	0.015	0.005	0.012	0.0035	NA	0.006
2.	Markanda	25.293 (6.774-39.929)	1.026 (<0.05-3.841)	<0.002	0.018	0.261	0.013	0.009	0.013	0.0028	NA	0.005
3.	Indradyumna	4.668 (1.961-7.176)	0.167 (<0.05-0.693)	<0.002	0.013	1.371	0.011	0.006	0.013	0.0033	NA	0.006
4.	Swetaganga	3.883 (1.075-10.939)	0.401 (<0.05-1.31)	<0.002	0.014	0.189	0.014	0.004	0.008	0.0029	NA	0.011
5.	Parvati sagar	3.468 (1.242-8.891)	0.156 (<0.05-0.658)	<0.002	0.016	0.188	0.016	0.011	0.024	0.0030	NA	0.006
**Class 'C'		50	-	0.05	-	50	-	1.5	15.0	0.01	-	0.10
**Class 'E'		-	-	-	-	-	-	-	-	-	-	-

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

Data for the period April, 2022

Class 'C' :Drinking water source with conventional treatment followed by disinfection

Sl. No.	Sampling Location	Physical parameters		Organic pollution Indicators				Mineral constituents								
		Annual average values (Range of values)														
		TSS	Total alkalinity	COD	NH ₄ -N	Free NH ₃ -N	TKN	EC	SAR	% Na	B	TDS	TH	Cl	SO ₄	F
		(mg/L)		(mg/L)				(μS/cm)			(mg/L)					
Pond in Jeypore town																
1.	Jagannathsagar	21 (11-48)	106 (48-164)	18.6 (11-44)	0.98 (0.56-2.24)	0.029 (0-0.059)	4.81 (2.24-8.4)	338 (237-453)	1.11 (0.7-1.56)	32.12 (23.76-41.19)	<0.5 (<0.5-<0.5)	NA	103 (76-144)	45 (20-58)	17.3 (6-55.7)	0.31 (0.23-0.398)
Pond in Angul town																
1.	Raniguda	46 (14-185)	192 (80-304)	33.2 (23-59)	1.35 (0.56-3.92)	0.019 (0-0.045)	5.55 (1.68-12.32)	690 (482-923)	1.75 (1.17-2.37)	35.47 (26.75-42.18)	<0.5 (<0.5-<0.5)	NA	209 (144-280)	106 (80-160)	38.2 (14.2-58.8)	0.6 (0.27-0.985)
*Class 'C'		-	-	-	-	-	-	-	-	-	-	1500	-	600	400	1.5

Contd..

Sl. No.	Sampling Location	Nutrients				Heavy metals						
		Annual average values (Range of values)										
		NO ₃ ⁻	PO ₄ ³⁻ -P	Cr(VI) ##	T Cr	Fe##	Ni##	Cu##	Zn##	Cd##	Hg##	Pb##
		(mg/L)				(mg/L)						
Pond in Jeypore town												
1.	Jagannathsagar	4.753 (1.905-11.061)	0.061 (<0.05-0.111)	<0.002	0.014	0.455	0.019	0.004	0.016	0.0021	NA	0.011
Pond in Angul town												
1.	Raniguda	8.736 (1.415-25.879)	0.202 (<0.05-0.55)	0.003	0.011	0.114	0.021	0.004	0.008	0.0036	NA	0.009
**Class 'C'		50	-	0.05	-	50	-	1.5	15.0	0.01	-	0.10
**Class 'E'		-	-	-	-	-	-	-	-	-	-	-

* Tolerance limit for Inland Surface water bodies (IS-2296-1982)

##Data for the period April, 2022

Class 'C': Drinking water source with conventional treatment followed by disinfection