

**NATIONAL GREEN TRIBUNAL EASTERN ZONE BENCH, KOLKATA**

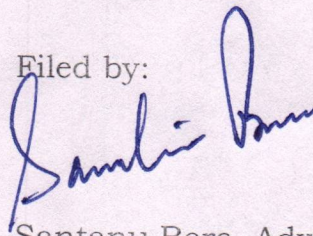
**ORIGINAL APPLICATION No. 99 / 2025/EZ**

(News Items "Unchecked urbanisation pushing Deepor Beel into environment crisis : Experts appearing in the Assam Tribune dated 22.04.2025")

**I N D E X**

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Filed by:



Santanu Bora, Advocate

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Ph. No. 9864176825

1-1-1  
Filed by -  
Respondent no. 4  
Plmsh - Santan Ben  
S.C., Assam, N.G.T

**BEFORE THE NATIONAL GREEN TRIBUNAL,  
EASTERN ZONE BENCH, KOLKATA**

Original Application No. 99 of 2025/EZ

In the Matter of:

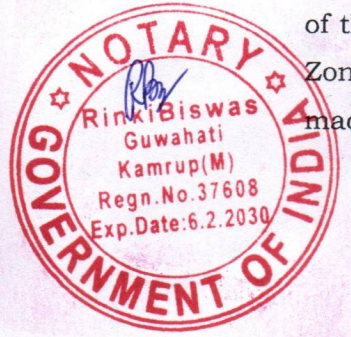
*News Item "Unchecked urbanisation pushing Deepor Beel into environment crisis: Experts appearing in the Assam Tribune dated 22.04.2025".*

Affidavit in Reply on behalf of the Respondent No.4

I Shri Hirdesh Mishra, son of Sri G P Mishra Advocate, aged about 56 years, by faith Sanatan, by occupation Indian Forest Service, residing at:- Guwahati, Assam. do hereby solemnly affirm and state as follows:

1. That I am the Member Secretary, Assam State Wetland Authority o/o the PCCF &HoFF Assam, Aranya Bhawan, Panjabari, Guwahati-781037, Assam in the State of Assam and as such I am fully conversant with the facts and circumstances of the case.
2. That I have received the notice and copy of the above-mentioned Original application, as well as the orders dated 06.05.25 and 21.07.25, of the National Green Tribunal, Principal Bench as well as of the Eastern Zone Bench, have gone through the same and understood the contents made therein.

Hirdesh Mishra  
Member Secretary  
Assam State Wetland Authority, Assam



3. That I will traverse only through those portions which are relevant for the present purpose, as well as for which the clarifications are sought for. The portions of the Original application, not replied to shall not be treated as to be my admission.

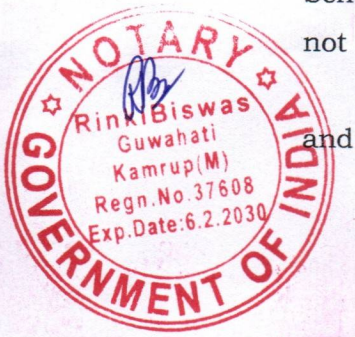
4. That at the answering deponent begs to state that, there is no encroachment on the notified boundary of Deepor Beel Wild Life Sanctuary. (hereinafter referred to as the DBWLS). Be it mentioned that as per the Notification dated 21<sup>st</sup> February, 2009, the total area of the DBWLS is 4.1 Sq. Km., and the entire area is intact and free from any encroachment.

A copy of the said Notification is annexed herewith and marked as Annexure - A

5 The answering deponent further denies the fact of loss of biodiversity, as alleged in the impugned news item dated 22.04.2025. In this connection it is stated that the Deepor Beel Wetlands form an integral part of broader habitat for the resident elephant herd of the Garbhanga -Rani reserve Forest, and the daily movement of the herd to and fro via established corridor is systematically documented by the forest department, Deepor beel Wild Life Range, and has recorded a largest herd of 120 elephants on 8<sup>th</sup> August, 2024.

Be it mentioned here that the forest department has identified six regular corridors to access the Deepor Beel, and the wetlands also support resident water bird, grassland bird species and a variety of migratory birds. It is also stated that, in order to sustain and enhance biodiversity, the habitat improvement initiatives, such as removal of water hyacinth and nesting areas are undertaken by the Central Sector Schemes (CSS) regularly. Thus, the question of loss of biodiversity does not arise at all.

The said statement of movement of elephants is annexed herewith, and marked as annexure -B.



Hirdeh Mishra  
Member Secretary  
Assam State Wetland Authority

- 3 -

Instrument Sl. No. 37  
Date 23/8/25

6. That, as regards the question of water quality, it is made clear, that a "Quick Status Evaluation of Deepor Beel Water Quality", conducted by Indian Institute of Technology, Guwahati, found that dissolved oxygen level in most cases exceeded the minimum of 4mg/L (Gracia, et al., 2023)

Photocopies of the said report of IIT, Guwahati is annexed herewith and marked as annexure - C.

7. It is pertinent to mention that the Forest department is very much aware about its duties and responsibilities, and it is a fact that the effective conservation of Deepor Beel's dynamic and multifaceted eco-system relies on the sustained and co-ordinated efforts of all concerned entities. As such the forest department, in fulfilling its mandate within a collaborative framework, engages with all relevant stakeholder departments.

It is to mention that the forest department remains steadfast in its commitment to safeguard Deepor Beel as one of the most significant wetlands of the region and looks forward to continued collaborative efforts towards shared objectives.

8. That the statements made out in the foregoing paragraphs are true to the best of my knowledge and belief and also based on records and the same are also my respectful submissions before this Hon'ble Court and that I have not suppressed any material facts.

Identified by  
*Rinki Biswas*  
Advocate  
Enrolment No. 969 of 1999-2000

*Hirdeesh Mishra*  
Member Secretary  
Assam State Wetland Authority  
Deponent

**NOTARY**  
Rinki Biswas  
Guwahati  
Kamrup (M)  
Regn.No.37608  
Exp.Date:6.2.2030  
**GOVERNMENT OF INDIA**

*Rinki Biswas*  
**Rinki Biswas**  
**NOTARY**  
**GOVT. OF INDIA**  
**Guwahati, Kamrup (M)**  
**Regn. No. 37608**

Solemnly affirmed before me this day.  
I certify that I read over and explained  
the contents to the declared and that  
the declarant seemed perfectly to  
understand them

23 AUG 2025

Ab  
2/3/09  
Shri Madan

9  
Anali  
25/1/09

GOVERNMENT OF ASSAM  
ENVIRONMENT & FORESTS DEPARTMENT

ORDERS BY THE GOVERNOR  
NOTIFICATION

Dated Dispur, the 21<sup>st</sup> February, 09.

No. FRM. 140/2005/260: In exercise of the power conferred under Section 18 and Section 26 A(1)(b) of the Wildlife (Protection) Act, 1972 (as amended up to date) and in supersession of Government notification vide No. FRM. 140/2005/229 dated 12-9-08, the Governor of Assam is pleased to declare the areas described in the schedule below as the Deepar Beel Wildlife Sanctuary w.e.f. the date of publication in the official Gazette.

SCHEDULE - A

District (civil)	-	-	-	Kamrup
Subdivision (Civil)	-	-	-	Guwahati
Circle (Civil)	-	-	-	Palasbari
Mouza	-	-	-	Ramcharani
Forest Division	-	-	-	Guwahati Wildlife Division
Name of Sanctuary	-	-	-	Deepar Beel Wildlife Sanctuary
Area	:	-	-	4.1 Sq K.M.

SCHEDULE - B

The Deepar Beel Wildlife Sanctuary comprising of the area covered by Dag No. 194,673,399 and 55 of Mikirpara Chakard village of Palasbari circle as per following boundary description.

Reference point :- The Reference point is a tree angled permanent concrete pillar, demarcating the boundary of Deepar beel from revenue village and U.G.R.

East :- The demarcated boundary line runs from permanent triangular pillar NO 124 with the following distance and bearing.

From B.P. No.	1-2 at Bearing	126° at distance	21.00 mts
	2-3	146°	33.50 mts
	3-4	112°	20.00 mts
	4-5	82°	7.00 mts
	5-6	156°	16.00 mts
	6-7	110°	20.00 mts
	7-8	115°	15.00 mts

8-9	82°	8.00 mts
9-10	114°	11.00 mts
10-11	180°	5.00 mts
11-12	127°-30	8.00 mts
12-13	102°	6.00 mts
13-14	119°	31.00 mts
14-15	180°	2.00 mts
15-16	125°	13.00 mts
16-17	70°	8.00 mts
17-18	102°	20.00 mts
18-19	92°	5.00 mts
19-20	100°	13.00 mts
20-21	102°	18.00 mts
21-22	133°	16.00 mts
22-23	206°	61.00 mts

(The demarcated line runs eastward from B.P. No.1 to B.P No.23 excluding the dag No. 720, 726, 728, 729, 1243 and others of Dakhin Jalukbari revenues village and 1340 others of Tetelia revenue village).

South :- The demarcated boundary line runs from B.P No.23 to 103 towards West. The bearing and distance of the demarcated line as follows:-

From B.P. No.	Bearing	Distance	
23-24,		281°-30	17.00 mts.
24-25		180°	2.00 mts
25-26		278°-30	13.00 mts
26-27		269°-30	10.00 mts
27-28		317°	6.00 mts
28-29		369°	10.00 mts
29-30		289°	18.00 mts
30-31		206°-30	2.00 mts
31-32		305°	1.75 mts
32-33		15°	3.00 mts
33-34		287°	11.50 mts
34-35		213°	2.00 mts
35-36		285°-30	5.00 mts
36-37		200°	4.00 mts
37-38		269°	10.00 mts
38-39		200°	7.00 mts
39-40-41		276°	20.50 mts
40-41		247°	5.00 mts
41-42		290°-30	13.00 mts
42-43		321°	8.00 mts

43-44	225	8.00 mts
44-45	262°-30	4.50 mts
45-46	260°	16.00 mts
46-47	270	2.00 mts
47-48	310	4.00 mts
48-49	46-30	8.00 mts
49-50	9	6.00 mts
50-51	339	7.00 mts
51-52	309	9.50 mts.
52-53	360	8.00 mts
53-54	316	8.00 mts
54-55	299	18.00 mts
55-56	288	10.00 mts
56-57	319°-30	12.00 mts
57-58	274°	48.00 mts
58-59	24°	15.00 mts
59-60	331°	18.00 mts
60-61	306°	16.00 mts
61-62	216°	4.00 mts
62-63	297°-30	21.00 mts
63-64	209°	13.00 mts
64-65	180°	6.50 mts
65-66	159°	6.00 mts
66-67	203°	2.00 mts
67-68	170°	4.00 mts
68-69	221°	7.00 mts
69-70	187°	7.00 mts
70-71	145°	8.00 mts
71-72	84°	10.00 mts
72-73	215°	15.00 mts
73-74	141°	3.00 mts
74-75	243°	6.00 mts
75-76	202°-30	7.00 mts
76-77	131°-30	10.00 mts
77-78	113°	4.00 mts
78-79	92°-30	4.00 mts
79-80	74°-30	6.50 mts
80-81	34°	8.00 mts
81-82	135°-30	18.00 mts
82-83	291°-30	4.00 mts
83-84	247°-30	7.50 mts
84-85	278°	21.00 mts
85-86	260°	5.50 mts
86-87	221°-30	6.00 mts

87-88	216°	17.73 mts
88-89	267°	3.75 mts
89-90	216°	4.00 mts
90-91	274°	3.50 mts
91-92	227°	3.00 mts
92-93	188°	22.00 mts
93-94	267°-30	6.00 mts
94-95	202°-30	10.00 mts
95-96	132°	4.25 mts
96-97	27°	6.00 mts
97-98	292°-30	8.50 mts
98-99	360°	2.00 mts
99-100	309°	8.00 mts
100-101	283°-30	7.00 mts
101-102	260°-30	8.25 mts
102-103	269°	7.00 mts

(The following land under Dag No of revenue village have been excluded :-

Dag No. 1. - 1109, 1108, 1107, 1026, 1025, 1024, 1017, 1016, 1415, 1014, 1164, 1229, 1242, 1286, 990, 1209, 1289, 949, 1221, 948, 1212, 957, 940, 944, 948, 941, 940, 939, 698, 697, 696, 695, 624, 693, 205, 291, 203, 202, 201, 200, 199, 193, 197, 196, 195, 203, 299, 210, 211, 212, 688, 687, 686, 684, 633, 631, 1313, 677, 670, 674, 673, 671, 656, 665, 664, 655, 633, 662, 648, 645, 64, 1291, 537, 1213, 535, 533, 532, 515.

West :- The demarcated Western boundary line of Deepar Beel Wildlife Sanctuary then runs towards West from B.P. 103 to 124 with the following bearings and distance.

From B.P. No.	Bearing	Distance
103-104	5°	67.00 mts
104-105	40°	3.00 mts
105-106	326°	6.00 mts
106-107	40°	7.23 mts
107-108	335°	5.00 mts
108-109	55°	8.00 mts
109-110	300°	8.25 mts
110-111	70°	14.00 mts
111-112	321°	5.00 mts
112-113	288°	10.00 mts
113-114	12°	3.00 mts
114-115	92°-30	8.00 mts
115-116	340°-30	8.00 mts
116-117	158°-30	11.00 mts
117-118	97°-30	5.50 mts

118-119	258-30	6.00 mts
119-120	15°	16.00 mts
120-121	350°	8.00 mts
121-122	28°	20.00 mts
122-123	3518°	9.00 mts
123-124	316°	10.00 mts

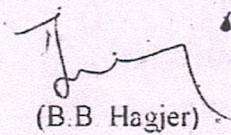
(The demarcated line excluded the revenue patta land of the following dag no. of revenue village of Remeharant mouza under Palashbari Circle.

Dag No. 1-25, 1351, 339, 340, 341, 342, 345, 349, 350, 1324, 1316, 1318, 1290, 1325.

North :- In the North demarcated line runs from temporary pillar No 124 to permanent triangular boundary pillar No. 1.

	<u>Degree</u>	<u>Distance</u>
124-125	93-30°	94.00 mts ✓
125-1 (Reference point)	80-30°	48.00 mts ✓

Thus the demarcated boundary line of the traverse is closed.

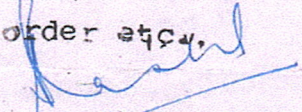


(B.B Hagjer)  
Commissioner & Secretary to Government of Assam  
Department of Environment and Forest  
Dispur, Guwahati-06

Memo No. FRM.140/2005/260-A. Dated Dispur, the 21st Feb'09

Copy to :-

1. The P.P.S. to Chief Minister, Assam, Dispur, Guwahati-6.
2. The P.S. to Minister, Environment & Forests etc., Assam, Dispur, Guwahati-6.
3. The Principal Chief Conservator of Forests, Assam, Guwahati-8.
4. The Principal Chief Conservator of Forests (Wildlife) Assam, Guwahati-8.
5. The Chief Conservator of Forests, Assam, .....
6. The Divisional Forests Officer, *wildlife Guwahati* .....
7. The Deputy Director, Assam Govt. Press, Samunimaidan, Ghy-21 for publication in the next issue of extra-ordinary Assam Gazette

By order etc.,  


Deputy Secy. to the Govt. of Assam,  
Environment and Forests Department.  
*man*

Statement of Elephant Movement at Deeparbeel from Rani and Garbhanga R.F under  
Kamrup East Division in between the regular path(dandi) of Mikirpara.

Months of July/2024

Date	Number of Elephant	Timing of Elephant to go down in Deeparbeel	Timing of Elephant to get up from Deeparbeel	Date of Elephant to get up from Deeparbeel	G.P.S. Coordinate down in Deeparbeel	G.P.S. Coordinate get up from Deeparbeel	Place
05/07/2024	1 No	7.50 P.M	5.00 A.M	06/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
06/07/2024	5 Nos	8.10 P.M	6.14 A.M	07/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
07/07/2024	15 Nos	9.15 P.M	5.00 A.M	08/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
08/07/2024	120 Nos	8.10 P.M	6.45 A.M	09/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
09/07/2024	1 No	8.12 P.M	9.45 A.M	10/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
27/07/2024	1 No	12.38 A.M	5.55 A.M	28/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara
28/07/2024	1 No	8.14 P.M	5.28 A.M	29/07/2024	N 26°06'25" E 91°37'57"	N 26°06'25" E 91°37'57"	Mikirpara

Submitted



(Dhaneswar Doley, AFS)

Range Forest Officer

DeeparBeel Wildlife Range.

Geetanagar, Guwahati-21

# Quick Status Evaluation of Deepor Beel Water Quality



**Submitted By:**

**Prof. Arup Kumar Sarma, Ph.D.**

**Prof. Ajay Kalamdhad, Ph.D.**

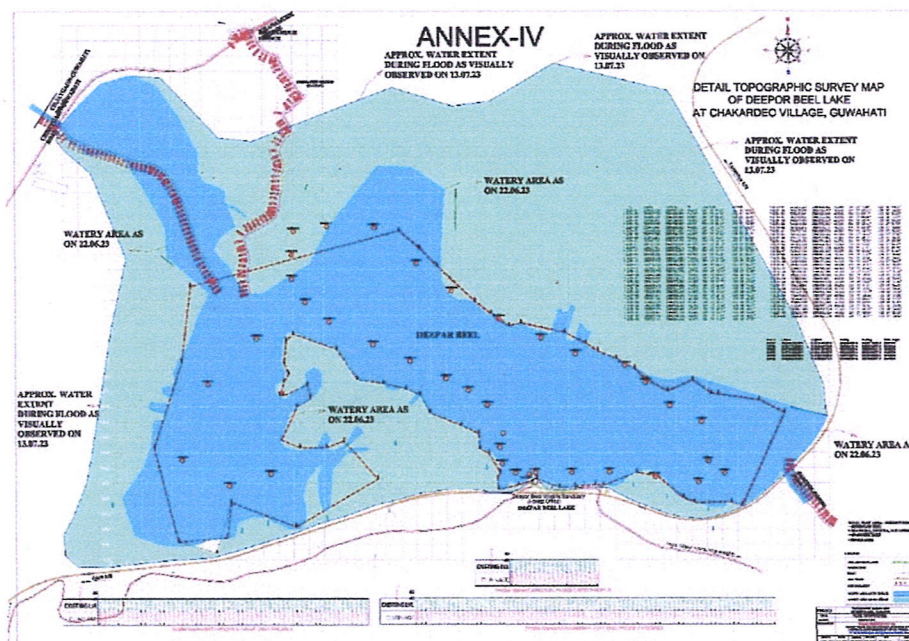
**Department of Civil Engineering**

**Indian Institute of Technology Guwahati**

**July 17, 2023**

<b>Consulting TEAM</b>	
<b>Name</b>	<b>Designation</b>
<b>Prof. Arup Kumar Sarma, Ph.D.</b>	<b>Professor (HAG)</b>
<b>Prof. Ajay Kalamdhad, Ph.D.</b>	<b>Professor</b>
<b>Dr. Ankit Pratim Goswami</b>	<b>Research Associate</b>
<b>Mr. Monish Goswami</b>	<b>Research Scholar</b>
<b>Mr. Bhaskar Jyoti Das</b>	<b>Junior Research Fellow</b>

## Study Area and Analysis of Samples



**Fig. 1. Sampling Sites of Deepor Beel**

The sampling for water samples from Deepor Beel was done on morning of 13<sup>th</sup> July 2023. A total of 38 samples, each of one litre, were collected from all accessible areas covering Deepor Beel. Sampling locations are shown in Figure. As south western part was not accessible because of excessive hyacinth growth 5 recent samples were included in the data. Analytical experiment conducted on site to test the samples are Dissolved Oxygen and Turbidity using portable instruments by ThermoFisher©. A total of 25 parameters were tested. After the samples were brought to the laboratory, the following analytical experiments were conducted: pH, Electric Conductivity, Alkalinity, Hardness, Biochemical Oxygen Demand, Chemical Oxygen Demand. To further study the quantity and nature of solids present in the samples of Deepor Beel, Total Dissolved Solids and Total Suspended Solids were analysed. To get an idea of the anions present in the samples the following elements or compounds were tested: Fluoride, Chloride, Nitrate, Phosphate, Ammonia. Furthermore, cations were also detected and quantified: Sodium, Potassium, Calcium, Iron. Experiments for detection of heavy metals was done for Lead, Copper, Cadmium, Manganese. The results of the sampling analysis are shown the tables 1 and table 2. Table 1 contains 12 parameters and table 2 contains rest of the 13 parameters. As the report is prepared in 3 days, as requested, BOD, is not provided. However, the same can be provided later. Georeferenced photographs taken during 13<sup>th</sup> July samplings are presented in the Annexure-1 for reference. Annexure-2 contains details of water quality index showing suitability of Deepor Beel water for drinking and survival of fish.

Table 1: Result of 12 Parameters

Sampling Date: 13/07/2023												
Sampling Number	DO (mg/L)	pH (mg/L)	EC (mg/L)	TURBIDITY (NTU)	ALKALINITY (mg/L)	HARDNESS (mg/L)	COD (mg/L)	TDS (mg/L)	TSS (mg/L)	F <sup>-</sup> (mg/L)	Cl <sup>-</sup> (mg/L)	NO <sub>3</sub> <sup>-</sup> (mg/L)
1	8.65	6.52	0.24	27.30	112.00	80.00	37.40	127.00	42.33	0.21	16.80	1.59
2	8.00	6.54	0.24	27.50	118.00	86.00	38.40	131.00	43.66	0.29	16.27	2.49
3	8.07	6.26	0.25	29.20	110.00	74.00	43.37	132.00	44	0.23	13.80	1.52
4	8.03	6.51	0.25	31.40	96.00	86.00	31.37	133.00	44.33	0.16	17.03	3.30
5	7.62	6.23	0.25	31.10	112.00	70.00	38.92	134.00	44.66	0.15	16.59	1.40
6	6.73	6.66	0.26	27.60	116.00	92.00	30.40	131.30	43.76	0.24	17.24	4.50
7	7.39	6.32	0.25	19.20	88.00	96.00	32.37	135.00	45	0.27	18.82	6.50
8	7.20	6.27	0.25	26.40	112.00	78.00	31.37	134.80	44.93	0.23	15.11	1.40
9	6.55	6.32	0.25	27.40	86.00	84.00	29.93	135.20	45.06	0.22	29.51	4.83
10	6.47	6.46	0.24	23.50	130.00	92.00	43.90	132.80	44.26	0.33	18.32	1.83
11	6.59	6.15	0.23	22.20	96.00	78.00	41.90	127.40	42.46	0.28	21.53	1.51
12	6.47	6.21	0.23	23.90	90.00	80.00	31.37	131.10	43.7	0.27	19.10	0.29
13	1.31	6.49	0.22	23.70	95.00	102.00	76.98	126.10	42.03	0.25	21.75	3.28
14	6.16	6.54	0.22	23.40	110.00	90.00	33.30	122.50	40.83	0.14	13.33	4.67
15	9.17	6.47	0.21	21.40	80.00	68.00	35.37	117.00	39	0.30	11.04	1.53
16	8.29	6.33	0.22	21.90	86.00	66.00	31.37	116.80	38.93	0.36	22.43	0.40
17	8.54	6.52	0.22	20.40	110.00	75.00	30.10	113.70	37.9	0.21	14.51	1.85
18	8.36	6.54	0.22	20.50	104.00	72.00	28.90	115.50	38.5	0.22	13.08	5.76
19	7.71	6.26	0.22	21.10	104.00	86.00	31.37	116.10	38.7	0.23	16.05	3.53
20	8.58	6.51	0.23	21.30	106.00	82.00	31.37	120.00	40	0.24	22.25	7.48
21	8.34	6.23	0.26	21.30	106.00	94.00	30.20	136.30	45.43	0.37	31.64	1.97
22	8.41	6.66	0.22	24.80	106.00	94.00	29.90	118.70	39.56	0.26	29.73	2.40
23	6.78	6.21	0.23	25.10	108.00	84.00	31.37	123.00	41	0.33	22.00	2.01

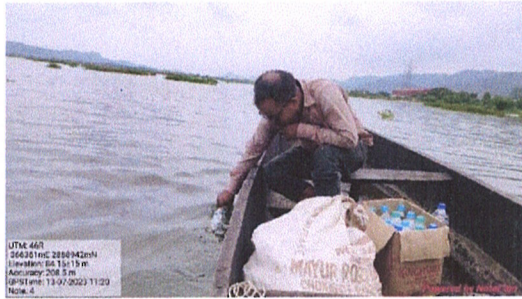
24	7.78	6.48	0.23	23.50	112.00	78.00	31.37	127.20	42.4	0.30	25.04	1.53
25	7.91	6.35	0.25	25.60	86.00	84.00	42.30	131.00	43.66	0.34	11.93	0.40
26	8.17	6.36	0.24	28.40	130.00	92.00	46.30	127.00	42.33	0.24	14.58	1.85
27	7.83	6.40	0.21	26.90	96.00	78.00	31.37	111.70	37.23	0.22	12.08	5.76
28	7.86	6.42	0.20	28.00	90.00	80.00	31.37	110.50	36.83	0.22	12.05	3.53
29	6.44	6.44	0.22	17.51	95.00	102.00	44.30	118.80	39.6	0.22	12.25	7.48
30	6.75	6.46	0.21	15.47	110.00	90.00	49.30	119.50	39.83	0.37	14.65	1.97
31	6.18	6.51	0.24	15.30	80.00	68.00	31.37	129.20	43.06	0.25	22.73	2.45
32	6.61	6.23	0.24	16.72	86.00	66.00	31.37	122.80	40.93	0.33	26.00	2.01
33	6.10	6.66	0.22	17.65	110.00	75.00	30.20	122.80	40.93	0.34	31.93	0.40
<b>Sampling Date: 06/06/2023</b>												
34	4.61	6.32	0.30	4.20	96.00	78.00	62.75	560.00	350.00	0.27	17.53	1.52
35	3.36	6.27	0.31	2.50	90.00	80.00	62.75	580.00	190.00	0.26	17.14	0.30
36	3.56	6.32	0.30	3.50	95.00	102.00	62.75	570.00	250.00	0.26	20.75	10.29
37	8.70	6.46	0.23	1.10	110.00	90.00	31.37	510.00	260.00	0.19	13.34	4.68
38	1.28	6.15	0.32	3.60	80.00	68.00	94.12	700.00	220.00	0.31	21.05	1.53

**Table 1: Result of Rest of 13 Parameters**

Sampling Date: 13/07/2023												
Sampling Number	PO <sub>4</sub> <sup>3-</sup> (mg/L)	SO <sub>4</sub> <sup>2-</sup> (mg/L)	Na <sup>+</sup> (mg/L)	K <sup>+</sup> (mg/L)	Ca <sup>2+</sup> (mg/L)	Mg <sup>+2</sup> (mg/L)	Cd (mg/L)	Fe (mg/L)	Mn (mg/L)	Cu (mg/L)	Pb (mg/L)	NH <sub>3</sub> <sup>-</sup> (mg/L)
1	3.32	6.46	23.44	6.15	51.38	5.321	0.007	0.28	0.16	0.57	0.01	0.37
2	3.47	7.8	27.73	7.266	43.27	6.800	0.008	0.57	0.37	0.65	0.02	0.41
3	3.00	11.95	21.00	5.64	43.37	6.416	0.007	0.48	0.20	0.60	0.01	0.41
4	2.00	8.97	20.70	9.139	59.36	6.565	0.007	0.52	0.31	0.63	0.01	0.42
5	2.90	12.73	17.45	4.99	39.81	6.231	0.007	0.35	0.18	0.59	0.01	0.95
6	3.78	16.23	27.30	6.839	58.44	5.233	0.007	0.15	0.12	0.57	0.01	0.54
7	2.46	16.69	32.37	9.546	47.15	7.031	0.008	0.42	0.42	0.71	0.02	1.38
8	2.48	12.26	16.85	5.702	48.45	5.579	0.007	0.34	0.18	0.58	0.01	0.70
9	4.32	15.54	23.96	8.02	54.01	7.238	0.008	0.44	0.51	0.73	0.03	0.54
10	3.35	18.33	27.38	8.213	58.55	6.909	0.008	0.56	0.39	0.66	0.02	1.04
11	3.82	17.15	23.98	10.12	46.95	6.929	0.008	0.43	0.41	0.68	0.02	0.37
12	3.11	13.51	24.46	8.51	49.77	7.198	0.008	0.35	0.49	0.73	0.03	0.36
13	3.16	15.6	34.64	10.02	54.24	7.077	0.008	0.39	0.43	0.73	0.02	0.34
14	3.00	12.74	25.35	8.438	43.81	6.423	0.007	0.53	0.21	0.61	0.01	0.60
15	3.51	12.65	15.24	11.37	38.80	7.534	0.014	0.52	0.57	0.59	0.03	0.94
16	3.56	11.43	32.82	12.30	36.39	7.482	0.008	0.38	0.53	0.74	0.03	0.93
17	3.70	5.658	19.40	5.5	43.78	6.391	0.007	0.42	0.19	0.59	0.01	0.54
18	2.78	5.859	26.97	7.913	42.32	6.733	0.008	0.43	0.36	0.64	0.02	0.47
19	3.40	8.530	26.13	7.84	42.82	6.654	0.007	0.47	0.34	0.63	0.02	0.53
20	4.04	14.29	25.56	8.393	52.63	6.528	0.007	0.54	0.29	0.62	0.01	0.47
21	2.55	17.68	26.86	10.51	49.56	6.454	0.007	0.24	0.28	0.62	0.01	0.93
22	3.08	8.789	27.67	14.6	51.90	6.451	0.007	0.10	0.26	0.62	0.01	0.87
23	2.55	6.500	29.84	11.13	54.59	6.432	0.007	0.43	0.24	0.62	0.01	0.66

24	3.51	12.65	15.24	11.37	38.80	7.031	0.008	0.51	0.42	0.71	0.02	1.38
25	3.59	13.43	22.82	10.30	36.39	5.579	0.007	0.34	0.18	0.58	0.01	0.70
26	3.70	5.658	19.40	5.5	43.78	7.238	0.008	0.44	0.51	0.73	0.03	0.54
27	2.78	5.859	26.97	7.913	42.32	6.909	0.008	0.50	0.39	0.66	0.02	1.04
28	3.40	8.530	26.13	7.84	42.82	6.929	0.008	0.52	0.41	0.68	0.02	0.37
29	4.04	14.29	25.56	8.393	52.63	7.198	0.008	0.55	0.49	0.73	0.03	0.36
30	2.55	17.68	26.86	12.51	59.56	7.077	0.008	0.34	0.43	0.73	0.02	0.34
31	3.08	8.789	27.67	14.6	41.90	6.423	0.007	0.53	0.21	0.61	0.01	0.60
32	2.55	6.500	19.84	16.13	54.59	7.534	0.014	0.42	0.57	0.59	0.03	0.94
33	3.59	8.43	32.82	12.30	36.39	5.579	0.007	0.34	0.18	0.58	0.01	0.70
<b>Sampling Date: 06/06/2023</b>												
34	3.85	17.16	23.99	10.12	46.96	5.60	0.07	0.01	0.83	0.42	0.68	0.03
35	3.12	13.51	24.47	8.51	49.77	5.60	0.08	0.01	0.85	0.50	0.74	0.03
36	3.16	15.60	34.65	10.03	94.25	5.60	0.07	0.01	0.84	0.44	0.74	0.03
37	3.01	20.75	25.36	8.44	73.82	8.40	0.05	0.01	0.53	0.21	0.61	0.02
38	3.51	12.65	15.25	11.37	38.81	11.20	0.07	0.01	0.93	0.58	0.60	0.03

# Annexure - I







**Annexure – II**

Water quality of rivers, lakes, estuaries as well as groundwater are established based on the drinking water quality standards provided by BIS (IS 10500: 2012). This code in turn can be used to develop water quality index (WQI) based on different techniques which is used to evaluate the quality of water of different sources that can be used for different purposes like drinking water, irrigation etc. In this analysis, entropy based WQI (EWQI) is used to evaluate the status of Deepor Beel in the month of July 2023. Fig II.1 show IS 10500: 2012 from which drinking water quality standards of different parameters to evaluate the EWQI.

Also, regarding fish survival in contaminated water, there is a recommendation of minimum 4 mg/L of dissolved oxygen (DO) (Garcia et. al, 2023). As can be observed from such results, most of the sites were having DO values greater than the minimum value, only 13, 35, 36 and 38 were found unsuitable for fish life.

**Table II.1.** Water quality scale for EWQI

<b>EWQI</b>	<b>Water Quality</b>
< 50	Excellent
50-100	Good
100-150	Average
150-200	Poor
>200	Extremely poor

**Table II.2.** EWQI values for the different Sites in Deepor Beel.

<b>Sampling Sites</b>	<b>EWQI</b>	<b>Sampling Sites</b>	<b>EWQI</b>
1	133.7408	21	141.8213
2	166.6663	22	144.7679
3	143.0066	23	147.2432
4	158.3577	24	171.7776
5	139.7408	25	136.2593
6	133.2905	26	184.4225
7	165.8721	27	165.8299
8	135.5142	28	170.1363
9	185.7671	29	177.5637
10	167.4642	30	166.5894
11	164.6508	31	137.2882
12	178.777	32	177.0756
13	176.922	33	132.0682
14	143.2917	34	576.6044
15	178.8137	35	629.3776
16	181.1265	36	618.3458
17	131.705	37	473.0995
18	154.7757	38	568.7001
19	151.8972		
20	146.4885		

*Indian Standard*  
**DRINKING WATER — SPECIFICATION**  
*( Second Revision )*

**1 SCOPE**

This standard prescribes the requirements and the methods of sampling and test for drinking water.

**2 REFERENCES**

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

**3 TERMINOLOGY**

For the purpose of this standard the following definition shall apply.

**3.1 Drinking Water** — Drinking water is water intended for human consumption for drinking and cooking purposes from any source. It includes water (treated or untreated) supplied by any means for human consumption.

**4 REQUIREMENTS**

Drinking water shall comply with the requirements given in Tables 1 to 4. The analysis of pesticide residues given in Table 3 shall be conducted by a recognized laboratory using internationally established test method meeting the residue limits as given in Table 5.

Drinking water shall also comply with bacteriological requirements (*see 4.1*), virological requirements (*see 4.2*) and biological requirements (*see 4.3*).

**4.1 Bacteriological Requirements**

**4.1.1 Water in Distribution System**

Ideally, all samples taken from the distribution system including consumers' premises, should be free from coliform organisms and the following bacteriological quality of drinking water collected in the distribution system, as given in Table 6 is, therefore specified when tested in accordance with IS 1622.

**4.2 Virological Requirements**

**4.2.1** Ideally, all samples taken from the distribution

**Table 1 Organoleptic and Physical Parameters**  
*(Foreword and Clause 4)*

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units, <i>Max</i>	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	pH value	6.5-8.5	No relaxation	Part 11	—
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU, <i>Max</i>	1	5	Part 10	—
vi)	Total dissolved solids, mg/l, <i>Max</i>	500	2 000	Part 16	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

IS 10500 : 2012

**Table 2 General Parameters Concerning Substances Undesirable in Excessive Amounts**  
(Foreword and Clause 4)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, <i>Max</i>	0.03	0.2	IS 3025 (Part 55)	—
ii)	Ammonia (as total ammonia-N), mg/l, <i>Max</i>	0.5	No relaxation	IS 3025 (Part 34)	—
iii)	Anionic detergents (as MBAS) mg/l, <i>Max</i>	0.2	1.0	Annex K of IS 13428	—
iv)	Barium (as Ba), mg/l, <i>Max</i>	0.7	No relaxation	Annex F of IS 13428 <sup>a</sup> or IS 15302	—
v)	Boron (as B), mg/l, <i>Max</i>	0.5	1.0	IS 3025 (Part 57)	—
vi)	Calcium (as Ca), mg/l, <i>Max</i>	75	200	IS 3025 (Part 40)	—
vii)	Chloramines (as Cl <sub>2</sub> ), mg/l, <i>Max</i>	4.0	No relaxation	IS 3025 (Part 26) <sup>a</sup> or APHA 4500-Cl G	—
viii)	Chloride (as Cl), mg/l, <i>Max</i>	250	1 000	IS 3025 (Part 32)	—
ix)	Copper (as Cu), mg/l, <i>Max</i>	0.05	1.5	IS 3025 (Part 42)	—
x)	Fluoride (as F) mg/l, <i>Max</i>	1.0	1.5	IS 3025 (Part 60)	—
xi)	Free residual chlorine, mg/l, <i>Min</i>	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, <i>Max</i>	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xiii)	Magnesium (as Mg), mg/l, <i>Max</i>	30	100	IS 3025 (Part 46)	—
xiv)	Manganese (as Mn), mg/l, <i>Max</i>	0.1	0.3	IS 3025 (Part 59)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, <i>Max</i>	0.5	No relaxation	Clause 6 of IS 3025 (Part 39) Infrared partition method	—
xvi)	Nitrate (as NO <sub>3</sub> ), mg/l, <i>Max</i>	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, <i>Max</i>	0.001	0.002	IS 3025 (Part 43)	—
xviii)	Selenium (as Se), mg/l, <i>Max</i>	0.01	No relaxation	IS 3025 (Part 56) or IS 15303 <sup>a</sup>	—
xix)	Silver (as Ag), mg/l, <i>Max</i>	0.1	No relaxation	Annex J of IS 13428	—
xx)	Sulphate (as SO <sub>4</sub> ) mg/l, <i>Max</i>	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H <sub>2</sub> S), mg/l, <i>Max</i>	0.05	No relaxation	IS 3025 (Part 29)	—
xxii)	Total alkalinity as calcium carbonate, mg/l, <i>Max</i>	200	600	IS 3025 (Part 23)	—
xxiii)	Total hardness (as CaCO <sub>3</sub> ), mg/l, <i>Max</i>	200	600	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, <i>Max</i>	5	15	IS 3025 (Part 49)	—

**NOTES**

1 In case of dispute, the method indicated by <sup>a</sup> shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

**Table 3 Parameters Concerning Toxic Substances**  
(Foreword and Clause 4)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Cadmium (as Cd), mg/l, Max	0.003	No relaxation	IS 3025 (Part 41)	—
ii)	Cyanide (as CN), mg/l, Max	0.05	No relaxation	IS 3025 (Part 27)	—
iii)	Lead (as Pb), mg/l, Max	0.01	No relaxation	IS 3025 (Part 47)	—
iv)	Mercury (as Hg), mg/l, Max	0.001	No relaxation	IS 3025 (Part 48)/ Mercury analyser	—
v)	Molybdenum (as Mo), mg/l, Max	0.07	No relaxation	IS 3025 (Part 2)	—
vi)	Nickel (as Ni), mg/l, Max	0.02	No relaxation	IS 3025 (Part 54)	—
vii)	Pesticides, µg/l, Max	See Table 5	No relaxation	See Table 5	—
viii)	Polychlorinated biphenyls, mg/l, Max	0.000 5	No relaxation	ASTM 5175*	—
ix)	Polynuclear aromatic hydrocarbons (as PAH), mg/l, Max	0.000 1	No relaxation	APHA 6440	or APHA 6630
x)	Total arsenic (as As), mg/l, Max	0.01	0.05	IS 3025 (Part 37)	—
xi)	Total chromium (as Cr), mg/l, Max	0.05	No relaxation	IS 3025 (Part 52)	—
xii)	Trihalomethanes:				
a)	Bromoform, mg/l, Max	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
b)	Dibromochloromethane, mg/l, Max	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
c)	Bromodichloromethane, mg/l, Max	0.06	No relaxation	ASTM D 3973-85* or APHA 6232	—
d)	Chloroform, mg/l, Max	0.2	No relaxation	ASTM D 3973-85* or APHA 6232	—

**NOTES**

1 In case of dispute, the method indicated by "\*" shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

**Table 4 Parameters Concerning Radioactive Substances**  
(Foreword and Clause 4)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 14194	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Radioactive materials:				
a)	Alpha emitters Bq/l, Max	0.1	No relaxation	Part 2	—
b)	Beta emitters Bq/l, Max	1.0	No relaxation	Part 1	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

**Fig II.1: IS 10500: 2012 Standard Values**

## Reference

García, A., Araúz, D., Martínez, E., & Molino, J. (2023). Environmental characterization of the estuarine zone of the Gulf of Montijo, province of Veraguas, Panama. *PLoS One*, 18(6), e0283606.