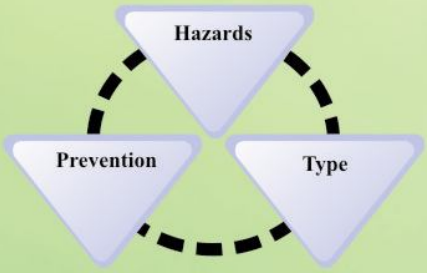
ENVIS Newsletter

Water Quality of Kumaon Rivers



जहाँ है हरियाली।
वहीं है खुशहाली।।

Editorial & Technical Support

JAI RAJ
Member Secretary,
UEPPCB

AMARJEET SINGH
EO
Project Coordinator,
ENVIS Centre, UEPPCB

ANKUR KANSAL
Assistant Envt. Officer
UEPPCB

NIHARIKA DIMRI
Information Officer
ENVIS Centre, UEPPCB

ENVIS CENTRE, UEPPCB, Dehradun.
E-mail: info@envis-ueppcb Website : www.envis-ueppcb.org

INTRODUCTION

Water is the most precious resource essential to sustain the life on earth. Rapid industrialization and urban development results in inclusion of variety of pollutants into rivers including heavy metals having geological origin and entry into river bodies by weathering and erosion and due to anthropogenic activities like mining, discharge of industrial and domestic effluent. Anthropogenic activities like mining, disposal of treated and untreated toxic waste, and metal chelates from different industries resulted in deterioration of water quality rendering serious environmental problems. Discharge of heavy metals with industrial effluent of pulp and paper mills and Distilleries were also reported. Inadequate urban sanitary infrastructure, lack of formulation of plans, and effective implementation of necessary pollution control measures are making the situation worse. Due to rapid industrialization and flow of urban population in past few years is suspected to deterioration of water quality of ecologically rich Himalayan State of India namely Uttarakhand. There have been several studies on water quality monitoring of rivers flowing through Uttarakhand.

The State of Uttarakhand borders Tibet on north, Nepal on east, and the states of Himachal Pradesh and Uttar Pradesh in west and south respectively. Uttarakhand lies between geo-coordinates from 30019'48" N to 7803'36" E. Uttarakhand has geographical area of 53566 Sq Km. Out of the total area, about 85% is hilly/forest/glacier area and remaining 15% area is burdened with most of the commercial activities. The whole state of Uttarakhand is divided into two geographical areas namely Garhwal and Kumaon area. Garhwal area is nourished by river Ganga, Yamuna and Tons, while the river Kosi, Ramganga, Gola etc. are flowing through Kumaon area. Almost all the water bodies of Kumaon region, presented in this newsletter, are of non-glacier origin and mainly seasonal rivers. This newsletter is presented with an objective to access water quality of Himalayan rivers flowing trough Uttarakhand which carries industrial and domestic effluent. Most of the rivers of Kumaon area are part of Ramganga River System.

1.1 The Ramganga System:

Ramganga System is a part of Himalayan rivers. A number of small streams originating from the Chorkhaldhar and the Khankarkhet ridges of the Dudhatoli range from the upper tip-tributaries of the Ramganga. As soon as it flows eastward from Mahalchauri, the river reaches in the Almora district and draining through Chaukhutiya, Masi and Bhikiyasain, it again enters the district of Garhwal, a little ahead of Dewal. The Mandal, largest Siwalik river of the eastern Garhwal, meets the Ramganga at Loharchaur and a little below the Palain Nadi traversing through the Patali dun, meets the Ramganga at Buksar. Maon it enters the Bhabar area at Kalagarh and further drains the Bijnor district.

1.2 Industrialization & Urbanization :

Industrialization & Urbanization play a vital role in growth and development of any country. This rapid industrialization is also having a direct and indirect adverse effect on our environment. Industrial development manifested due to setting up of new industries or expansion of existing industrial establishments resulted in the generation of industrial effluents, specially small scale cottage industries which discharge untreated effluents cause air, water, soil and solid waste pollution.

2.0 SCOPE OF THE PRESENT NEWSLETTER :

To present the river water quality of Dhella, Bhella and Kosi and also to present the pollution load due to effluent discharge into these river.

3.0 DATA COLLECTION:

Data of River water quality, Industrial Discharge Effluent characteristics have been collected from the Board and compiled for various output.

4.0 SIGNIFICANCE OF ANALYTICAL PARAMETER

pH : is a measure of the acidity or basicity of an aqueous solution.[1] Pure water is said to be neutral, with a pH close to 7.0 at 25 °C (77 °F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline.

Biological oxygen demand (BOD) : is expressed as weight of oxygen consumed per unit volume of water during a defined period of time at a defined temperature.

Total dissolved solids (TDS) : is the measure of total inorganic salts and other substances that are dissolved in water.

Total suspended solids (TSS) : are the portion of solids that usually remains on the filter paper. Suspended solids consist of silt, clay, fine particles of organic and inorganic matter, which is regarded as a type of pollution because water high in concentration of suspended solid may adversely affect growth and reproduction rates of aquatic fauna and flora.

Electrical conductivity (EC) : is the measure of the ability of an aqueous solution to convey an electric current. This ability depends upon the presence of ions, their total concentration, mobility, valence and temperature.

5.0 Industrial Pollution Load

Industrial Effluent Discharge is shown in Table 1, 2 & 3 respectively.

Table 1

S.No.	Name of Industry	Effluent Qty KLd
River Kosi		
1	Cheema Paper Mills Ltd., (Board Division), Kashipur	5000
2	Multiwal Pulp and Board Kashipur	10,000
3	India Glycol Ltd., Kashipur	4000
4	Multiwal Duplex, Kashipur	2500
Total Effluent Discharge		**21,500**

Table 2

S.No.	Name of Industry	Effluent Qty KLd
River Dhella		
1.	Naini Paper Mills , Kashipur	6500
2.	Naini Tissue Ltd., Kashipur	6600
3.	Bahal Paper Mill, Kashipur	6000
4.	Katyani Paper Mill, Jaspur Road, Kashipur	3000
5.	Fiber MarxPaper Ltd., Jaspur	5500
6.	Shree Shyam Pulp & Board Mills (unit-2), Kashipur	4000
7.	Siddarth Paper, Unit-2, Kashipur	6500
8.	Vishvanath Paper Mills, Jaspur	5000
9.	Prolofic Paper (P) Ltd., Kashipur	3000
10.	Siddarth Paper Mill, Kashipur	3600
11.	Siddeshwari Paper Mills Kashipur	3800
Total Effluent Discharge		**53,500**

Table 3

S.No.	Name of Industry	Effluent Qty KLd
River Bahella		
1.	Goaraya Straw Board Mills ,	1500
2.	Vishwakarma Paper & Board Mills,	3000
3.	Banwari Paper Mills , Kashipur	3500
4.	DSM Sugar (Kashipur Sugar Ltd.), Kashipur	1000
Total Effluent Discharge		**9000**

6.0 RIVER WATER QUALITY:

pH:

Data has being compiled since April, 07 to March, 10 is presented in Table 4, 5 & 6 for River Kosi, Dhella & Bhella. The pH of the Kosi River ranged from 7.31 to 7.80 , River Dhella ranged from 6.67 to 7.62, River Bahella ranged from 6.51 to 7.44. The temporial variation of pH is shown in figure 1, 2 & 3. Minimum value of pH in River Kosi is in July, 07 and August, 08 River Dhella in May, 07 & River Bhella in June, 08 whereas maximum value of pH in River Kosi in June, 09 ; River Dhella in April, 08; River Bhella in Feb, 08. All values of pH are found within the prescribed limit.

Dissolved Oxygen (DO) :

Temporial variation of DO during April 2007 to March 2010 in river Kosi, Dehla and Bhela is presented in figure 4, 5 & 6 respectively. DO in River Kosi varies from 3.4 mg/l to 7.2 mg/l with average value 4.8 mg/l. It is interesting to mention here that D.O. is always found nill in River Dhella except Jan, 08 and August, 08 which itself 1.8 mg/l and 1.6 mg/l. DO in River Bhella is also found nil at all occasion except in November 2007 and January 2008. This is showing overall very poor quality of the river in terms of Dissolved Oxygen. Deficit in DO level may be due to heavy industrial effluent, untreated sewage, lest natural water in rivers and dead river ecosystem. Due to these conditions Aquatic Ecosystem is no more in the river and river needs immediate remediation plan for its survival. While comparing the water quality of rivers in terms of Dissolved Oxygen with the Primary Water Quality Criteria as prescribed under Environment (Protection) Rules, 1986, water quality or river Kosi is found to be fall in SW-II where the water is suitable for bathing, contact water sports and commercial fishing. However river Dhela and Bhela with no Dissolved oxygen can not be put any category.

Electrical conductivity:

Variation in EC is shown in fig. 7, 8 & 9. EC in River Kosi ranged from 410 to 730 (µmhos/cm). It is found minimum in Aug, 07 & 08 and maximum in June, 07. EC in River Dhella ranged from 560 to 1840 (µmhos/cm). It is found minimum in Aug, 07 and maximum in June, 09. EC in River Bahella ranged from 490 to 1750 (µmhos/cm). It is found minimum in Nov, 07 & Jan, 08 and maximum in July, 09. Water Quality is found suitable for irrigation purpose.

Total dissolved solids (TDS) :

Variation in TDS is shown in fig. 10, 11 & 12 respectively. TDS in River Kosi ranged from 287 to 504. Value of TDS is found nill in Nov, 08 and maximum in Jun, 07. TDS in River Dhella ranged from 438 to 1191. It is minimum in Aug, 07 and maximum in July, 07. TDS in River Bahella ranged from 337 to 1660. It is minimum in Apr, 09 and maximum in May, 07 .

Biological Oxygen Demand (BOD):

BOD values during April 2007 to March 2010 are presented in table 4, 5, 6 respectively. The BOD values in River Kosi is found from 2.2 mg/l to 7.2 mg/ L, with minimum value in Nov, 08 and maximum in Nov, 09. Whereas BOD in River Dhella is found ranged from 13.0 to 110.0 mg/ L, and is minimum in Jan, 08 and maximum in June, 09 and Aug., 09. BOD in River Bahella ranged from 16.0 to 120.0 mg/ L, and is minimum in Aug., 07 and maximum in July, 09 . showing overall very poor quality of the river. Graphical representation is shown in figure 13, 14 & 15.

Table 4

Water quality characteristics of River Kosi (Driyal Bridge)

S No	Months	Colour	Odour	pH	E Conductance (µmhos/cm)	T D S (mg/L)	D O (mg/L)	B O D (mg/L)
1	Apr, 07	Colourless	Odourless	7.42	590	407	6.4	6.8
2	May, 07	Colourless	Odourless	7.33	570	482	5.2	6.0
3	Jun, 07	Colourless	Odourless	7.62	730	504	6.2	4.8
4	July, 07	Muddy	Odourless	7.31	460	326	3.4	6.8
5	Aug, 07	Muddy	Odourless	7.58	410	303	4.2	5.6
6	Sept, 07	Colourless	Odourless	7.46	540	411	5.8	4.4
7	Oct, 07	Colourless	Odourless	7.33	570	426	5.4	6.0
8	Nov, 07	Colourless	Odourless	7.61	480	371	5.8	5.2
9	Dec, 07	Colourless	Odourless	7.66	490	378	5.0	5.6
10	Jan, 08	Colourless	Odourless	7.59	480	321	8.4	2.2
11	Mar, 08	Colourless	Odourless	7.66	510	367	6.0	4.4
12	Apr, 08	Colourless	Odourless	7.46	570	432	6.6	4.0
13	May, 08	Colourless	Odourless	7.40	620	467	6.2	4.4
14	June, 08	Colourless	Odourless	7.46	490	349	5.2	3.8
15	July, 08	Colourless	Odourless	7.42	450	314	4.4	4.0
16	Aug ,08	Muddy	Odourless	7.31	410	287	7.4	3.6
17	Sep, 08	Colourless	Odourless	7.53	440	307	6.4	3.2
18	Oct, 08	Colourless	Odourless	7.49	430	298	6.8	3.0
19	Nov, 08	Colourless	Odourless	7.68	430	-	6.8	0.0
20	Apr, 09	Colourless	Odourless	7.52	580	417	3.2	4.8
21	May, 09	Colourless	Odourless	7.32	570	421	6.6	4.0
22	June, 09	Colourless	Odourless	7.80	550	397	5.8	4.4
23	July, 09	Colourless	Odourless	7.51	490	373	6.4	3.6
24	Aug, 09	Colourless	Odourless	7.64	450	312	5.4	3.2
25	Sep, 09	Muddy	Odourless	7.46	460	317	3.4	6.0

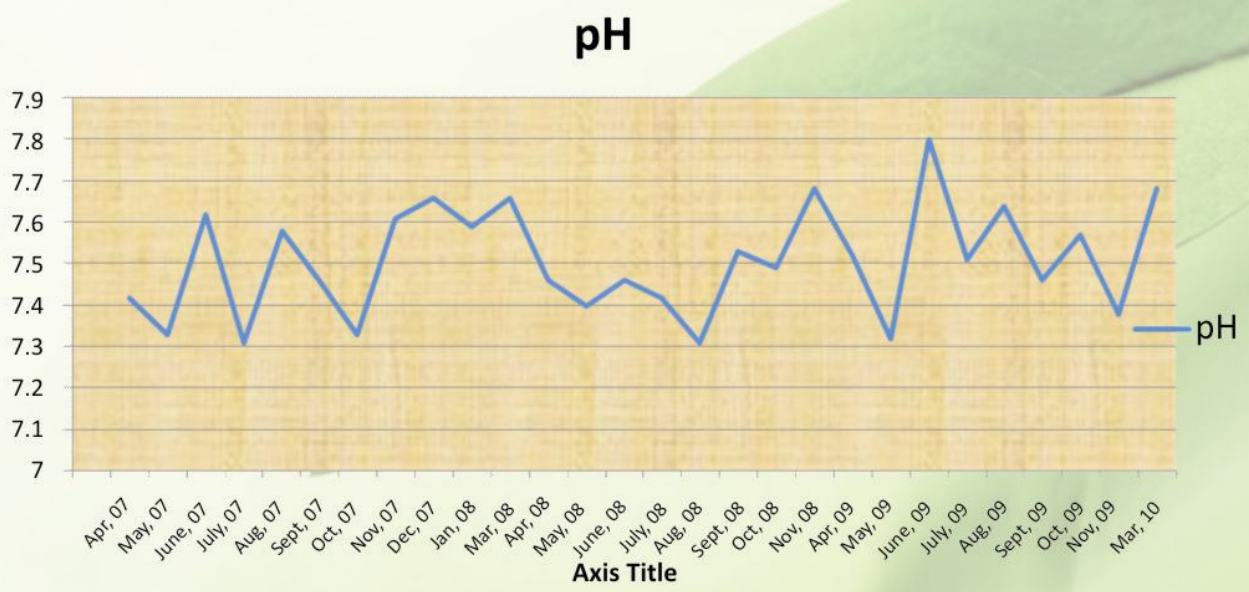
Table 5

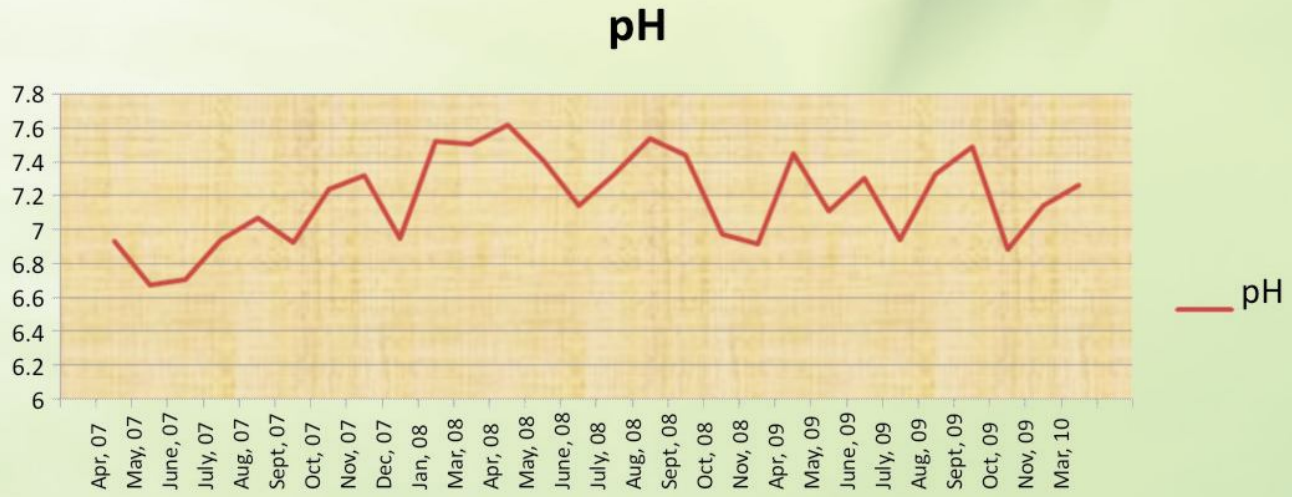
Water quality characteristics of River Dhella (Ganeshpur)								
S No	Months	Colour	Odour	pH	E Conductance (µmhos/cm)	T D S (mg/L)	D O (mg/L)	B O D (mg/L)
1	Apr, 07	Yellowish	Odourless	6.93	1260	935	0.0	60.0
2	May, 07	Yellowish	Odourless	6.67	1320	947	0.0	56.0
3	June,07	Yellowish	Odourless	6.70	1400	984	0.0	48.0
4	July, 07	Yellowish	Odourless	6.94	1610	1191	0.0	64.0
5	Aug, 07	Muddy	Odourless	7.07	560	438	0.0	14.0
6	Sep, 07	Turbid	Odourless	6.92	750	564	0.0	38.0
7	Oct, 07	Blackish	Odourless	7.24	940	661	0.0	56.0
8	Nov, 07	Turbid	Odourless	7.32	720	549	0.0	28.0
9	Dec,07	Blackish	Odourless	6.95	880	656	0.0	52.0
10	Jan, 08	Turbid	Odourless	7.52	680	461	1.8	13.0
11	Mar, 08	Brown	Odourless	7.51	1340	958	0.0	84.0
12	Apr, 08	Brownish	Odourless	7.62	1470	1019	0.0	92.0
13	May, 08	Brownish	Odourless	7.41	1220	919	0.0	84.0
14	June, 08	Yellowish	Odourless	7.14	1320	962	0.0	56.0
15	July, 08	Muddy	Odourless	7.33	1010	663	0.0	44.0
16	Aug, 08	Muddy	Odourless	7.54	800	564	1.6	20.0
17	Sep, 08	Yellowish	Odourless	7.44	960	648	0.0	36.0
18	Oct, 08	Yellowish	Odourless	6.97	890	636	0.0	64.0
19	Nov, 08	Brownish	Odourless	6.91	710	549	0.0	56.0
20	Apr, 09	Brownish	Odourless	7.45	1390	1043	0.0	88
21	May, 09	Brownish	Odourless	7.11	1440	1127	0.0	92
22	June, 09	Brownish	Unpleasent	7.30	1840	1378	0.0	110
23	July, 09	Brownish	Unpleasent	6.94	1430	1029	0.0	96
24	Aug, 09	Brownish	Odourless	7.33	1090	781	0.0	110
25	Sep, 09	Brownish	Odourless	7.49	1110	784	0.0	84
26	Oct, 09	Brownish	Odourless	6.88	1510	1086	0.0	100
27	Nov, 09	Brownish	Odourless	7.14	990	713	0.0	68
28	Mar,10	Brownish	Odourless	7.26	1310	959	0.0	56

Table 6

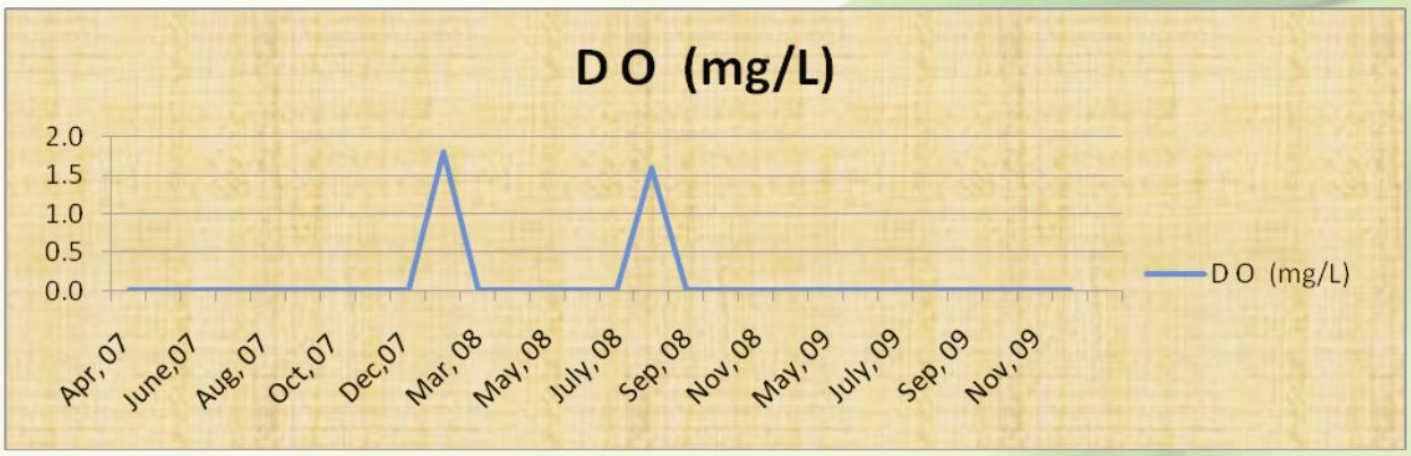
Water quality characteristics of River Bahella (Bazpur Road)

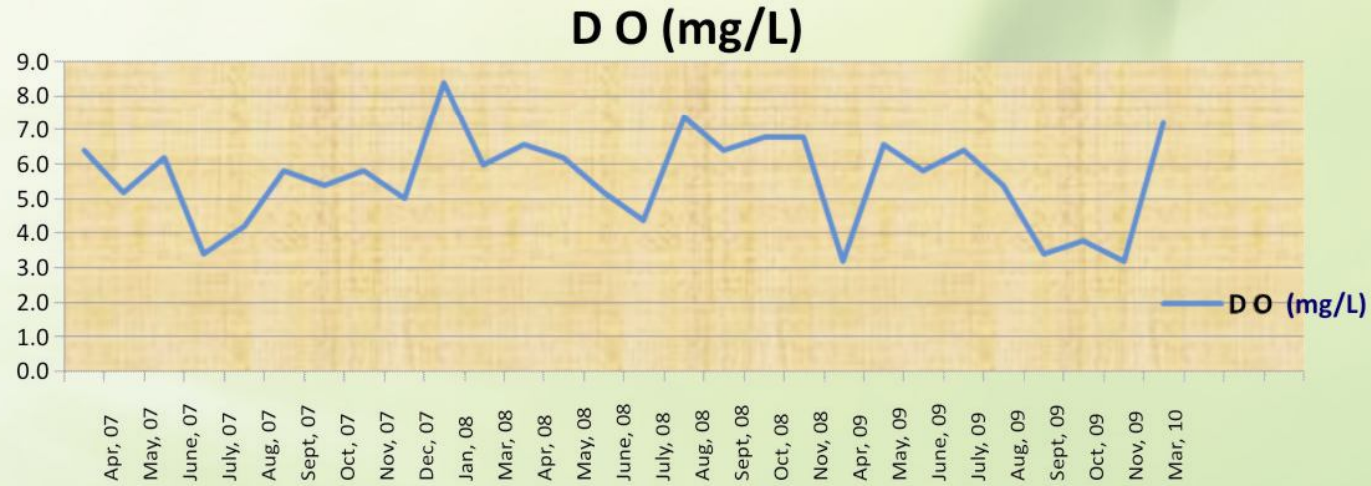
S No	Months	Colour	Odour	pH	E Conductance (µmhos/cm)	T D S (mg/L)	D O (mg/L)	B O D (mg/L)
1	Apr, 07	Brownish	Odourless	6.72	1510	1146	0.0	96.0
2	May, 07	Brownish	Odourless	6.56	1660	1660	0.0	80.0
3	June, 07	Yellowish	Odourless	6.74	1680	1186	0.0	78.0
4	July, 07	Turbid	Odourless	6.86	880	713	0.0	60.0
5	Aug, 07	Turbid	Odourless	6.98	520	379	1.0	16.0
6	Sep, 07	Yellowish	Odourless	7.16	680	527	0.0	46.0
7	Oct, 07	Yellowish	Odourless	7.06	650	521	0.0	36.0
8	Nov, 07	Turbid	Odourless	7.11	490	366	1.8	20.0
9	Dec, 07	Brownish	Odourless	7.14	910	704	0.0	68.0
10	Jan, 08	Turbid	Odourless	7.38	490	349	0.6	19.0
11	Feb, 08	Yellowish	Odourless	7.44	660	476	0.0	54.0
12	Mar, 08	Brownish	Odourless	7.19	1480	1061	0.0	96.0
13	Apr, 08	Brownish	Odourless	7.10	980	694	0.0	68.0
14	May, 08	Brownish	Odourless	7.06	1010	727	0.0	72.0
15	June, 08	Brownish	Odourless	6.86	1470	1061	0.0	64.0
16	July, 08	Turbid	Odourless	6.51	830	518	0.0	48.0
17	Aug, 08	Muddy	Odourless	7.09	710	497	0.0	26.0
18	Sep, 08	Turbid	Odourless	6.90	790	559	0.0	32.0
19	Oct, 08	Brownish	Odourless	7.22	1010	701	0.0	36.0
20	Nov, 08	Turbid	Odourless	7.06	590	473	0.0	32.0
21	Apr,09	Brownish	Odourless	6.88	1080	337	0.0	64
22	May,09	Brownish	Odourless	6.95	1140	889	0.0	60
23	June,09	Brownish	Unpleasent	7.09	1390	1077	0.0	72
24	July,09	Brown	Unpleasent	7.32	1750	1241	0.0	120
25	Aug,09	Brownish	Odourless	6.69	1120	817	0.0	84
26	Sep,09	Turbid	Odourless	7.23	930	649	0.0	60
27	Oct,09	Brownish	Unpleasent	7.34	1070	767	0.0	88
28	Nov,09	Turbid	Odourless	7.41	720	524	0.0	46
29	Mar, 10	Brownish	Odourless	6.94	1040	718	0.0	42.0

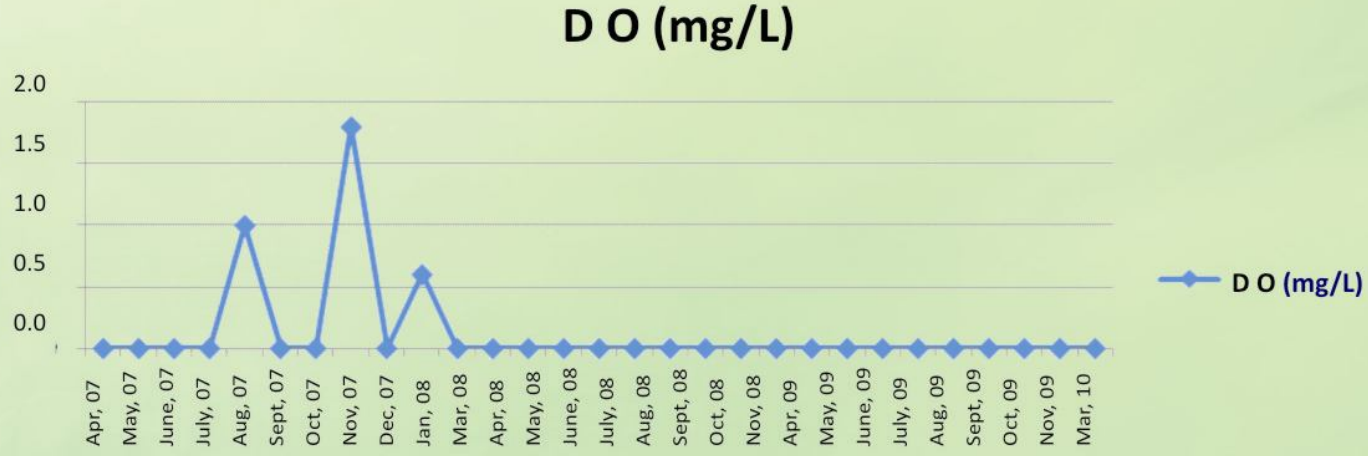

pH
7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
7
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10
Axis Title
pH

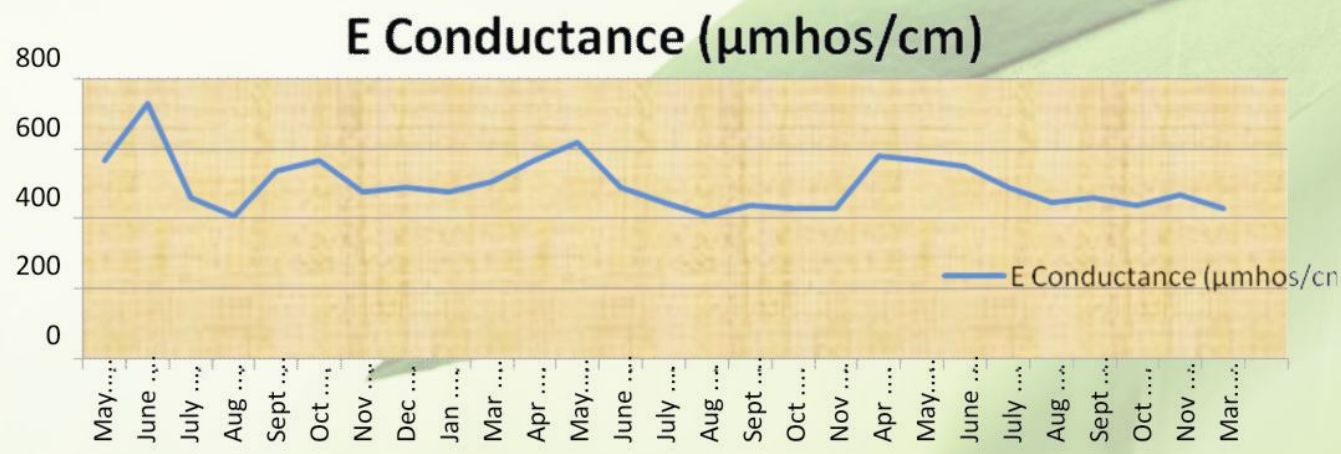

pH
7.8
7.6
7.4
7.2
7
6.8
6.6
6.4
6.2
6
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10
pH

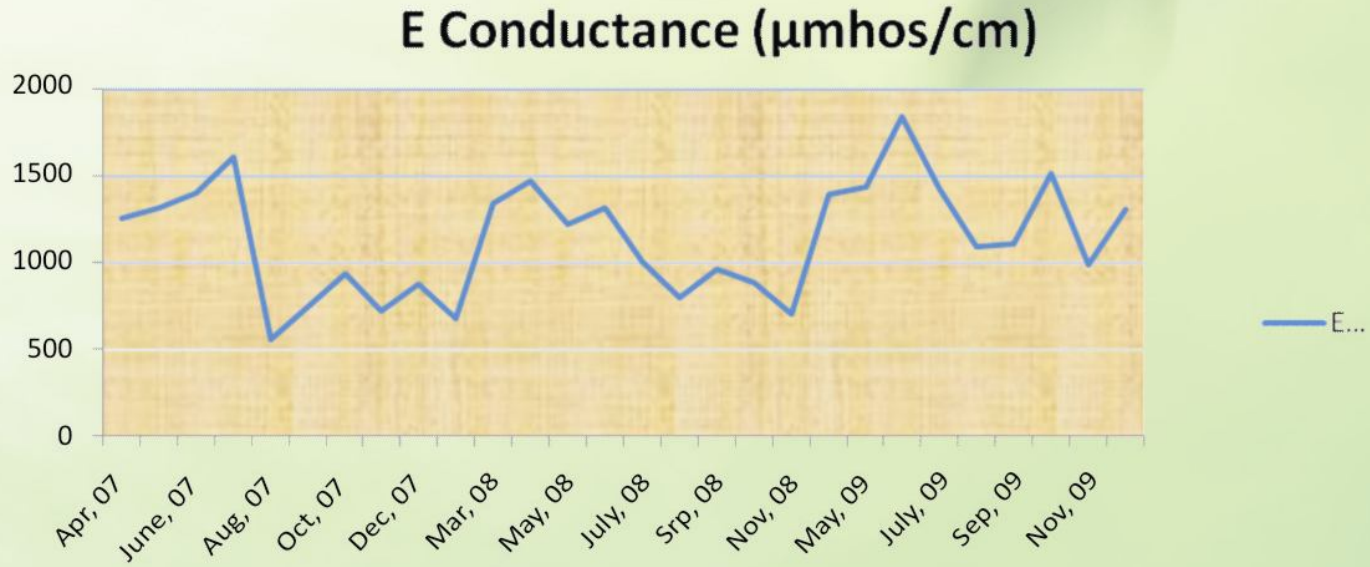

pH
8
7.5
7
6.5
6
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10
pH

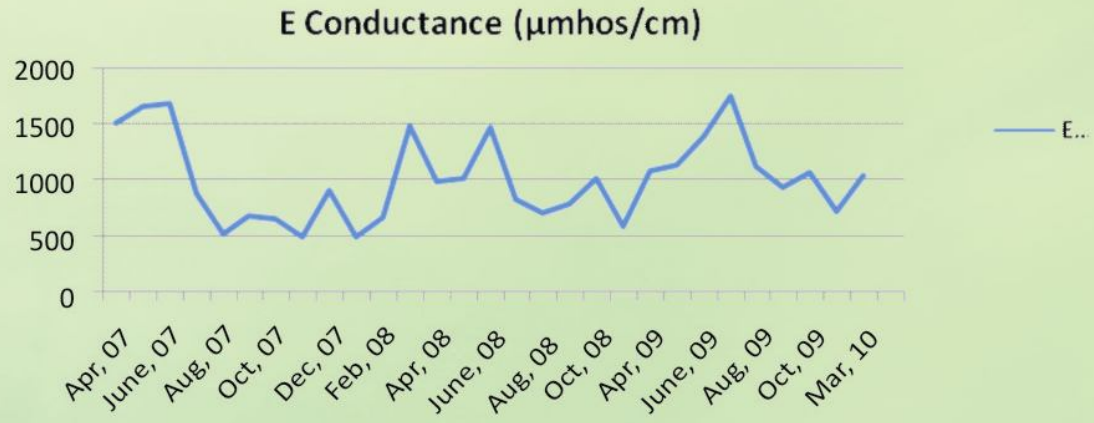

D O (mg/L)
2.0
1.5
1.0
0.5
0.0
Apr, 07
June,07
Aug, 07
Oct, 07
Dec,07
Mar, 08
May, 08
July, 08
Sep, 08
Nov, 08
May, 09
July, 09
Sep, 09
Nov, 09
D O (mg/L)

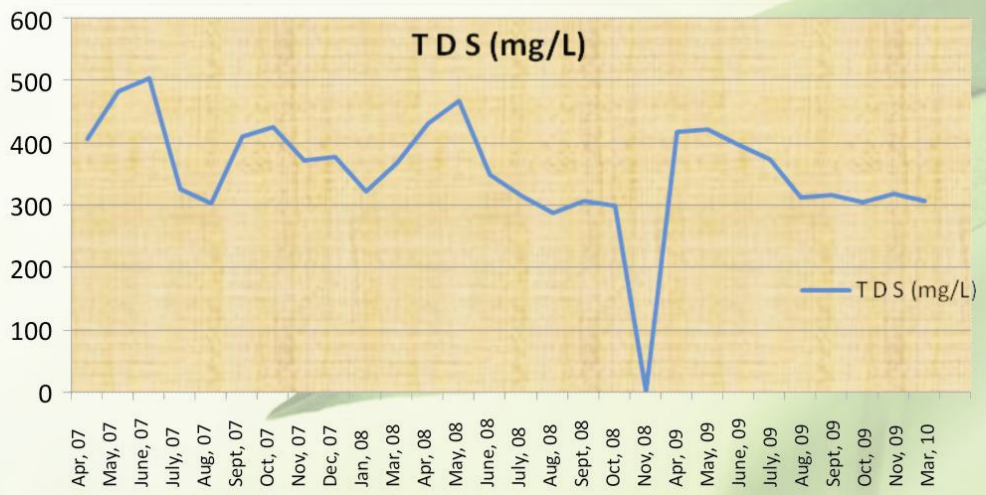

D O (mg/L)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10
D O (mg/L)

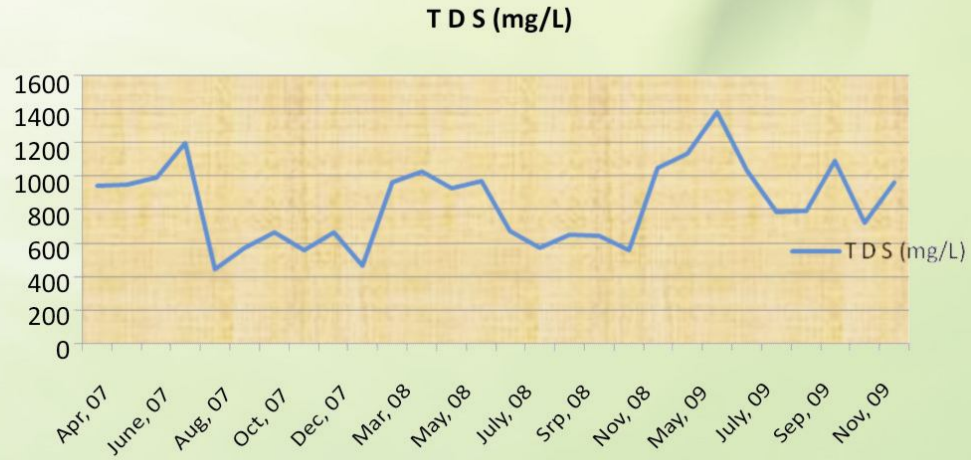

D O (mg/L)
2.0
1.5
1.0
0.5
0.0
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10
D O (mg/L)

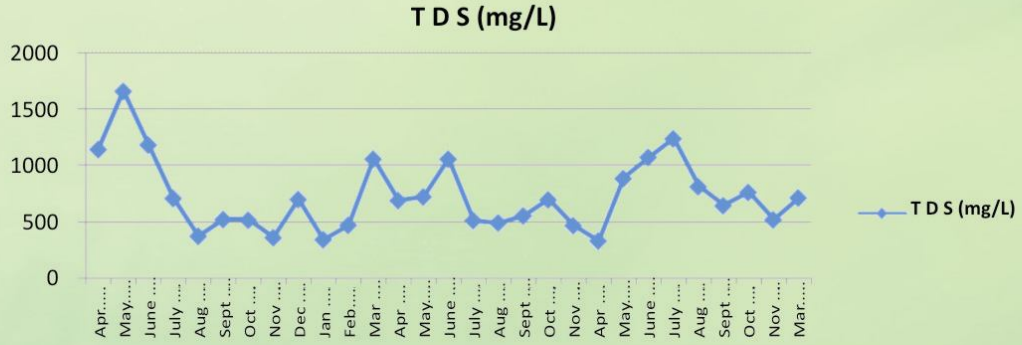

E Conductance (µmhos/cm)
800
600
400
200
0
E Conductance (µmhos/cm)

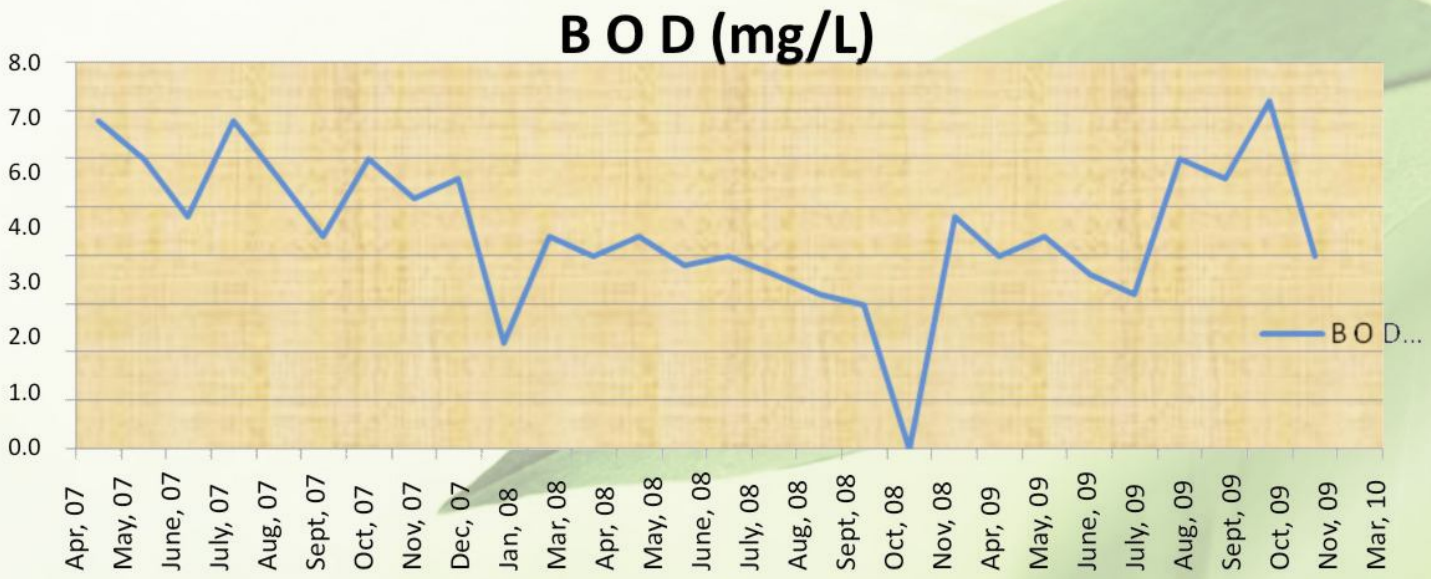

E Conductance (µmhos/cm)
2000
1500
1000
500
0
Apr, 07
June, 07
Aug, 07
Oct, 07
Dec, 07
Mar, 08
May, 08
July, 08
Srp, 08
Nov, 08
May, 09
July, 09
Sep, 09
Nov, 09
E...

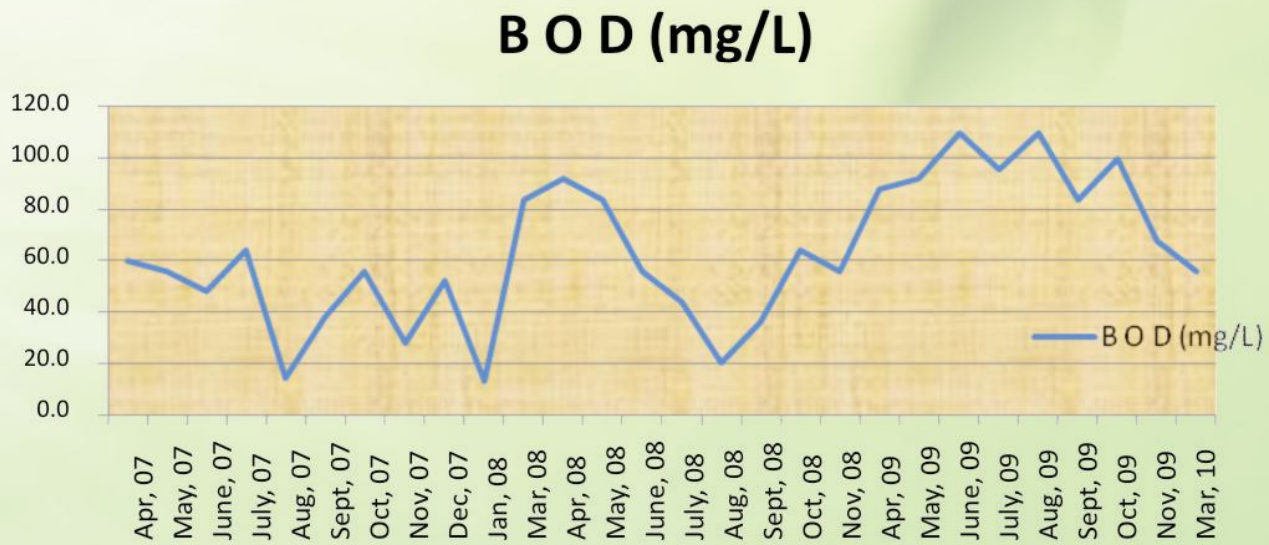

E Conductance (µmhos/cm)
2000
1500
1000
500
0
Apr, 07
June, 07
Aug, 07
Oct, 07
Dec, 07
Feb, 08
Apr, 08
June, 08
Aug, 08
Oct, 08
Apr, 09
June, 09
Aug, 09
Oct, 09
Mar, 10
E..

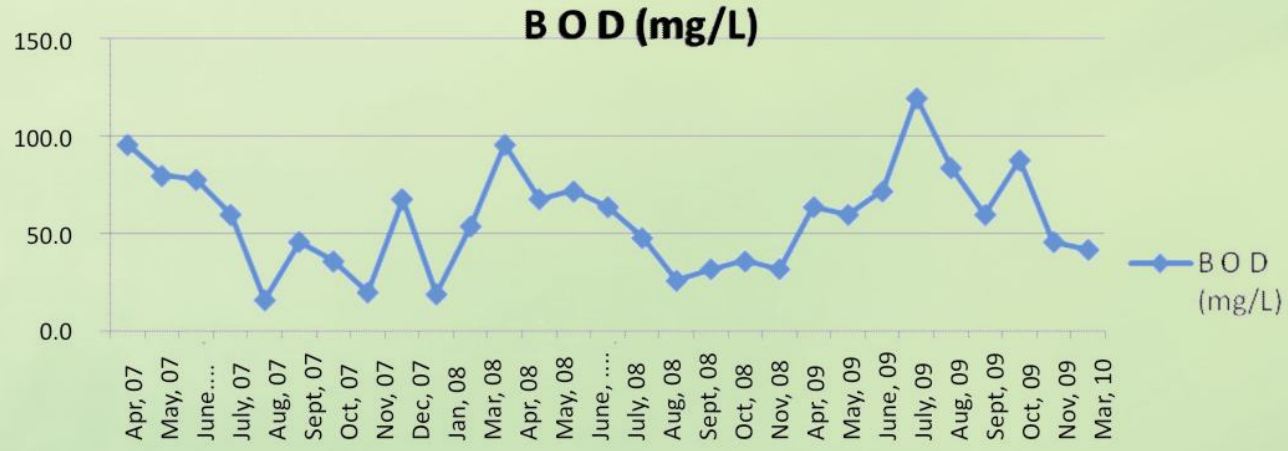

T D S (mg/L)
600
500
400
300
200
100
0
T D S (mg/L)
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10


T D S (mg/L)
1600
1400
1200
1000
800
600
400
200
0
T D S (mg/L)
Apr, 07
June, 07
Aug, 07
Oct, 07
Dec, 07
Mar, 08
May, 08
July, 08
Srp, 08
Nov, 08
May, 09
July, 09
Sep, 09
Nov, 09


T D S (mg/L)
2000
1500
1000
500
0
T D S (mg/L)
Apr.....
May.....
June ....
July ....
Aug ....
Sept ....
Oct ....
Nov ....
Dec ....
Jan ....
Feb....
Mar ....
Apr ....
May.....
June ....
July ....
Aug ....
Sept ....
Oct ....
Nov ....
Apr ....
May.....
June ....
July ....
Aug ....
Sept ....
Oct ....
Nov ....
Mar.....


B O D (mg/L)
8.0
7.0
6.0
4.0
3.0
2.0
1.0
0.0
B O D...
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10


B O D (mg/L)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
B O D (mg/L)
Apr, 07
May, 07
June, 07
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, 08
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10


B O D (mg/L)
150.0
100.0
50.0
0.0
B O D (mg/L)
Apr, 07
May, 07
June....
July, 07
Aug, 07
Sept, 07
Oct, 07
Nov, 07
Dec, 07
Jan, 08
Mar, 08
Apr, 08
May, 08
June, ...
July, 08
Aug, 08
Sept, 08
Oct, 08
Nov, 08
Apr, 09
May, 09
June, 09
July, 09
Aug, 09
Sept, 09
Oct, 09
Nov, 09
Mar, 10

7.0 CONCLUSION

The major source of surface and ground water pollution is injudicious discharge of untreated sewage and huge quantity of industrial effluents directly into the surface water bodies resulting in serious surface and ground water pollution. This loss of water quality may cause health hazards, livestock and death of aquatic lives, crop failure and loss of aesthetics. This problem is aggravated by lack of awareness, inadequate operation and maintenance of Effluent Treatment Plants, untreated sewage disposal, absence of skilled staff in industries, least natural flow in rivers. From the present study, it can be concluded although the results are some what inline with the safe limits but the toxic level of harmful materials can mix up with the ground water, if no precautionary measures will be taken for adequate treatment of the sewage and industrial effluents. While comparing the water quality of rivers with the Primary Water Quality Criteria as prescribed under Environment (Protection) Rules, 1986, water quality or river Kosi is found to be fall in SW-II where the water is suitable for bathing, contact water sports and commercial fishing. However river Dhela and Bhela with no Dissolved oxygen can not be put any category. The water of these rivers are found suitable for irrigation purpose These rivers need much attention for their remediation.

8.0 RECOMMENDATIONS

The following technically and economically applicable options can be adopted to minimize wastes:

- Sewage Treatment Plant should be installed to treat the sewage of Kashipur town and nearby area.
- More emphasis should be on recycling of waste water in industries.
- Identify industrial units that are the biggest polluters. The National Environmental Quality Standards (NEQS) regarding wastewater should be strictly enforced on such industries.
- The drainage system should be properly constructed, covered and lined to reduce the leakage and overflow of the effluents, and the addition of solid materials like paper and plastic bags to the effluent drains which reduces the flow velocity and increasing the percolation chances to ground water causing ground water contamination.
- River rehabilitation plan should be developed.
- Common Effluent Treatment plant should be made.
- Awareness program in terms of corporate responsibilities and regulatory compliance to be made.
- Trees play an important role in cleaning the environment. Trees not only consume high concentrations of carbon dioxide but also act as filters to absorb dust and toxic particulate matter. It is strongly recommended that tree plantation be undertaken in and around the Industrial Clusters.

11.0 ACTIVITIES

1. Mr Jai Raj, Member Secretary, Pollution Control Board having interaction with Dr. Farooq, Chairman and other members of the Confederation of Indian Industries (CII), Uttarakhand Chapter on 04/10/2011 pertaining to the problems of industries in the State.

Interaction with CII reg. Problem of Industries.

2. Workshop on Biomedical Waste Management on 22 November, 2011 at Dehradun organized jointly by Uttarakhand Environment Protection & Pollution Control Board & EPTRI.
3. Training on Biomedical Waste Management to Doon Hospital Staff by Officials of the Board.
4. Inauguration of Regional Office, Roorkee.

Feedback Form

Dear Information seeker,
ENVIS Centre, UEPPCB, Dehradun furnishes you with the services to collect and disseminate information related to environment of Uttarakhand. To share information with us you are requested to fill up the form given below:

Your feed back is valuable to us and will be highly appreciated.

Name: _____

Designation: _____

Department: _____

Address: _____

_____

City: _____

State: _____

Country: _____

Pin: _____

ENVIS CENTRE TEAM

Sh. Amarjeet Singh, EO
Project Co-ordinator
Email: asoberoi@yahoo.com

Mrs. Niharika Dimri
Information Officer
email: dimriniharika@gmail.com

Mrs Rachna Nautiyal
D.E.O
email: rachna_nautiyal@ymail.com

From:
ENVIS-CENTRE

Uttarakhand Environment Protection & Pollution Control Board
E-115 Nehru Colony, Haridwar Road, Dehradun, Phone Tel-0135-2668092