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Study On Water Quality Of Dhaka-Narayangang-Demra Canal In Bangladesh

Dr. Md. Zahid Husain Khan
Associate Professor
Department of Civil Engineering
World University of Bangladesh,Dhaka.
drzhusain@yahoo.co

***Abstract*—Water quality is an important factor for safety issues associated with public health and also for aquatic life. More and more water quality issues are becoming a significant concern due to the growth of population, urban expansion and development. Thus assessment of surface and ground water quality has become an essential criteria for overall description of the quality of water used for different purposes. In this study the water quality data obtained from four stations at Dhaka- Narayngong- Demra (DND) canal was evaluated. DND canal is one of the important drinking water sources of the capital city of Dhaka, Bangladesh and its water is treated at Saidabad water treatment plant (SWTP). The analysis of thirteen water quality parameters were done for water samples in laboratory. It was found that Biochemical Oxygen Demand (BOD), Color, Dissolved Oxygen (DO), Total Suspended Solid (TSS), Turbidity values are not within the limit values given in the water quality standards. The polluted water enter DND canal from Shitalakhya river which is polluted mainly due to urban sewage. If pollution rate of DND canal is reduced significantly then the water treatment efficiency of SWTP will be much higher and the treatment cost will be significantly reduced.**

Keywords—Water quality; water pollution; quality parameters.

1. INTRODUCTION

Fresh water resources are very limited in the world and preserving fresh water quality is important for public health and also for aquatic life. Today water quality issues have come to a significant concern due to growth of population, urban expansion and technological development. Water can easily be contaminated in different ways through unregulated disposal practices. These factors influence the quality of water resources, especially for surface waters, causing water contamination. World health organization (WHO) reported that in developing countries over three million people die every year because of waterborne disease. Thus, proper assessment and reporting of surface water quality is an important issue.

Dhaka-Narayanganj-Demra (DND) canal area is located between the cities of Dhaka & Narayanganj in Bangladesh and bounded by the Shitalakhya river. DND canal located mainly at Narayanganj district. The study area lies between 23° 38'to 23° 46'north latitude and 90° 32' to 90° 38' east longitude. The total boundary of the DND canal is 4.5 km. The population of DND area is about 8,00,000 (2012). There are about 242 industries such as textile dyeing industry, pharmaceuticals industry, food manufacturing industry, cottage industry, plastic and rubber product, paper and paper product, leather goods and products at DND area. These industries discharge huge amount of effluents, sewage sludge and solid waste materials directly into the surrounding water body of this area and pollute the canal water.

DND canal water is used as drinking water source and treated at Saidabad Water Treatment Plant (SWTP). The raw water is pumped from the Shitalakhya river into DND canal which is a 4.5 km long open canal, 30-70 meter wide and 3 to 4 meter deep. From the DND canal water is led by gravity through a closed culvert to the inlet pump station of the SWTP. The pollution of the Shitalakhya river to a large extent comes from urban sewage which is leaking from the heavily polluted Norai khal into the Balu river and further into the Shitalakhya river shortly upstream of the Sarulia intake pump station. Finally the polluted water enter DND canal from Shitalakhya river. If pollution rate of DND canal is reduced significantly then the water treatment efficiency would be much higher therefore, the treatment cost will be significantly reduced. So the target of the study is to determine the water quality of DND canal.

2. METHODOLOGY

Laboratory data are essential to know quality of surface and ground water. To obtain such data, four different sampling locations were chosen from four cross sections of the DND canal. Name of the four cross sections are: Konapara, Basher pool, Lohar pool and Staff Quarters.

Water quality monitoring has been carried out through collection and analysis of water samples during the month of July 2015. The collected water samples have been analyzed for a total of 13 water quality parameters namely Dissolved Oxygen (DO), pH, Color, turbidity, Chloride, Hardness ($CaCO_3$), Temperature, Biochemical Oxygen Demand (BOD_5),

Ammonia(NH_3), Total Dissolved solids (TDS) , Total Suspended Solids (TSS), Nitrate (NO_3) and Nitrite (NO_2).

3. DESCRIPTION OF DND CANAL

Dhaka-Narayangang-Demra (DND) project area is located between the cities of Dhaka and Narayangang in Bangladesh and bounded by the Shitalakhya river. It was started in 1964 and completed in 1968 at a cost of Tk 22.9 million. The area is about 56.79 sq. km and about 800,000 people (2012) are living here. The project provides flood control for 4,860 ha, irrigation for 6,070 ha, pumped drainage for 4,860 ha and gravity drainage for 2,470 ha of land. But as the project is located close to Dhaka city urbanization is taking place rapidly. In recent years DND area is facing extensive water logging during the monsoon as a common and regular problem of the area like water pollution, traffic congestion, air and noise pollution, unsystematic solid waste disposal etc. Heavy rainfall of even small duration causes water logging on most of the areas. This water logging is primarily due to inadequate storm water sewer infrastructure or absence of any sewer system at all, rapid growth of population and unplanned development activities and moreover the encroachment of the canal by land grabbers day by day.

Fig 1: Study area of DND canal.

4. POLLUTION SOURCE ASSESSMENT

Surveys were carried out for observing the types of outfalls discharging into DND canal. There are two types of outfalls observed along the DND canal. They are: Storm sewer pipe outfall and Open channel outfall. Apart from the two outfalls some private outfalls are also observed.

The storm drain conduit is most often a circular pipe. This sewer pipe is made of concrete, plastic, metal etc. These outfalls are permanently discharging storm sewers into DND canal. But illegal connection is made from domestic and commercial establishment into the storm sewer. It is located near Konapara.

Fig.2: Storm sewer pipe out fall near Konapara

Open channel outfalls are easily identifiable along the banks of DND canal of the four cross-sections. Many domestic drains and industrial out falls have been seen in mainly as open road side drains/channels.

Fig 3: Storm Sewer out fall near Basher pool

Fig 4: Open chanr el out fall at Lohar pool

Fig 5: Sewer out fall near Staff Quarter

5. SELECTION OF SAMPLING POINTS

The number of sampling sites in a water body during any study depends on a number of factors such as possible spatial variation of pollutants, detection of pollutants, detection of pollutants peaks frequency of sample collection and physical limitations of laboratory facilities. To assess the DND water quality numerous sampling areas are required but vast investigation was not feasible in this study due to time limitations. So, four cross-sections along the DND canal were selected for sampling locations for this study. Sampling location was chosen such that the samples are adequately representative of the system as a whole. In this regard samples were collected from well mixed sections of the canal. Every sampling point was carefully chosen at a considerable distance downstream of major outfalls into the canal.

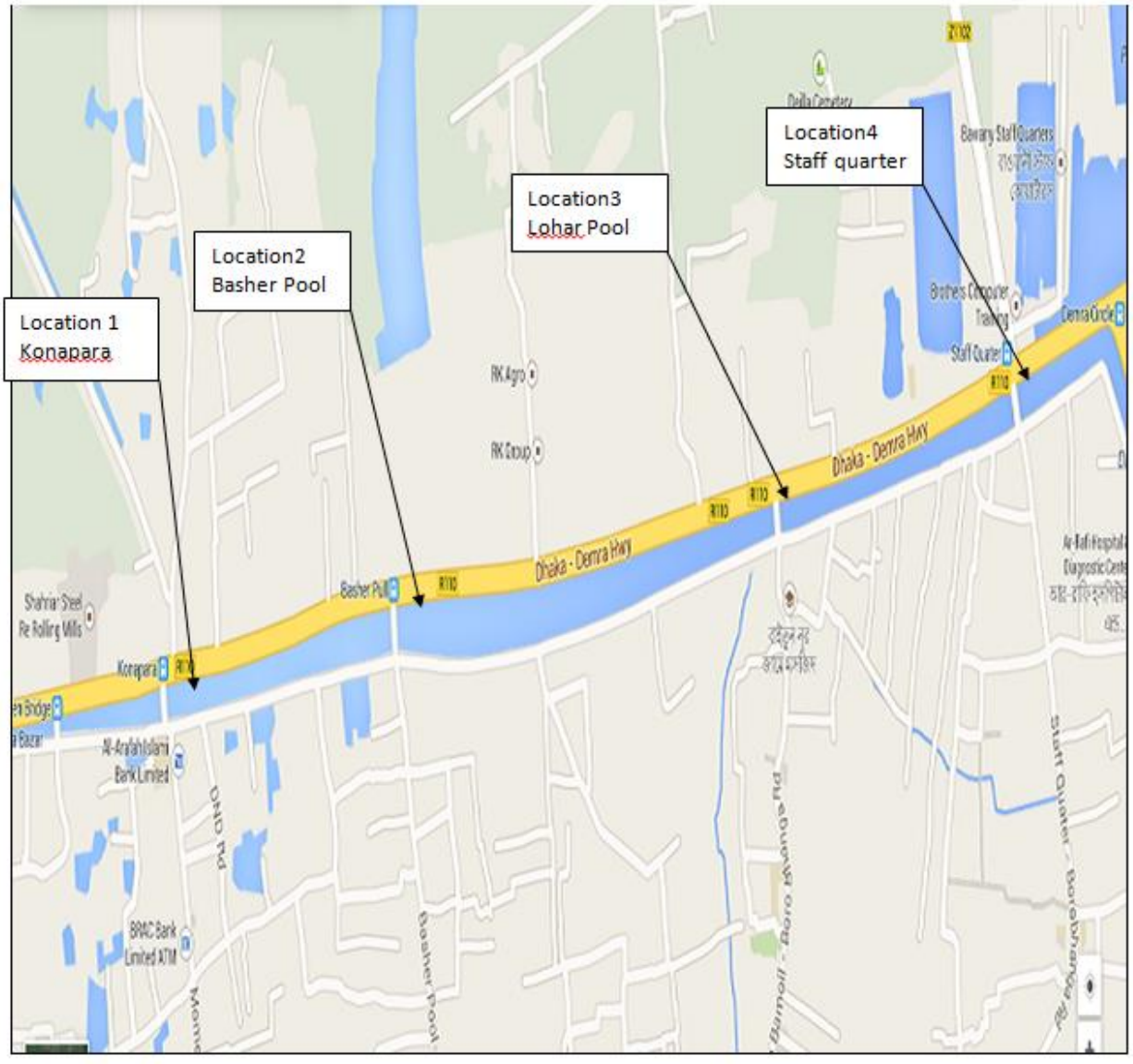

Fig 6: Location of water sampling points

6. RESULTS

Parameters	Unit	Bangladesh Standard	Konapara	Basher pool	Loharpool	Staff quaters
Ammonia	mg/l	0.5	1.05	0.18	0.12	0.19
BOD_5	mg/l	0.2	13.5	13.2	13.2	13.4
Chloride	mg/l	150-600	13.5	13.5	13.0	13.9
Color	Pt-Co	15	387	199	186	181
DO	mg/l	6	1.63	3.60	3.62	3.25
Hardness	mg/l	200-500	70	58	60	80
Nitrate	mg/l	10	1.1	0.9	0.6	0.7
Nitrite	mg/l	Less than 1	3	2	2	3
pH	-	6.5-8.5	4.65	6.48	6.24	6.67
TSS	mg/l	10	16	21	16	14
TDS	mg/l	1000	71.5	75	71	72
Temperature	^oC	20-30	30	30	30	30
Turbidity	NTU	10	66	32	29	27

7. CONCLUSIONS

The study focuses on the assessment of the water quality of DND canal including spatial variation and identification of pollution sources with waste water out falls in the study area. The types of pollution in the canal focused in this study are mainly due to some point and non-point sources of pollution.

DND canal water is used as drinking water source and treated in SWTP. The raw water is pumped from the Shitalakhya river into DND canal and from there the water is led by gravity through a closed culvert to the inlet pump station of the SWTP. The pollution of the Sitalakhya river to a large extent comes from urban sewage which is leaking from the heavily polluted Norai Khal into the Balu River and further into the Sitalakhya river shortly upstream of the Sarulia intake pump station. Finally the polluted water enter DND canal from Shitalakhya river. If pollution rate of DND canal is reduced significantly then the water treatment efficiency of SWTP would be much higher therefore, the treatment cost will be significantly reduced.

- The pH of DND canals varied from 4.66 to 6.67 and most of the time it showed little alkaline in nature.
- There is a trend of increasing DO from starting to end location of study area.
- There is a major variation of color of DND canal water from 387 Pt-Co to181 Pt-Co within the study area.
- DND canal water can be considered as well mixed.
- Stagnant water of DND canal increases pollution level and decreases self cleansing capacity.

8. RECOMMENDATIONS

More intensive sampling and analysis, including sampling of water from different depths and more spatial locations would better describe the canal water quality. Seasonal variation of water quality should be studied. The flora and fauna population of DND canal should be carefully monitored to assess the effect of water quality on the local ecology. To prevent the pollution of the canal various attempts should be taken some of which are as follows:

- Existing land use pattern around DND canal should be changed to decrease domestic and industrial discharges.
- Residential buildings and slums should be removed from the bank of the canal and illegal encroachment should be stopped by enforcing laws and regulations.
- Use of canal banks for bathing & washing clothes should be restricted.
- Suitable policy should be framed to raise the public awareness.

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