

Course Title: Environmental Engineering (Sessional – I)

Course Code: CE – 352

Submitted to

- 1. Prof. Dr. Asiful Hoque**
- 2. Prof. Dr. Md. Reaz Akter Mullick**
- 3. Mr. Mohammad Saiful Islam**
- 4. Ms. Maisha Kabir**

A Comprehensive Study on The Water Quality of
‘Chaktai Khal’

Submitted by Group No. 15

Md. Abdul Adol (1901117)

Md. Shahed Hassan (1901118)

Iqbal Mahmud (1901119)

Tufail Ahmed Anik (1901120)

Mohammad Mohsin (1901121)

A.K.M Ahasanul Haque (1901122)

Md. Rayhan Chowdhury (1901123)

Reazul Hoque Chowdhury (1901124)

Table of Contents

Introduction..... 2

Project Location..... 2

Sample Collection..... 2

Water Quality Parameter..... 4

Significance..... 5

Result..... 6

Drinking Water Standards..... 6

Discussion..... 7

INTRODUCTION

Chaktai Khal is a canal located in the city of Chittagong, Bangladesh. It is an important part of the Chittagong sea port and the Karnafuli River. However, over time, the canal has become silted up with mud and sand flowing down from upstream, causing water logging to become a chronic problem in Chittagong. In light of this issue, we conducted a study to determine the water quality of *Chaktai Khal*.

The aim of this project is to determine the water quality of *Chaktai Khal* and to provide valuable insights into the current state of the canal. In this report, we present our findings from the project work.

PROJECT LOCATION

In this study project, the water samples were collected directly from *Chaktai Khal*, a prominent water body located at latitude 22.361732 and longitude 91.842838. The specific sampling site was situated near the *Arkan Road* and *Ghashia Para*.



Fig: Surroundings of the project location

The choice of this particular sampling location was made after careful consideration to ensure representative data collection from the Khal. The latitude and longitude coordinates provided above serve to precisely identify the exact point of sample collection, thus enabling the reproduction of the study and facilitating future research in the same area.

SAMPLE COLLECTION

The sampling process was carefully conducted, employing spot sampling techniques to ensure accuracy and representativeness. A total of 12 liters of water samples were collected using clean bottles that were specifically chosen to prevent any contamination.



Fig: Collected sample covered by black polythene

To preserve the samples' original characteristics and minimize potential alterations, each bottle was covered with black polythene during collection and transportation.



Fig: A group photo with collected sample at the project location

The implementation of spot sampling techniques allowed us to collect water samples from distinct locations within *Chaktai Khal*, providing a comprehensive assessment of the water body's overall quality. The use of clean bottles and the careful handling of the samples served to prevent any unintended introduction of foreign substances, ensuring the reliability of the data acquired during this study project.

Furthermore, the application of black polythene covers played a significant role in shielding the samples from exposure to sunlight and potential alterations in temperature, thus maintaining the samples' true characteristics until laboratory analysis.

WATER QUALITY PARAMETER

After collecting the water sample and observing the current state of the Chaktai Khal, we decided to conduct some specific tests to determine its water quality. At first, we decided to determine the turbidity, TS, TDS, and TSS of the water sample to check its physical characteristics. The water seemed very bad and had a very bad odor. Hence, we decided to check its physical parameters and conducted the mentioned tests.

Then, we determined the pH, alkalinity, hardness, BOD, COD, amount of chloride, iron, and free CO₂ to check its chemical characteristics. There were some specific reasons for selecting these chemical parameters. Since pH is a very important parameter, we decided to measure the pH of our sample.

There was a high possibility of having bicarbonates, carbonates, etc., as it had direct contact with soil. Hence, we decided to determine the alkalinity and hardness.

Chaktai Khal is directly connected with many sewage lines and hence carries a large amount of sewage wastewater. Besides, it carries lots of waste from different industries. So, we decided to conduct chloride, iron, BOD, and COD tests.

Though there was a small chance of having free CO₂ in the water, we still decided to determine the amount of free CO₂ to know whether our guess was correct or not.

To check the biological characteristics, we decided to conduct the Total Coliform & Fecal Coliform (TC FC) test. Because the water carries a large amount of sewage wastewater as we mentioned earlier.

So, our selected parameters to check the water quality of Chaktai Khal were pH, turbidity, total Solid (TS), total dissolved solid (TDS), total suspended solid (TSS), CO₂, alkalinity, hardness, chloride, iron, biological oxygen demand (BOD), chemical oxygen demand (COD), total coliform & fecal Coliform (TC FC).

SIGNIFICANCE OF CONDUCTED TEST

- 1. pH:** pH is a measure of the acidity or alkalinity of water. It is crucial to know the pH because it affects the solubility and toxicity of various substances in the water. Improper pH levels can harm aquatic life and indicate potential issues with water treatment for human consumption.
- 2. Turbidity:** Turbidity refers to the cloudiness or haziness of water caused by suspended particles. High turbidity can interfere with light penetration, disrupting aquatic ecosystems and making water treatment more challenging.
- 3. TS, TSS, TDS:**

- a. **Total Solids (TS):** TS is the concentration of all solids, both suspended and dissolved, in water. It is essential to assess water quality and identify potential sources of pollution. High TS levels may lead to sedimentation and impact water clarity.
 - b. **Total Dissolved Solids (TDS):** TDS represents the total concentration of dissolved inorganic and organic substances in water. High TDS can affect taste, lead to scaling in pipes, and reduce the effectiveness of some water treatment processes.
 - c. **Total Suspended Solids (TSS):** TSS measures the concentration of suspended particles in water. Elevated TSS levels can block sunlight, clog fish gills, and reduce oxygen levels, harming aquatic organisms.
4. **CO₂:** Carbon dioxide (CO₂) levels in water are essential for understanding carbon cycling in aquatic environments. CO₂ affects water acidity, influences marine life, and contributes to the overall global carbon cycle.
5. **Alkalinity:** Alkalinity is the ability of water to neutralize acids. It helps maintain stable pH levels and buffer against pH fluctuations, making it critical for aquatic organisms' survival.
6. **Hardness:** Hardness measures the concentration of calcium and magnesium ions in water. It affects the taste of water and can lead to scaling in pipes and water heaters.
7. **Chloride:** Chloride levels indicate the salinity of water. High chloride concentrations can impact drinking water quality, agricultural irrigation, and freshwater ecosystems.
8. **Iron:** Iron content in water can cause staining, affect taste, and promote the growth of certain bacteria. It is important to monitor iron levels to ensure water suitability for various uses.
9. **Biological Oxygen Demand (BOD):** BOD measures the amount of dissolved oxygen consumed by microorganisms in water during the breakdown of organic matter. High BOD levels indicate organic pollution, which can lead to oxygen depletion and harm aquatic life.

10. Chemical Oxygen Demand (COD): COD measures the amount of oxygen required to oxidize organic and inorganic substances in water. It provides valuable information about water pollution and the effectiveness of wastewater treatment processes.

11. Total Coliform & Fecal Coliform (TC & FC): Coliform bacteria serve as indicators of water quality and potential fecal contamination. Their presence can signal the possible presence of harmful pathogens that can cause waterborne illnesses.

RESULT

SL. No.	Source of water	Test Name	Result	Unit
1	Chaktai Khal	pH	6.98	-
2		Turbidity	65.00	NTU
3		Total Solid (TS)	1570.00	mg/L
		Total Dissolved Solid, (TDS)	560.00	mg/L
		Total Suspended Solid, (TSS)	1010.00	mg/L
4		CO ₂	8.80	mg/L
5		Alkalinity	280.00	mg/L
6		Hardness	28.00	mg/L
7		Chloride	82.00	mg/L
8		Iron	16.85	mg/L
9		Biological Oxygen Demand, (BOD)	44.00	mg/L
10		Chemical Oxygen Demand, (COD)	576.00	mg/L
11		Total Coliform & Fecal Coliform, (TC FC)	TNTC	colonies/100ml

DRINKING WATER STANDARDS

SL. No.	Test Name	BECR (1997) Guideline Value	Unit
1	pH	6.50-8.50	-
2	Turbidity	10.00	NTU
3	Total Solid (TS)	-	-
	Total Dissolved Solid, (TDS)	1000.00	mg/L

	Total Suspended Solid, (TSS)	-	-
4	CO ₂	10.00	mg/L
5	Alkalinity	20.00-200.00	mg/L
6	Hardness	200.00-500.00	mg/L
7	Chloride	150.00-600.00	mg/L
8	Iron	0.30-1.00	mg/L
9	Biological Oxygen Demand, (BOD)	0.20	mg/L
10	Chemical Oxygen Demand, (COD)	4.00	mg/L
11	Total Coliform & Fecal Coliform, (TC FC)	0.00	-

DISCUSSION

By conducting the project, we had determined pH, turbidity, total Solid (TS), total dissolved solid (TDS), total suspended solid (TSS), CO₂, alkalinity, hardness, chloride, iron, biological oxygen demand (BOD), chemical oxygen demand (COD), total coliform & fecal Coliform (TC FC) of the *Chaktai Khal*.

The pH of the sample water was found 6.98. Hence, the water of the *Chaktai Khal* is almost neutral or slightly acidic.

The turbidity of the sample water was found 65 NTU. It indicates that the water contains higher amount of suspended particle. This result also matched with another test result. The value of TS, TDS, and TSS were found 1570 mg/L, 560mg/L, 1010 mg/L respectively. We had noticed that the water contains suspended solid in very high amount. Almost 65% of total solid were suspended solid. Hence, these solids can be removed from the water through filter. But, it will clog the filter bed and create excess pressure on the filter bed.

The water contains only 8.8 mg/L of free CO₂ which was expected. Because, surface water usually contains less than 10 mg/L of free CO₂.

The alkalinity and the hardness of the water sample were found 280 mg/L and 28mg/L respectively. Since hardness is less than alkalinity, there was no non-carbonate hardness in the sample water. It contains only carbonate hardness which is actually temporary hardness. Hence, the hardness of the water can be easily removed by the application of heat only.

The concentration of chloride and iron was high. Besides, the number of TC & FC were uncountable, and the value of BOD₅ was very high. So, it can be said that the waterbody carries lots of sewage waste water and there was a higher amount of sewage pollution. The COD values is also very high which indicates that the waterbody carries different types of waste in a large amount.

After analyzing the result, it can be said that the water quality of *Chaktai Khal* is very poor.