ANALYSIS OF POLLUTION IN RIVER YAMUNA ON DIFFERENT PARAMETERS IN DELHI REGION

Submitted in partial fulfillment of the requirements of the

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In

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by

RISHABH ADITYA
15GSCE105006

Under the guidance of

Mr. ASIF HUSSAIN

SCHOOL OF CIVIL ENGINEERING

GALGOTIAS UNIVERSITY

GREATER NOIDA

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CERTIFICATE

This is to certify that the project work entitled "**Analysis of Pollution in River Yamuna on Different Parameters in Delhi Region**" being submitted by ***Rishabh Aditya (1522108005)*** to the School of Civil Engineering, Galgotias University, Greater Noida, for the award of the degree of **Master of Technology in Civil Engineering** is a bonafide work carried out by him under my supervision and guidance. The thesis work in my opinion has reached the requisite standard, fulfilling the requirements for the said degree.

The results contained in this report have not been submitted, in part or full, to any other university or institute for the award of any degree or diploma.

Mr. ASIF HUSSAIN
Asst. Professor
School Of Civil Engineering

Prof. (Dr) Manju Dominic
Dean,
School of Civil Engineering

External Examiner

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Place: _____ **15GSCE105006**

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ABSTRACT

Our theory means to comprehend the elements of the connection between the River Yamuna, Delhi, India. We inquire as to why it has dropped by that a megacity that is so clearly dependent on a river has turned its back to it for quite a few years now. Quickly, one would expect that as the city developed, principles and organizations would rise that administered the utilization of riverine assets for the common sustenance of the river and the city. While the rationality and the adequacy of 'restraining the river' involves much discussion, the scantiness of open activity on the Yamuna in Delhi is in itself fascinating. Hypothetically it is anything but difficult to foresee that without sufficient partner investment, the administration of an open access basic pool asset is indefensible. We additionally gathered and tried examples of river water and riverside soil for lethality. Our social examinations illuminate the city-river disengage, and on the very idea of our city. The interaction of progress and coherence in these towns makes fascinating advising with regards to the setting of urbanization. The objective of this paper is to explore the assess of Yamuna water quality of Delhi region city by analyzing the specified parameters. This paper illustrate with the experimental result of collected sample test performed on Yamuna river water. A WQI from the experimental result has been estimated and ultimately reflects the Yamuna water quality.

Key Word: Yamuna River , WQI , Riverside Soil , Water Quality Index

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CHAPTER 1

INTRODUCTION

1.1 GENERAL:

The Yamuna River is one of north India's most spoiled rivers, home to a rich not all that awful collection of verdure and is the most crucial water source. In Hindu old stories, it is considered as a victor among the most blessed rivers after the Ganges, and is one of the veritable tributaries of the river Ganges. Full scale length of the Yamuna up to its inspiration of blend with the Ganges is around 1370 km. Its catchment area is spread more than 366,220 km2 and it falls in six remarkable conditions of Haryana, Himachal Pradesh, Uttar Pradesh, Delhi, Madhya Pradesh and Rajasthan. Giganticness of the catchment can be checked from how it is in every way that really matters 10% of the outright landmass of the nation. Water is a basic and major asset dependably support. It is utilized in a wide extent of areas like for example water supply and sanitation, course, vitality creation, loosening up and distraction, development and living space for land and water capable life. With the making masses, innovative and social change, budgetary improvement and the specific water transparency in nation’s water has changed into an extraordinary asset.

Figure 1.1: Yamuna at Yamunotri

Figure 1.2: Yamuna at Delhi

River Yamuna, the best tributary of the Ganga River, is a respected river in Indian tales and a boss among the most dirtied rivers in India. Two or three voyage focuses are masterminded at the bank. In this way different stretches, particularly these nearby urban fixations for example Delhi, Mathura, Agra, which present a beast proportion of untreated water into the river, are altogether dirtied. Most vital occupations of Yamuna water can't avoid being water structure, nuclear family water supply and mechanical use. This causes a high entry of polluted water into the river. Sources from neighborhood use cause around 85 % of the total contamination. Other than there are two or three diffused wellsprings of sullying, for example, open crap, washing, washing, dumping of waste and dead bodies, submersion of pictures, and so on.

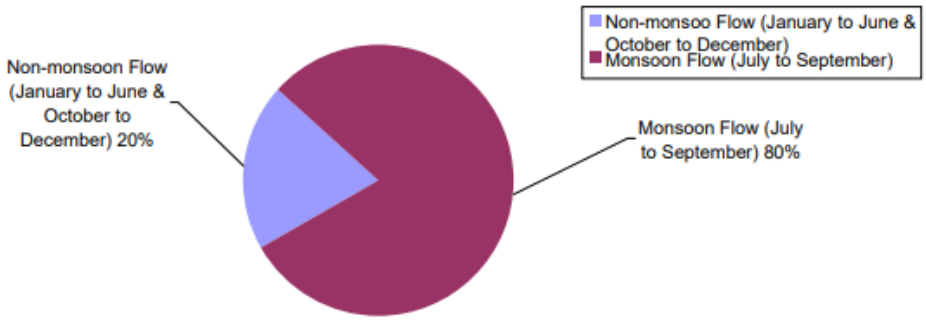

Figure 1.3: Water Flow Estimation in Yamuna River

1.2 MOTIVATION:

Our theory means to comprehend the elements of the connection between the River Yamuna and Delhi in India. We inquire as to why it has dropped by that a megacity that is so clearly dependent on a river has turned its back to it for quite a few years now. Quickly, one would expect that as the city developed, principles and organizations would rise that administered the utilization of riverine assets for the common sustenance of the river and the city. While the rationality and the adequacy of 'restraining the river' involves much discussion, the scantiness of open activity on the Yamuna in Delhi is in itself fascinating. Hypothetically it is anything but difficult to foresee that without sufficient partner investment, the administration of an open access basic pool asset is indefensible. Along these lines, we set off examining networks nearest to the river: explicitly, the towns of Jagatpur and Madanpur Khadar (South Delhi) We additionally gathered and tried examples of river water and riverside soil for lethality. Our social examinations illuminate the city-river disengage, and on the very idea of our city. The interaction of progress and coherence in these towns makes fascinating advising with regards to the setting of urbanization. We keep on being captivated by the social, social and perceptual removing of these networks from the river. A portion of the inquiries that we investigate are: Does the removing of the network clarify the absence of open demand for a cleaner Yamuna? Is there requirement for an intentionally guided activity to resuscitate the river? We likewise investigate questions identified with the methodology of the state to the river. The consent conceded by the state in Delhi to hold certain mega social occasions on the floodplains bring into center a few issues. How has the river been encircled in the authoritative story? What is the effect of the political economy on the nature of the river? Is it an issue of the state versus the common society? Presentation we are a network that either crosses or goes along the river consistently to the University. The Yamuna severs our city. But then today is very fringe to our day cognizant presence. We wished to cure that – to bring the river and its issues the all-important focal point, to look at why it has stopped by that a megacity that is so clearly reliant on a river has turned its back to it for a very long while now. Any river is shared by a few and the 'utilization' of it has unintended outcomes. Without suitable guideline, it is probably going to be abused, and subject to the deplorability of the lodge. The need to adjust destructive utilizations like drinking and water system with non-wasteful utilizations like natural security, preservation and entertainment among others is an intermittent topic in 'riparian' writing (Nallathiga, Ramakrishna 2015). The way that a river changes over reality just confounds issues. We find this paper in the exchange on

the lodge. The system that we pursue has been created by ElinorOstrom and her partners over a time of 50 years. Quickly Ostrom's work has contended that administration of the lodge (Hardin, 1968; Ostrom 1991, 2008, Siefkes, 2009) is a proper system for looking at the connection between individuals and the bio-physical world. She places that an answer for the 'awfulness of the hall's is conceivable. Arrangements can be found in little implementable changes to the Common Pool Resources (CPR) “activity circumstance ". The Institutional Analysis and Development (IAD) system for examination that was created by Ostrom and her associates and that was later broadened.

1.2 Objective:

The objective of the study is to assess the Yamuna water quality of Delhi region city by analyzing the specified parameters. The specific objectives of the current study are:

- To collect the samples from the specified locations of Yamuna river.
- To test the parameters of the samples thus collected.
- Compare the results with the BIS 10500:2012.
- Prepare WQI from the result so obtained.
- Assess the Yamuna water quality.

CHAPTER 2
LITERATURE SURVEY

2.1 Previous Work and Author's Review

"Andreea-MihaelaDunca" et al.[1] This analysis is based upon the water resources of the board, and demonstrates the need to maintain the complete, bi-sided understanding of the dynamics and to implement the European Union Water Frame Directive to enhance the water supply and quality achieved by a normal water shelter downstream country like Timissa, a two-country hydrographical cup. The Water Quality File spatial example (WQI) and its sub-records are useful in selecting the areas of genuine water sources that make for the use of water quality in this bowl. We have broken down the WQI estimates for 10 fragments of the two most important Banat Rivers with unprecedented significance for budgetary life in South West Romania and North East Serbia. We agreed to use the WQ If, or a wide range of time (2004–2014), in request to determine the water quality, to take the best and least averages annual estimates of physical parameters, synthetic parameters and natural parameters (DO, pH, BOD5, temperature, absolute P, N-NO2−, and turbidity) into account.

Kiran Kumar Vadde et al., [2] the third largest freshwater lake in China is Taihu Lake which fills ~30 million people as a drinking water hotspot. The Tiaoxi River is one of the major rivers of this lake, supplying over 60% of its water supply. Taihu Lake has challenged characteristic problems; it is therefore fundamental to reflect on the water nature of its inflows. This study suggested that the physical and microbiological characteristics of Tiaoxi River be investigated as well as that of the spatial and periodic water quality assorts. During the three seasons 2014–2015, water samples were collected from 25 areas around the Tiaoxi River. Fourteen criteria of water quality including various improvements and small life forms have been measured as well as data examined through accurate multivariate exams. Unusual conditions (> 1 mg / L) of whole nitrogen (TN) in all territories for all seasons were seen in the physical-substance test. Absolute phosphorus (PT), nitrite-N (NO2-N) and ammonium-N (NH4-N) outperformed beyond that which many believed to be feasible in similar territory. Specific graded kit tests showed that the test targets could be grouped into three water-quality meetings arranged as low, moderate and high emission areas. Basic portion (PCA) test for the whole dataset identified four important sections which explained 83 percent of the range, and the key parameters responsible for water quality assortments were pH, conductivity, TP and NO3-N. The

general findings have shown that part of the Tiaoxi River study areas are significantly impacted by emissions from different sources, which can be attributed to land use policies and anthropogenic activities.

The spacious profile of the river water quality is adverse in a range of climatic areas. Muhammad Mazhar Iqbal et al., [3]. Our analysis analyzed this partial size of the Water Quality Index (WQI) in order to assess this miracle. The study was carried out in more than four essential climate classes of Asia subject to the classification system for the Koppen-Geiger environment: tropical, mellow, cold and dry. For water quality amusements, QUAL2Kw was chosen and considered the one-dimensional model for surface water quality. For the model figures over various environmental groups, agreements and approvals were openly carried out. Specific true tests test the accuracy of the water quality model. The spatial profile of WQI was solved by using model wishes subject to separate oxygen (DO), organic oxygen request (BOD), nitrate (NO3) and ph. Results have shown that in the climate zones of the unforgiving portion, there are a more decreasing longitudinal range in WQI than in different regions, with the status of WQI not increasing. Streams from completely dry, silent and tropical environments give a raising DO example of the longitudinal profiles of major river streams. Since this analysis has established that the DO components are unmistakably influenced by any air environment, such as reaeration, oxygenation and disso valence of oxygen. The results of this analysis will give the impetus to the implementation of a program to improve the water quality fairly.

Liu Lu et al., [4] the paper shows the rule and figuring methodology of the basic fragment examination which is a useful strategy for water quality assessment. Eight markers consolidate crumbled oxygen, permanganate record, BOD, antacid nitrogen, copper, zinc, unusual phenol, oil in 20 checking regions of Ningbo urban river were poor somewhere near using significant fragment examination. Three components with 86.67% of amassed responsibility rates were removed from the primary data, which consolidate regular issue factor, overpowering metal issue factor, smelling salts nitrogen and unusual phenol factor. The results exhibit that half water regions can't accomplish the rules, most by far of them arranged in Yinzhou River, Yin River and Fenghua River. The results contain with the genuine condition.

Miao Qun et al., [5] Comprehensive water quality particular check list, in context on single factor water quality obvious affirmation file, is another device for reviewing surface water quality. This assessment framework for water quality can absolutely delineate the general water

quality and review water quality conceptually and quantitatively. We utilize this method to review the water nature of Dagu River in Laixi district of Qingdao, China, utilizing one year's checking information of three periods including water-inadequate period, water-basic period and water rich period. The outcomes demonstrate that the water nature of this valley meet the iii class of territorial water condition zone norms, while the water nature of the water-rich period is the most discernibly dreadful and the water nature of lower comes to is more heartbreaking than upper achieves, which is essentially as indicated by the confirmed circumstance. This paper demonstrates that the general water quality ID record legitimizes utilizing in the river water quality appraisal.

Zhang lipping et al., [6] this paper explores Wen Yu River bowl in Beijing's water quality territory. The entire bowl is divided into 22 control territories and 10 defilement markers according to the location rule and field examination. The paper analysis of the basic pollution markers and the guideline sullying duty zones is focused on strategies for sensitive SPSS in the main component analysis procedure. The result shows that four deleted elements represent 91, 81% unrefined details. In this case, the four isolated essential parts such as F1, F2, F3 and F4 can be illuminated. The limit of a comprehensive explanation for the assessment can be found as F=0.692F1 + 0.125F2 + 0.106F3 + 0.077F4, depending on the responsibility dimensions of the division in the table. The results show that the most obsessively dismal water quality is in the NO.14 fragment among 19 movement back and forth, and the better water quality is in the NO.12 section, the 19 cross portions pollution is in the NO.14 > NO.7 > NO.2 > NO.13 > NO.11 > NO.6 > NO.8 > NO.19 > NO.13 > NO.13 > NO.3 > NO.15 > NO.12. The efficient steps to enhance the water quality of the Wen Yu River bowl are definitive procedures, unique approaches and the board.

Wang Jucui et al., [7] Assessment the movements of surface water quality in different events all through one year is a critical viewpoint for evaluating transient assortment of river sullying on account of typical or anthropogenic commitment of point and non-direct sources toward water condition that is a tiny bit at a time debilitating. In this paper, imperative fragment examination and factor examination (PCA and FA) is driven by the ordinary estimation of 16 watching data taken from Shaanxi Reach of the Jing he River in three years and secluding it into dry season, run of the mill water season and wet season. Moreover, the most critical water quality parameters in different events is picked by the standard that the association coefficient estimation

of water quality variable of rotated factor stacked network is greater than 85%. Examination shows that the most critical parameters are in a general sense saltiness lists of ordinary commitment to dry season, the standard parameters in wet season are lists of non-point source pollution by anthropogenic data (tallying nitrogen healthy file and saltiness record) and the list of upstream common sullying (shaky phenol) which is passed on by significant proportion of flood. No evident consistency in other water period. Besides, sulfate is reliably the most noteworthy water quality parameter in Jinghe River, Shaanxi Province in different water period.

In terms of the goliath proportion of district wastewater entering the riber, Deepshikha Sharma et al.,[8] river Yamuna, in the Non-Capital Space (NCT) conventionally called Delhi (India), were subjected to enormous defilement and tainted. Although the YAP I and II (YAP) has defined undertakings (as of 1993 to date), the efficiency of the river in NCT has not improved. A key test for the environmental boss was to recover the water quality of the river. The present paper reviews the water quality record for the Yamuna River within the NCT in order to analyze the deferred effects of YAP I and II exercises. The analysis was carried out for 10 years (2000–2009) using the WQI to depict the sully portion in the river. The analysis also shows the fundamental pollutions affecting the quality of the river water in the center of the region. Rundowns were enrolled in four areas, specifically Palla, ODRB, Nizamuddin, Okhla in the river for pre-rainstorm, tempest and post-rainstorm seasons. It was noticed that water quality continued to run from incredible to mediocre in Palla to decrease in order in all different areas. Body, DO, utter and fecal coliforms and free smelling salts were seen as important stretching parameters.

He Ying et al., [9] Urban rivers are immovably related to the social and money related life. Regardless, urban rivers were dirtied in different degrees. This paper explores Tianjin Outer Ring Sewage River and Jinhe River to direct water quality examination. The results exhibited that the two rivers were dirtied. Measures are proposed to improve the water quality. The paper can be used as a fundamental data for the defilement state and to offer admonishment to treatment of urban rivers.

Zhenxiang Xing et al., [10] one of the most remarkable techniques for normal organization is water quality assessment. The water quality assessment can be used to clearly define the consistency and purity of water in different regions, and the evolving examples of water quality in different times can be accomplished. The assessment of the water quality may be considered a feathery question, given the trade mark cushion and the qualification of the impact

on the water nature of the assessment record. The paper attempted to determine the certifiable status of underground water quality in a coiled detailed assessment model based upon the entropy weighing procedure (FCE-EW). The FCE-EW will overcome the effects weight of each water quality indicator by mining information on underground water tests observed using the entropy methodology and the water quality vulnerability can be considered in the detailed cushy assessment. The possible outcomes of the logical study showed that the assessment results of underground water by FCE-EW appeared differently to those of the RAGABP and the PPC. The FCE-EW can therefore be used to overview quality of water for all purposes as an OK procedure.

ChalisaVeesommai et al., [11] the water quality examination is a champion among the most noteworthy points of view in organizing biological systems. It is essential to recognize area and portrayal strategies and structures for water superiority examination. The noteworthy course is to provoke simple perception for open use. This paper presents the river Sensing Processing Actuation shapes (rSPA) for affirmation and course of action of various water parameters in Chao Phraya River. As shown by rSPA systems of various water-quality-parameters, we find the pollutions of conductivity, saltiness and complete deteriorated strong (TDS), which are amassed from upstream to downstream. In a couple of spots of the river, we have examined water quality in a most outrageous estimation of toxic substances in term of oxidation-decline potential (ORP). The important run effect of parameter is to express high to very high effects in term of stalled oxygen, second is to express widely appealing to high effect in term of conductivity, third is to express low to particularly high effect in term of absolute broke down strong, fourth is to express absolutely safe to high effect in term of turbidity and the latter is to express absolutely okay for effect in term of saltiness.

Sun Nan et al., [12] On reason of checking data from 2001 to 2005 of Songhua River's dry season in Harbin by Harbin Environmental Protection Administration, this paper applicator Radial Basis Function Neural Network (RBFNN) model reliant on Hybrid Hierarchy Genetic Algorithm (HHGA) andtaked water quality appraisal of six watching fragments: Zhushuntun, Ashe internal estuary, lower Ashe estuary, Hulan inside estuary, lower Hulan estuary and High Dingzi mountain. The result exhibited that the model was reasonable and feasible, which didn't just choose the structure and parameters of RBFNN accommodatingly and precisely, yet had practical end. The water nature of six checking regions was respectively, inferior, iv, inferior, iv, iv by vaccinating. Zhushuntun was simply accord with water quality target. The territory from

Zhushuntun and Ashe inside estuary was outrageous defilement zone. The watching and evaluation of water condition can give the consistent reason to water resources' organization and the tally of water normal breaking point.

The typical ordinary water structures in the Huainan mining area of Panji are the Nihe River, Jin-Song and al., [13]. This paper analyzes and tests the water quality for physicochemical log, normal particles, generous metal segments and microorganisms by setting centres, measuring and inspecting regions in different seasons. The results show that Nihe River is dirty and plain, that DO is rich, that BOD and COD are higher than conventional and that the water is poor. The channel is more downstream than upstream. Standard particulate matter, metal segments overpowering, micro-organisms and physical-chemical lists extend and affect the overall effect from up to downstream. As, Se, Cr, Cu, Zn is not bey standard, while Hg is bystander, while the Cd and Hg is by-standard and Pb by-standard. The price of metal parts As, Se, Cr, and Cu is overshadowed by a standard. In addition, water differentiates in different seasons and has a common range. An inspection and assessment provide the theoretical justification for safety and full usage of the water.

The Wei River anticipated the money development of the monetary zone in Guan Zhong-Tianshui to be a crucial task. Li Wang et al., [14] the reasonable value of the money-related area of Guanzhong-Tianshui has been prevented by and without over-exploitation. The evolving example of the water existence of the Wei River and the reasons for this are addressed on the basis of the data from 2000 to 2008 on the basic control portions of the Wei River in an attempt to provide intelligent assistance in regulating water and the leading body on the Wei River. The paper utilizes a movement of the logical processes, including the standardized record of specific defilements, the Daniel test creation and the Spearman rank coefficient of association. It is possible to derive the conclusions. (1) A stepped drop example of a consolidated record of the typical pollution occurs in the Wolongsi control zone and a poor red example in the other significant control regions of the Wei River is given of a planned characteristic sullying log. (2) (3) the improvement of the Wei River's water nature is caused by the movement of grounds. A significant cause may be the obvious cut in mechanical point sources from the harmful contaminants, which allows defilements to decay into the water body. Another reason is to convince people to control the tangling from step to step. In addition, there is an undeniable increase in the organizational system to enhance the water quality of the Wei River.

“N. Rahmanian et al., [15] the drinking water quality was explored in associated parts with Perak state, Malaysia, to guarantee the constant supply of spotless and safe drinking water for the general wellbeing security. In such manner, a nitty gritty physical and substance investigation of drinking water tests was completed in various private and business territories of the state. Various parameters, for example, pH, turbidity, conductivity, absolute suspended solids (TSS), complete broke down solids (TDS), and substantial metals, for example, Cu, Zn, Mg, Fe, Cd, Pb, Cr, As, Hg, and Sn were investigated for each water test gathered during winter and summer periods. The acquired estimations of every parameter were contrasted and the standard qualities set by the World Health Organization (WHO) and nearby benchmarks, for example, National Drinking Water Quality Standard (NDWQS). The estimations of every parameter were observed to be inside as far as possible set by the WHO and NDWQS. Generally speaking, the water from every one of the areas was observed to be protected as drinking water.”

CHAPTER 3
METHODS AND METHODOLOGY

3.1 Water Quality in Yamuna River:

Since 1977, the Central Pollution Control Board has been performing water quality tests in River Yamuna. Such tests are made clear in various papers, see: The following:

• 'The Ganga Basin, Part-I: the Yamuna Sub bowl (ADSORBS/2/1980-81).'

• 'Quality and trend of River Yamuna (ADSORBS/10/1982-83).'

• 'Assimilation Point Pollution Capacity – The Yamuna River in UT – Delhi (CUPS/12/1982-83).'

• 'The Yamuna River Water Quality Condition (ADSORBS-32/1999-2000).'

Table 3.1: Method and Equipment's Used

S.NO	PARAMETERS	METHOD	EQUIPMENT
1.	Alkalinity	Titration by H_2SO_4	
2.	Conductivity	Electrometric	Conductivity meter
3.	pH	Electrometric	pH Meter
4.	Turbidity	-	Turbidity meter
5.	Hardness (Calcium and Magnesium also)	Titration by EDTA	
6.	Total Dissolved Solids	Gravimetric method	-
	Total Suspended Solids	Gravimetric method	-
8.	Temperature		Mercury meter
9.	Dissolved Oxygen	Winkler Azide method	
10.	BOD	Winkler Azide method	
11.	COD	$K_2Cr_2O_7$	COD Digestion unit

Figure 3.1: Riverbed farming in Yamuna River (D/s Okhla Barrage)

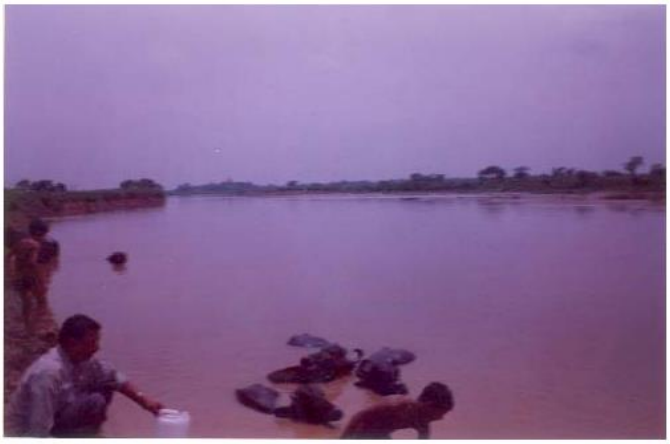

Figure 3.2: Cattle Wading in Yamuna River (Palwal)

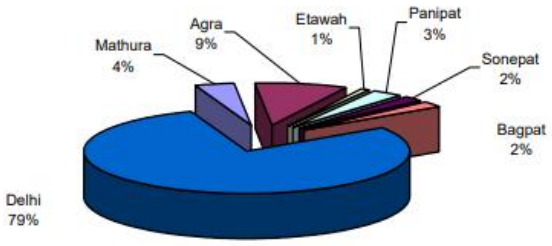

Figure 3.3: City-wise Contribution of Pollution Load in Yamuna River

3.2 Water parameters testing process

3.2.1 Conductivity Testing Process:

Conductivity of a substance is defined as the ability or power to conduct or transmit heat, electricity or sound. “Its unit are Siemens per meter [S/M] in si and milliohms per centimeter [mmho/cm] in U.S. customary units. Its symbol is k or s.”

1. Calibrate the conductivity with the KCL Solution

TEMP=25°C

Calibrate Reading=12.88.

Standard value of conductivity meter=0.1

Press Conductivity.

3.2.2 PH Testing Process:

Ph. is a chemical parameter in which we find out the concentration of hydrogen in the surface water.

Ph. =−log10e [H^+]

1to6-Acidic water.

7-Neutral.

8to14-Bases.

Calibrate in ph. for 4.0 or 7.0 through ph. buffer solution.

3.2.3Alkanity Testing Process:

Alkanity is define as quantity of ions present in water that will react to neutralize hydronium (H+) ions or it is the measure of the ability of water to neutralize the acids.

- A/c to conductivity if the value of conductivity comes in ms then we will take 10 mL of sample.
- If the conductivity value comes in a ɥs then will take 25 mL of sample of water.

- Alkanity mix indicator =5-6 drops.
- Then titrate with H_2SO_4, Normality=0.02.
- Colored appeared pink.
- Check burette reading.

Calculate the Alkanityof the Sample

=Burette reading ofsample×Normality of H_2SO_4×50×1000/ Sample of volume

➢ Sample-1(Sonia Vihar)

B. R=3.8 mL

$$=\frac{3.8\times0.02\times50\times1000}{25}$$

=152mg/L

➢ Sample-2(Wazirrabad Barrage)

=Burettereadingofsample×Normality of H_2SO_4 ×50×1000/ Sample of volume

=B. R=3.9 mL

$$=\frac{3.9\times0.02\times50\times1000}{25}$$

=156mg/L

➢ Sample-3(Baghpat Tehsil)

B. R=4.2 mL

$$=\frac{4.2\times0.02\times50\times1000}{25}$$

=168mg/L

➢ Sample-4(Katha Village)

B. R=3.9 mL

$$=\frac{3.9\times0.02\times50\times1000}{25}$$

=156mg/L

- Sample-5(Palla Village)

B. R=4.2 mL

$$=\frac{4.2\times0.02\times50\times1000}{25}$$

=168mg/L

- Sample-6(BaghpatCollect rate)

B. R=4 mL

$$=\frac{4\times0.02\times50\times1000}{25}$$

=160mg/L

3.2.4Total Hardness of Water:

- It is defined as concentration of multi metallicvalentcations in a water solution.
- In another we define as to find out the calcium and magnesium in a given water of sample.
- Processor or Testing Process of Hardness of Calcium and Magnesium.
- A/c to conductivity we take the sample 25 mL.
- Titrate by EDTA.
- EBT indicator hardness.
- Molarity of EDTA =0.01.
- 1-spituala is given in the water sample.
- 4-5 drop of hardness buffer solution given in the water sample.
- Colored appeared=pink.

- After titration.
- Sky blue colored appeared=Note the burette reading.

Sample-1(Sonia Vihar)

=B. R=5.6 mL

Total Hardness (As $CaCO_3$)

- $\frac{\text{Burette Reading Molarity Of Edta}\times100\times1000}{\text{Sample of Volume}}$

$=\frac{5.6\times0.01\times100\times1000}{25}$

=224mg/L

- Sample-2(Wazzirabad Barrage)

TOTAL HARDNESS AS $Caco_3$

B. R=5.7 M l

$=\frac{\text{B. R}\times\text{Molarity of EDTA}\times100\times1000}{\text{Sample volume}}$

$=\frac{5.7\times0.01\times100\times1000}{25}$

=228mg/L

- Sample-3(Baghpat Tehsil)

Total Hardness as $CaCO_3$

B. R=5.4 mL

$=\frac{\text{B.R}\times\text{Molarity of EDTA}\times100\times1000}{\text{Sample Volume}}$

$=\frac{5.4\times0.01\times100\times1000}{25}$

=216mg/L

- Sample-4(Katha Village)

Total Hardness as $CaCO_3$

B. R=6.1 mL

$$= \frac{B.\ R \times \text{Molarity of EDTA} \times 100 \times 1000}{\text{Sample Volume}}$$

$$= \frac{6.1 \times 0.01 \times 100 \times 1000}{25}$$

=244mg/L

- Sample-5(Palla Village)

Total Hardness as $CaCO_3$

B.R=6.3 mL

$$= \frac{B.\ R \times \text{Molarity of EDTA} \times 100 \times 1000}{\text{Sample Volume}}$$

$$= \frac{6.3 \times 0.01 \times 100 \times 1000}{25}$$

=252mg/L

- Sample-6(BaghpatCollect rate)

Total Hardness as $CaCO_3$

B. R=5.1 mL

$$= \frac{B.\ R \times \text{Molarity of EDTA} \times 100 \times 1000}{\text{Sample Volume}}$$

$$=\frac{5.1\times0.01\times100\times1000}{25}$$

=204mg/L

3.2.5 Calcium Testing Process:

- Mix light Ammonium Perpurate.
- 4-5 drop NaOH (Sodium Hydroxide).
- Titrate by EDTA.
- Then note the burette reading.

➢ Sample-1(Sonia Vihar)

B.R=3 mL

$$=\frac{\text{Burette Reading}\times\text{MolarityofEDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{3\times0.01\times40\times1000}{25}$$

=48mg/L

➢ Sample-2(Wazzirabad Barrage)

➢ Calcium As Ca

B. R=2.4 mL

$$=\frac{\text{B. R}\times\text{Molarity of EDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{2.4\times0.01\times40\times1000}{25}$$

=38.4mg/L

➢ Sample-3(Baghpat Tehsil)

Calcium asCA

B.R=3.4mL

$$=\frac{\text{B.R}\times\text{MolarityofEDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{3.4\times0.01\times40\times1000}{25}$$

=54.4mg/L

- Sample-4(Katha Village)

Calcium asCA

B. R=3.5 mL

$$=\frac{\text{B. R}\times\text{Molarity of EDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{3.5\times0.01\times40\times1000}{25}$$

=56mg/L

- Sample-5(Palla Village)

Calcium as Ca

B. R=3.2 mL

$$=\frac{\text{B. Molarity of EDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{3.2\times0.01\times40\times1000}{25}$$

=52.8mg/L

- Sample-6(BaghpatCollect rate)

Calcium as Ca

B. R=3.6 mL

$$=\frac{\text{B. Molarity of EDTA}\times40\times1000}{\text{Sample Volume}}$$

$$=\frac{3.6\times0.01\times40\times1000}{25}$$

=57.6mg/L

3.2.6 Magnesium Testing Process:

- Sample-1(Sonia Vihar)

Magnesium as (Mg)

$$= \frac{(THBR-CABR) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243}{Sample\ Volume}$$

$$= \frac{(5.6-3) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=25.27mg/L

- Sample-2(Wazzirabad Barrage)

Magnesium as Mg

$$= \frac{(Thbr-Cabr) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243)}{Sample\ Volume}$$

$$= \frac{(5.7-2.4) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=32mg/L

- Sample-3(Baghpat Tehsil)

Magnesium as Mg

$$= \frac{(Thbr-Cabr) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243)}{Sample\ Volume}$$

$$= \frac{(5.4-3.4) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=19.44mg/L

- Sample-4(Katha Village)

Magnesium as Mg

$$= \frac{(Thbr-Cabr) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243)}{Sample\ Volume}$$

$$= \frac{(6.1-3.5) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=25.27mg/L

- Sample-5(Palla Village)

Magnesium as Mg

$$= \frac{(Thb-Cabr) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243}{Sample\ Volume}$$

$$= \frac{(6.3-3.2) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=29.16mg/L

- Sample-6(BaghpatCollect rate)

Magnesium as Mg

$$= \frac{(Thbr-Cabr) \times Molarity\ of\ EDTA \times 100 \times 1000 \times 0.243}{Sample\ Volume}$$

$$= \frac{(5.1-3.6) \times 0.01 \times 100 \times 1000 \times 0.243}{25}$$

=14.58mg/L

3.2.7 Total Dissolve Solid:

- TDS can also be measure approximately by measuring electrical conductivity or specific conductance of the water.
- Instrument-Di-ionic Tester.

- Take the initial wt. of beaker in gram.

- Then fill the beaker with water sample up to 25 mL.
- Then take the blank beaker dry in oven for 2 hrs. at 105°C.
- Total time taken 8hrs at 105°C.

Total Dissolve Solid= (Final wt.-Initial wt.) $\times 10^6$/ Sample Volume

➢ Sample-1(Sonia Vihar)

- Initial wt. of beaker=51.0435gram
- Fill the beaker up to 25 mL.
- Keep the beaker in the oven at 105°C for 8hrs.
- Final wt. of the beaker=51.0567

➢ Sample-1(Sonia Vihar)

$$\text{TDS} = \frac{(\text{Final wt.} - \text{Initial wt.}) \times 10^6}{\text{Sample Volume}}$$

$$= \frac{(51.0567-51.0435) \times 10^6}{25}$$

=528mg/L

➢ Sample-2(Wazirrabad Barrage)

- Firstly, take the initial wt. of beaker=51.2800gram.
- Fill the beaker up to 25mL.
- Keep the beaker in the oven at 105°C for 8hrs.
- Then take the final wt. of the beaker=51.2878gram.

TDS = (Final wt.-Initial wt.) $\times 10^6$/ Sample Volume

$$= \frac{(51.2878-51.2800) \times 10^6}{25}$$

=312mg/L

➢ Sample-3(Baghpat Tehsil)

- Initial wt. Of Beaker=50.8415gram
- Fill the Beaker Up to 100 mL
- Keep the Beaker in The Oven At 105°C For 8hrs.
- Final Wt. Of the Beaker=50.8829

TDS = $\frac{(\text{Final Wt.} - \text{Initial Wt.}) \times 10^6}{\text{Sample Volume}}$

$= \frac{(50.8829-50.8415) \times 10^6}{100}$

=414mg/L

➢ Sample-4(Katha Village)

- Initial Wt.of Beaker=53.2412gram.
- Fill the Beaker Up to 100 mL.
- Keep the Beaker in The Oven At 105°C For 8hrs.
- Final Wt. Of the Beaker=53.2733.

TDS = $\frac{(\text{Final Wt.} - \text{Initial Wt.}) \times 10^6}{\text{Sample Volume}}$

$= \frac{(53.2733-50.2412) \times 10^6}{100}$

=321mg/L

➢ Sample-5(Palla Village)

- Initial Wt. Of Beaker=50.4216gram
- Fill the Beaker Up to 100 mL
- Keep the Beaker in The Oven At 105°C For 8hrs.
- Final Wt. Of the Beaker=50.4596

TDS = $\frac{\text{(Final Wt. –Initial Wt.)} \times 10^6}{\text{Sample Volume}}$

$= \frac{(50.4596-50.4216) \times 10^6}{100}$

=380mg/L

- Sample-6(BaghpatCollect rate)

- Initial Wt. Of Beaker=52.1020gram
- Fill the Beaker Up to 100 mL
- Keep the Beaker in The Oven At 105°C For 8hrs.
- Final Wt. Of the Beaker=52.1368

TDS = $\frac{\text{(Final Wt. –Initial Wt.)} \times 10^6}{\text{Sample Volume}}$

$= \frac{(52.1368-52.1020) \times 10^6}{100}$

=348mg/L

3.2.8 Total Suspended Solid:

- It is physical water quality parameter.
- Suspended solid comes in water from inorganic particles like oils Greece.
- And it may also come from organic particles like plant fibers (algae).
- Take one sample and one filter paper.
- Kept for drying 3hrs at 105°C in 100 mL of sample.
- Cold the sample.
- Then wt. the beaker.

- Sample-1(Sonia Vihar)

=Initial wt. of filter paper=0.1269gram

=final wt. of filter paper=0.1277gram

TSS= (final wt.-Initial wt. of Filter paper) $\times 10^6$/ Sample volume

$$= \frac{(0.1277-0.1269) \times 10^6}{100}$$

=8mg/L

- Sample-2(Wazirabad Barrage)

=Initial wt. of filter paper=0.1285gram

=Final wt. of filter paper=0.1333gram

$$\text{TSS} = \frac{(\text{Final wt.-Initial wt. of filter paper}) \times 10^6}{\text{Sample volume}}$$

$$= \frac{(0.1333-0.1285) \times 10^6}{100}$$

=48mg/L

- Sample-3(Baghpat Tehsil)

=Initial Wt.of Filter Paper0.1005gram

=Final Wt.of Filter Paper=0.1024gram

$$\text{TSS} = \frac{(\text{Final Wt.-Initial Wt.of Filter Paper}) \times 10^6}{\text{Sample Volume}}$$

$$= \frac{(0.1024-0.1005) \times 10^6}{50}$$

=38mg/L

- Sample-4(Katha Village)

=Initial Wt.of Filter Paper=0.1028gram

=Final Wt.of Filter Paper=0.1031gram

TSS = $\frac{\text{(Final Wt.-Initial Wt.of Filter Paper)} \times 10^6}{\text{Sample Volume}}$

$= \frac{(0.1031-0.1028) \times 10^6}{50}$

=6mg/L

- Sample-5(Palla Village)

=Initial Wt.of Filter Paper=0.1023gram

=Final Wt. Of Filter Paper=0.1036gram

TSS= $\frac{\text{(Final Wt.-Initial Wt.of Filter Paper)} \times 10^6}{\text{Sample Volume}}$

$= \frac{(0.1036-0.1023) \times 10^6}{50}$

=26mg/L

- Sample-6(BaghpatCollect rate)

=Initial Wt.of Filter Paper=0.1022gram

=Final Wt.of Filter Paper=0.1041gram

TSS = $\frac{\text{(Final Wt.-Initial Wt. Of Filter Paper)} \times 10^6}{\text{Sample Volume}}$

$$= \frac{(0.1041-0.1022) \times 10^6}{50}$$

$$=38 mg/L$$

3.2.9 Temperature Testing Process:

- Sample-1(Sonia Vihar)

Temp Reading=17.8°C

- Sample-2(Wazirabad Barrage)

Temp Reading=17.6°C

- Sample-3(Baghpat Tehsil)

Temp Reading=18°C

- Sample-4(Katha Village)

Temp Reading=19°C

- Sample-5(Palla Village)

Temp Reading=17°C

- Sample-6(BaghpatCollect orate)

Temp Reading=20°C

3.2.10 Dissolve Oxygen Definition:

- At a particular temp the max qty of oxygen present in dissolve form in water is known as dissolve oxygen.
- The DO can be measured by wrinkles methods.
- Sample in BOD bottle (full 300ml).
- 2mLmagnoussulphate reagent + 2ml alkali azide.

- Shake and wait for 5 min (yellow ppt)+2 ml conc: H_2SO_4
- Mix 200 mL sample.
- Titrate with 0.025 N sodium thiosulphate.
- Pale yellow+2 mL starch indicator (blue color).
- Titrate with 0.025 N sodium thiosulphate.
- Colordisappear.

➢ Sample-1(Sonia vihar)

Burette Reading=6.2Ml

$$=\frac{\text{Burette Reading Sodium Thiosulphate}\times 8\times 1000}{\text{Sample Volume}}$$

$$=\frac{6.2\times 0.025\times 8\times 1000}{200}$$

=6.2mg/L

➢ Sample-2(Wazirabad Barrage)

$$=\frac{5.7\times 0.025\times 8\times 1000}{200}$$

=5.7mg/L

➢ Sample-3(Baghpat Tehsil)

Burette Reading=5.6 mL

$$=\frac{\text{Burette Reading Sodium Thiosulphate}\times 8\times 1000}{\text{Sample Volume}}$$

$$=\frac{5.6\times 0.025\times 8\times 1000}{200}$$

=5.6mg/L

➢ Sample-4(Katha Village)

Burette Reading=6.4 mL

=Burette Reading Sodium Thiosulphate×8×1000

Sample Volume

=6.4×0.025×8×1000

200

=6.4mg/L

- Sample-5(Palla Village)

Burette Reading=6.2 mL

=Burette Reading Sodium Thiosulphate×8×1000

Sample Volume

=6.2×0.025×8×1000

200

=6.2mg/L

- Sample-6(BaghpatCollect rate)

Burette Reading=6.5 mL

=Burette Reading Sodium Thiosulphate×8×1000

Sample Volume

=6.5×0.025×8×1000

200

=6.5mg/L

3.2.11 Cod (Chemical-Oxidation Demand) Testing Process:

- The amt. of 0_2 required to oxidize both biodegradable & non-biodegradable organic matter is termed as COD.
- It is experimentally determined by using potassium di-chromate &sulphuric acid in waste water sample.
- 50mL of blank distilled water sample taken.
- Sample taken in 50mL in a cod cylinder.
- 1-spituala mercury sulphate.
- 10mL potassium di-chromate.
- 30mL H_2SO_4 (Sulphuric acid).
- hrs for cod digestion assembly.

- Cold the samples.
- 50mL distilled give in sample.
- Then sample taken in a conical flask.
- Then mix ferron indicator.
- 5-6 drops.
- Colored appeared green.
- Titration with FAS.
- Colored appeared red wine colored in the sample.

➢ Sample-1(Sonia Vihar)

$$Cod = \frac{(Bl\ B.R\ Reading - Sample\ B.R\ Reading) \times N\ of\ Fas \times 8 \times 1000}{Sample\ Volume}$$

=Sample B.R=24 mL

= ((25.1-24)×0.1×8×1000)/50

=17.6mg/L

➢ Sample-2(Wazirabad Barrage)

$$Cod = \frac{(Bl\ B.R\ Reading - Sample\ B.R\ Reading) \times N\ of\ Fas \times 8 \times 1000}{Sample\ Volume}$$

Normality of FAS=0.1

= ((25.1-23)×0.1×8×1000)/50

=33.60mg/L

➢ Sample-3(Baghpat Tehsil)

$$Cod = \frac{(Bl\ B.R\ Reading - Sample\ B.R\ Reading) \times N\ of\ Fas \times 8 \times 1000}{Sample\ Volume}$$

=Blank B. R=25.4 mL

=Sample B. R=25.1 mL

Cod= (25.4-25.1) ×0.1×8×1000

20

=12mg/L

- Sample-4(Katha Village)

Cod= (Bl B.R Reading-Sample B.R Reading) ×N of Fas×8×1000

Sample Volume

=Blank B. R=25.4 mL

=Sample B. R=24.2 mL

Cod= (25.4-24.2) ×0.1×8×1000=48mg/L

20

- Sample-5(Palla Village)

Cod= (Bl B.R Reading-Sample B.R Reading) ×N of Fas×8×1000

Sample Volume

=Blank B. R=25.4 mL

=Sample B. R=24 mL

Cod= (25.4-24) ×0.1×8×1000

20

=56mg/L

- Sample-6(BaghpatCollect rate)

Cod= (Bl B.R Reading-Sample B.R Reading) ×N Of Fas×8×1000

Sample Volume

=Blank B. R=25.4 mL

=Sample B. R=23.9 mL

Cod= $\frac{(25.4-23.9) \times 0.1 \times 8 \times 1000}{20}$

=60mg/L

Figure 3.4: Baghpat Tehsil Images

Figure 3.5: SoniaVihar

3.2.12 Turbidity testing process:

- Sample-1(Sonia vihar)

=3.1 NTU

- Sample-2(Wazirabad Barrage)

=12.7 NTU

- Sample-3(Baghpat Tehsil)

=0.8 NTU

- Sample-4(Katha Village)

=6.4 NTU

- Sample-5(Palla Village)

=7.9 NTU

- Sample-6(BaghpatCollect rate)

=3.6NTU

CHAPTER 4
OBSERVATION AND RESULT

4.1 OBSERVATIONS:

4.1.1 WQI METHOD:

The WQI method is a powerful method tool that makes the public, particularly policymaking, easy to communicate water quality. The WQI calculated using a weighted arithmetical index method to evaluate the impact of waste dumping on immediate soil and surface water bodies on dumpsites is a simple tool that allows the integration of water parameters that are accordingly important for the quality of water.

The WQI is given as;

$$WQI = \frac{\sum_{i=1}^{n} q_i w_i}{\sum_{i=1}^{n} w_i}$$

Where

Qi = I water quality parameter quality ranking.

$$\sum_{i=1}^{n} w_i = 1$$

WI = unit waiting for the parameter of the water quality

$$q_i = 100\left(\frac{v_i - v_{io}}{s_i - v_{io}}\right)$$

VI = I parameter value,

Vi0 = I parameter value,

Si = standard permissible parameter Vi0 = 0 for PH andD0

In the majority of cases, vi0 = 0 for PH.

The unit weight (WI)

$$w_i = \frac{K}{s_i}$$

Where $k = \frac{1}{\sum_{i=1}^{n} \frac{1}{s_i}}$

Table 4.1: Rating of water quality for various WQI

WQI	Rating Of Water Quality
0-25	Excellent
26-50	Good
51-75	Poor
76-100	Very poor
ABOVE 100	Unsuitable for drinking

4.1.2 Sampling testing and site images:

Figure 4.1: Conductivity of Sample-5(Palla Village)

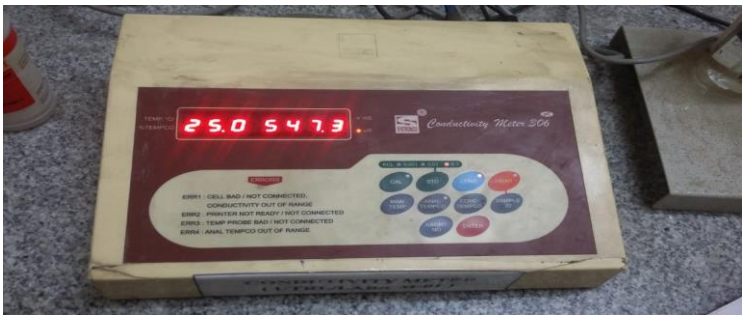

Figure 4.2: Conductivity of Sample-6(BaghpatCollectrate)

Figure 4.3: Conductivity Value of Sample-4(Katha Village)

Figure 4.4: Conductivity Value of Sonia Vihar

Figure 4.5: Turbidity Value of Sonia Vihar

Figure 4.6: Conductivity Value of Wazirabad Barrage

Figure 4.7: Turbidity Value of Sample-3(Baghpat Tehsil)

Figure 4.8: Turbidity Value of Sample-4(Katha Village)

Figure 4.9: Ph Value of Sample-4(Katha Village)

Figure 4.10: Ph Value of Sample-3(Baghpat Tehsil)

Figure 4.11: Ph Value of Sample-5(Palla Village)

Figure 4.12: PH Value of Sample-6(BaghpatCollectrate)

Figure 4.13: Samples in A Cod Digestion Uni

4.2 RESULT:

Table 4.2: Sampling Location (1) Sonia Vihar

S. No	Parameter	Test Method	Results	Units	Tolerance limit as per IS:2296			
					Class A	Class B	Class D	Class E
1.	pH	IS:3025(Part-11)	6.96	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	DO	IS:3025(Part-38)	6.2	mg/L	6.0	5.0	4.0	-
3.	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	4.8	mg/L	2.0	3.0	-	-
4	(COD)	IS:3025(Part-58)	17.6	mg/L	-	-	-	-
5.	TDS	IS:3025(Part-16)	528	mg/L	500	-	-	2100
6.	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	224	mg/L	300	-	-	-
7.	Calcium (as Ca)	IS:3025(Part-40)	48.0	mg/L	80	-	-	-
8.	Magnesium (as Mg)	IS:3025(Part-46)	25.27	mg/L	24	-	-	-
9.	Alkalinity	IS:3025(Part-23)	152	mg/L	-	-	-	-
10.	Conductivity	IS:3025(Part-14)	745.5	µS/Cm	-	-	1000	2250
11.	Turbidity	IS:3025(Part-10)	3.1	NTU	-	-	-	-
12.	TSS	IS:3025(Part-17)	8	mg/L	-	-	-	-
13.	Temp	IS:3025(Part-4)	17.8	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for the farming and propagation of fish and wildlife.

E-water Class for irrigation, industrial cooling and waste management

The table 4.1 shows the testing result of sampling location in Sonia Vihar. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296. The PH value of sampling location water shows this is under the class A, B, D and E category that means this can be used in drinking water, outer bathing, fish culture, wild life propagation, irrigation, industrial cooling and control waste disposal. According to the dissolved oxygen value this under class a category. The Biological Oxygen Demand (Max.) BOD (at 27^0C for 3 days) value is 4.8 mg/L. The Chemical Oxygen Demand (COD) is 17.6mg/L. the total Dissolved Solid 528mg/L according to this value is in out of limit. Total Hardness (as $CaCO_3$) is 224mg/L according to this value this under the class a category. The Calcium (as Ca) of the water is 48mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 25.27mg/L according to this this is in out of limit. The Alkalinity of the water is 152mg/L. The Turbidity of the water is 3.1NTU. The Conductivity of the water is 745.5µS/Cm. The Total Suspended Solid of the water is 8 mg/L. The temperature of the water is 17.8 ^0C.

Table 4.3: Sampling Location 2 Wazirabad Barrage

SN.NO	Parameter	Test Method	Results	Units	Tolerance limit as per IS:2296			
					Class A	Class B	Class D	Class E
1	pH	IS:3025(Part-11)	7.31	-	6.5 - 8.5	6.5-8.5	6.5-8.5	6.5-8.5
2	DO (as O_2) Min.	IS:3025(Part-38)	5.7	mg/L	6.0	5.0	4.0	-
3	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	8.75	mg/L	2.0	3.0	-	-
4	(COD	IS:3025(Part-58)	33.60	mg/L	-	-	-	-
5	TDS	IS:3025(Part-16)	312	mg/L	500	-	-	2100
6	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	228	mg/L	300	-	-	-

7	Calcium (as Ca)	IS:3025(Part-40)	38.4	mg/L	80	-	-	-
8	Magnesium (as Mg)	IS:3025(Part-46)	32	mg/L	24	-	-	-
9	Alkalinity	IS:3025(Part-23)	156	mg/L	-	-	-	-
10	Conductivity	IS:3025(Part-14)	797.1	µS/Cm	-	-	1000	2250
11	Turbidity	IS:3025(Part-10)	12.7	NTU	-	-	-	-
12	TSS	IS:3025(Part-17)	48	mg/L	-	-	-	-
13	Temp	IS:3025(Part-4)	17.6	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for the farming and propagation of fish and wildlife.

Class E-water Class for irrigation, industrial cooling and waste management

The table 4.2 shows the testing result of sampling location in Wazirabad Barrage. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296.the parameters are we are finding in water is pH, Dissolved Oxygen (as O_2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as $CaCO_3$), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature.The PH value of sampling location water shows this is under the class A, B, D and E category that means this can be used in drinking water, outer bathing, fish culture, wild life propagation, irrigation, industrial cooling and control waste disposal. According to the dissolved oxygen value this is under the class A so this we can use in Drinking water without conventional treatment but after disinfection. The Biological Oxygen Demand (Max.) BOD (at 27^0C for 3 days) value this is 8.75 mg/L. The Chemical Oxygen Demand (COD) is 33.60 mg/L, the total Dissolved Solid 312 mg/L according to this value this under the class A category. Total Hardness (as $CaCO_3$) 228 mg/L according to this value this under the class A category. The Calcium (as Ca) of the water is 38.4 mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 32mg/L. The conductivity of the water is

797.1µS/Cm. The Turbidity of the water is 12.7NTU. The Total Suspended Solid of the water is 48 mg/L. The temperature of the water is 17.6 ^0C.

Table 4.4: Sampling Location 3 Baghpat Tehsil

S. No	Parameter	Test Method	Results	Units	Tolerance limit as per IS:2296			
					Class A	Class B	Class D	Class E
1.	pH	IS:3025(Part-11)	7.43	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	DO (as O_2) Min.	IS:3025(Part-38)	5.6	mg/L	6.0	5.0	4.0	-
3.	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	3	mg/L	2.0	3.0	-	-
4	COD	IS:3025(Part-58)	12	mg/L	-	-	-	-
5.	TDS	IS:3025(Part-16)	414	mg/L	500	-	-	2100
6.	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	216	mg/L	300	-	-	-
7.	Calcium (as Ca)	IS:3025(Part-40)	54.4	mg/L	80	-	-	-
8.	Magnesium (as Mg)	IS:3025(Part-46)	19.44	mg/L	24	-	-	-
9.	Alkalinity	IS:3025(Part-23)	168	mg/L	-	-	-	-
10.	Conductivity	IS:3025(Part-14)	656.5	µS/Cm	-	-	1000	2250
11.	Turbidity	IS:3025(Part-10)	0.8	NTU	-	-	-	-
12.	Total Suspended Solid	IS:3025(Part-17)	38	mg/L	-	-	-	-
13.	Temperature	IS:3025(Part-4)	18	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for the farming and propagation of fish and wildlife.

Class E-water Class for irrigation, industrial cooling and waste management

The table 4.3 shows the testing result of sampling location in Baghpat Tehsil. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296. The PH value of

sampling location water shows this is under the class A, B, D and E category that means this can be used in drinking water, outer bathing, fish culture, wild life propagation, irrigation, industrial cooling and control waste disposal. According to the dissolved oxygen value out of limit. The Biological Oxygen Demand (Max.) BOD (at 27^0C for 3 days) value is 3 and it is under the class B limit. The Chemical Oxygen Demand (COD) is 12 mg/L, the total Dissolved Solid 414 mg/L according to this value is in class A. Total Hardness (as $CaCO_3$) 216 mg/L according to this value this under the class A category. The Calcium (as Ca) of the water is 54.4mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 19.44mg/L according to this is in class A. The Alkalinity of the water is 168mg/L. The Turbidity of the water is 0.8NTU. The Conductivity of the water is 656.5 µS/Cm. The Total Suspended Solid of the water is 38 mg/L. The temperature of the water is 18 ^0C

Figure 4.5: sampling location 4 in Katha Village

S. No	**Parameter**	**Test Method**	**Results**	**Units**	**Tolerance limit as per IS:2296**			
					Class A	**Class B**	**Class D**	**Class E**
1.	pH	IS:3025(Part-11)	7.57	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	DO (as O_2) Min.	IS:3025(Part-38)	6.4	mg/L	6.0	5.0	4.0	-
3.	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	12.75	mg/L	2.0	3.0	-	-
4	COD	IS:3025(Part-58)	48	mg/L	-	-	-	-
5.	TDS	IS:3025(Part-16)	321	mg/L	500	-	-	2100
6.	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	244	mg/L	300	-	-	-
7.	Calcium (as Ca)	IS:3025(Part-40)	56	mg/L	80	-	-	-

8.	Magnesium (as Mg)	IS:3025(Part-46)	25.27	mg/L	24	-	-	-
9.	Alkalinity	IS:3025(Part-23)	156	mg/L	-	-	-	-
10.	Conductivity	IS:3025(Part-14)	510.2	µS/Cm	-	-	1000	2250
11.	Turbidity	IS:3025(Part-10)	6.4	NTU	-	-	-	-
12.	TSS	IS:3025(Part-17)	6	mg/L	-	-	-	-
13.	Temperature	IS:3025(Part-4)	19	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for the farming and propagation of fish and wildlife.

Class E-Water Class for irrigation, factory cooling and waste management.

The table 4.5 shows the testing result of sampling location in Katha Village. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296. The PH value of sampling location water shows this is under the class A, B, D and E category that means this can be used in drinking water, outer bathing, fish culture, wild life propagation, irrigation, industrial cooling and control waste disposal. According to the dissolved oxygen value this under class a category. The Biological Oxygen Demand (Max.) BOD (at 27^{0}C for 3 days) value is 12.75 mg/L. The Chemical Oxygen Demand (COD) is 48 mg/L. the total Dissolved Solid 321 mg/L according to this value is in class A. Total Hardness (as $CaCO_3$) is 244 mg/L according to this value this under the class A category. The Calcium (as Ca) of the water is 56 mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 25.27 mg/L. The Alkalinity of the water is 156 mg/L. The Turbidity of the water is 6.4NTU. The Conductivity of the water is 510.2µS/Cm. The Total Suspended Solid of the water is 6 mg/L. The temperature of the water is 19 ^0C.

Table 4.6: Sampling Location 5palla village

S.No	Parameter	Test Method	Results	Units	Tolerance Limit as per IS:2296			
					Class A	Class B	Cass D	Class E
1.	pH	IS:3025(Part-11)	7.99	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	DO (as O_2)	IS:3025(Part-38)	6.2	mg/L	6.0	5.0	4.0	-
3.	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	16.50	mg/L	2.0	3.0	-	-
4	(COD)	IS:3025(Part-58)	56	mg/L	-	-	-	-
5.	TDS	IS:3025(Part-16)	380	mg/L	500	-	-	2100
6.	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	252	mg/L	300	-	-	-
7.	Calcium(as Ca)	IS:3025(Part-40)	52.8	mg/L	80	-	-	-
8.	Magnesium(as Mg)	IS:3025(Part-46)	29.16	mg/L	24	-	-	-
9.	Alkalinity	IS:3025(Part-23)	168	mg/L	-	-	-	-
10.	Conductivity	IS:3025(Part-14)	603.9	µS/Cm	-	-	1000	2250
11.	Turbidity	IS:3025(Part-10)	7.9	NTU	-	-	-	-
12.	TSS	IS:3025(Part-17)	26	mg/L	-	-	-	-
13.	Temperature	IS:3025(Part-4)	17	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for fish culture and wild life propagation.

Class E-Water for irrigation, industrial cooling and control waste disposal.

The table 4.6 shows the testing result of sampling location in Palla Village. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296. The PH value of sampling location water shows this is under the class A, B, D and E category that means this can be used in drinking water, outer bathing, fish culture, wild life propagation, irrigation, industrial cooling and control waste disposal. According to the dissolved oxygen value this under class a category. The Biological Oxygen Demand (Max.) BOD (at 27^0C for 3 days) value is 16.50 mg/L. The Chemical Oxygen Demand (COD) is 56 mg/L. the total Dissolved Solid 380 mg/L according to this value is in class A. Total Hardness (as $CaCO_3$) is 252 mg/L according to this value this under the class A category. The Calcium (as Ca) of the water is 52.8 mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 29.16 mg/L. The Alkalinity of the water is 168 mg/L. The Turbidity of the water is 7.9NTU. The Conductivity of the water is 603.9µS/Cm. The Total Suspended Solid of the water is 26 mg/L. The temperature of the water is 17 ^0C.

Table 4.7: Sampling Location 6 Baghpatcollectrate

S.No	Parameter	Test Method	Results	Units	Tolerance Limit as per IS:2296			
					Class A	Class B	Class D	Class E
1.	pH	IS:3025(Part-11)	8.08	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	DO (as O_2) Min.	IS:3025(Part-38)	6.5	mg/L	6.0	5.0	4.0	-
3.	BOD (at 27^0C for 3 days)	IS:3025(Part-44)	21	mg/L	2.0	3.0	-	-
4	COD	IS:3025(Part-58)	60	mg/L	-	-	-	-
5.	TDS	IS:3025(Part-16)	348	mg/L	500	-	-	2100

6.	Total Hardness (as $CaCO_3$)	IS:3025(Part-21)	204	mg/L	300	-	-	-
7.	Calcium(as Ca)	IS:3025(Part-40)	57.6	mg/L	80	-	-	-
8.	Magnesium(as Mg)	IS:3025(Part-46)	14.58	mg/L	24	-	-	-
9.	Alkalinity	IS:3025(Part-23)	160	mg/L	-	-	-	-
10.	Conductivity	IS:3025(Part-14)	547.3	µS/Cm	-	-	1000	2250
11.	Turbidity	IS:3025(Part-10)	3.6	NTU	-	-	-	-
12.	TSS	IS:3025(Part-17)	38	mg/L	-	-	-	-
13.	Temperature	IS:3025(Part-4)	20	^{0}C	-	-	-	-

Remarks:

Class A-Drinking water without conventional treatment but after disinfection.

Class B-Water for outdoor bathing.

Class D-Water for the farming and propagation of fish and wildlife.

Class E-Water Class for irrigation, factory cooling and waste management.

The table 4.7 shows the testing result of sampling location in Baghpatcollect rate. Here we are using the testing method IS3025, he we can see result tolerance limit as per IS2296. The PH value of sampling location water shows this is in out of limit. According to the dissolved oxygen value is 6.5 this is out of limit. The Biological Oxygen Demand (Max.) BOD (at 27^0C for 3 days) value is 21 mg/L. The Chemical Oxygen Demand (COD) is 60 mg/L. the total Dissolved Solid 348 mg/L according to this value is in class A. Total Hardness (as $CaCO_3$) is 204 mg/L according to this value this under the class A category. The Calcium (as Ca) of the water is 57.6 mg/L according to this value this under class A. The Magnesium (as Mg) of the water is 14.58 mg/L according to this this is in class A. The Alkalinity of the water is 160 mg/L. The Turbidity of the

water is 3.6NTU. The Conductivity of the water is 547.3µS/Cm. The Total Suspended Solid of the water is 38 mg/L. The temperature of the water is 20 ^0C.

4.2.1 Bod Testing Process and Result:

(Bio-Oxidation Demand)

- It Is the Amt. Of O_2 Required to Oxidize the Biodegradable Organic Matter.

Bod= (Doi-Dof) ×Dilution Factor

DF=Volume of Diluted Sample

Volume of Organic Sample

- Bod Is Done Under 3days at 27°C

Table 4.8: Sample-1(Sonia Vihar)

BOD		
Volume of sample taken (%)	25.0	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.7	mg/L
Final Sample DO	5.4	mg/L
Initial Blank DO	7.0	mg/L
Final Blank DO	6.9	mg/L
BOD (Sample) = (Initial Blank DO -Final Blank DO)	1.30	mg/L
BOD (Blank) = (Initial Blank DO -Final Blank DO)	0.10	mg/L

BOD(I)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	4.80	mg/L
Volume of sample taken (%)	50.00	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.5	mg/L
Final Sample DO	4.0	mg/L
Initial Blank DO	7.0	mg/L
Final Blank DO	6.90	mg/L
BOD (Sample) = (Initial Blank DO -Final Blank DO)	2.50	mg/L
BOD (Blank) = (Initial Blank DO -Final Blank DO)	0.10	mg/L
BOD(II)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	4.8	mg/L
BOD = [BOD (I) + BOD (II)/2]	4.80	**mg/L**

Table 4.9: Sample-2(Wazirabad Barrage)

BIOLOGICAL OXYGEN DEMAND (BOD)		
Volume of sample taken (%)	10.0	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.8	mg/L

Final Sample DO	5.8	mg/L
Initial Blank DO	7.0	mg/L
Final Blank DO	6.9	mg/L
BOD (Sample) = (Initial Blank DO - Final Blank DO)	1.00	mg/L
BOD (Blank) = (Initial Blank DO - Final Blank DO)	0.10	mg/L
BOD(I)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	9.00	mg/L
Volume of sample taken (%)	20.00	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.7	mg/L
Final Sample DO	4.9	mg/L
Initial Blank DO	7.0	mg/L
Final Blank DO	6.90	mg/L
BOD (Sample) = (Initial Blank DO - Final Blank DO)	1.80	mg/L
BOD (Blank) = (Initial Blank DO - Final Blank DO)	0.10	mg/L
BOD(II)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	8.5	mg/L
BOD = [BOD (I) + BOD (II)/2]	**8.75**	**mg/L**

Table 4.10: Sample-3(Baghpat Tehsil)

BOD		
Volume of Sample Taken (%)	25.0	%
Normality Of 0.025 N Sodium Thiosulphate (N)	0.025	N
Initial Sample Do	6.7	Mg/L
Final Sample Do	5.8	Mg/L
Initial Blank Do	7.1	Mg/L
Final Blank Do	6.9	Mg/L
Bod (Sample) = (Initial Blank Do -Final Blank Do)	0.90	Mg/L
Bod (Blank) = (Initial Blank Do - Final Blank Do)	0.20	Mg/L
Bod(I)= {(Bod Sample-Bod Blank) X100}/Vol.Of Sample Taken (%)	2.80	Mg/L
Volume of Sample Taken (%)	50.00	%
Normality Of 0.025 N Sodium Thiosulphate (N)	0.025	N
Initial Sample Do	6.6	Mg/L
Final Sample Do	4.8	Mg/L
Initial Blank Do	7.1	Mg/L
Final Blank Do	6.90	Mg/L
Bod (Sample) = (Initial Blank Do -Final Blank Do)	1.80	Mg/L
Bod (Blank) = (Initial Blank Do - Final Blank Do)	0.20	Mg/L
Bod (Ii)= {(Bod Sample-Bod Blank) X100}/Vol.Of Sample	3.2	Mg/L

Taken (%)		
Bod = [Bod (I) + Bod (Ii)/2]	**3.00**	**Mg/L**

Table 4.11: Sample-4(Katha Village)

Biological Oxygen Demand (Bod)		
Volume of Sample Taken (%)	10.0	%
Normality Of 0.025 N Sodium Thiosulphate (N)	0.025	N
Initial Sample Do	6.6	Mg/L
Final Sample Do	5.0	Mg/L
Initial Blank Do	7.1	Mg/L
Final Blank Do	6.9	Mg/L
Bod (Sample) = (Initial Blank Do -Final Blank Do)	1.60	Mg/L
Bod (Blank) = (Initial Blank Do -Final Blank Do)	0.20	Mg/L
Bod(I)= {(Bod Sample-Bod Blank) X100}/Vol.Of Sample Taken (%)	14.00	Mg/L
Volume of Sample Taken (%)	20.00	%
Normality Of 0.025 N Sodium Thiosulphate (N)	0.025	N
Initial Sample Do	6.6	Mg/L
Final Sample Do	4.1	Mg/L
Initial Blank Do	7.1	Mg/L

Final Blank Do	6.90	Mg/L
Bod (Sample) = (Initial Blank Do -Final Blank Do)	2.50	Mg/L
Bod (Blank) = (Initial Blank Do -Final Blank Do)	0.20	Mg/L
Bod (Ii)= {(Bod Sample-Bod Blank) X100}/Vol.Of Sample Taken (%)	11.5	Mg/L
Bod = [Bod (I) + Bod (Ii)/2]	**12.75**	**Mg/L**

Table 4.12: Sample-5(Palla Village)

(BOD)		
Volume of sample taken (%)	10.0	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.7	mg/L
Final Sample DO	4.5	mg/L
Initial Blank DO	7.1	mg/L
Final Blank DO	6.9	mg/L
BOD (Sample) = (Initial Blank DO -Final Blank DO)	2.20	mg/L
BOD (Blank) = (Initial Blank DO -Final Blank DO)	0.20	mg/L
BOD(I)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	20.00	mg/L
Volume of sample taken (%)	20.00	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N

Initial Sample DO	6.6	mg/L
Final blank D0	3.8	Mg/L
Initial blank DO	7.1	Mg/L
Final blank D0	6.90	Mg/L
BOD(sample)=(initial blank DO-Final blank DO)	2.80	Mg/L
BOD(blank)=(initial blank DO-final blank DO)	0.20	Mg/L
BOD={(BOD sample-BOD blank)*100}/vo. Of sample taken(%)	13	Mg/L
BOD = [BOD (I) + BOD (II)/2]	**16.50**	**mg/L**

Table 4.13: Sample-6(BaghpatCollectrate)

BIOLOGICAL OXYGEN DEMAND (BOD)		
Volume of sample taken (%)	10.0	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.8	mg/L
Final Sample DO	4.4	mg/L
Initial Blank DO	7.1	mg/L
Final Blank DO	6.9	mg/L
BOD (Sample) = (Initial Blank DO -Final Blank DO)	2.40	mg/L
BOD (Blank) = (Initial Blank DO -Final Blank DO)	0.20	mg/L

BOD(I)= {(BOD Sample-BOD Blank) x100}/Vol.of sample taken (%)	22.00	mg/L
Volume of sample taken (%)	20.00	%
Normality of 0.025 N Sodium thiosulphate (N)	0.025	N
Initial Sample DO	6.7	mg/L
Final blank DO	2.5	mg/L
Initial Sample DO	7.1	Mg/L
Final blank DO	6.90	Mg/L
BOD(sample)=initial Blank DO-Final blank DO	4.20	mg/L
BOD(sample)=initial blank DO-Final blank DO)	0.20	mg/L
BOD(Blank)={(BOD sample -BOD Blank)*100/vol.of sample taken (%)	20	mg/L
BOD = [BOD (I) + BOD (II)/2]	**21.00**	**mg/L**

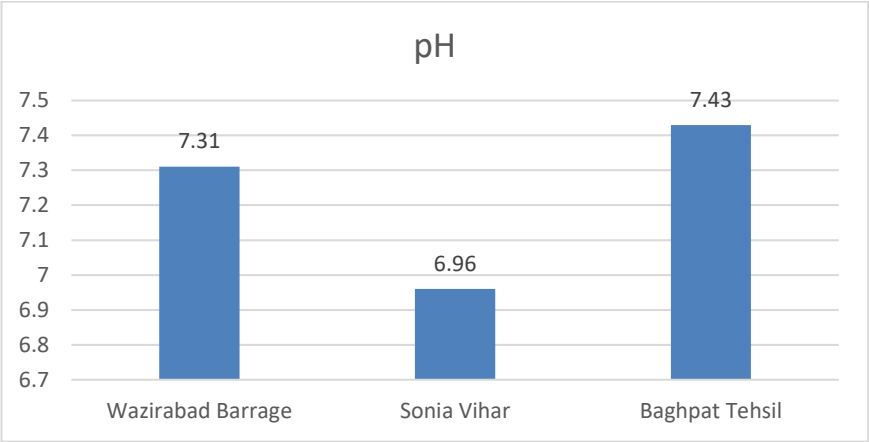

Figure 4.14: Graph diagram of PH

The figure 4.14 shows the Graph diagram of PH, here we are comparing the PH value of three sampling location and it is wazirabadbarrage, Sonia vihar and baghpat tehsil. Here we can see

high PH value is high baghpat tehsil location and low PH value is wazirabad barrage location, the PH value is good in Sonia vihar location and the value is 6.96.

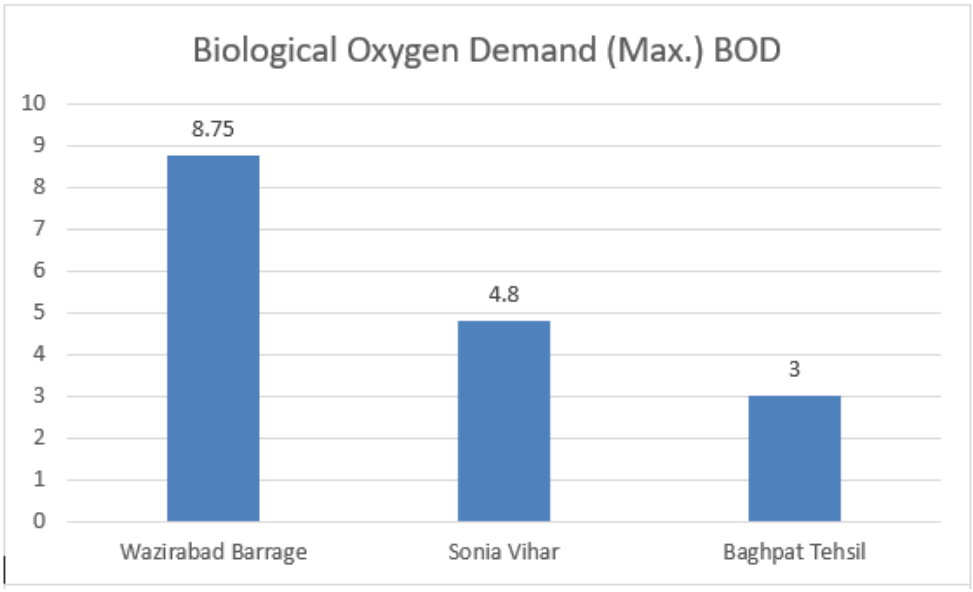

Figure 4.15: Graph diagram of biological oxygen demand

The figure 4.15 shows the Graph diagram of biological oxygen demand, here we are comparing the biological oxygen demandvalue of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here biological oxygen demand high in wazirabad barrage and low in baghpattehsil. Biological oxygen demand comparatively better in baghpat tehsil location.

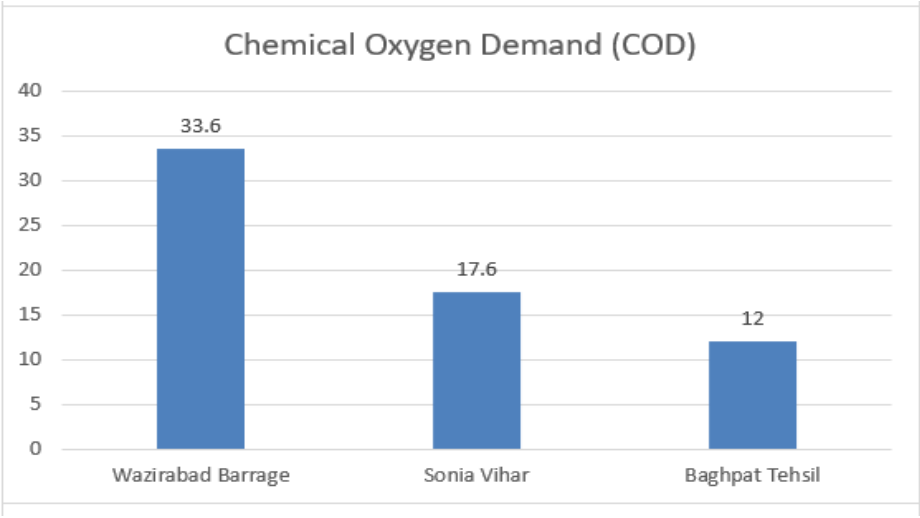

Figure 4.16: Graph diagram of chemical oxygen demand

The figure 4.16 shows the Graph diagram of chemical oxygen demand, here we are comparing the chemical oxygen demand value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here chemical oxygen demand high in wazirabad barrage and low in baghpat tehsil. Chemical oxygen demand comparatively better in baghpat tehsil location.

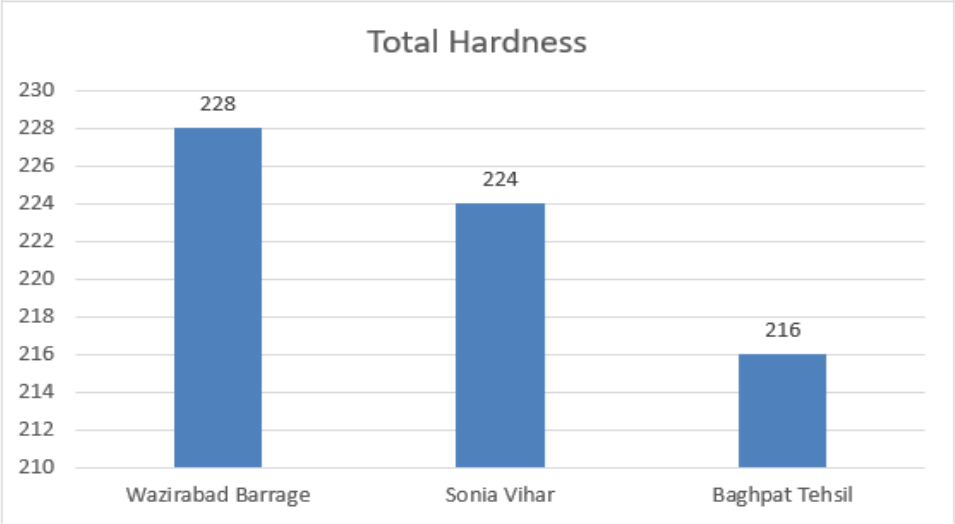

Figure 4.17: Graph diagram of total hardness

The figure 4.17 shows the Graph diagram of total hardness, here we are comparing the total hardness value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here total hardness high in wazirabad barrage and low in baghpat tehsil. Total hardness comparatively better in baghpat tehsil location.

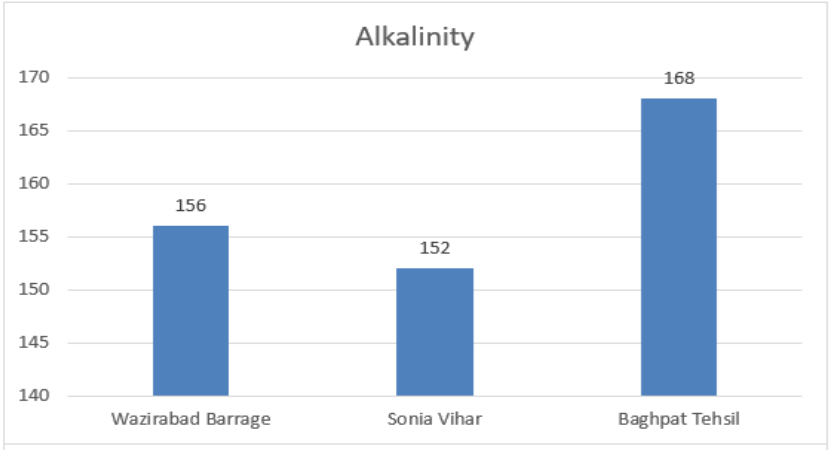

Figure 4.18: Graph diagram of alkalinity

The figure 4.18 shows the Graph diagram of alkalinity, here we are comparing the alkalinity value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here alkalinity high in baghpat tehsil and low in Sonia vihar. Alkalinitycomparatively better in baghpat tehsil location. Alkalinity water should be in 20-200 mg/L.

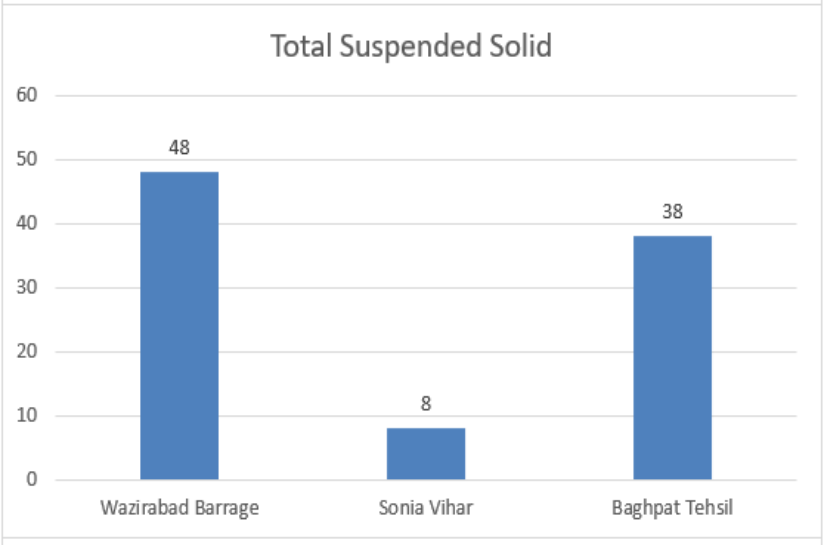

Figure 4.19: Graph diagram of total suspended solid

The figure 4.19 shows the Graph diagram of total suspended solid, here we are comparing the total suspended solid value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here total suspended solid high in wazirabad barrage and low in Sonia vihar.

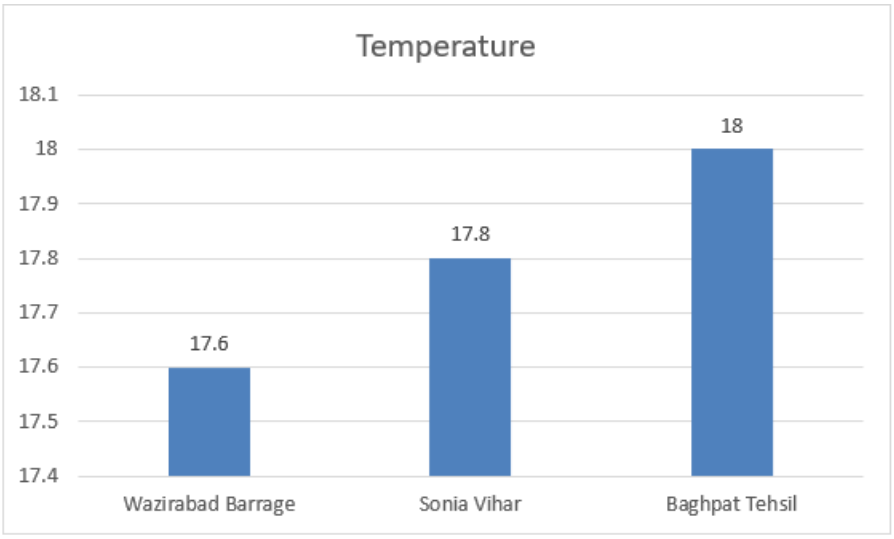

Figure 4.20: Graph diagram of temperature

The figure 4.20 shows the Graph diagram of temperature, here we are comparing the temperature value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here temperature high in baghpat tehsil and low in wazirabad barrage. Total hardness comparatively better in baghpat tehsil location.

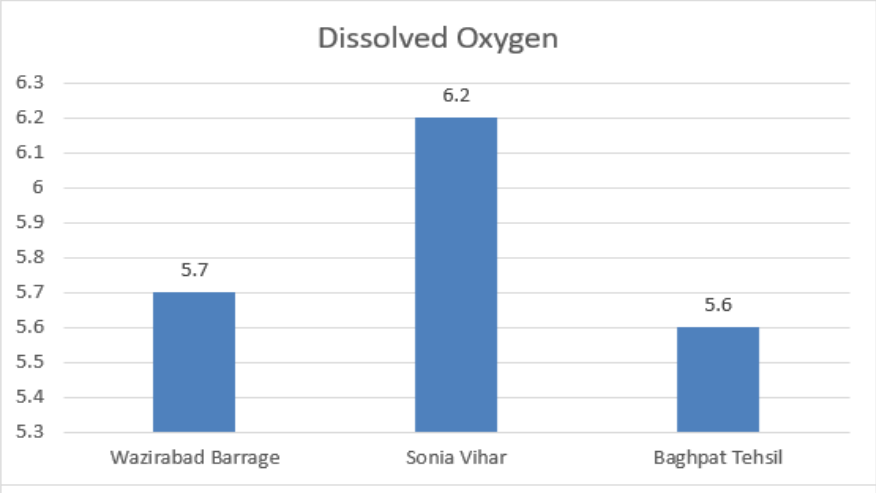

Figure 4.21: Graph diagram of dissolved oxygen

The figure 4.21 shows the Graph diagram of dissolved oxygen, here we are comparing the dissolved oxygen value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here dissolved oxygen high in Sonia viharand low in baghpat tehsil. Dissolved oxygen comparatively better in baghpat tehsil location.

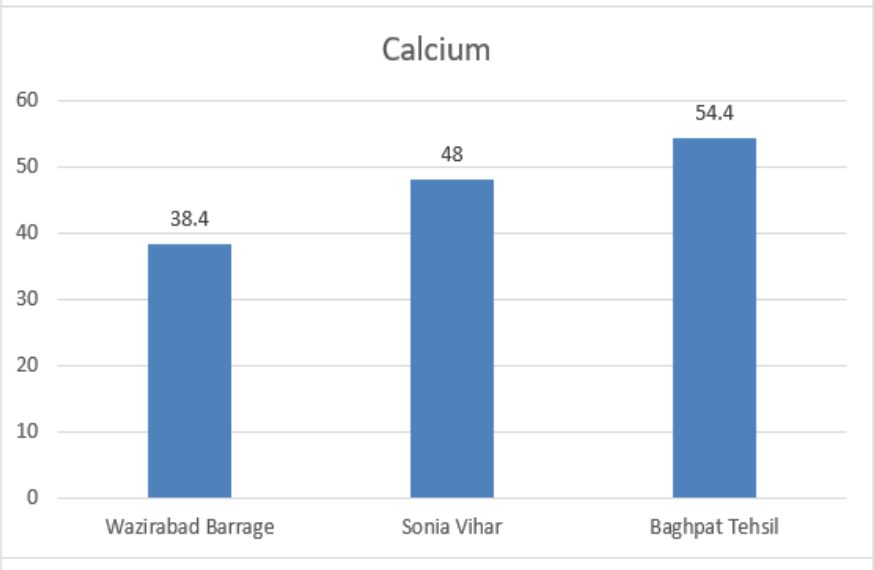

Figure 4.22: Graph diagram of calcium

The figure 4.22 shows the Graph diagram of calcium, here we are comparing the calcium value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here calcium high in baghpat tehsil and low in wazirabad barrage. Calcium comparatively better in baghpat tehsil location.

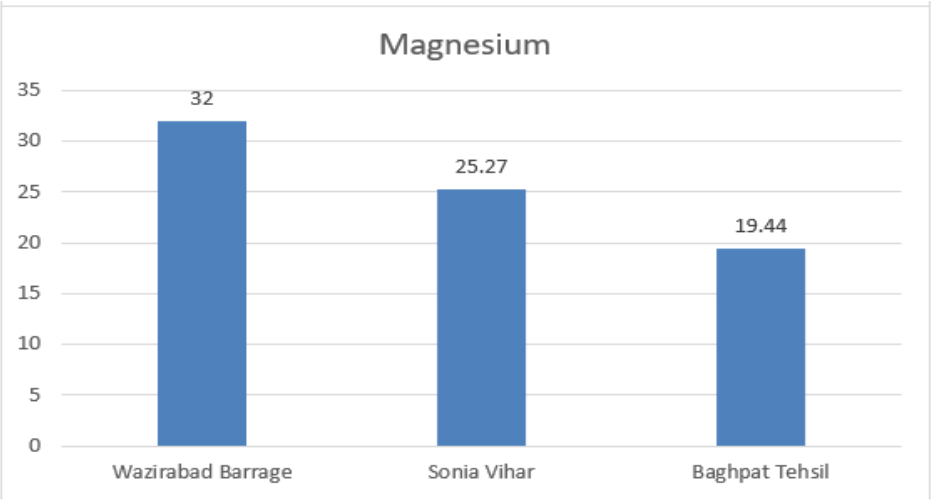

Figure 4.23: Graph diagram of magnesium

The figure 4.23 shows the Graph diagram of magnesium, here we are comparing the magnesium value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here magnesium high in wazirabad barrage and low in baghpat tehsil. Magnesium comparatively better in baghpat tehsil location.

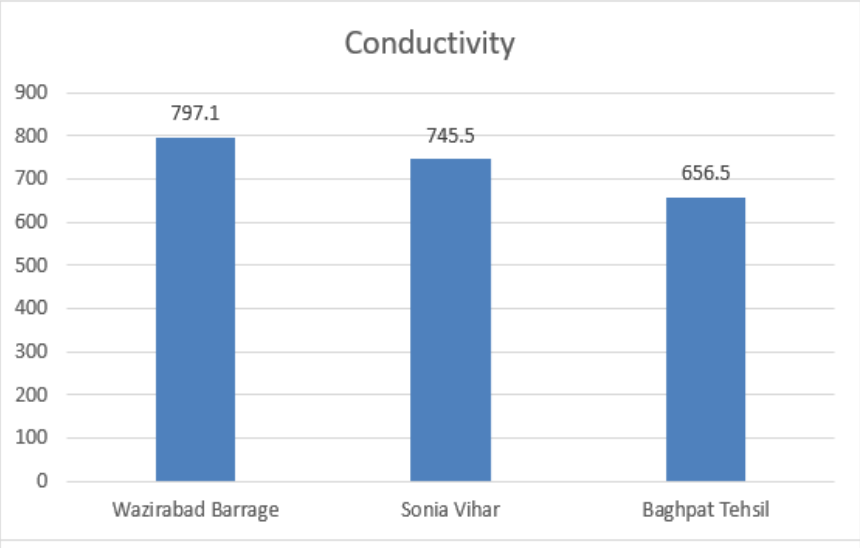

Figure 4.24: Graph diagram of conductivity

The figure 4.24 shows the Graph diagram of conductivity, here we are comparing the conductivity value of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here conductivity high in wazirabad barrage and low in wazirabad barrage.

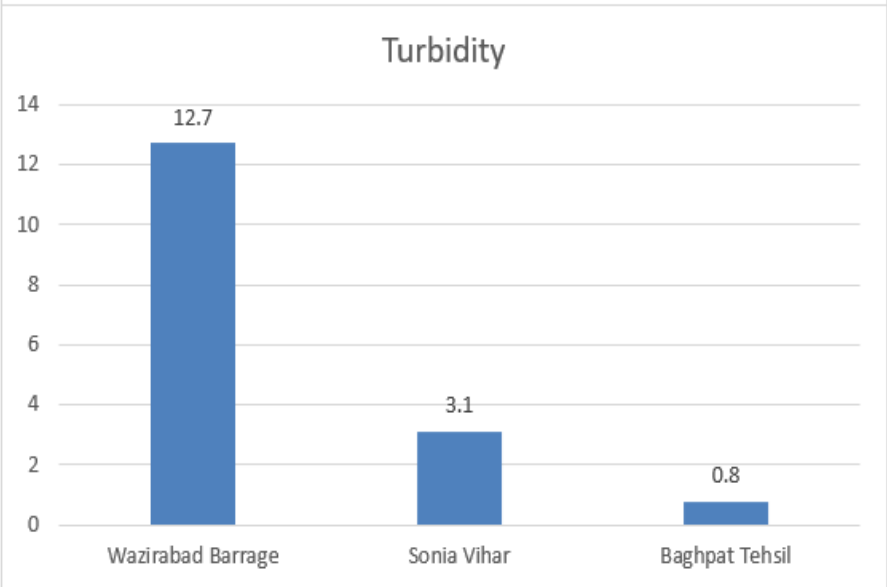

Figure 4.25: Graph diagram of turbidity

The figure 4.25 shows the Graph diagram of turbidity, here we are comparing the turbidityvalue of three sampling location and it is wazirabad barrage, Sonia vihar and baghpat tehsil. Here turbidityhigh in wazirabad barrage and low in baghpat tehsil.

Table 4.14: parameters of water in differentthree best sampling location

Parameter	**Wazirabad Barrage**	**Sonia Vihar**	**Baghpat Tehsil**
pH	7.31	6.96	7.43
Dissolved Oxygen	5.7	6.2	5.6
Biological Oxygen Demand (Max.) BOD	8.75	4.8	3
Chemical Oxygen Demand (COD)	33.6	17.6	12
Total Dissolved Solid	312	528	414
Total Hardness	228	224	216
Calcium	38.4	48	54.4
Magnesium	32	25.27	19.44
Alkalinity	156	152	168
Conductivity	797.1	745.5	656.5

Turbidity	12.7	3.1	0.8
Total Suspended Solid	48	8	38
Temperature	17.6	17.8	18

The above table we can see the different parameters value in different location, the parameters ARE pH, Dissolved Oxygen (as O_2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as $CaCO_3$), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature and here we are comparing the three different location wazirabad barrage, Sonia vihar and baghpat tehsil.

Table 4.15: measured values of the WQP and WHO guidelines

MEAURED VALUES RESULTS									**TOLERENCE LIMITS AS PER IS-2296**			
PARAMETERS	**TEST METHOD**	**SW 1**	**SW 2**	**SW 3**	**SW 4**	**SW 5**	**SW 6**	**UNITS**	**CLASS-A**	**CLASS-B**	**CLASS-D**	**CLASS-E**
PH	IS-3025	6.96	7.31	7.43	7.57	7.99	8.08	-	(6.5-8.5)	(6.5-8.5)	(6.5-8.5)	(6.5-8.5)
DISSOLVE OXYGEN(O2)	IS-3025	6.2	5.7	5.6	6.4	6.2	6.5	mg/L	6.0	5.0	4.0	-
BOD	IS-3025	4.8	8.75	3	12.75	16.50	21	mg/L	2.0	3.0	-	-
COD	IS-3025	17.6	33.60	12	48	56	60	mg/L	-	-	-	-
TOTAL DISSOVE SOLIDS	IS-3025	528	312	414	321	380	348	mg/L	500	-	-	2100
TOTAL HARDNESS AS (CACO3)	IS-3025	224	228	216	244	252	204	mg/L	300	-	-	-

CALCIUAS (CA)	IS-3025	48.0	38.4	54.4	56	52.8	57.6	mg/L	80	-	-	-
MAGNESIUM AS (MG)	IS-3025	25.27	32	14.44	25.27	29.16	14.58	mg/L	24	-	-	-
ALKANITY	IS-3025	152	156	168	156	168	160	mg/L				
CONDUCTIVITY	IS-3025	745.5	797.1	656.5	510.2	603.9	547.3	ųS/Cm	-	-	1000	2250
TOTAL SUSPENDED SOLIDS	IS-3025	8	48	38	6	26	38	mg/L				
TEMPERATURE	IS-3025	°17.8	°17.6	°18	°19	°17	°20	°C				
TURBIDITY	IS-3025	3.1	12.7	0.8	6.4	7.9	3.6	NTU	-	-	-	-

The above table we can see the different parameters value in different location, the parameters ARE pH, Dissolved Oxygen (as O_2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as $CaCO_3$), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature. And here also shows different classes of water that means class A class B class D and class E. and the different class representing theClass A-Drinking water after disinfection, without traditional therapy. Outdoor swimming class B-Water.

Table 4.16: calculated values of WQI

PARAMETERS	si	1/si	UNIT WEIGHT (Wi=K/si)	SW1(qi)	SW2(qi)	SW3(qi)	SW4(qi)	SW5(qi)	SW6(qi)
PH	8.5	0.117	0.174	2.67	20.67	28.67	38	66	72
DO	6.0	0.166	0.247	4.93	103.48	104.65	95.34	0.97	94.18
BOD	3.0	0.333	0.495	160	291.66	100	425	550	7.00
TDS	2100	0.0004	0.0007	25.14	14.85	19.71	15.28	18.09	16.57
HARDNESS AS CACO3	300	0.003	0.004	74.66	76	72	81.33	84	68
CALCIUM	80	0.0125	0.018	60	48	68	70	66	72
MAGNESIUM	24	0.0416	0.061	105.29	133.23	81	105.29	121.5	60.5
CONDUCTIVITY	2250	0.0004	0.0006	33.13	35.42	29.17	22.67	26.84	24.32
TOTAL			WQI=	465.82	723.41	503.2	852.91	933.4	1107.57
	1/si=0.673		Wi=1						
	K=1/1/Si=1.485		AVERAGE WQI=	4586.31/6=764.4					

The above table we can see the different parameters value in different location, the parameters ARE pH, Dissolved Oxygen (as O_2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as $CaCO_3$), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature.

CHAPTER 5
CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION:

Hence here we are studied the quality analysis of Yamuna river in different location in India. Here we are selecting some location of Yamuna River. The locations are wazirabad barrage, Sonia vihar ,baghpat tehsil, Katha village, Palla village and BaghpatCollectrate. Here we are finding the different parameters that is pH, Dissolved Oxygen (as O_2) Min, Biological Oxygen Demand (Max.) BOD, Chemical Oxygen Demand (COD), Total Dissolved Solid, Total Hardness (as $CaCO_3$), Calcium (as Ca), Magnesium (as Mg), Alkalinity, Conductivity, Turbidity, Total Suspended Solid and Temperature finally we are finding WQI using equation when the WQI is less 100 it is good for drinking and it is greater than 100 it is not good for drinking ,here we are getting the WQI in Yamuna river water is 764.4 so it is greater than the 100 that mean it is not good for drinking .Its should be restored and treatment process will be done.

5.2 FUTURE SCOPE:

Study covers the water quality parameters that give stable results. For complete status of river each pollution parameters should be observe. As we realize that the Yamuna in the various location in city stretch has become nearly dead and not usable for any type of designated uses. Instantaneous mending should be done there. Abundant time and flow are needed for self-purification of the area. Put in of pollution load should be lowest. One proposal for the flow of all point source inlet towards the stretch after Delhi Region. ‘Control, not prohibition’ is the keyword. In following times government should lay hold of the decision to band garbage waste putting in Yamuna River and treating this water using various technology after we can use this water for drinking or other use. This water we can use by using some purification or recycling this water that was helpful in future.it should.

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