

# GROUND WATER QUALITY MONITORING AROUND SEWAGE TREATMENT PLANT

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**Abstract**— Because of the urbanization and increasing population, more water is consumed so more is generated from houses, industry and commercial centre in a city. That waste water may contain hazards, volatile and suspended impurities. Such waste water is treated to reduce to level hazards before discharging. Such process is made in the treatment plants, that plant could may affect the surrounding ground water quality around the STP through intrusion. Hence the ground water around the 5km radius, of STP is collected every 1km analysed for various, physio- chemical and biological character. Such as pH, TDS, Hardness, Alkalinity, Chloride, Turbidity, Calcium, Magnesium, Potassium, etc., and them being compared with WHO and BIS standard, also the rate of increase of contaminants from STP to the ground water table for the current year and previous year is also assessed. Then suitable remedial measure is suggested based on the level of pollution in economical manner.

**Keywords**— Ground water, pH, TDS, Hardness, Alkalinity, Chloride, Turbidity, Calcium, Magnesium, Potassium, WHO, BIS, Sewage Treatment Plant (STP), Ground water table, Previous year.

## I. INTRODUCTION

Water is the most important in shaping, the land and regulating the climate. It is one of the most important compounds that profoundly influences life. In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid population explosion, and accelerated industrialization. By which more hazardous waste are generated from various sources. And when they are exposed to reach by ground water, they severely affect the quality of GWT. If such water is used for domestically and agricultural purpose they directly and indirectly affect the living organism whom they use it. Hence the waste water is made to treatment for the elimination of hazard in it, before discharging into water bodies. In the treatment process, water is stagnated for settling of suspended, dissolved and solid waste to from as sludge. During this process, water seeps into the ground water and hence quality of GWT affects.

Because of the waste water penetration around the sewage treatment plant water table is monitored, periodically to ensure the health of native. For the radius of 5km from STP is analysed by taking samples from every 1km for four direction is north, south, east, west, is collected and test are performed. If the contaminant is more than the standard value then suitable measure and ideas could be suggested and implemented before affecting peoples. Hence ground water is an importance source of water supply for the native people around Mannampandal. It is required to persevere the quality of ground water. Due to the rapid development of living standard, high population growth and massive migration in the region, the demand of water has increased but the surface water is not enough to fulfil the needs. It is required to providing the safe ground water supply.

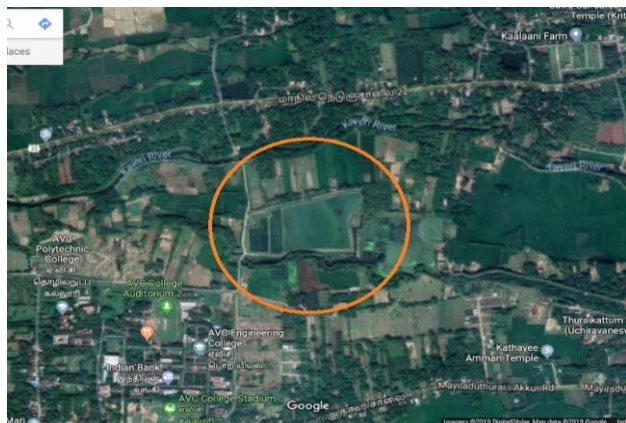


FIG (1) – SATELLITE MAP OF STP

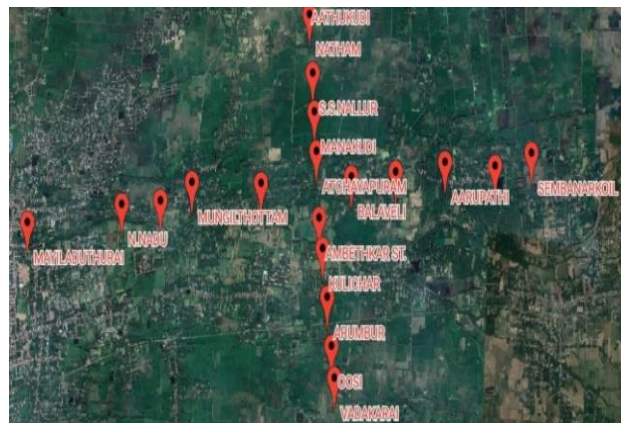


FIG (2) – PLACES AROUND STP

## II. GROUND WATER

Ground water is a subsurface water which is colourless, odourless, and with any specific waste. Ground water is the main source for the water supply and agricultural other domestic purpose. But it is mainly affected by the contaminant percolating from the surface to subsurface.

## III. STUDY AREAS

The waste water treatment plants are located at Mannampandal near Mayiladuthurai in Nagapattinam district having latitude is  $1143^{\circ}$  N and longitude is  $79.689^{\circ}$  E at their waste water treatment plant is located for various zone. The sewage from each zone will be collected through branch sewers and main sewers to pumping station and the conveyed to the sewage treatment plant unit 1 (5.85MLD) constructed at Aarupathi village. The sewage will be treated by aerobic method. The effluent will be let into through natural course leading to sathiyavanan channel.

## IV. CHARACTERISTICS OF WASTE WATER

The properties of waste water can be classified as,

- 4.1 Physical characteristics
- 4.2 Chemical characteristics
- 4.3 Biological characteristics

### 4.1 4.2 PHYSICAL AND CHEMICAL ANALYSIS

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physic-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity. Water does content different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, colour, odour, pH, turbidity, TDS etc., while chemical tests should be performing for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characters. For obtaining more and more quality and purity water, it should be tested for its trace metal, heavy metal contents and organic i.e. pesticide residue. It is obvious that drinking water should pass these entire tests and it should content required amount of mineral level.

## V. NEED FOR GROUND WATER MONITORING

In order to eliminate the hazards before polluting the ground water. If mixed, the fixed in its starting age. Finding the most appropriate treatment method for the elimination of comparison. Fixing the extend of pollutants in the ground water. Suggesting the suitable methods for retentions form causes. Ensuring the shape and reliability of ground water.

## VI. SEWAGE

Sewage is a waste matter such as face of dirty water from houses and industries which flow away through sewer. Waste matter from domestic or industrial establishment i.e., carried away in sewers or drains for dumping or conversion into a from that is not toxic.



**FIG (3) – POLISHING POND**

## VII. TREATMENT OF SEWAGE

The process of removing or treating the harmful matters present in the sewage and make the sewage into harmless one for safe disposal is called treatment of sewage.



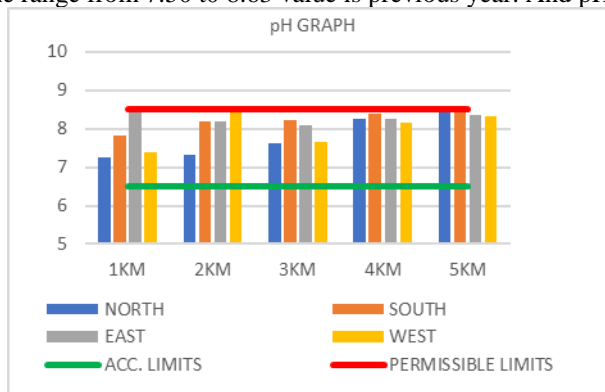
**FIG (4) – TREATMENT UNIT**

**TABLE (1) – RESULT AND DISCUSSION OF GROUND WATER QUALITY IN EACH DIRECTION**

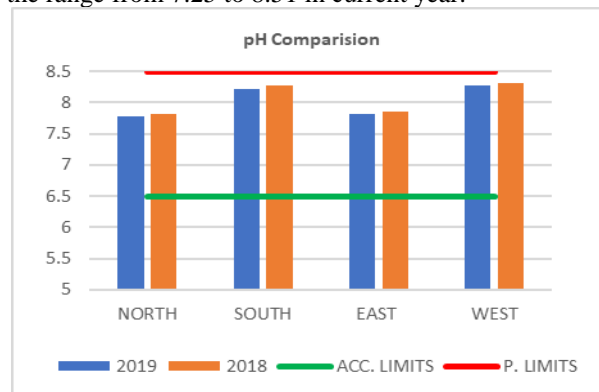
S.NO	PARAMETERS & UNITS	NORTH	SOUTH	EAST	WEST
1	pH	7.25 – 8.43	7.83 – 8.48	7.40 – 8.32	8.19 – 8.51
2	Turbidity (NTU)	0 – 0.6	0 – 3.3	0 – 20.2	0 – 6.9
3	Electrical conductivity ( $\mu\text{s}/\text{cm}$ )	0.37 – 0.84	0.46 – 1.30	0.25 – 0.73	0.32 – 0.65
4	TDS (mg/L)	284 – 622	357 – 967	249 – 499	190 – 575
5	Total Solids (mg/L)	40 – 140	60 – 120	80 – 100	60 – 140
6	Potassium (mg/L)	1 – 35	1 – 12	1 – 4	1 – 24
7	Calcium (mg/L)	8 – 19	10 – 22	8 – 15	7 – 16
8	Sodium (mg/L)	21 – 38	19 – 49	16 – 33	14 – 32
9	Total alkalinity (mg/L)	120 – 280	80 – 240	100 – 320	200 – 361
10	Total hardness (mg/L)	180 – 320	160 – 320	160 – 320	180 – 320
11	DO (mg/L)	7.2 – 8.3	7.2 – 8.4	6.8 – 8.4	7.1 – 8.2
12	Chlorides (mg/L)	330 – 530	400 – 550	380 – 632	420 – 628
13	TSS (mg/L)	40 -100	60 – 80	40 – 60	60 – 120

## VIII. PH

pH testing is a process of analysis whether the solution a water with a ph. <7 is consider acidic and with a ph. > 7 is considered alkalinity. The normal range for pH. in ground water system is 6.5 to 8.5. The pH of ground water was about neutral the range from 7.50 t0 8.63 value is previous year. And pH. neutral the range from 7.25 to 8.51 in current year.



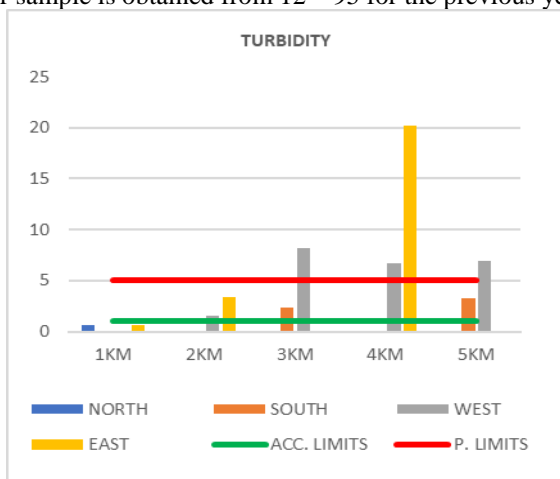
GRAPH (1) – pH VALUE 2019



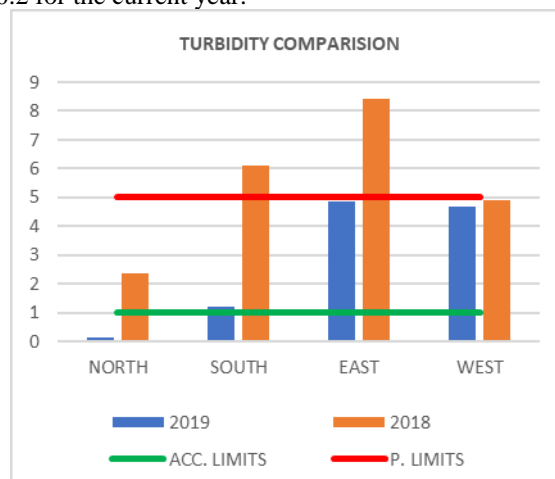
GRAPH (2) – COMPARISION OF pH VALUE (2018 - 19)

IX. TURBIDITY

Suspension of particles in water interfering with passage of light is called turbidity. Turbidity is caused by wide variety of suspended particles. Turbidity can be measured either by its effect on the transmission of light which is termed as ephelometry as per IS:10500-2012 the acceptable and permissible limits are 1 and 5 NTU respectively. The turbidity of ground water sample is obtained from 12 – 95 for the previous year and 0 – 20.2 for the current year.



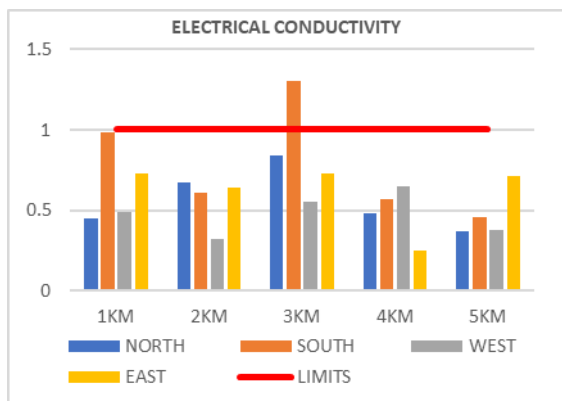
GRAPH (3) – TURBIDITY OF GROUND WATER 2019



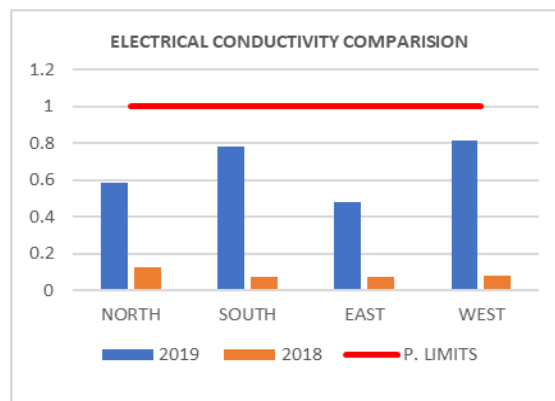
GRAPH (4) – COMPARISION OF TURBIDITY – 2018 - 19

X. ELECTRICALCONDUCTIVITY

EC is a measure of total salt contenting water. It's a determination of levels of inorganic constituents in water. EC ranged between 0.056µs/cm to 0.196 µs/cm. Difference of total solids and suspended solids is used to determine the filterable solids by the help of filtrate and following the procedure as above. In water sample it can also be estimated from conductivity measurement. The acceptable and permissible limits as per IS: 10500-2012 is 500 and 2000 mg/l respectively.



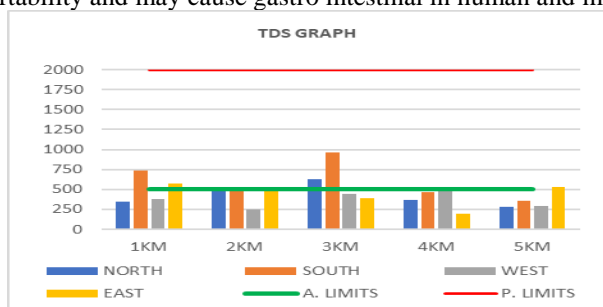
GRAPH (5) – ELECTRICAL CONDUCTIVITY – 2019



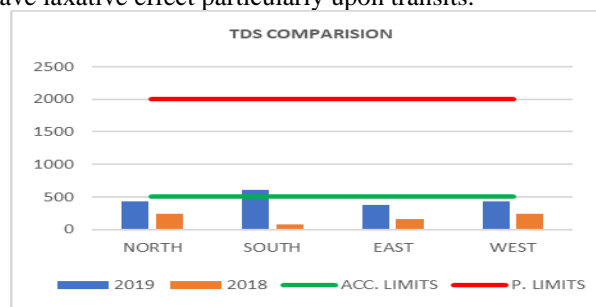
GRAPH (6) – COMPARISION OF EC (2018 – 19)

XI. TDS

Total dissolved solids area measure of total inorganic substances dissolved in water. TDS indicates the general nature of water quality or salinity. During the study TDS is found between ranged 0 to 60mg/l. The TDS concentration was found to be above the permissible limit may be due to the leaching of various pollutants into the ground water which can decrease the portability and may cause gastro intestinal in human and may also have laxative effect particularly upon transits.



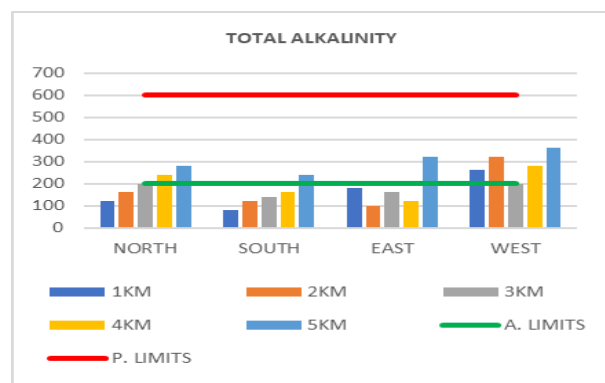
GRAPH (7) – TDS FOR 2019



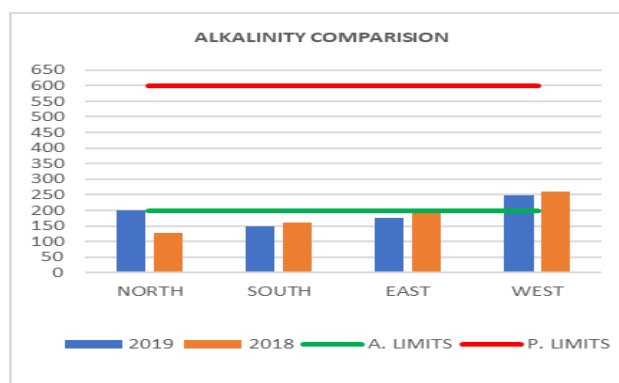
GRAPH (8) – COMPARISION OF TDS (2018 – 19)

XII. ALKALINITY

The total alkalinity was found to be in the range of 40 to 160mg/l in ground water samples which are caused mainly due to OH, CO<sub>3</sub>, HCO<sub>3</sub> ions. Alkalinity is the strength of a [buffer solution](#) composed of [weak acids](#) and their [conjugate bases](#). It is measured by titrating the solution with a [monoprotic acid](#). The below graphs show the alkalinity present in the ground water and its comparison.



GRAPH (9) – TOTAL ALKALINITY 2019

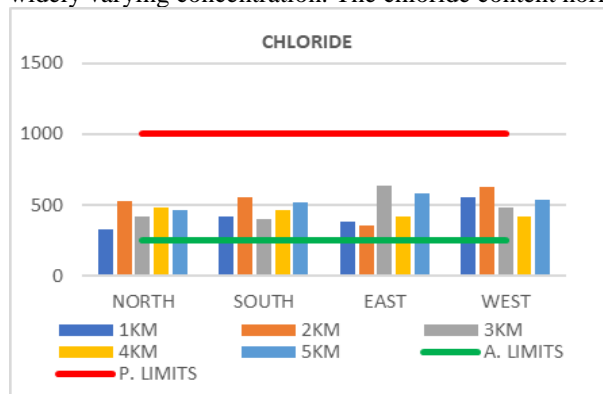


GRAPH (10) – COMPARISION OF ALKALINITY (2018 – 19)

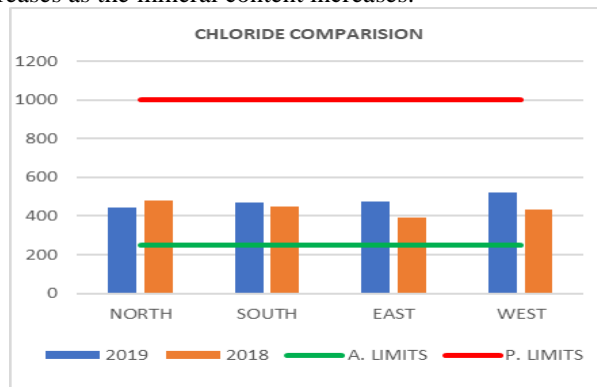
XIII. CHLORIDES

The value of chloride obtained 360 to 560 mg/l as presented in table which is further compared with the standard values 250mg/l. Department of National Health and Welfare, Canada reported that chloride in ground water may results both natural and Anthropogenic sources such as run – off containing salts, the use of inorganic fertilizers, landfill, leachates, septic tank effluents, animal feeds, industrial effluents, irrigation drainage and sea water intrusion in coastal areas. Chlorides is not harmful to human at low concentration but could alter the taste of water at concentration above 250 mg/L.

Chlorides are present in the ground water, and are essential elements of life. Chloride occurs in all-natural water in widely varying concentration. The chloride content normally increases as the mineral content increases.



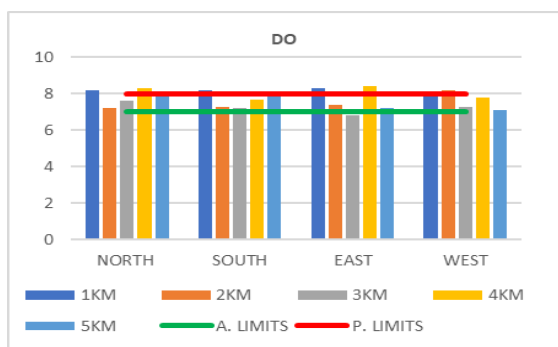
GRAPH (11) – CHLORIDES 2019



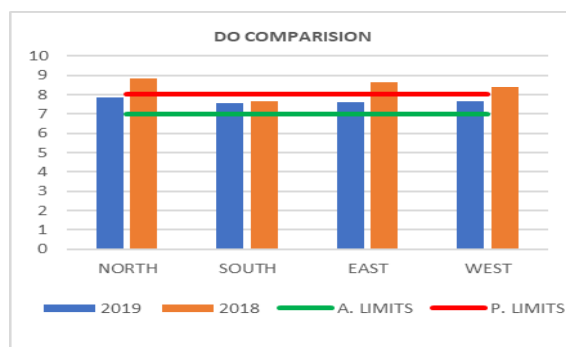
GRAPH (12) – COMPARISON OF CHLORIDES (2018 – 19)

XIV. DISSOLVED OXYGEN

Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. In limnology (the study of lakes), dissolved oxygen is an essential factor second only to water itself. A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality. The acceptable limits and permissible limits for dissolved oxygen is 7 – 8mg/L.



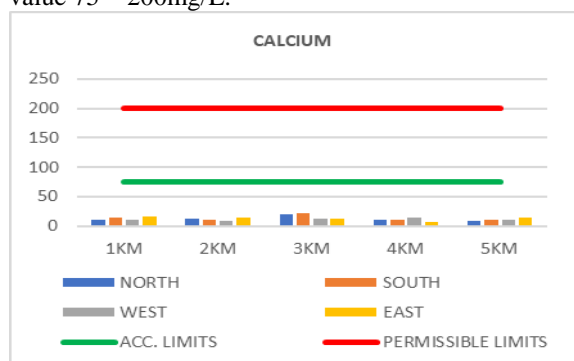
GRAPH (13) – DISSOLVED OXYGEN 2019



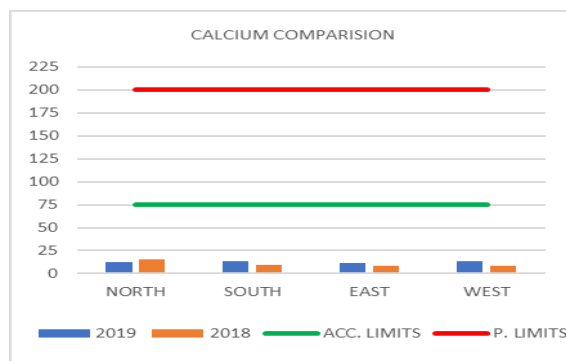
GRAPH (14) – COMPARISON OF DO (2018 – 19)

XV. CALCIUM

Calcium are found in ground water that has come in contact with certain rocks and minerals especially lime and gypsum. When these materials are dissolved, they release calcium. The calcium in ground water of sample are found maximum value 75 – 200mg/L.



GRAPH (15) – CALCIUM 2019



GRAPH (16) – COMPARISON OF CALCIUM (2018 - 19)

Conclusions

The conclusion of our research works all the parameters except DO, Turbidity and ph is not satisfying the BIS standards in some cases. The DO results show some places have been contaminated. The following directions are NORTH –

1Km & 4Km; SOUTH – 1Km & 5Km; EAST – 1Km & 4Km; WEST – 2Km. The turbidity results show some places have been contaminated. The following directions are, EAST – 4Km; WEST – 3Km, 4Km & 5Km. The ph results show some places have been contaminated. The following directions are, WEST – 2Km. The above directions are contaminated and doesn't satisfy the BIS standards. Hence the ground water doesn't contaminate by the STP.

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