# Water Quality Assessment Of Ground water Around KMML Area Chavara.

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**Abstract**— Clean water is one of the most valusable resource in our planet. Increasing disturbance of natural landscape due to urban expansion affects water resource and water quality. Quality of drinking water have greater importance, this thought inspired us to conduct this project. So the sample water was collected from the open wells around the KMML area. Then the main physiochemical and biological analysis of the parameters like, conductivity, salinity, turbidity, pH, BOD, COD, TDS, iron, nitrate etc. were done and found that the samples collected from places near KMML are polluted. Hence the use of waters of open wells in and around the industrial area may cause health hazards to nearby inhabitants. So it is necessary to control the contaminant transportation and ground water pollution in and around KMML area.

**Index Terms**— Open wells, Ground water pollution, Physiochemical parameters, MPNcoli forms, Water Quality Index and GIS mapping.

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## 1 INTRODUCTION

Water is essential natural resource for sustaining life and environment that we have always thought to be available in abundance and free gift of nature. However, chemical composition of surface and subsurface water is one of the prime factors on which the suitability for domestic, industrial or agriculture purpose depends. Natural, readily available waters such as shallow groundwater, surface water, water from the boreholes and springs are the main sources for drinking water production[reference5]. Large scale industrial growth has caused serious concern regarding the susceptibility of ground water contamination due to waste materials [reference 11]. Effluents and other waste materials from the factories which are subjected to reaction with percolating rain water reach the aquifer system and hence degrade the ground water quality[reference 3]. Heavy metals constitute a very heterogeneous group of elements widely varied in their chemical properties and biological functions. They are persistent in nature, therefore get accumulated in soil and plants.

Kerala Minerals and Metals Ltd. (KMML) located at Chavara, Kollam district is one of the major industries in Kerala. It is the only integrated plant with Mineral separation plant, Synthetic Rutile plant with acid regeneration facility and Titanium dioxide pigment production plant in a single complex [reference 11]. People around this industrial area mainly depend on ground water source, particularly the open wells for their domestic purposes. Quality of ground water is deteriorating at a faster pace due to industrial wastes being discharged into the surroundiing areas and people in this area suffer from health hazards. So it is significant to check the ground water contamination

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## 2 METHODS AND MATERIALS

### 2.1 Study Area Selection.

The investigation was carried out by selecting ten open wellsamples representing different localities around the KMML industrial area, Chavara, Quilon district is located at $8^0 59'69.8''$N latitude and $7^0 00'19.17''$E longitude. The areal extend of KMML is about 210 acres.

### 2.2 Sampling.

Fifteen open well samples were collected in one directionally within the range of 5km-6km around KMML from fifteen wells at a certain depth. All the samples were collected in bottles and preserved. Tests like conductivity, turbidity, pH, TDS, hardness were conducted within 8 days of sample collection. Again the samples were collected from same stations and the remaining tests were done.

### 2.3 Test procedures

pH and turbidity tests were conducted using pH meter and turbidimeter respectively. Test for hardness was done by using the reagents erichrome black T indicator, ammonium buffer solution, std EDTA titrant 0.01M. Chloride test was done by using the reagents chlorine free distilled water, std silver nitrate solution(0.0141N), potassium chromate indicator, acid or alkali for adjusting Ph.

### 2.4 Sample stations.

Samples were collected and the latitude and longitude of sample stations were noted by using GPS as shown in table1.

**Table 1- Sample stations.**

| Sample No. | Distance from KMML (Km) | Latitude | Longitude |
|---|---|---|---|
| S1 | - | 8.99655° | 76.53011° |
| S2 | 0.03 | 9.00606° | 76.52731° |
| S3 | 0.8 | 9.00660° | 76.53453° |
| S4 | 0.9 | 9.00559° | 76.53468° |
| S5 | 1.1 | 8.99759° | 76.53652° |
| S6 | 1.3 | 8.99568° | 76.53023° |
| S7 | 1.7 | 9.00459° | 76.52411° |
| S8 | 2.1 | 8.99767° | 76.53877° |
| S9 | 2.7 | 9.00864° | 76.52414° |
| S10 | 3.0 | 9.00854° | 76.53920° |
| S11 | 3.1 | 9.01065° | 76.54152° |
| S12 | 3.7 | 9.00573° | 76.54523° |
| S13 | 5.0 | 9.01103° | 76.55446° |
| S14 | 5.4 | 9.01448° | 76.45334° |
| S15 | 5.8 | 9.01445° | 76.43344° |

## 2.5 MEASUREMNT AND ANALYSIS OF WATER QUALITY PARAMETERS.

**Table 2- Results of pH, Hardness, Turbidity.**

| Sample No. | pH | Hardness (ppm) | Turbidity (NTU) |
|---|---|---|---|
| S1 | 7.29 | 236 | 63 |
| S2 | 7.24 | 214 | 59 |
| S3 | 7.02 | 180 | 44 |
| S4 | 6.74 | 192 | 32 |
| S5 | 6.81 | 136 | 28 |
| S6 | 6.79 | 104 | 23 |
| S7 | 6.72 | 76 | 18 |
| S8 | 6.70 | 69 | 15 |
| S9 | 6.68 | 62 | 13 |
| S10 | 6.65 | 58 | 12 |
| S11 | 6.63 | 53 | 10 |
| S12 | 6.42 | 49 | 08 |
| S13 | 6.34 | 46 | 06 |
| S14 | 5.93 | 41 | 04 |
| S15 | 5.72 | 42 | 03 |

**Table 3- Results of TDS, Conductivity, Salinity**

| Sample No. | TDS(mg/l) | Conductivity (µs/cm) | Salinity |
|---|---|---|---|
| S1 | 3600 | 1650 | 0.243 |
| S2 | 2400 | 1520 | 0.175 |
| S3 | 1800 | 1340 | 0.158 |
| S4 | 1500 | 1150 | 0.143 |
| S5 | 900 | 842 | 0.096 |
| S6 | 600 | 754 | 0.091 |
| S7 | 400 | 644 | 0.084 |
| S8 | 200 | 542 | 0.081 |
| S9 | 600 | 527 | 0.076 |
| S10 | 400 | 490 | 0.068 |
| S11 | 320 | 494 | 0.062 |
| S12 | 120 | 344 | 0.056 |
| S13 | 200 | 261 | 0.042 |
| S14 | 180 | 223 | 0.031 |
| S15 | 120 | 218 | 0.025 |

**Table 4- Results of Chloride, COD, Iron.**

| Sample No. | Chloride (mg/l) | COD (mg/l)) | Iron (mg/l) |
|---|---|---|---|
| S1 | 338.76 | 144 | 3.285 |
| S2 | 327.31 | 100.2 | 2.859 |
| S3 | 308.04 | 80 | 2.192 |
| S4 | 294.94 | 68 | 1.492 |
| S5 | 283.21 | 56 | 0.895 |
| S6 | 274.914 | 51 | 0.784 |
| S7 | 259.94 | 47 | 0.761 |
| S8 | 169 | 42 | 0.706 |
| S9 | 114.96 | 37.98 | 0.685 |
| S10 | 74.97 | 31.06 | 0.527 |
| S11 | 54.98 | 28.80 | 0.244 |
| S12 | 59.98 | 25.60 | 0.222 |
| S13 | 45.76 | 22.40 | 0.231 |
| S14 | 36.21 | 20.00 | 0.197 |
| S15 | 29.99 | 12.80 | 0.091 |

## 3. RESULTS AND DISCUSSION.

### A. Analysis of pH

The variation and range of Ph of sample wells are shown in above table 1. The Ph ranges from 7.29 to 5.72. the sample s1,s2,s3 shows alkaline nature and all other samples shows slightly acidic nature.

### B. Analysis of hardness

Hardness varies from 236 to 41 (ppm). It is clear from the table 1 that the hardness for the sample near the KMML are beyond the limit and as distance from kmml increases hardness value decreases.

### C. Analysis of turbidity

Just like hardness the samples near kmml have turbidity values beyond the limit and as distance increases turbidity decreases.

### D.Analysis of TDS

The TDS values ranges from 3600 to 120 (mg/l). Samples near KMML have more dissolved solids compared to samples far away from KMML.

### E. Analysis of Iron.

The permissible limit for Iron is 0.3 mg/l. It is clear that, their values are beyond the limit for 10 sampling points. And it is within the limit for remaining samples.

## 4. CONCLUSION

All the well water near KMML exhibited high COD, TDS, total hardness, iron etc. which are sourced to industrial wastes being discharged into the surrounding areas. The values of TDS, BOD, COD and iron exceeded the permissible limit. Hence, the well water near KMML is unsuitable for domestic purpose, as confirmed by water quality index. The consumption of the well water around the industrial area may cause health hazards to the local residents. It is necessary to control the contaminant transporation and ground water pollution in and around KMML area.

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