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COMPARISON BETWEEN GROUND WATER QUALITIES IN BACHOK WITH THE NATIONAL DRINKING WATER QUALITY STANDARD 1983

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***Abstract*- Ground water is the most valuable natural water resource to the people in Bachok for the dependence on this source. This paper discusses to what extent the differences of the ground water quality in the research area with the National Drinking Water Quality standard guidelines 1983. For three years the data of the ground water quality were used to observe the differences occurred that is in 1990, 1999 and 2011. The parameters for Chloride (Cl), Nitrate (NO3), Ammonia (NH4), Ferum (Fe), Manganese (Mn), Sodium (Na), Potassium (K), Calcium and Magnesium (Mg) are used to compare with the standard that has been set by the Ministry of Health Malaysia (MOH) in the chart form. The results of this study found that almost all the ground water parameters in the well in Bachok exceed the national drinking water standard, such as Chloride (Cl), Ammonia (NH4), Ferum (Fe), Manganese (Mn) and Potassium (K). Three more parameters which are Sodium (Na), Nitrate (NO3) and Magnesium (Mg) were found that only in some wells exceed the drinking water standard 1990. Although there are still wells that exceed the standard, the most recent data in 2011 showed a decline compared to 1990 and 1999. Monitoring action and drastic measures must be taken to ensure the quality of the drinking water in Bachok is safe to be used.**

***Keyword*: Ground Water Quality**

I. INTRODUCTION

Groundwater is one of the most valuable natural resource for its quality that contained in the body of water itself can be helpful in terms of humans' health, economic development and ecology diversity. Consistent temperature, the natural quality, open limited exposure to pollution, and lower development costs, and so on, causing it to become one of the most important resources making it becomes one of the most important resources for all climates in rural or urban areas in developed and developing countries (Tood and Mays, 2005). Groundwater is defined as water in the saturated zone (Fitts, 2002) that fills the pore spaces between mineral grains or rock cracks in the subsurface soil. Groundwater is usually formed by rain or melting snow that seeps down through the soil into the foundation stones (Bank et al, 2002;. Nerves and Choudhury 1998).

Groundwater use is usually meant for domestic, agricultural and industrial. The use of water in rural areas is estimated to be 98% for domestic use (Todd, 1980). The increment of high cost of maintenance of surface water in developing countries opens up to the use of groundwater for domestic, urbanization, agriculture, and industrial activities. Groundwater is one of the most valuable resource all over the world to the human, industrial, and for agriculture use (Ayazi et al, 2010;. Manap et al, 2012, 2013; Neshat et al, 2013; Pradhan, 2009).

Water quality is referring to the suitability of the water resource for the use of various sector such as domestic, agriculture, drainage, recreation, and industrial used by humans or animals. The groundwater biological and chemical features can be used for various use. Groundwater is less susceptible to bacterial contamination of surface water due to the nature of the rock and subsoil acts as a filter bacteria carried by surface water infiltration. Piatrik (1992), the natural groundwater is of good quality and has a mineral needed by humans. In fact ground water free from bacteria and viruses, except in the shallow aquifer and can be used as a clean water resource for humans.

II. GROUNDWATER QUALITY ISSUES

Groundwater quality degradation is a global issue that is taken seriously at the moment. Increased reliance on groundwater resources of the world, making the issue of pollution is taken seriously. Production of toxic substances from human activities add to the deterioration of the quality of the groundwater, when pollutants began to seep into the subsurface soil and penetrate the aquifer.

The exploitation of the groundwater resource to fill the increased needs in the world along with the decrement of the annual flow adds the deterioration of the bad quality all over the world. The intervention in the natural water balance. Human intervention in the water balance affecting the chemical reaction in aquifer and lead to the existence some chemicals in solid form. (Singh et al., 2007).

The chemical content in the groundwater in such area usually influenced by the area such as atmosphere, evapotranspiration, sedimentation, soil, water and rock interaction and atropogenic activities (Singh et al., 2005). Groundwater resource in alluvium form area is high risky to the pollution because of the rapid increase of pollution and with the agriculture and industrial activities (US. EPA, 1993). Groundwater is an indispensable resource for drinking water in urban which is developing, especially in a place that has no public water supply facilities as adequate infrastructure is lacking or in weak economic conditions.

The contamination of the groundwater resulting from the disposal of waste materials on the surface and in the ground, moving from the surface down into the sub-surface (Miller, 1980). Land subsidence due to groundwater abstraction can lead to excessive degradation of water resources has occurred in the cities in Asia (Foster and Chilton, 2003) if this issue were viewed cynically it is possible that this situation will spread to other cities. Wastes that come from various sectors such as domestic, agricultural, and industrial will be disposed in the area that specially constructed for waste such as reservoir, pit or placed on the ground. These remnants are actually safely diposed by humans. But these contaminants is an agent to the degradation of groundwater. For example, solid waste buried in the ground will seep into the groundwater aquifer when assisted by the flow of rain water or surface water, which sweeping the contaminants into the aquifer.

Malaysia use some parameter Water Quality Index (IKA) to in determine the water quality that are DO, BOD, COD, pH, TSS and AN (JAS, 1994). But the overall water quality is comprised of the physical and biological aspect. Laboratory test should be performed according to the standards that has been set to ensure the groundwater supply in the area taken is safe to use without violating the conditions sets by the Ministry of Health Malaysia. Feroz (1987), groundwater that are free from two things which are pathogenic bacteria and viruses, can be exploited for various use.

III.RESEACRH AREA AND METHODLOGY

Case studies have been conducted in the Bachok district (Beris Kubur) to see how much is the comparison of the groundwater quality changes of the study area with the standard guidelines of the National Drinking Water Quality, 1990. Bachok district is famous for its agricultural activities in which the area for the agricultural sector is 23.109 hectares. In 1998 Kelantan is the state with the lowest in term of the provision for the clean water supplies. The failure to provide an adequate supply of clean water will be worse during the drought. The state requires an additional amount of 146 million liters of clean water a day to achieve 100% of the adequate clean water supply (Hassan, 1999). To overcome the problem of insufficient demand for clean water, the groundwater is considered as the best way to overcome this problem and do not involve high costs. However, the quality of the groundwater is doubtful if there is no treatment process involve.

Data were collected using the groundwater quality sampling method from the Mineral and Geoscience Department of Kelantan. Data comparison between the groundwater quality in the research area with the standard guidelines of the National Drinking Water Quality 1990 is used to see if there was a decrease in the quality of the water.

IV. RESULTS AND DISCUSSION

This section discusses the findings that have been obtained. Comparisons were made with the National Guidelines for Drinking Water Quality, Ministry of Health Malaysia, 1983. There are a number of parameters exceeds the standards set by the Ministry of Health.

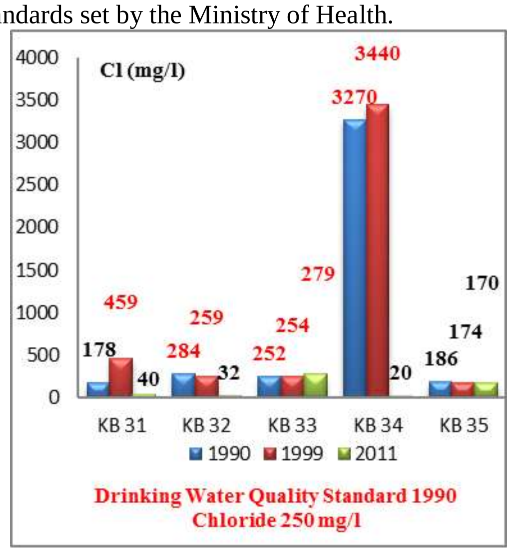

Figure 1: Chloride Content in Groundwater

Standard guidelines for chloride in national drinking water is 250 mg/l. Figure one shows the violation of water quality standards drink Cl concentrations occur in the well KB 31 only in 1990, ie 456 mg/l. Well KB32 recorded two years exceeds the standards set in 1990 (284 mg/l) and 1999 (259 mg/l). The quality of KB33 is the worst wells with three years beyond the conditions set by the Ministry of Health Malaysia, namely 252 mg/l (1990), 254 mg/l (1999) and 279 mg/l (2011). Well KB34 recorded Cl concentrations far exceeding the national drinking water quality standards ie 3270 mg/l in 1990 and 1999 is 3440 mg/l. It is worrying if no treatment is done before the use of groundwater by residents of the study area. KB35 is the most free of any contamination chloride and safe to use.

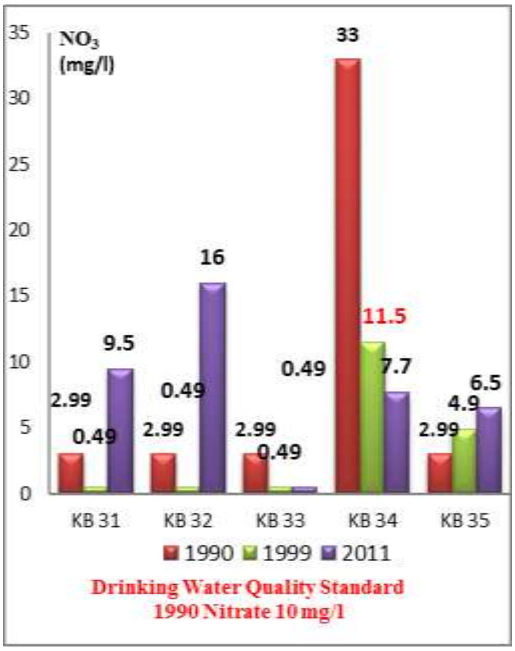

Figure 2: Nitrate Content in Groundwater

Figure two shows nitrate concentrations in wells applies only KB 32 in 2011 with a total concentration of 16 mg NO_3 and wells KB 34 1990 (33 mg/l). On the whole content of nitrates in groundwater in the study area did not show significant threat to drinking water quality standards violations in 1990 that establishes the nitrate 10 mg/l.

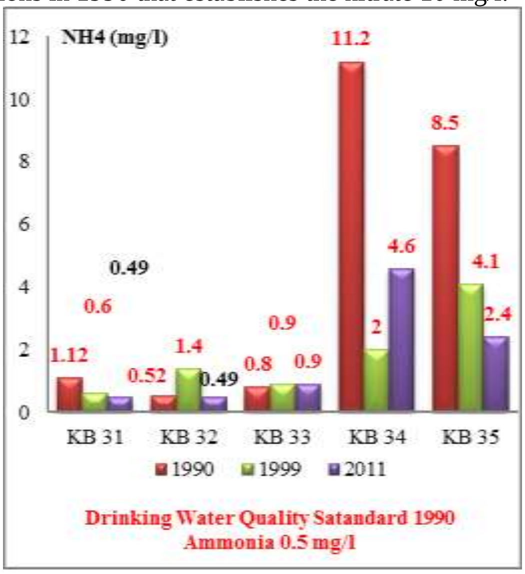

Figure 3: Ammonia Content in Groundwater

Almost the entire study area wells experiencing problems with high ammonia concentrations in groundwater and drinking water quality exceeds the requirements set. Figure three shows only the most recent year data (2011) does not exceed the ammonia content of drinking water standards have been set in wells 1990 KB 31 and B32. But the remaining three wells year 1990 exceeded the drinking water requirements which restrict the content of ammonia in water is 0.5 mg/l. Well KB 33 recorded increases in the concentration of NH_4 from 1990 (0.8 mg/l) to 0.9 mg/l in 1999 and 2011. KB 34 and 35 show a rather alarming amount of ammonia with a relatively high value. Station 3 1990 KB (11.2 mg/l) decreased to 2.0 mg/l (1999) and in 2011 (4.6 mg/l). B35 NH4 content of groundwater showed a downward pattern. In 1990 the amount of ammonia 8.5 mg/l, decreased to 4.1 mg/l (1999) and 2011 (2.4 mg/l), but still above the national drinking water standards in 1990, which specifies the amount of NH_4 in drinking water is 0.5 mg/l.

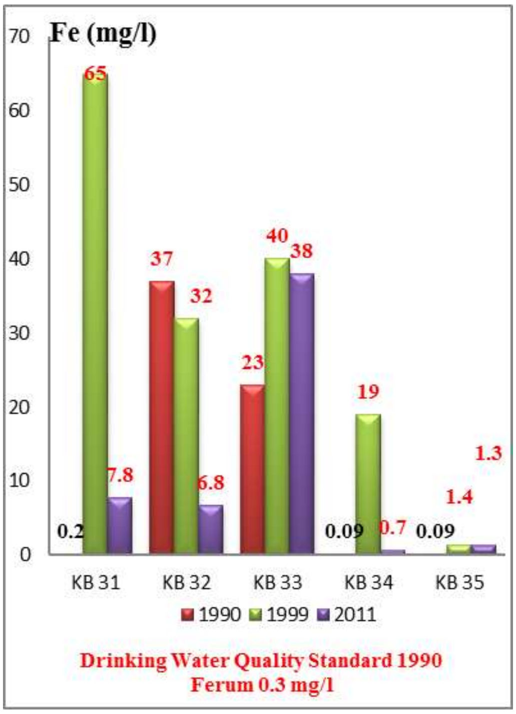

Figure 4: Ferum Content in Groundwater

The concentration of iron in the study area, accounting for almost all wells exceed the national drinking water standards in 1990 that solidified the iron of 0.3 mg/l. The highest iron content was recorded in 1999 in the well KB31 (65 mg/l). However, other wells are still recorded value far exceeds the requirements prescribed iron as well KB 32, the concentration of iron in groundwater in 1990 (37 mg/l), 32 mg/l (1999) and 6.8 mg/l (2011). KB 33 also shows the three years beyond the standards set by 1990 (23 mg/l), 1999 (40 mg/l) and the most recent data year 2011 (38 mg/l). Well KB 34 only two years Fe concentrations exceeded the prescribed standards of 1999 (19 mg/l), 2011 (1.9 mg/l) and KB 35 years with the same amount of 1.4 mg/l and 1.2 mg/l.

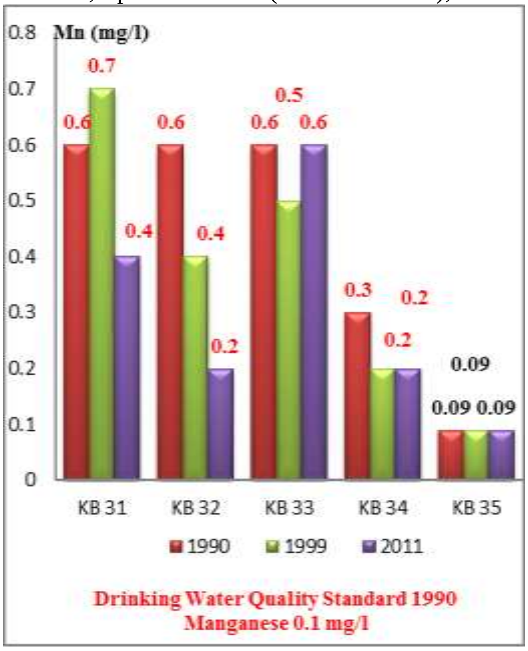

Figure 5 : Manganese Content in Groundwater

Drinking Water Quality Standards in 1990 has set the amount of Mn in drinking water is 0.1 mg/l. Figure five shows all of the wells have manganese content exceeded the standards set unless KB 35 independent samples of Mn in three years. Take the highest value recorded in 1999 at 0.7 mg/l in wells KB 31. In 1990 and 2011 the number of Mn content in groundwater in KB 33 are still in the highest resistance of 0.6 mg/l.

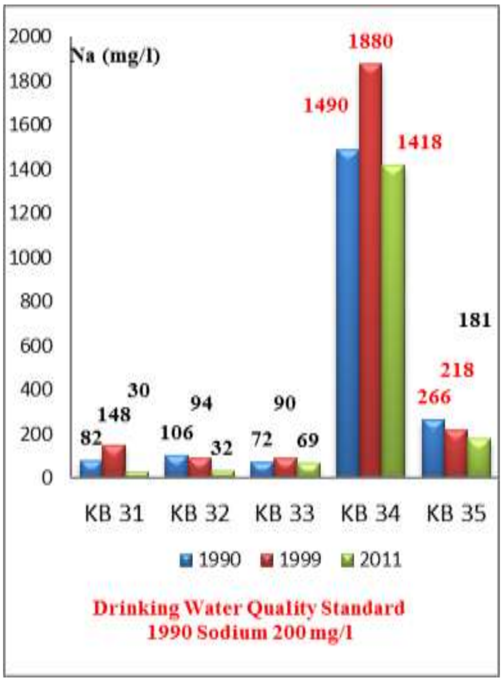

Figure 6 : Sodium Content in Groundwater

Figure six shows two wells have concentrations of Na KB 34 KB 34 and 35. Well recorded relatively high sodium content of drinking water quality standards in 1990 that establishes the Na was 200 mg/l. 1990 sodium recorded 1490 mg/l and increased to 1880 mg/l (1999) and 2011 (1418 mg/l). Na concentrations in wells KB 35 just two years past the drinking water standards of 1990 were 266 mg/l and 1999 (218 mg/l). Although the data in the recent year does not exceed drinking water standards are set, but continued observation is needed.

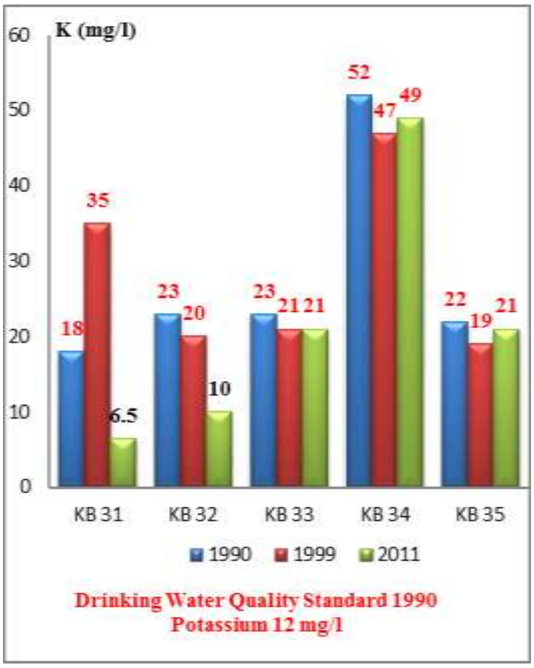

Figure 7 : Potassium Content in Groundwater

Almost all wells observed exceeded the drinking water standards set for potassium, but only two wells still in safe and quality unpolluted wells and KB 31 KB 32 in 2011. Well KB 34 shows the very high concentration of potassium surpass quality standards 1990 drinking water of 12 mg / L set by the Ministry of Health Malaysia. In 1990 the total potassium concentration is 52 mg / L and decreased 47 mg / L (1999) and slightly increased in 2011 to 49 mg / L. But other wells recorded value far exceeded drinking water standards in 1990 and drastic measures need to be done to find the cause groundwater contamination that occurred.

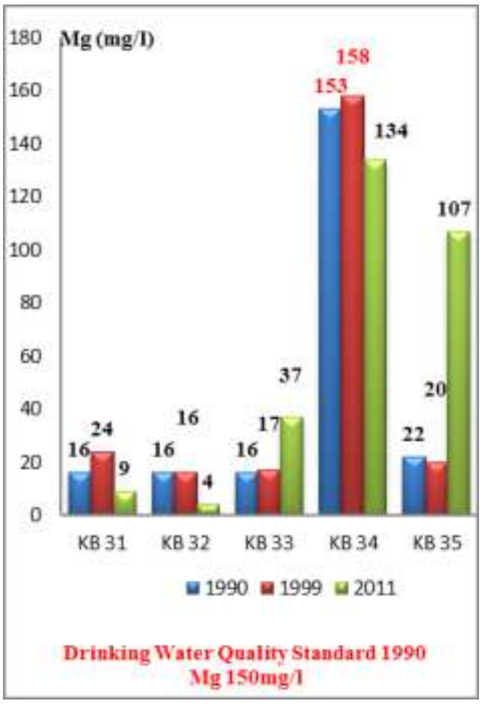

Figure 8 : Magnesium Content in Groundwater

Overall wells for the parameter magnesium (Mg) are controlled only one station exceeded drinking water standards requirements that stations 34 KB in 1990 (153 mg/l) and 1999 (158 mg/l). Standards set by the ministry of health of the Mg content in drinking water is 150 mg/l. Although the value is not large, and no pollution latest data recorded in recent years, but the observation and supervision is necessary to ensure water supply used by residents of the study area is free from contamination of Mg.

V. CONCLUSION

The results of this study can conclude that almost all the parameters of groundwater in the well in Bachok is exceeding the national drinking water standard 1990 such as Chloride (Cl), Ammonia (NH4), Ferum (Fe), Manganese (Mn) and Potassium (K). Three more parameters that are Sodium (Na), Nitrate (NO3) and Magnesium (Mg) resulted with just a few well exceeding the national drinking water standard 1990.

The study area is famous for its agriculture sector. Addition of the agricultural sector can have an impact on groundwater quality. Agricultural activities certainly involve the use of fertilizers and pesticides to ensure a more lucrative yields. The use of these two ingredients may undermine the quality of groundwater if used excessively. Pollution from fertilizers and pesticides can occur rapidly because these two ingredients can be absorbed into the soil and water bodies with ease. Easily diffuse nature of this material may indirectly reduce the quality of groundwater available is less susceptible to pollutants.

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