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Groundwater Quality Analysis In Sidomulyo Hamlet, Argomulyo Village, Kalaena District East Luwu County

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ABSTRACTS

The geographical condition of Kalaena District is one of the sub-districts in East Luwu Regency. Kalaena District is located at 2º 03' 00" – 2º 30' 31" South Latitude and 120 º 49'30" - 121 º 00' 30" East Longitude with an area of 64.54 km2. Groundwater is part of the water that is below the surface of the ground, groundwater is a necessary need for the community, making the quality of groundwater very necessary to be maintained and maintained. The data collection stage is the activity of retrieving all the required field data. The data used in this study were obtained from the results of direct surveys in the field on several wells in Argomulyo village, taking water samples and then testing the pH value, color, taste, smell, turbidity, weather, well depth, water level, well diameter, citizen interview data and research documentation photos, then several samples were subjected to laboratory tests to find out the chemical content in the residents' wells. It is known that the results of the study show that the contents of TDS, DO, calcium, iron and chloride are still below the threshold, only turbidity has a value above the permitted threshold, the feasibility of shallow groundwater is based on Government Regulation of the Republic of Indonesia No.22 article 1 paragraph 37 of 2021 in the research area based on the results of chemical analysis and physical tests performed. fall into class 3 category.

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INTRODUCTION

One of the important energy sources in the world is water (Yuono, 2019). Water is a very vital need for human life. Therefore, if the need for water has not been fulfilled it can have a major impact on health, such as diarrhea, lead confusion, polio and others (Agusanaterny & Fahira, 2022). In living cells, both plants and animals, most are composed of water, as in plant cells contained more than 75% or in animal cells contained more than 67% (Sinia & Susilo, 2021). Of the 40 million cubic miles of water on the surface and in the ground, it turns out that no more than 0.5% (0.2 million cubic miles) can be directly used 38 JAF, Vol. 13 No. 2 (2017), 38-47 is used for human purposes. According to the Ministry of Health (1994), in Indonesia the average water requirement is 60 liters per capita, including: 30 liters for bathing purposes, 15 liters for drinking purposes and the rest for other purposes (Kuntoro & Asyifa, 2020).

Judging from the place where it is stored, water sources can be classified into several types of water sources, namely rainwater, surface water, groundwater, and sea water (Renne, 2012). Each of these water sources naturally has its own water quality characteristics, this happens because water quality is greatly influenced by the natural conditions where the water is located and the conditions of the places it passes through (Permana, 2020). Groundwater is a necessary need for the community (Yuliani & Pradana, 2019). The increasing population and along with the growing needs, making groundwater quality very necessary to be maintained and maintained (Laily, 2021).

Groundwater is the main source of freshwater reserves working in the hydrostatic cycle (Darwis & Sc 2018). Groundwater is provided for human consumption, agriculture, industry and many ecosystems depend on groundwater, especially during the dry season (Akbar, 2022). Argomulyo Village is one of the areas passed by the Kalaeana River. Argomulyo village is located in Kalaena Kiri

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sub-district, East Luwu regency, south Sulawesi province, where the east and north of the village are rice fields, the west is a plantation area while the southern part is a mountainous area.

The majority of residents in Sidomulyo hamlet get clean water from dug wells with depths ranging from 8 to 15 meters, where water sources used for rice fields and plantations use water from the Kalaena River where the depth of the embankment made ranges from 3 to 5 meters. Thus, the quality of groundwater in Sidomulyo hamlet can be affected by the water quality of the Kalaena River. In addition, coupled with poor sanitation, such as saptik tangka and livestock cages located about 10 to 20 meters from dug wells and the habit of local residents who often throw liquid waste in the form of used water for washing dishes, clothes, bathing, and so on directly to the ground. So that it can reduce the quality of groundwater itself. According to an elder who was in Argomulo village and was an early transmigrant who occupied Argomulyo village said that in the past in Argomulyo village, especially in Sidomulyo hamlet there was a river flow that gradually died and for decades buried various materials that made the former river flow shallower and can now be converted to several things, such as ponds or erected buildings. Because some of the factors mentioned above greatly affect groundwater quality, the author decided to take the title of research on 'analysis of groundwater quality in Sidomulyo Hamlet, Argomulyo Village, Kalaena District, East Luwu Regency.

METHODS

This research was conducted in several stages. The first stage of administrative preparation is in the form of managing requirements from departments and faculties before preparing the final project report and managing research recommendation letters before leaving for the research site. In the second stage, a literature study was carried out, in the third stage, field survey activities and data processing, the author made observations in the form of field orientation in order to understand the situation and conditions of the data collection area.

The data collection stage is the stage of implementing the work all the data needed will be collected to support report preparation activities later. In data retrieval consists of two types of data used, among others. Primary data is in the form of ambient air temperature, water sampling then tests pH value, color, taste, smell, turbidity, weather, well depth, water level height, well diameter, resident interview data and research documentation photos. Secondary data are data obtained from scientific journals and books of previous research results that are directly related to the purpose of research. (Nashrullah et al., 2018; Rusdin et al., 2021).

The data obtained from the field that will be used as the next research writing is compiled based on the purpose of the study, namely about the potential formation of acid mine water by kinetic test methods. Furthermore, the processed data is analyzed to obtain the kinetic test results of acid mine water. (Nawir and Umar, 2018). Data analysis is taken directly in the field and processed using excel applications and making graphs to obtain and find out the acidity parameters of the samples studied.

RESULTS AND DISCUSSION

Sample Analysis

The sampling point is located close to rice fields and also close to irrigation drains, samples were taken on Monday, October 31, 2022 at 10:11 WITA, precisely at coordinates X 265780.00 m E, and Y 9723879.00 m S, at the time of sampling the weather was sunny with an air temperature of 32 ° Celsius with a well depth of ± 5 meters, samples were taken in the form of wellwater samples made by residents and springs were found in the well. It can be seen in Figure 1.

The research sample was tested using physical analysis, to determine the elements contained in residents' well water which is used as daily needs. The results of physical analysis data that show several elements as characteristics of acid mine water, with values of Fe and Mn. elements. It can be seen from Table 1 below.

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Figure 1. Sampling

Table 1. Results of Chemical Analysis of sample element values

SAMPLE			
No	**Parameters**	**Result**	**Quality Standards**
1	TDS	259(ppm)	0,3
2	Water temperature	30,4°c	-
3	pH	7	-
4	Color	Yellowish	-
5	Smell	Metal	-
6	Taste	-	-

Figure 2. Testing the quality of water samples using physical methods

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The physics test of water is to know the properties of water. Thus, if there are physical parameters that are out of predetermined limits, they can be controlled immediately. Physical tests include pH, TDS and turbidity. Testing activities can be seen in Figure 2.

The results of sample analysis can be seen in table 2 that the pH, TDS and turbidity values are included in the quality of groundwater that can be used by the community for domestic purposes, with the test values on the samples showing appropriate results from quality standard values.

In addition to physical tests, chemical tests are also carried out on samples, researchers perform chemical tests on samples because they are close to rice fields and irrigation canal embankments. Researchers conducted tests in kima at the Public Health Polytechnic Laboratory with results that can be seen in the following figure.

Results of chemical tests at the Public Health Polytechnic Laboratory with results that can be seen in the following table.

Figure 3. Water samples while in the laboratory

Table 2. Laboratory Test Results

Parameters	Unit	Maximum limitations	Examination results	Method specifications
Turbidity	NTU	25	25,5	Turbiditymeter
Iron	mg/l	30	0,01	Fotometer
Manganese	mg/l	0,5	0	Fotometer
Total awareness	mg/l	500	138,3	Titrimetri
Calcium	mg/l	200	11,9	Titrimetri
Chloride	mg/l	600	17,1	Titrimetri
DO	mg/l		5,1	Titrimetri

Air Temperature Analysis Results

From an ecological point of view, thermal energy has something to do with things that happen in the water and is an important factor in maintaining water as an aspect of the environment. Temperature is an important physical factor, where rising temperatures can accelerate chemical reactions. Temperatures in the study area were still relatively stable in the tropics.

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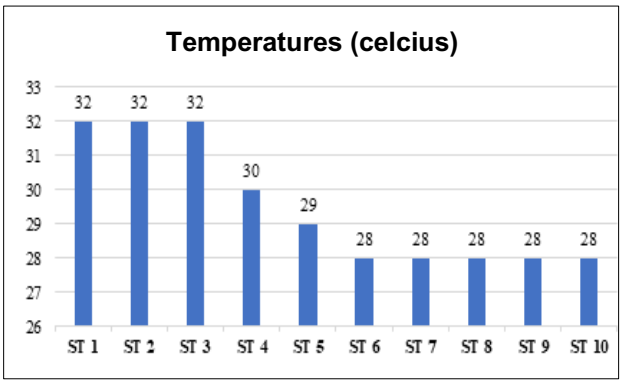

Figure 4. average water temperature

Depth of Citizen's Well

From the chart below, it can be seen that the depth of the residents' wells ranges from 4 to 7 meters below the ground surface, this is an illustration that the water used by residents to meet their daily needs is shallow surface water, namely water sourced from subsurface springs and also from seepage of surface water that is absorbed and filtered by the soil layer and mixed back into the well.

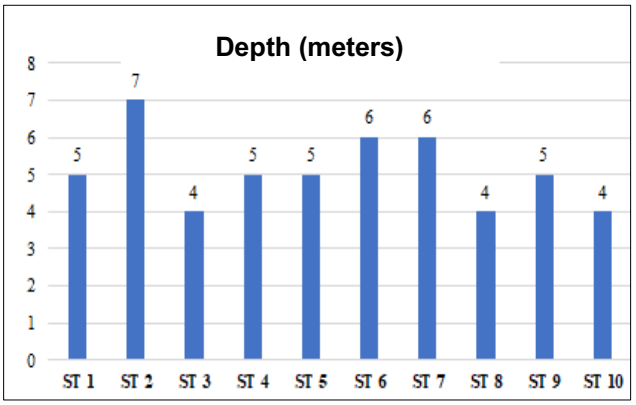

Figure 5. Citizen Well Depth Graph

Total Dissolved Solid (TDS) Analysis Results

TDS or total dissolved air is an indicator of dissolved solids, both in the form of organic and non-organic compounds, the notion of dissolved refers to solid particles that have a size below 1 nano-meter.

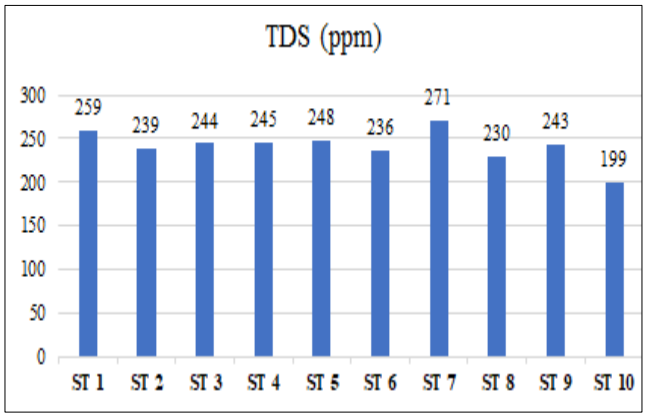

Figure 6. TDS graph of water in residents' wells

From the graph shown above, the TDS of water in residents' wells ranges from 199 ppm to 271 ppm, this means that the water condition in the area studied based on TDS parameters is good to

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quite good, which ranges from 150-300 ppm. Where the water in samples 2, 3, 4, 5, 6, 8, 9, and 10 is classified as good water, because it has a TDS below 250 ppm / liter, while samples 1, and 7 are categorized as quite good where they have ppm ranging from 250-300. Where can be concluded TDS water in the area studied is still classified as feasible to meet daily needs.

Water Temperature Measurement Results

Water temperature is one of the parameters that is often measured, because of its usefulness in studying physical, chemical, and biological processes. Temperature is directly or indirectly strongly influenced by sunlight. Water temperature in Indonesia ranges from 25-32 ° C, the diagram above shows the water temperature in the area studied is the average temperature in tropical climates.

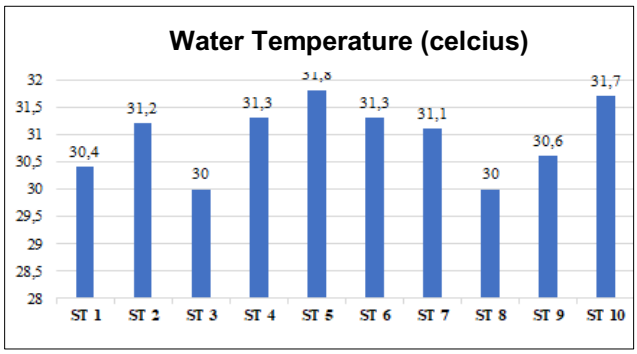

Figure 7. average water temperature

Water pH Measurement Results

Hydrogen potential (pH) is a degree that determines the level of acidity or alkalinity of a solution or liquid, the pH unit range is 1-14 with a neutral pH of 7 where the lower the pH in water, the more acidic the solution or liquid, and the higher the pH value, the more alkaline a liquid is, the ideal pH in water is 7, in the area studied the pH of the water ranges from 6-7. Where points 3, 4, and 10 have a pH value of 6, which is pH that can be categorized as acidic but still suitable for use.

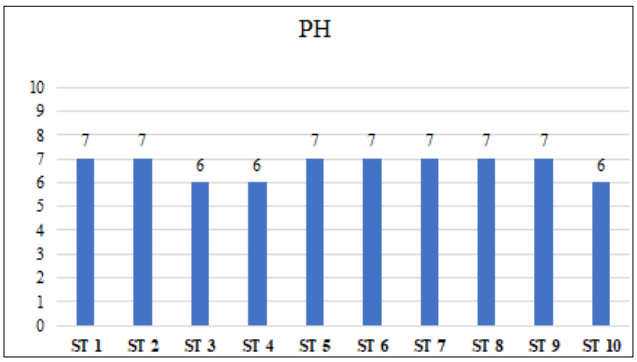

Figure 8. pH Graph of Water in Residents' Wells

Turbidity Analysis Results

Water turbidity is influenced by fine materials floating in the water in the form of organic matter such as plankton, tiny bodies, detritus, or in the form of inorganic materials such as mud and sand. In the results of the analysis of the three samples above, all three have turbidity levels above the maximum allowable limit, this can be caused by the nature of the soil in the study area which is easily eroded by water flow, besides that the depth of residents' wells only ranges from 4 to 7 meters which makes the bottom point of the well in the form of sand which can increase the turbidity level of the well water. According to the well owner, the source of spring water is not only at the bottom of the well, but the seepage of surface water through the walls of the well, this also adds aspects that affect the turbidity of the water.

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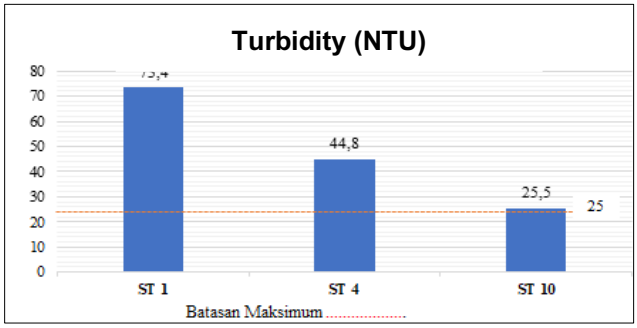

Figure 9. Turbidity Analysis Graph

Results of Disolved Oxygen (DO) Analysis

Wells in the study area are dug wells, which are wells that provide water derived from groundwater that is relatively close to groundwater, which is susceptible to contamination by seepage so that it has the potential to experience a decrease in water quality, as explained in the previous parameters.

Dissolved Oxygen is a parameter that is inversely proportional to turbidity, where the higher the turbidity level in water, the lower the dissolved oxygen content in the water. This can happen because saptic tanks are less permanent, rice field water or rice field irrigation that contains many toxic substances, or waste water used to wash and others, which enter the well through seepage and mix with well water.

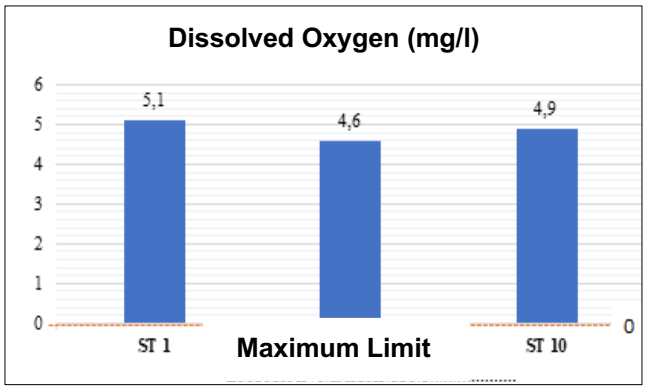

Figure 10. Disolve Oxygen Analysis Graph

Calcium Analysis Results

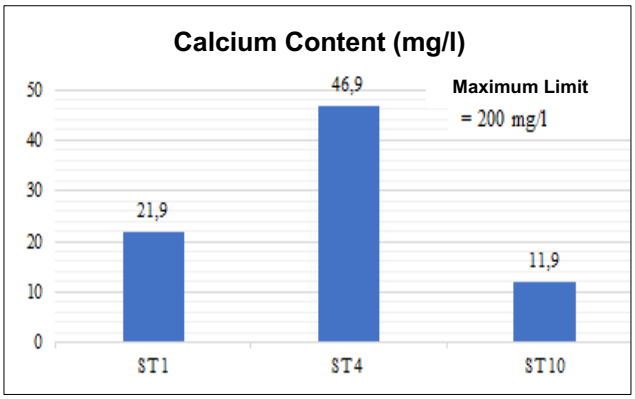

Figure 11. Calcium Analysis Chart

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Based on the results of laboratory analysis, the three samples showed that the water in the study area was still suitable for daily use because none of the three samples exceeded the predetermined threshold of 200 mg / l according to the rules of PERMENKES No.416 / MENKES / IX / 1990.

Results of Total Hardness Analysis

Hardness is one of the chemical parameters of clean water quality, the level of water hardness is basically determined by the amount of calcium and magnesium according to PERMENKES No. 492 / MENKES / PER / IV / 2010, the maximum level allowed for clean water is 500 mg / l, from the analysis conducted in the laboratory the three samples tested have a total hardness of less than 200 mg / l, However, in the hardness level classification, the results of the analysis of samples 1 and 2 have a medium hardness level of 74-150 mg / l, while sample 3 has a high hardness level of > 150 mg / l.

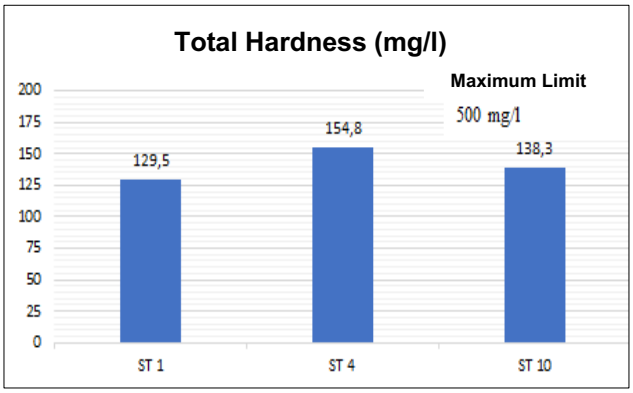

Figure 12. Total Hardness Analysis Chart

Iron Analysis Results

Iron is one of the chemical elements that can be found in almost every place on earth, in all geological layers and all bodies of water. In the analysis conducted, the three samples above have an iron content below the maximum threshold of less than 30 mg / l, or from the three samples have an iron content of < 1mg / l.

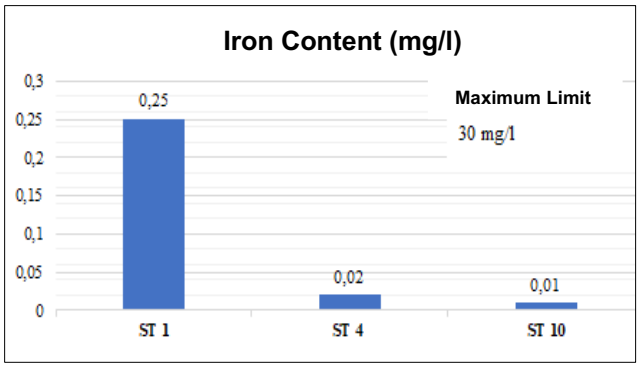

Figure 13. Iron Analysis Chart

Chloride Analysis Results

Based on the results of the analysis above, the three samples tested still have a chloride content below the maximum allowable limit of < 600 mg / l, but the results of the analysis show that the third sample has the highest chloride content of 37.9 mg / l, this could be because the sampling location at point 3 is close to the swamp, which is < 100 meters, as well as the 2nd sample is about 100 meters from the rice field area, while on Point 1 is a sample whose point is relatively far from rice fields, swamps, and water irrigation canals, which is about 300 meters.

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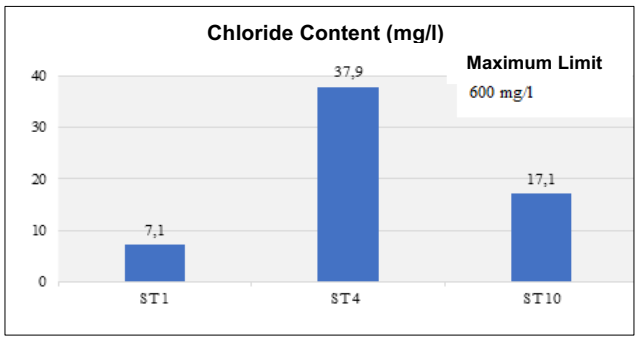

Figure 14. Chloride Analysis Graph

DISCUSSION

Based on the results of testing well water samples at the research location showed the results of physical analysis in the form of, yellowish color only at stations 2 and 3 where the water samples were relatively clear, while the odor in the samples tested almost all samples smelled like metal in each sample tested, while at the turbidity level of the samples tested almost had the same turbidity, Only samples 2 and 3 are relatively clear, and sample 4 is the sample that has the most concentrated turbidity. In physical tests, researchers also conduct tests with parameters in the form of TDS and pH, where the pH at stations 1 to 10 can still be categorized as normal, namely with pH values of 6 and 7. While the results on different TDS parameters are 259ppm in sample 1, 239ppm in sample 2, 244ppm in sample 3, 245ppm in sample 4, 248ppm in sample 5, 236ppm in sample 6, 271ppm in sample 7, 230 ppm in sample 8, 243 ppm in sample 9, and in sample 10 have a TDS value of 199 ppm can be concluded further east, the TDS value tends to be small. In addition to conducting physical tests, researchers also conducted laboratory tests at the Public Health Polytechnic Laboratory, where to determine the value or content in the form of turbidity, iron, manganese, total consciousness, calcium, chloride, and total oxygen (DO). The deliti samples are samples at stations 1, 4, and 10. Researchers conducted chemical tests at that point not without reason, where at station 1, the sampling point was close to the rice field area and also the water disposal irrigation channel, at point 4 was the most turbid sample, also close to the landscape in the form of swamps, at point 10 which was the easternmost point in the area studied was a station far from sewerage or swamps but close to the rice field area. The results of laboratory analysis can be seen in the following discussion.

Chemical analysis of the 3 samples based on the parameters of Iron (Fe) <0.3 and Manganese (Mn) <0.1, which is below the value of Environmental Quality Standards by the Decree of the Minister of Environment and Forestry of the Republic of Indonesia Number 22 of 2021. The results of the physical test of 3 samples showed that the pH values were 7, 6 and 7, while the results of Turbidity analysis of 3 well water samples had values of 73.4 NTU, 25.5 NTU and 44.8 NTU.

The correlation of the values of water sample analysis can be seen that the 3 water samples, samples 1, 2, and 3 are in residential areas in the form of closed wells (Figures 4.1, 4.5, and 4.12). It is known that the pH of the water in the 3 samples is still categorized as normal, TDS or solutes are also low, and undissolved substances are also almost non-existent, only turbidity (turbidity) is high and must be filtered in order to be consumed, of the three samples tested have turbidity above the threshold, where the farther from the swamp or irrigation flow, the turbidity in the sample is lower, In the DO parameter, in theory, the DO content will be lower if the turbidity level of a sample, the lower the ability of water to bind oxygen, this can be shown where the three samples have a DO content below the water quality standard, which is 6 mg / l (PP No 22 of 2021). In calcium parameters, samples taken at stations far from water (streams and swamps have a small amount of calcium, although the calcium level in the sample is still below the threshold

In the total hardness parameter, samples far from swamps have a moderate hardness level of less than 150 mg / l and in sample 3 where the sample has a high hardness level (>150mg / l). The iron content in the three samples tested all had a relatively low content, this is in line with what is explained in discussion 4.1.15. And the results obtained from the correlation analysis, samples included in the class 3 category can be intended for plants and designations that require the same water quality standards. Where if you want to be used for daily needs, prevention must be done by using treatment, one of which is filtering before the water is used. The poor quality of water in the study area can be caused because the average depth of 2 wells in the research site only ranges from 4-7 meters, besides that the location of the well is also near the bathroom cubicle where detergent

wastewater used to wash and used bath water re-enters the ground and mixes with water. Proximity of wells to rice fields, swamps, irrigation canals.

CONCLUSION

Based on the results of the analysis of shallow groundwater quality in the research area based on PP No. 22 of 2021, the content of TDS, DO, calcium, iron and chloride is still below the threshold, only turbidity that has values above the threshold is allowed.

The feasibility of shallow groundwater based on Government Regulation of the Republic of Indonesia No.22 article 1 paragraph 37 of 2021 in the research area is based on the results of chemical analysis and physical tests carried out. Included in the class 3 category, if used for cooking activities, tretmen (filtering) must be carried out first.

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