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A Study Of Groundwater Aquifers In Tumbur Village Wer Tamrian District Tanimbar Islands District

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KEYWORDS
Brackish Water Aquifers, Well Design, RES2DINV

ABSTRACkK

Water is a primary human need that must be met, but as time increases, the rate of population growth means that water needs are increasingly not being met. The geoelectric method is a geophysical method that utilizes electrical properties to interpret the earth's subsurface. The main aim of the geoelectric method is to find the resistivity value of a rock. The higher the resistivity value, the more difficult it is for the rock to carry an electric current, and vice versa. For this reason, one solution to meet the needs of the Lorulun Village community is to search for groundwater aquifers using one of the methods that can be used, the geoelectric resistivity method. The data collection and analysis method used in this research is to conduct a survey at the location to review and see the conditions directly at the research location. Identification To determine the existence of a water-bearing layer at a certain depth, we can use geophysical methods, namely the geoelectric resistivity method, to obtain an overview of the soil layers below the surface. Apart from that, it can also predict the potential for deep and shallow groundwater in the research area. The problem in this research is analyzing deep groundwater sources based on the characteristics and implementation of geoelectric results and the aim of this research is to conduct a survey and design deep groundwater wells based on the characteristics and implementation of geoelectric results in Tumbur Village, Wer Tamrian District. The data is processed based on the apparent resistivity equation, so that the apparent resistivity value (ρa) is obtained by entering the values ΔV, I, a, and K into the Microsoft Excel program. Then processed using RES2DINV software. The water source is at two points, namely geoelectric drilling points 01 and 02, respectively, where the aquifer is found. The casing screen installation process is placed at 3 meters and 12 meters. The use of gravel packs from a depth of 2 to 12.5 meters is to protect the drilled wall hole from landslides and also act as a filter for mud or other materials entering the screen. and with a depth of ± 15 meters, the resistivity shows a brackish water aquifer. This is caused by the influence of seawater intrusion By conducting a survey and designing a deep-ground water well based on the characteristics and implementation of geoelectric results in Tumbur Village, Wer Tamrian District,

INTRODUCTION

The geoelectric method is a geophysical method that utilizes electrical properties to interpret the earth's subsurface (Rolia & Sutjiningsih, 2018). The geoelectric method itself is an active geophysical method. It is said to be an active geophysical method because the main principle is to inject electric current originating from outside the system into the ground. The main aim of the geoelectric method is to find the resistivity value of a rock. The higher the resistivity value, the more difficult it is for the rock to carry an electric current, and vice versa (Ammar & Kamal, 2018). The geoelectric method is often used to determine the condition of subsurface rocks through resistivity analysis or the ability to conduct electricity from materials in the earth. In this way, the depth, thickness and distribution of the water-bearing layer can be determined. The geoelectric survey method is able to provide potential difference values, current strength values, and rock resistivity values (Permana, Buana, Akmam, Amir, & Putra, 2020). The resistivity value of this rock, with further data processing, will be obtained for each rock layer. Based on this, the subsurface layers of the soil can be described by the different resistivity values of each layer. So these results can provide a good picture of the existence of potential groundwater sources according to the type of rock layer.

Water is a primary human need that must be met, but as time increases, the rate of population growth means that water needs are increasingly not being met (Cosgrove & Loucks, 2015). This also happens in the outermost areas, which are becoming increasingly developed, namely Tumbur Village and Wer Tamrian District, so the need for clean water will increase along with the increase in human activity. The community needs that must be met are cooking, bathing, washing and other needs (Eichelberger, Hickel, & Thomas, 2020). For this reason, one solution to meet the needs of the Tumbur village community is to search for groundwater aquifers using one of the methods that can be used, the geoelectric resistivity method. Identification: To determine the existence of a water-bearing layer at a certain depth, we can use geophysical methods, namely the geoelectric resistivity method, to obtain an overview of the soil layers below the surface.

The working principle of the geoelectric method is to flow an electric current into the earth through two current electrodes and a potential electrode (Rolia & Sutjiningsih, 2018), then measure the potential difference for each particular electrode distance to determine the deep subsurface structure, and then increase the distance between each current electrode and potential electrode accordingly. The greater the electrode distance, the deeper the penetrating effect of the downward current, so that the physical properties of deeper rocks can be known (Muhardi, Faurizal, and Widodo 2020). The geoelectric method is based on the fact that different materials will have different types of resistance when an electric current flows through them (Akintorinwa & Okoro, 2019).

This research area is an area that is utilized and can be developed to carry out various activities for many parties, therefore, the need for clean water is important to obtain good water sources and the location of the aquifers in this area. Apart from that, it can also predict the potential for deep and shallow groundwater in direct proportion to sufficient land area and can support the lives of people in villages prone to water availability (Das, Parveen, Ghosh, & Alam, 2021). From the description above, the author was interested in conducting research on the groundwater aquifer study in Tumbur Village, Wer Tamrian District, Tanimbar Islands Regency.

METHOD RESEARCH

Data Collection Techniques

Primary data

Primary data is data obtained from researchers' direct observations in the field.

1. Equipment Specifications :
   IRES T300F with the following specifications :
   a. Transmitter
   b. Receiver
   c. Accessories

a) Implementation Procedures
   a. Prepare the tools by installing geoelectric tools. Installation is carried out by connecting the device to the battery for power, right and left current and potential cables to each electrode into the ground.
   b. Embed the current electrode and potential electrode into the ground
   c. Make sure the potential needle moves and the current loop needle also moves up
   d. Set output more than 0,
   e. Turn the coarse/fine lever to adjust the potential value to show a value of 0 mV so that the data obtained is valid
   f. Press the start button to inject current and pay attention to the current value
   g. Once the current value is stable, remember the stable number then press “hold” to hold the potential value from changing
   h. Note the current and potential values that are read (the current value is the stable value before pressing “hold” button, the potential value is the value displayed after pressing the “hold” button
   i. After recording, move the distance following the distance specified in the measurement table.
   j. The next data reading is the same as the previous method until the displacement corresponds to the desired maximum stretch

b) Secondary Data
   Secondary data neededin this research includes :
   1. Geological Map
   2. Hydrogeological Map
   3. Groundwater Basin Map
   4. Situation map from satellite imagery (Google Earth)

RESULTS AND DISCUSSION

Processing result in Tumbur Village RT 02/01 Point 01

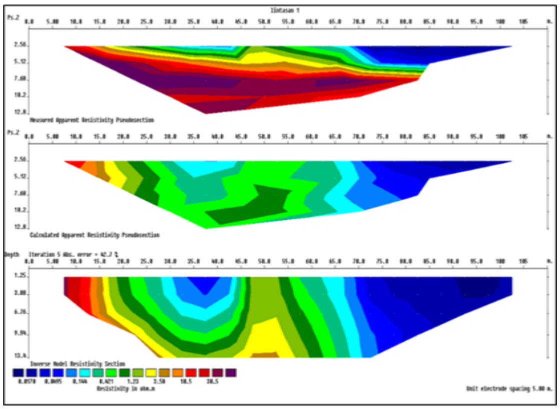

Figure 1, Subsurface Resistivity Model at Geoelectric Point 01

Figure 2

	Tanah lempung, basah lembek (Akuiklud)
	Tanah Lanau basah lembek (Akuiklud/Akuitar)
	Tanah lanau (Akuitar)
	Pasir, batupasir (Akuifer)
	Batuan keras, batuan dasar (Akuifug)

Sumber.: Dep. PU SNI 03 – 2818 -1992

The results of modeling Point AM-01 using the Res2DINV device can be seen in the cross section that the lowest resistivity value is 0.0170 ohm.m while the highest value is 30.5 ohm.m. Differences in resistivity values are represented by color, where low resistivity values are colored blue and high resistivity values are colored red to purple (Barfod, Møller, & Christiansen, 2016).

Based on the results of processing using RES2DINV software, it can be interpreted that there is an unconfined aquifer at a depth of 10 meters at an electrode distance of 30 meters to 40 meters, a confined/bottom aquifer at a depth of 2.5 meters to 11 meters at an electrode distance of 13 to 25 meters, The recommendation is that drilling can be carried out at a depth of > 15 meters at an electrode distance of 30 to 45 meters.

Processing results in Tumbur Village RT 02/01 Point 02

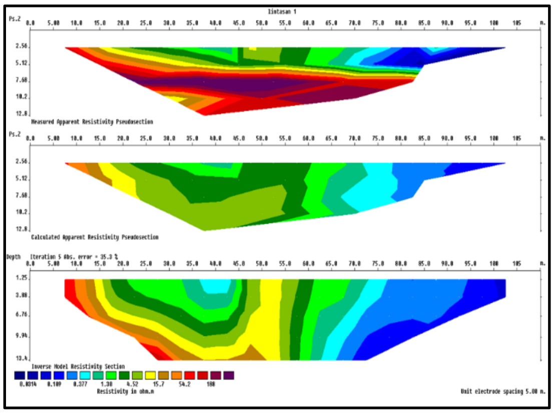

Figure 3, Subsurface Resistivity Model at Geoelectric Point 02

The modeling results of Point AM-02 can be seen in the cross section above, that the lowest resistivity value is 0.0314 ohm.m while the highest value is 188 ohm meters. There is an unconfined aquifer at a depth of 10 meters to 12 meters at an electrode distance of 30 meters to 40 meters (Qaisar et al., 2020). The confined/bottom aquifer is at a depth of 2 meters to 10 meters at an electrode distance of 12 to 85 meters and for recommendations drilling can be carried out at a depth of > 15 meters at an electrode distance of 30 to 45 meters. An electrode distance of 70-100 meters is not recommended because the aquifer or groundwater can be brackish, this is because the location of the drilling plan is a lowland area and is a coastal area.

Test wells are drilled wells that take pressured water sources from the Aquifer layer or Saturated Zone underground (Misstear, Banks, & Clark, 2017). Drilling depth generally ranges from 30 to 100 meters or depends on hydrogeological conditions and permits granted by the local government agency.

The advantage of using a Deep Well is that the availability of water is greater than pantek wells or shallow wells (Maciver, 2013), besides that aquifer layers containing salty or brackish water can be avoided. The following is the well design according to the geoelectric results in Tumbur Village, Wer Tamrian District.

Drilling Recnnebdations

a. Geoelectric drill point well design 01

Construction of geoelectric drill point 01 is recommended with a depth of ± 15 meters. The process of installing the screen casing is placed at 2.5 meters and 11 meters with a diameter of Ø 6 according to the location of the aquifer. The use of casing pipe and screen is GIP medium A pipe. Use of gravel pack from a depth of 15 meters so that it can protect the drilled wall hole from landslides as well as act as a filter for mud or other materials entering the screen (Stevanović, 2015).

b. Geoelectric drill point well design 02

Construction of geoelectric drill point 02 is recommended with a depth of ± 15 meters. The process of installing the screen casing is placed at 3 meters and 10 meters with a diameter of Ø 6 according to the location of the aquifer. The use of casing pipe and screen is GIP medium A pipe. Use of gravel pack from a depth of 2 meters to 11 meters so that it can protect the drilled wall hole from landslides as well as act as a filter for mud or other materials entering the screen (Poehls & Smith, 2011).

CONCLUSION

Based on the processing results at geoelectric drill point 01 using RES2DINV software, it can be interpreted that there is an unconfined aquifer at a depth of 10 meters at an electrode distance of 30 meters to 40 meters, a confined/bottom aquifer at a depth of 2.5 meters to 11 meters at an electrode distance 13 to 25 meters, the recommendation is that drilling can be carried out at a depth of > 15 meters at an electrode distance of 30 to 45 meters and based on the processing results at geoelectric drill point 02 using RES2DINV software, it can be interpreted that there is an unconfined aquifer at a depth of 10 meters at an electrode distance of 30 meters to 40 meters, the aquifer is confined/bottomed at a depth of 2 meters to 11 meters at an electrode distance of 13 to 25 meters, for recommendations drilling can be carried out at a depth of > 15 meters at an electrode distance of 30 to 45 meters

The process of installing the screen casing is placed at 3 meters and 15 meters with a diameter of Ø 6 according to the location of the aquifer. The use of casing pipe and screen is

GIP medium A pipe. The use of gravel pack is to protect the drilled wall hole from landslides and also act as a filter for mud or other materials entering the screen. The resistivity shows that the aquifer is brackish water. This is caused by the influence of sea water intrusion. This means carrying out surveys and designing deep ground water wells based on the characteristics and implementation of geoelectric results in Tumbur Village, Wer Tamrian District.

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