

## THE UTILIZATION OF BRACKISH WATER FOR THE PREVISION OF RAW WATER PAREPARE

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### ABSTRACT

River water is one of the surface water that can be used as a source raw water is commonly used by Regional Drinking Water Companies (PDAM) in Indonesia. One of the rivers planned to be an alternative source of raw water in the city of Parepare is the Karajae River where there is interaction between fresh water and sea water. Sea water intrusion in rivers can cause rivers to have high salinity so that the water

feels salty. This study aims to assess the water quality in the Karajae River estuary in terms of salinity and pH parameters. The Karajae River water sampling refers to the Indonesian National Standard (SNI 6989.57: 2008) in sections 7 and 8. Research in the river estuary area is carried out for 12 months (October 2017 to September 2018) at 6:00 - 8:10 at the time of the tide and 16.00 - 18:05 at low tide. Based on the results of the discussion it can be concluded that the results of the examination of water quality for salinity and pH in the Karajae River for 12 months still meet the water quality standards according to Government Regulation No. 82 of 2001. The salinity value at the tide condition is 0.02 ‰ - 16.82 ‰. The maximum level of salinity is in September at point 6 of 16.82 ‰. The minimum salinity level was in January at points 1,2,3,4 and 5 at 0,02 ‰. While the salinity at low tide ranging from 0.00 ‰ - 16.090 ‰, at low tide the maximum salinity level is 16.090 ‰ which is located at point 3 in September 2018 and the minimum salinity is 0.00 ‰ which is located at point 5 to point 10 in October 2017.

**KEYWORD:** Karajae River, water quality, salinity, pH, tides.

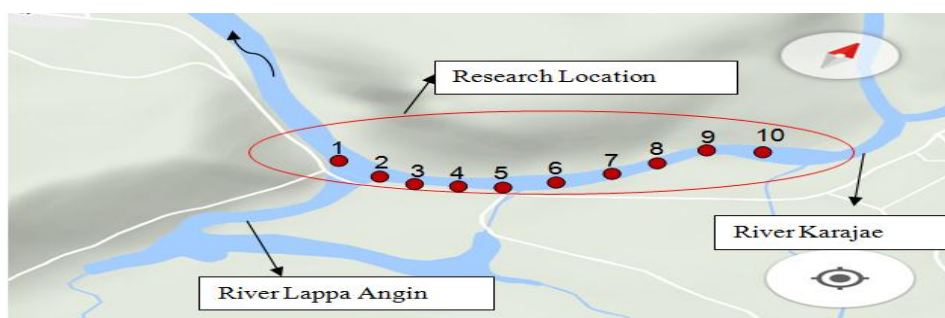
## INTRODUCTION

River water is commonly used by Regional Water Companies (PDAM) in Indonesia. One of the rivers that is planned to be an alternative source of raw water for the City of Parepare is Karajae River. This river is 155 km north of Makassar City, South Sulawesi Province. This river empties into the sea where there is interaction between fresh water and sea water. This interaction will affect the spread of salinity, Selintung Mary (2011). Driving factors such as tides that affect the occurrence of sea water intrusion. Based on the description above, it is necessary to do research on salinity and salinity distribution in the Karajae River so that it can be used as a source of raw water. Salinity usually occurs in rivers that are generally directly related to the sea through estuaries. Circulation of water in the estuary area is strongly influenced by freshwater flows that originate from river bodies and salt water from the sea. More height the tidal, more further the sea water intrusion or vice versa. More hight the tide, the sea water will enter into the river at a considerable distance. Sea water intrusion in rivers can cause rivers become more salinity so that the water becomes salty. This study aims to assess the water quality in Karajae river estuary in terms of salinity and pH parameters.

## METHODS RESEARCH

### Time and Location of Research

Research in the river estuary area is carried out for 12 months (October 2017 to September 2018) at 6:00 - 8:10 at high tide and at 16:00 - 18:05 at low tide. The data used in this study consisted of pH, and salinity. The research location was in the Karajae River, Lemoe Sub-District, Bacukiki District, Parepare City (Figure 1).



**Figure (1): Research Location Map.**

### Sample Analysis Method

Taking water samples is done by using a boat, a dipper and a 1500 ml aqua bottle that has been labeled with a name at each observation point to facilitate analysis. The sample was immediately taken to the water quality and productivity laboratory of the Hasanuddin University Faculty of Marine and Fisheries and immediately tested in less than 24 hours. Sampling is carried out 1 time in pairs and 1 time in low tide each month.

Sampling of the Karajae River water refers to the Indonesian National Standard (SNI 6989.57: 2008) in sections 7 and 8, National Standard Agency (2008).

## RESULTS AND DISCUSSION

### The Chemical Quality Conditions of The Karajae River Estuary

the chemical quality of the Karajae River measured in this study consisting of salinity and pH (Figure 2 to Figure 5).

#### Salinity

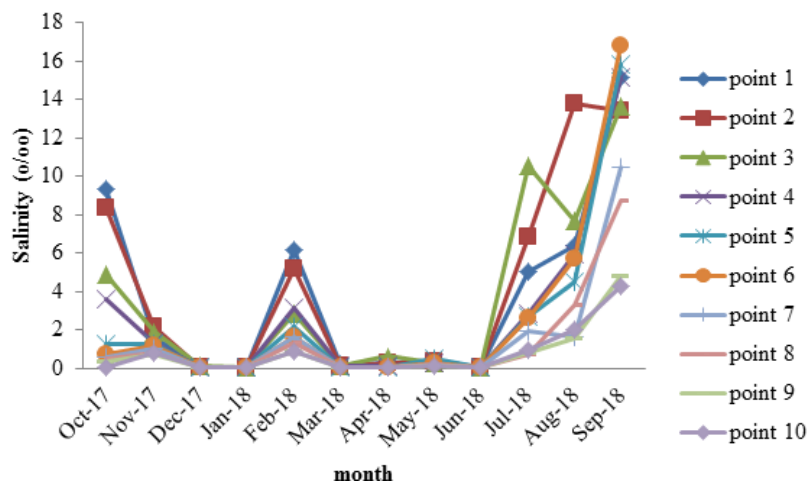


Figure (2): Salinity graph at high tide.

Figure 2 shows the salinity value at the tide condition is  $0.02 \text{ ‰}$  -  $16.82 \text{ ‰}$ . The maximum level of salinity is in September at point 6 of  $16.82 \text{ ‰}$ . The minimum salinity level was in January at points 1,2,3,4 and 5 at  $0.02 \text{ ‰}$ . From the picture it can be concluded that during the dry season high salinity levels. The high salinity value at high tide is caused by the large amount of sea water that enters the Karajae river which causes river water mix with sea water.

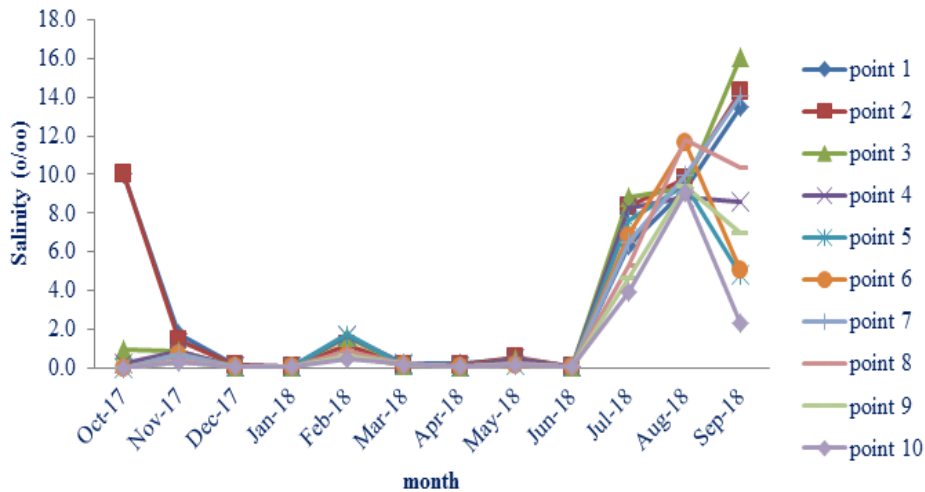


Figure (3): Salinity graph at low tide.

Figure 3 shows salinity at low tide ranging from 0.00 ‰ - 16.090 ‰, at low tide the maximum salinity level is 16.090 ‰ which is located at point 3 in September 2018 and the minimum salinity is 0.00 ‰ which is located at point 5 to point 10 in October 2017.

Based on the results of the analysis it can be concluded that the salinity range has a significant effect on changes in salinity values. The low salinity value at low tide is caused by the mass of sea water at low tide so that the salinity distribution pattern is low in the area leading to the middle stream and this occurs because no sea water enters through tidal events so that the salinity around the estuary is more influenced by fresh water at low tide compared to high tide.

pH

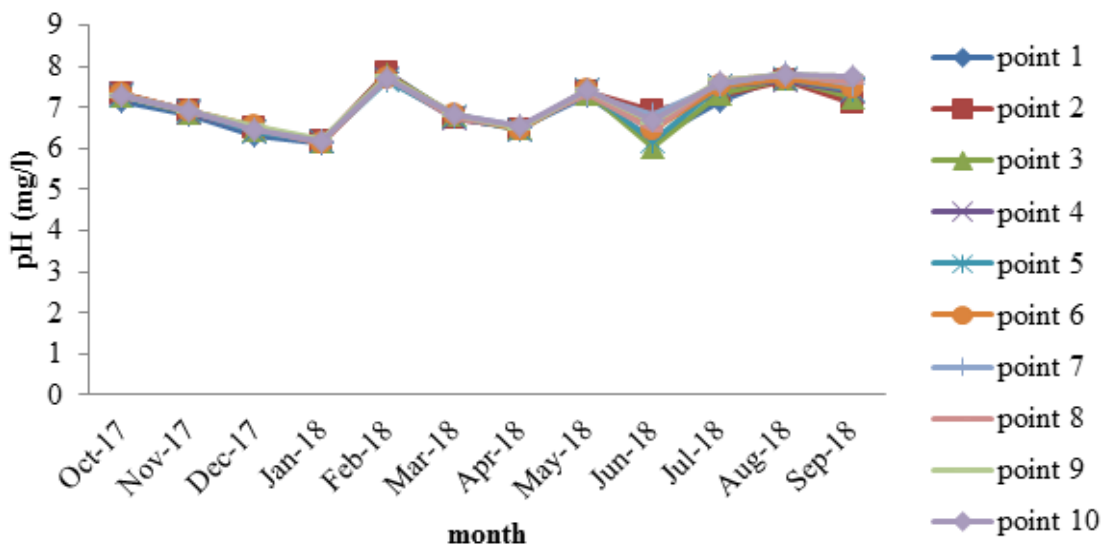


Figure (4): Graph pH at high tide.

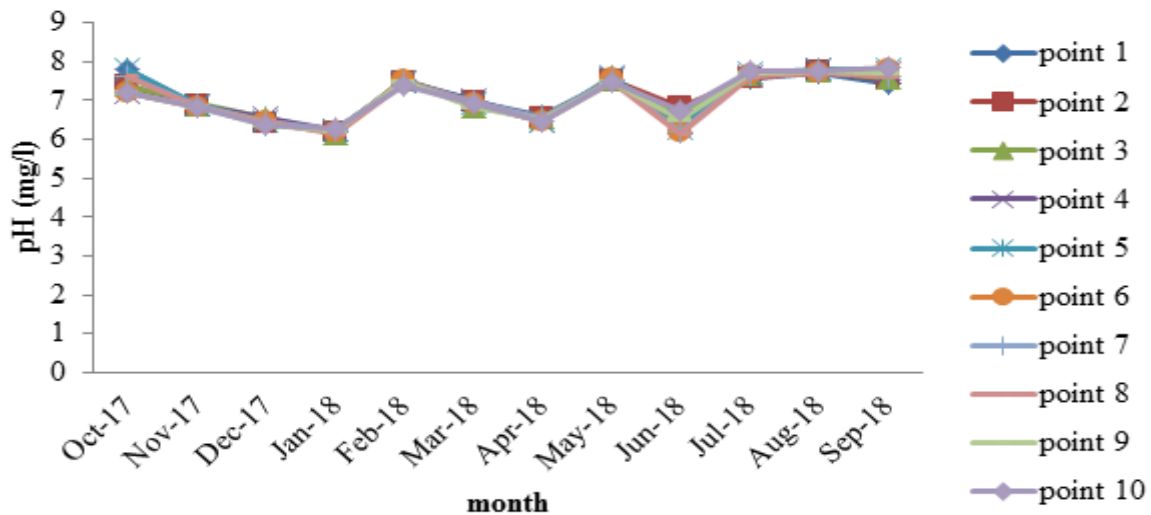


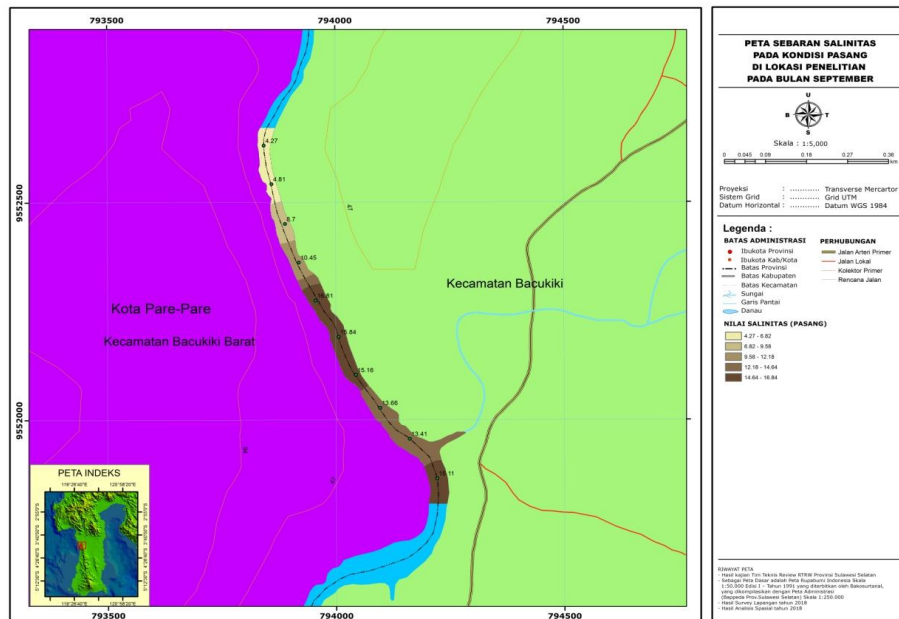
Figure (5): Graph pH in low tide conditions.

Results measurements for each observation point at high tide and at low tide of 6.14 – 7.86 mg/l. There were no significant differences at each observation point (Figure 4 and Figure 5). This shows that pH at 10 points in the Karajae River still meets clean water quality standards based on Government Regulation No. 82 of 2001 for 12 months. For parameters pH values between 6 - 9 is in first class water criteria, which can be used for various purposes such as water tourism, fisheries, livestock and others.

## Distribution Patterns of Salinity

### At Tidal Conditions

The salinity value range at tidal conditions is 0.00 ‰ - 16.82 ‰. Where the highest salinity value in the Karajae River at high tide (dry season) is in September 2018 averaging 11,827 ‰. To see the pattern of salinity distribution at high tide can be seen in Figure 6.



**Figure (6): Distribution patterns of salinity at high tide conditions.**

In the picture above we can see the distribution pattern of salinity areas (downstream estuaries) at a distance of 3.6 km from the mouth of the estuary. Based on interpolation results, the highest salinity was found in September 2018 with an average salinity value of 11,827 o/oo (dry season). And the lowest salinity is found in January 2018 and June 2018 with an average salinity value of 0.03 o/oo (rainy season). From the pictures it can be concluded that in the dry season the level of salinity is high. The high salinity value at high tide is caused by the large mass of sea water entering the Karajae River which causes river water to mix with sea water.

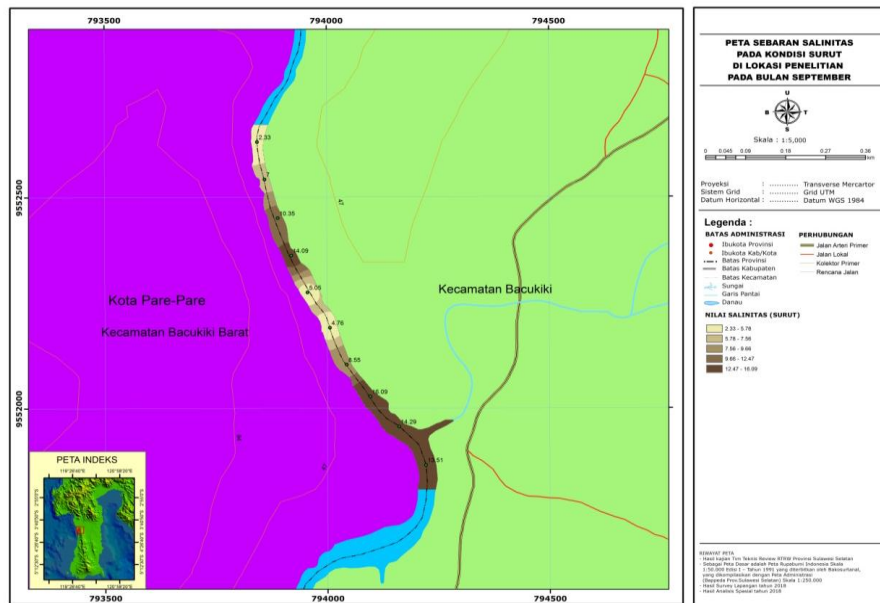
The main salt content contained in salinity is chloride (Cl) which causes saltiness when it exceeds the threshold. The source of chloride in human activities comes from human waste, especially urine. Chloride can also be an indicator of leak *septic tank* (Budiyono and Sumardiono, 2013).

In the picture above it can be seen that in the estuary area the salinity at high tide is higher than at low tide. Comparison of the value of salinity at the lowest tide and low tide can be seen at point 1 to point 10 for 12 months. According to Hutabarat and Evans (2001), when the tide value of salinity in the estuary area rises due to the water in the river mouth mixed with sea

water, while at low tide the salinity value of the river estuary is low due to the water in the river mouth dominated by fresh water.

**Tide At Low**

Tide At low tide the salinity value ranges from 0.00 o/oo - 16.090 o/oo where the average salinity value is 0.03 o/oo - 9.834 o/oo. To see the pattern of salinity distribution at low tide, it can be seen in Figure 7 below.



**Figure (7): Distribution patterns of salinity at low tide.**

From Figure 6 and Figure 7 we can compare the distribution of salinity at low tide. High salinity at high tide and low tide conditions is distributed during the dry season, whereas during the rainy season the salinity distribution is very low at low tide and low tide.

Based on interpolation results, the highest salinity at low tide is 16.090 o/oo located at point 3 in September 2018 and the lowest salinity is 0.00 o/oo located at point 10 in October 2017. Based on the results analysis it can be concluded that the distance of the salinity reach significantly influences the change in salinity value. The low salinity value at low tide is caused by the mass of sea water at low tide so that the salinity distribution pattern is low in the area towards the middle stream and this occurs because no sea water enters through the tidal event

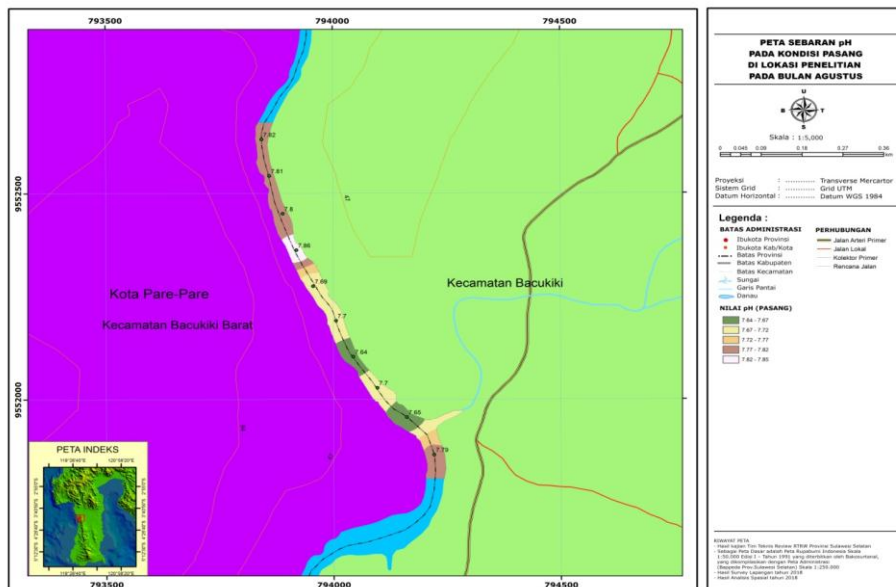
so that the salinity around the estuary is more influenced by fresh water at low tide compared to high tide.

Based on the salinity parameters, it can be concluded that water in the area middle stream can be used as raw water for drinking water. According to Jamali *et al.* (2007), the drinking water salinity standard is 0.5 ‰.

**pH**

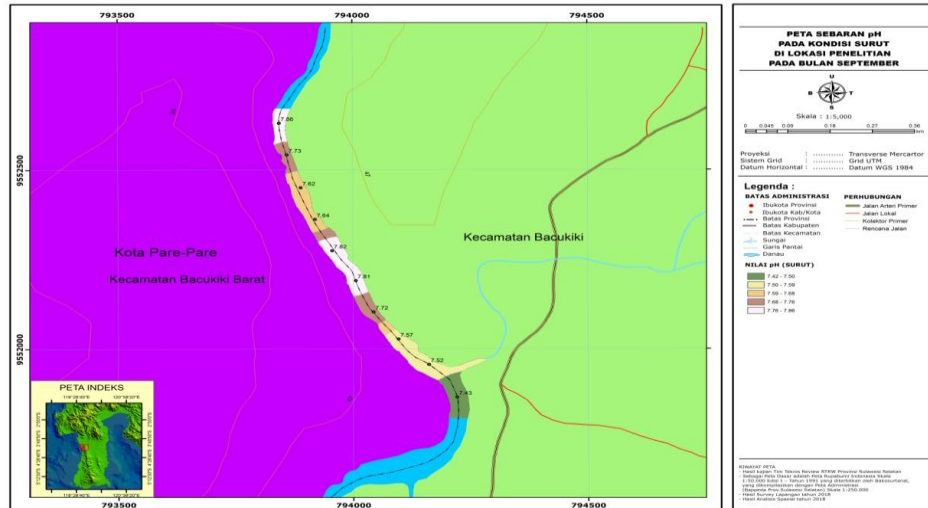
**At Tidal and Tidal Conditions**

The pH measurement results for each observation point at high and low tides are 6.14 - 7.86 mg / L. There were no significant differences at each observation point (Figure 8 and Figure 9). This shows that the pH at 10 points on the Karajae River still meets the quality standards for clean water quality based on Government Regulation No. 82 of 2001 for 12 months. For the parameters of pH value between 6-9 is a first-class water criteria, which can be used for various purposes such as travel, water, fisheries, livestock and others. To see the pattern of pH distribution at low tide, it can be seen in Figure 8 and Figure 9 below.



**Figure (8): Pattern for spreading pH at high tide conditions.**





**Figure (9): Pattern of spreading of pH at low tide.**

## CONCLUSION

Based on the results of the discussion it can be concluded that the results of the examination of water quality for salinity and pH in the Karajae River for 12 months still meet the water quality standards according to Government Regulation No. 82 of 2001. The salinity value at the tide condition is 0.02 ‰ - 16.82 ‰. The maximum level of salinity is in September at point 6 of 16.82 ‰. The minimum salinity level was in January at points 1,2,3,4 and 5 at 0,02 ‰. While the salinity at low tide ranging from 0.00 ‰ - 16.090 ‰, at low tide the maximum salinity level is 16.090 ‰ which is located at point 3 in September 2018 and the minimum salinity is 0.00 ‰ which is located at point 5 to point 10 in October 2017.

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