

ABSTRACT

The current problem experienced by Yogyakarta City is the increasing volume of wastewater followed by improper sanitation system. The wastewater has the potential to become a new source of recharge for shallow groundwater, but provides poor quality. On the other hand, communities still use dug wells to meet their need for clean water. Based on these problems, an urban recharge study needs to be carried out as an initial step for the study of shallow groundwater contamination in the city of Yogyakarta. The purposes of this study are to determine the characteristics of shallow groundwater and to estimate the rate of recharge of shallow groundwater in old and new residential areas of Yogyakarta City using the CMB and the WTF methods. This research was conducted in a span of six months representing the end of the dry season to the beginning of the rainy season, starting from September 2021 to February 2022. The data collection included measurements of groundwater levels, determination of physical properties of groundwater (pH, Total Dissolved Solids (TDS), Electrical Conductivity (EC)), analysis of chloride and nitrate concentrations in rainwater and groundwater, and shallow drilling. Moreover, secondary data (land cover, rainfall, PDAM pipeline network, and sewer system network) were obtained and processed. Data analysis includes evaluation of the characteristics of shallow groundwater and estimation of groundwater recharge using the CMB and the WTF methods. The results of this study indicate that the temporal increase in groundwater level has a positive correlation with an increase in TDS, EC, chloride, and nitrate concentrations. However, the groundwater level has a negative correlation with a decrease in pH. Spatially, relatively newer residential areas have shallower groundwater levels, lower pH, higher chloride and nitrate concentrations, and nearly the same TDS and EC as older residential areas. Based on the CMB method, the estimation results of groundwater recharge in old and new residential areas are 126 mm per year and 109 mm per year, respectively. Based on the WTF method, the estimation results of groundwater recharge in old and new residential areas are 298 mm per year and 842 mm per year, respectively.

Keywords: *Groundwater recharge, Water Table Fluctuation, Chloride Mass Balance*