



HYDROGEOLOGICAL PROPERTIES OF BANK STORAGE AREA IN CHANGWON CITY, KOREA

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Bank filtrated water has been used in developed countries such as United States, France, Germany, Austria, Nederland and so on. In Korea, most of the drinking water is provided from the surface water. However, drinking water acquisition is becoming difficult due to the degradation of surface water quality. In special, the quality of drinking water source is much lower in downstream area than in upstream area. Thus, the use of bank filtrated water is getting attracted by central and local governments in Korea. The bank filtrated water was surveyed in the areas of Yeongsan river, Nakdong river, Geum river and Han river. Up to present, however, the downstream areas of Nakdong river are most suitable places to apply the bank filtration system.

This study investigates hydrogeological characteristics of bank-storage area located in Daesan- Myeon, Changwon city, adjacent the downstream of Nakdong river. Changwon city is the capital city of Gyeongsangnam-Do province. Changwon city uses water derived from Nakdong river as municipal water. However, the quantity and quality of the river water are gradually decreased. Thus, Changwon city developed two sites of bank filtration system in Daesan-myeon and Buk-myeon. Pumping rate is 2,000m³/day at present and will be increased to 60,000m³/day in Daesan-myeon site at the end of the first stage of the project.

For the study, we conducted pumping tests four times on seven pumping wells (PW1, PW2, PW3, PW4, PW5, PW6, and PW7) and twelve drill holes (BH-2, OW2-OW12) in the area of 370 m x 100 m. Pumping wells PW1 and PW2 were drilled in 1999 by Samjung Engineering Co. and pumping wells PW3, PW4, PW5, PW6 and PW7 were drilled in 2000 by Donga Construction Co. and Daeduk Gongyeong Co. The pumping wells are located at 45-110 meters from Nakdong riverside.

The geology of the study area is composed of volcanic rocks (Palryeongsan tuff and

Jusasan andesitic rock) and alluvium. Palryeongsan tuff consists of mostly green tuff with partly tuffaceous sandstone, shale, mudstone and sandstone. Thick alluvium is overlain on Palryeongsan tuff (Samjung Engineering Co., 1999; Donga Construction Co. and Daeduk Gongyeong Co., 2000; Kim and Lee, 1964). The alluvium is composed of sand, sandy gravel and weathered zone from the surface (Table 1, Fig. 3). The aquifer is sandy gravel layer (Samjung Engineering Co., 1999). The gravel layer is thicker near the wells of PW1, PW2, PW3, and PW4 (13.5-17.5m), whereas is thinner near the wells of PW5, PW6, and PW7 (6.3-10.5m).

The pumping data obtained were analyzed to determine hydraulic parameters (transmissivity and storativity) using various models of pumping test analysis. The appropriate models for the study area were found from several models. The selected model for observation well is Theis model using corrected drawdown and the selected model for pumped well is Papadopulos-Cooper model using corrected drawdown. As a result, alluvial aquifer in the study area behaviors as confined aquifer rather than phreatic aquifer. Thus, infiltration amount from the river to the aquifer in the study area is lower than that from river to phreatic aquifer for the same water level change. And also storativity of the aquifer is represented by elastic storativity rather than specific yield.

Transmissivity obtained by the models ranges from 4.54×10^{-4} to 1.79×10^{-1} m²/s with arithmetic mean 2.92×10^{-2} m²/s. Storativity ranges from 2.59×10^{-4} to 5.54×10^{-1} with arithmetic mean 6.36×10^{-2} . Frequency distribution of hydraulic parameters was determined from statistical analyses. The distribution of transmissivity values does not follow normal distribution showing skewness 2.36 and kurtosis 5.085. Aquifer heterogeneity was found by hydraulic parameters and subsurface geology data in the study area. Furthermore, hydraulic parameters obtained at a well that serves as both pumping well and observation well were compared, and the correlation equation was determined to evaluate hydraulic parameters considering aquifer loss. Transmissivity values obtained by the two cases do not show distinct correlation. However, storativity values obtained by the two cases show distinct negative correlation.

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