

Sutham Rotchanameka 2014: A Study of Characteristic of Aquifer for Prediction of Subsidence on Bangkok and Vicinity by Mathematical Model. Doctor of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Warakorn Mairaing, Ph.D. 210 pages.

Land subsidence problems in Bangkok and its vicinity have been occurred mostly by extensive of groundwater withdrawal. The increasing in water demand was a consequence of rapid economic development and the expansion of domestic purposes. The problems caused extensive damage to the economic and environment as a whole such as flooding areas, intrusion of salt water, cracking of structures, stress changing in underground structures etc. The behavior of soil settlement due to groundwater changing is studied in this study for verification of land subsidence crisis and minimize those impacts. By using finite difference method to analyses the settlement, the mathematical model is produced. The study area cover in 7 provinces: Bangkok, Nonthaburi, PathumThani, SamutSakhon, SamutPrakan, NakhonPathom and Ayutthaya which have all 110 well stations.

The comparison of calculated and measured settlement showed very good agreement which had least square regression coefficient of 0.998. The plotting of soil settlement related to the groundwater changing which was called “**CADS**”. This parameter can also be used to predict the behavior of soil settlement in any areas as well. The inverse slope of CADS can be used as the settlement sensitivity index ( $i_s$ ) which is the settlement in any area per 1 m. of groundwater decrease in each aquifer. It was found that the maximum  $i_s$  of PD and NL aquifers are 0.5 cm/m/year at Amphoe Bang Pli, Samut Prakan and Amphoe Mueang Samut Sakhon respectively. This is useful for controlling of groundwater pumping in each area. The prediction of land subsidence for 5 water pumping scenarios was done for the next 20 years. It showed that Case 1 and Case 2.5 have the maximum cumulative settlement in 2027 about 37 cm. at the northern part area of Amphoe Bang Pli. And Case 4 showed the maximum cumulative swelling in 2027 about 74 cm at Min Buri, Bangkok. The result of finding the permissible yield of groundwater pumping which produce the settlement not exceed 1 cm/year, found that Case 2.3 show that settlement rate in most of the area. But some areas have the settlement rate more than 1 cm/year. It is Don Mueang district, which should has the pumping rate not more than the Case 2.2. And Lat Krabang, Prawet districts and the northern part area of Bang Pli have more serious the settlement thus some mitigation such as stop pumping and recharge water for raising the groundwater level should be considered. These will give the settlement rate less than 1 cm/year.

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Thesis Advisor's signature