

Development of Three-Dimensional Groundwater Model for Al-Corridor Well Field, Amman-Zarqa Basin

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Abstract : Corridor area (400 km²) lies to the north - east of Amman (60 km). It lies between 285-305 E longitude and 165-185 N latitude (according to Palestine Grid). It been subjected to exploitation of groundwater from new eleven wells since the 1999 with a total discharge of 11 MCM in addition to the previous discharge rate from the well field 14.7 MCM. Consequently, the aquifer balance is disturbed and a major decline in water level. Therefore, suitable groundwater resources management is required to overcome the problems of over pumping and its effect on groundwater quality. Three-dimensional groundwater flow model Processing Modflow for Windows Pro (PMWIN PRO, 2003) has been used in order to calculate the groundwater budget, aquifer characteristics, and to predict the aquifer response under different stresses for the next 20 years (2035). The model was calibrated for steady state conditions by trial and error calibration. The calibration was performed by matching observed and calculated initial heads for year 2001. Drawdown data for period 2001-2010 were used to calibrate transient model by matching calculated with observed one, after that, the transient model was validated by using the drawdown data for the period 2011-2014. The hydraulic conductivities of the Basalt- A7/B2 aquifer System are ranging between 1.0 and 8.0 m/day. The low conductivity value was found at the north-west and south-western parts of the study area, the high conductivity value was found at north-western corner of the study area and the average storage coefficient is about 0.025. The water balance for the Basalt and B2/A7 formation at steady state condition with a discrepancy of 0.003%. The major inflows come from Jebel Al Arab through the basalt and through the limestone aquifer (B2/A7 12.28 MCMY aquifer and from excess rainfall is about 0.68 MCM/a. While the major outflows from the Basalt-B2/A7 aquifer system are toward Azraq basin with about 5.03 MCMY and leakage to A1/6 aquitard with 7.89 MCMY. Four scenarios have been performed to predict aquifer system responses under different conditions. Scenario no.2 was found to be the best one which indicates that the reduction the abstraction rates by 50% of current withdrawal rate (25.08 MCMY) to 12.54 MCMY. The maximum drawdowns were decreased to reach about, 7.67 and 8.38m in the years 2025 and 2035 respectively.

Keywords : Amman/Zarqa Basin, Jordan, groundwater management, groundwater modeling, modflow

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