

The Influence of Multi-storey Underground Space Building to the Groundwater Seepage in Tianfu New Airport

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As an international and regional aviation hub, Chengdu Tianfu New Airport's flight level index is 4F, with the design plan has 6 runways. The first construction period has 3 runways to meet the annual passenger throughput of 40 million passengers, aircraft take-off and landing capacity of 320,000 vehicles. The underground space of Tianfu new airport is a multi-layered construction and a cross-traffic corridor: the upper level is the basement, the middle level is a belt subway structure parallel to the central axis of the airport, the lower level is a high-speed rail structure oblique to the central axis of the airport. The excavation depth of deep foundation pit reaches 23.3m. The surface of the site are red beds hills with a lots of ponds. Located in the northwest wing of the Jianyang Nose-like Anticlinal, the tectonic of the site is simple, and the sand and shale interbed stratum is a flat monoclinic formation. Usually the groundwater in the red beds is relatively smaller, but the local weak confined water exposed in the site means the complicated hydrogeological conditions. Based on the data of geological conditions, hydrogeological conditions and underground engineering in the site, this paper simulates the change of groundwater flow field under different working conditions with MODFLOW. According to a series of simulation results, obtained the following conclusions:

- (1) After grading, the landform of the site changed strongly, but outside the site the river and the valley is still retained, the flow field cannot adapt to the changed landform immediately.
- (2) Pumping results in the changes in the direction of runoff as well as the groundwater watershed, reduced the underground engineering's interception effect on the groundwater.
- (3) Compared the lower level, the middle level and the upper level, the impaction of lower level to the flow field is relatively small, because the groundwater cross-section reduction is relatively small, while its long axis has a certain angle of intersection with groundwater flow, which play a little role of blocking the groundwater compared with the horizontal subway station and the basement which is orthogonal to the groundwater flow.
- (4) During the construction of underground structures, there was no obviously groundwater obstruction, which related to the local meteorological and hydrological conditions. The rainfall in the site was relatively concentrated in the summer, while the evaporation and rainfall were average all year around. Thus there is no obvious increase in groundwater level.
- (5) During the operation period, the groundwater flow field adapting to the changed landform gradually, it cannot return to the natural flow field due to the landform. However, compared with the natural flow field, runoff discharge conditions of groundwater almost unchanged, only the groundwater level changes.