

GPS Levelling Without Geoid in Egypt Applied to Borg El-Arab City

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SUMMARY

Global Positioning System, GPS, has been used extensively in most of Engineering applications. This system offers fast and accurate positioning compared to the conventional methods. The GPS ellipsoidal heights are not suitable as vertical control in engineering applications. On the other hand, the use of careful GPS survey procedures coupled with high-resolution geoid models, to obtain orthometric heights is known by GPS levelling.

In this paper, GPS levelling technique is presented to densify local Benchmarks instead of time consuming and costly traditional technique i.e, levelling. The areas and distances in Egypt suitable to neglect the presence of geoid are investigated and determined based on the allowable levelling error. This study is done using the geoid resulting from the recent global geopotential models i.e. GRACE, and GPM98A. The areas with gentle slope geoid undulations are focused on. The technique is then applied to Borg El-Arab city. The results are compared to the levels determined by levelling technique. The errors are determined in case with no geoid and then with introducing geoid from GPM98A, EGM96, and GRACE models. The errors are presented and concluded. The concept of geometric geoid or corrector surface was introduced the corrector the observed ellipsoidal height and convert it to orthometric height. Four models were tested as corrector surfaces to choose only one. The results after using corrector surface indicate that the GPS levelling can replace the traditional levelling.