CHAPTER 4
CONCLUSION AND RECOMMENDATION

In this research work, gravity measurement and electrical resistivity sounding were carried out in Vientiane Capital of Lao PDR, an area bounded by latitudes 17°54′ N to 18°18′ and longitudes 102°24′ E to 103°00′ E. The purpose of this work is to determine regional subsurface geological structures of the area and to delineate area of fresh groundwater in Xaithani district.

All together 132 gravity stations with station spacing of 4 km and 30 points of electrical sounding were placed in the study area. In addition, rock samples from Champa formation of Cretaceous age were collected, from 7 sites within the study area and 4 sites at Phou Khaokay Mountain, for density determination.

The gravity anomaly of the study area ranges from 45 to 472 g.u. Regionally, the gravity anomaly of the study area decreases from west to east, i.e. about 440 g.u. in the west and less than 160 g.u. in the northeast of the study area. There is a tendency that the low anomaly continues further east. Since the study area is in the western part of the Vientiane basin, a decreasing of observed gravity anomaly eastward is not unexpected. In addition, medium gravity anomaly, 180 to 240 g.u., was observed in the southeastern part of the study area with their contour lines running parallel to Mekong River.

According to present gravity model, the thickness of basin sediment increases eastwardly. The maximum thickness of basin sediment of about 5 km is in the northeastern part of the study area. In gravity modeling, densities of 2.7 g/cm^3 and of 2.45 g/cm^3 were assigned for basement rock and basin sediment of Cretaceous age. In addition, salt deposits of maximum thickness of about 1,000 m were also included in the basin sediments and locations of faults and surface rock boundaries in the geological map of the study area were used as constraints for the gravity modeling.

It is also observed that the thickness of Cetaceous sediment in the northeastern part of the study area is too thick, 6,500 meters for constant density of 2.45 g/cm^3. The models were suggested to explain low Bouguer anomaly in this area. One was that the area explained compressional or extensional stresses in complex

tectonic regimes and another was intrusion of igneous rock at depth. Addition geological and geophysical information of this area should be acquired in the future for deciding on the most possible subsurface model of the study area.

Regarding to the depth map of bedrock obtained from the present gravity modeling, a rise of basement rock from an expected depth of 1,000 meters to 3,000 meters in the middle part of the study area is probably an explanation for changing in the course Nam Ngum River from north-south to west-east.

According to electrical sounding measurement, a thick layer of conductive ground was encountered as very shallow depth, says 0.7 to 13.6 meters. This conductive ground consists of 2 layers, a layer of resistivity 10 to 24 ohm-m overlies a layer of resistivity less than 10 ohm-m. The upper layer comprises sand, gravel, clay, siltstone, sandstone and claystone and anhydrite whereas the lower layer is mainly halite salt. The thickness of this conductive ground could not be determined from the present study due to the limitation of penetrating depth of the electrical current in conductive ground. However, a contour map of the bottom layer resistivity obtained from the sounding interpretation showed that there are 2 areas of which resistivity is higher than 30 ohm-m, one in the west and another in the south of Xaithani district. They are considered to be suitable areas for potential fresh groundwater. The depth to this interpreted groundwater layer is about 50 to 100 meters. Moreover, it can be observed that the TDS value of these potential groundwater zones is less than 500 ppm.

A combination of gravity and electrical sounding measurement was successfully employed in determining thickness of basin sediment and potential groundwater areas of Vientiane basin. It showed that the thickness of Vientiane basin increases eastward and is likely to continue further east. It also gives an evidence of unexpected shallow basement rock for a changing in course of Nam Ngum River from North-South to East-West in the middle part of the study area. Moreover, a shallow conductive ground of considerable thickness in large area of coverage observed in the electrical sounding measurement could be considered as an indicator of salt deposits in this basin. It is recommended that in order to complete the boundary of Vientiane basin, gravity measurement should be extended eastward and northeastward.