CHAPTER 4

CONCLUSIONS AND DISCUSSION

Gravity and vertical electrical sounding measurement were conducted in a study area bounded by latitudes 8° 33′ 28″N to 9° 19′ 35″N and longitudes 99° 7′ 38″E to 99° 42′ 34″E which is in Surat Thani Province of peninsular Thailand. The purpose of this study is to determine subsurface geological structures and systems of faults in the study area which might be related to heat sources and pathways of geothermal water in the study area.

All together four hundred gravity stations with station spacing of 1 to 2 km and 21 points of vertical electrical sounding measurement were conducted in the study area. In addition, rock samples of Jurassic-Triassic sandstone, Permian limestone, Carboniferous-Devonian-Silurian mudstone and Triassic granite from 12 sites were collected for density determination.

The observed Bouguer anomaly of the study area ranges from -200 to 450 g.u. Regionally, high Bouguer anomaly of 300 to 450 g.u. was observed in the northern part of the study area where Permian limestone, Jurassic sandstone and Quaternary sediment expose at the surface and low Bouguer anomaly of -200 to 150 g.u. was observed in the southwestern part of the study area where Triassic granite exposes as granitic ranges.

According to gravity model in the present work, Permian dolomitic limestone and limestone to a very shallow depth are responsible for a high Bouguer anomaly in the northern part of the study area. The 13 km thick body of granite is responsible for a low Bouguer anomaly in the southwestern part of the study area. Since hot springs SR7 and SR8 are close to a NW-SE trending strip of high Bouguer anomaly in the northern part of the study area, Permian rocks can probably be the reservoirs of these geothermal waters.

The depths to the Permian rocks were confirmed by results obtained from vertical electrical sounding measurement. The resistive bottom layer of 670 to 1,080 ohm-m were detected at depth 30 to 280 m within a region of a high Bouguer anomaly strip trending NW-SE in the northern part of the study area. Near the sounding point S10 was the location of the well no. 6753. A comparison between resistivity data and the geological profile from the well shows that the resistive bottom layer of 958.9 ohm-m at 160 m depth corresponds with limestone rock of Permian age.

In addition, locations of faults were drawn at the contacts between high resistivity and low resistivity units on the depth slice map of the resistivity model. The orientations of these faults are in NW-SE and NE-SW directions. The locations of the hot springs SR7 and SR8 are exactly correspond with the intersection of these two faults. In addition, the extension of these faults to NE and SW will pass through other hot springs in the nearby area, SR4 in the east, SR6 in the south and SR9 in the southwest, respectively.

From the present gravity study, faults with NW-SE and NE-SW orientation and Permian rock are likely to play a major role as pathways for the hot water from deep ground to the surface. High contents of calcium (387 to 392 mg/l) and magnesium (49.2 mg/l) in chemical analysis of hot water obtained from SR7 and SR8 hot springs (Appendix E) supports the above statements. Triassic granite of 13 km thickness will probably play a role as heat source for the geothermal system in the study area.

A NE-SW trending strip of Permian rock and Tertiary basin in the southwest of this Permian rock are probably evidences of a horst and half graben structure, which is a west extension of those developed in the Gulf of Thailand, east of the present study area (Polachan and Sattayarak, 1989). If this is the case, normal faults bounded the horst structure will be the conduits of the geothermal water in this hot spring area. This will agree with the results obtained from oil well drillings within the study area that the course of the Tapee River and the Phum Duang River seems to be influenced by vertical tectonic movement in the area (Gopher Oil, 1988 in Talong et al., 2001).