CHAPTER VI

CONCLUSION

The Wichian Buri sub-basin is one of five half garbens/garbens of the Phetchabun Basin, locates in Changwat Phetchabun, north central Thailand. The Wichian Buri sub-basin formed as a N-S trending half-garben between the major strike-slip faults where it originated. The half-garben structure of the basin is characterized by an east bounded half-garben in the south, and change to the west bounded half-garben in the north. The basin developed as a result of transtensional shear tectonics associated with right lateral movement on the NW-SE trending Mae Ping fault and left lateral movement along NE-SW trending Uttaradit fault, resulting from the collision of the Indian Plate with Erasian Plate since Eocene.

The Tertiary sedimentary sequence in the Wichian Buri sub-basin is entirely non-marine sediments of lacustrine and fluvial deposits with the maximum thickness of approximately 2500 m. in the deepest part of the basin. The proposed lithostratigraphy of Tertiary sequence of the Wichian Buri sub-basin has been sub-divided into 4 formations, namely; WB-1, WB-2, WB-3, and WB-4 Formations in ascending order. The lowermost unit is the WB-1 Formation that overlies unconformably on the Permo-Triassic metasediments and volcanics. The formation is characterized by an oxidized clastic sediments associated with rift volcanics. It is interpreted as representing alluvial-plain environment of deposition. Conformably overlying the WB-1 Formation is the claystone dominant sequence of the WB-2 Formation. Significant thickness of fluvio-lacustrine sediments of this formation dominates the sedimentary sequence in the Wichian Buri sub-basin. This formation can be subdivided into 3 members; WB-2A,

WB-2B, and WB-2C Members in ascending order. The lower part of the WB-2 Formation, the WB-2A Member consists predominantly of dark organic-rich claystone, containing a few siltstone layers. Abundant fresh water algae (*Pediastrum sp.*) confirm a lacustrine environment of deposition. The middle part of the WB-2 Formation is the WB-2B Member. The member is characterized by mainly claystone with interbedded sandstone and siltstone. Discrete packages of thin bedded sandstones within the claystone dominant sequence are interpreted as representing progradation of deltas in the open lake. The deltaic-lacustrine environment of deposition is proposed for the WB-2B Member. The upper part of the WB-2 Formation is the WB-2C Member. The member is characterized by interbedded claystone, sandstone, and siltstone. The depositional environment of the WB-2C Member is interpreted to be fluvio-lacustrine. Unconformably overlying the WB-2 Formation is the WB-3 Formation that consists mainly of sandstone interbedded with claystone, siltstone, and minor coal. These sediments are interpreted as fluvial origin. For the uppermost Tertiary sequence in the Wichian Buri sub-basin is the WB-4 Formation that was bounded by the unconformities same as the underlying WB-3 Formation. It is characterized by the claystone dominant sequence, comprises predominantly of grey claystone with minor interbeds of sandstone and siltstone. Abundant fresh water algae (*Botryococus sp.*) confirm lacustrine environment of deposition. Igneous units are present throughout the stratigraphic sequence and are areally widespread within the Wichian Buri sub-basin.

Consequently, collision of Indian Plate with Eurasian Plate was the cause of reversal of movement of Mae Ping fault zone from sinistral in Mesozoic to dextral in Tertiary. The major dextral movement along NW-SE trending faults, including the Red River, Mae Ping and Three Pagoda fault zone is believed to have occurred in the Oligocene and it resulted in large- scale dextral shear stress in the block between this

faults. This shear stress was expected to cause the major extension of the Wichian sub-basin in this region.

The Wichian Buri sub-basin is considered to be a rift basin. The sedimentological and tectonic evolution of the Wichian Buri sub-basin is dominantly by two principal extensional phases during Oligocene-Recent. An early phase of crustal extension in the region is characterized by major normal faulting leading to basin formation, and intrusions during Oligocene-Middle Miocene. During the Oligocene time, the border faults were re-activated responding to the reversal movement of major strike-slip faults in this region. Displacement along the border faults led to asymmetric half-garben of the basin and was the major driving mechanism for the syn-rift subsidence prior to the Middle Miocene. Extension related rifting began with the oldest sediments which deposited in alluvial plain environment. The increasing rate of extension with rapid subsidence in Early Miocene led to a pronounced increase in the asymmetry of the half-garben and lacustrine condition established over the basin, resulting thick basin fill of dark organic-rich claystone sequence. While the basin became more tectonic. Clastic sediments encroached upon the lake margins, and were shed to prograding alluvial fans and fan deltas into the basin. During the Middle Miocene, an increasing fluvial influence occupied over the basin and became to the drainage system at the end of Middle Miocene by regional uplift. A second extensional phase of the basin began with thermal subsidence and the widespread return of lacustrine condition in the basin during Late Miocene to Pliocene. Following deposition, extension segmented the basin into numerous NNW-SSE and few NNE-SSW rotated fault-blocks which were then covered by the younger strata of Quaternary deposited after the Pliocene-Pleistocene uplift.

Geochemical study of expected source rocks in the Wichian Buri sub-basin showed that the dark organic-rich lacustrine claystones of the WB-2 Formation are the

source of hydrocarbons discovered in the basin. The source material contains Type I/II kerogens which accumulated high quantities of liptinite maceral resulting in a highly oil-prone source. Maturity of source rocks in the basin is relative low. However, igneous activity with a high geothermal gradient are expected to be the principal factors influencing the maturation of the organic source in the Wichian Buri sub-basin.