CHAPTER 14

SUMMARY AND CONCLUSION

14.1 Summary

The area under study is represented by the basal part of the Barail Group of Tertiary Supper Group. The sediments of the Barail Group began with the deposition of massive, thick bedded, multilayered sandstones (Sahu and Naik, 1988), over the Disang Group without a hiatus followed by thin bedded one. The rocks of the Barail Group exposed in the area are made up of fine grained hard sandstones with thin intercalations of friable shales here and there. Sinha and Sastri (1973) opined that the deposition took place during flysch stages. The rocks of the study area trending towards NE-SW to NNE-SSW, dipping 25° to 65° SE in Khonoma-Mazema sectin and NW-SE strike, dipping 25° to 55° SW in the Khonoma-Jotsoma and Khonoma-Dzulake sections. Disang rocks are conformably overlain by the dominantly arenaceous sequence of Barail Groups of Oligocene age (Sinha and Sastri, 1973; Krishnan, 1968; Mathur and Evans, 1964). However, Handique et al., (1980), based on fossil evidence, opined that the Barail range from Late Eocene to Oligocene. According to Sinha, (1980), the Lower Barail Laisang subgroup represents an alternating sequence of sandstones and grey coloured silty shale. The sandstones are grey to light grey, hard, fine grained, massive to thin bedded.

The mechanical analyses and resultant size curves of the study area indicate the presence of finer fraction of the sediments mainly fine sand and silt in the present Barail sandstones. The study of different statistical size parameters and their interrelationship
suggest that the present sandstone is bimodal one where one mode is dominant and the other one is subordinate. The dominant mode is the sand mode and the subordinant mode is silt mode, and both the modes are mixing in the sediment subequally. Moreover, the study also suggest that the sediments are well sorted, symmetrical to slightly skewed in character and are of normal to moderately peaked types. These sediments were transported through suspension processes from the source to the site of deposition covering a long distance and were deposited in a shallow marine moderate energy environmental conditions.

The shape analysis of the present Barails sandstones suggests that they are matured in character. The study also indicates that the grains of sediment were undergoing prolonged transportation, where selective sorting processes separated the rounded grains from less rounded ones; or they may be the recycled sediments of older geosynclinal terrains. It also indicates that the sandstones were deposited in a tectonically stable part of the area, where sediments remain uneffected for a longer period during the time of deposition.

The overall provenance studies suggest that the Barail sandstones were derived from passive continental margins. The sediments were derived from both granitic as well as low ranked metamorphic sources. The sedimentary source also cannot be ruled out due to the presence of recycled sediments which may be derived from older rocks of nearby area. Enrichment of detrital quartz and depletion of labile grains suggest that the sandstones of the present area were derived from low to moderate relief area under humid
climatic conditions and were deposited in a chemically more active area under marine influence.

The paleoclimate studies suggest that the present Barail sandstones are matured in character and were derived from a sub-tropical terrain. The sediments were derived through intense chemical weathering, where rainfall was heavy and were deposited under humid to subhumid climatic conditions.

Different environmental processes suggest that the sediments of the present Barail sandstones were deposited under shallow marine to marine environmental conditions. The sediments containing very fine sand and silty particles were transported through suspension, both graded and uniform, to the site of deposition, and were deposited in marine environment under the influence of turbidity current. The well sorted character of the sediments and minor sedimentary structures of the sandstones also indicates similar setting of environmental conditions, under which they were deposited.

The textural classification indicates that the sediments of the present Barail sandstones belongs to "Silty sand" and "Sandy silt" group, where clay fraction is nil. The grain size indices classification indicates that they ranges from "Fine sand" to "Coarse silt". From the observation of mineralogical classification, it may be concluded that the sandstones of the present area are "litharenite" to "sublithicarenite", containing small amount of iron. From the over all studies of classification of the present Barail sandstones, it may be concluded that the sandstones are fine to very fine in nature,
composed of matured sand and silt size materials.

The petrographic studies suggest that the sediments of the present Barail sandstones were mainly derived from plutonic as well as metamorphic terrain of the surrounding area. The sediments were subjected to erosion by mechanical as well as chemical weathering and transported to a moderately long distances and deposited in shallow marine condition. The recycled character and the sedimentary rock particles present in the sandstones also indicate that some of the sediments of the present sandstones are coming from sedimentary rocks from the near by area. Thus, the provenance of the present Barail sandstones may be the older intrusive and metamorphic rocks of the Shillong plateau, situated towards the north of the study area and also it is linked with the older geosynclinal rocks of the near by area. After deposition lithification, diagenesis and consolidation of the sediments took place to form the present sandstones.

The heavy mineral studies suggest that the sediments of the present Barail sandstones were derived from two or more sources. The igneous and metamorphic sources may be the Shillong plateau, situated to the north of the area while the other may be the older geosynclinal rocks of the near by area. The more mature character and the presence of chemically stable heavy minerals like zircon and tourmaline suggest that the sediments of the present area were deposited through prolonge transportation. It also indicate that the sediments were deposited in a mild tectonic and moderate energy conditions.
The geochemical studies of the major oxides of the sandstones of the present area suggest that the sandstones are mainly lithicarenite, derived from granite, low grade metamorphic or sedimentary provenances and deposited in exogeosynclinal tectonic setting. Presence of passive margin tectonic setting also suggest that they are highly recycled in nature with enrichment of quartz and depletion of chemically unstable grain like feldspar. Over all studies of the trace elements of the present Barail sandstones indicate that the sediments were deposited in marine environment. The studies of rare earth elements of the present Barail sandstones suggest that the sediments were eroded from plutonic, metamorphic or sedimentary rocks and were transported by river to the site of deposition and deposited in marine environment.

14.2 Conclusion

From the over all studies, it may finally be concluded that the sediments of litharenitic to sublitharenitic character of the present Barail sandstones were derived from granitic and low to medium grade metamorphic terrains as well as older sedimentary rocks. The former two may be from the Shillong plateau area, situated to the north of the present area and the later may be from the older geosynclinal terrain, existed near the area of deposition. All the sediments were transported through a long distance and were deposited by uniform and graded suspension under the influence of turbidity current in marine environment. The sandstones were chemically and mineralogically mature in nature and were deposited in humid to
subhumid climatic conditions. Moreover, the Barail rocks of the present area were deposited in an exogeosynclinal set up that belongs to a passive continental margin. From the studies it may also be concluded that the Barail sandstones were deposited under mild tectonism in a moderate energy condition in the later part of the Eocene time.