CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The failure mechanisms in the study area are found their factor of safety brought in limit equilibrium condition.

Ramhlun Vengthar and Zohnuai sites are ‘unstable’ and are ‘probable to failure’ while, Zuangtui site is ‘relatively stable’. The study concluded after three parameters- the cohesion, the angle of friction and the unit weight with slope geometry using conventional limit equilibrium and probabilistic slope stability analyses.

From field investigations, Ramhlun Vengthar site is ‘earth slide’ of translational type, ‘suspended and advancing landslide’; Zuangtui site is classed as ‘earth slump’ of rotational type and ‘reactivated landslide’; Zohnuai site is ‘debris slide’ of translational type and ‘dormant landslide’ and Laipuitlang site is ‘rock slide’ of translational type and ‘reactivated landslide’.

The rock in the study area belongs to Upper & Middle Bhuban Formation which is composed of intercalating sandstone-shale rock types. Mineralogically, shale is dominated by montmorillonite and kaolinite as clay minerals. Moreover, the rocks are mostly achieved high degree of weathering.

Rocks of the study area can be classed under ‘highly decomposed rock’ in weathering grade. Ramhlun Vengthar average rock strength is 25.0 N/mm$^2$, Zuangtui rock is $<10$ N/mm$^2$, Zohnuai rock is 11 N/mm$^2$ and Laipuitlang rock is 28.0 N/mm$^2$ respectively.

The atterberg limits data shows that Ramhlun Vengthar and Zuangtui are ‘slightly plastic’, Zohnuai is ‘non- plastic’; and Ramhlun Vengthar soil is ‘semi-solid’ state, Zuangtui is ‘liquid’ state and Zohnuai is ‘hard’ state based on Consistency Index.
The triggering mechanisms of these landslides are continuous rainfall, toe erosion, steep slope, weathered bedrocks, clay minerals and human activities.

During the study period, immediate mitigation measures for Zohnuai and Zuangtui are suggested and recommended to the concern officials of the State PWD. Breast wall along the bypass road in Zohnuai and, retaining wall, breast wall and check dam in Zuangtui are constructed at the safe time.

To enhance resisting force and decrease driving force in Zohnuai area, proper drainage system and vegetation covering are suggested. For further strengthening resisting force, soil piling is recommended at the crown.

In Zuangtui area, widening road towards the west by at least 10m is also recommended to reduce the load and prevent water infiltration. Benches complete with ditch drains from rupture surface to above the crown (below settlement) is also suggested. The drains should be connected with proper drainage system (in and around settlement) leading to the nearby nallah.

Constructions of drainage system and check dams are recommended for Ramhlun Vengthar site.

Rock bolt and good drainage system are suggested for Laipuitlang rockslide.

The study confined to specific localities, but it may highlight the vulnerability of landslide in Aizawl city. Slope Stability analysis based on more geotechnical parameters with groundwater condition are suggested for further research.