CHAPTER XI

SUGGESTIONS

The investigation techniques being used in the present study are more or less the standard kinds that have been used in the similar studies elsewhere. But they are, for the very first time, adopted to the study of the landslide problem in the colluvial mass in Thailand. As they are found to bring good result in the present study, they are hereby suggested to be a standard practice in the investigation of area of problematic slopes or of questionable colluvial slopes further on.

11.1 Air photographic Study

Air photographic interpretation is important in the colluvial deposit study as it reveals the topographic and geomorphologic information which subsequently reflect the slope angle, lithologic and hydrologic condition of the underlying soil mass, and the geologic structures. A small-scale air photograph usually gives a rough idea on the geomorphologic condition of a large area while that of a larger scale,in this study 1:15,000 allows detailed features to be clearly seen, and the cause or controlling factors of the slope instability be narrowed down so that a proper and economic way of study to prove these could be conducted.

In the present study, the air photographic study illustrates the natural landslide scarps which underlie the highway embankment. It also shows the areas of groundwater recharge and discharge and the surface water blockade in the problematic zone. These natural

failure planes and unfavorable hydrologic condition play a great role in the slope failure in the colluvial mass and filled embankment here.

As of a suggestion, whenever a highway construction is planned in a hilly area, an air-photographic study of small and medium scales should be performed in the first hand. The small-scale air photograph should reveal the area of colluvial mass. If there is one, the medium scale air photograph with topographic and other maps, the scale should not be smaller than 1:15,000, should be used to find the vulnerable locations to slope failure in this colluvium. It is also suggested that the construction over the landslide-prone localities should be avoid.

11.2 Resistivity Study

The geophysical technique to obtain the subsurface information is a substitute of the standard drilling technique which is quite difficult and uneconomic in the colluvial area where the poorly graded loose mass composing of very fine particle to the large boulders occurs. Of all the geophysical investigation method, the electric resistivity technique is found to be the most proper as the soil resistivity relates directly to the groundwater condition in the mass. This results from the permeability and saturation condition in the soils. The knowledge could be interpreted further for the other physical properties of the material, and the extent of the soil/rock bodies. The geophysical investigation could also cover a large study area using less time and expense than the drilling which should be reduced to only checking method for the correct subsurface

information.

It has also been stated before that as a matter of interpretation, the resistivity method could detect a hidden plane of weakness, being observed as a thin layer of low resistivity which highly contrasting to the adjacent zones. The extent of such weak plane suggests the location and shape of the failure plane on which the sliding mass moves . This is especially true in the present study. As the irregularity of the failure surface was noted, the proper back-analysis on the slope stability could be chosen, in this case the Janbu's method. The result of stability analysis matches the field-observed slope failure features.

Furthermore, the resistivity method could predict the thickness and limit of the soil zones and the top of bedrocks. The proof could be acquired by the drilling method. This plus the benefit of the geophysical method mention above suggests that after the air photographic study the resistivity study should be performed in a similar area prior to the other conventional means of site investigation.