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RECTIFICATION OF ROAD CUT FAILURES OCCURRED BETWEEN CULVERT 5/11 AND 5/13-A: A CASE STUDY FROM DEHIOVITA-DARANIYAGALA- NOORIYA ROAD IN KEGALLE DISTRICT

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Frequent road cut failures especially in newly developed roads cause serious traffic disruptions, and pose a danger to human beings, property and the environment. A road cut failure has occurred between culvert 5/11 and 5/13 along Dehiovita-Deraniyagala road, which is the only access to Deraniyagala and Nooriya in 2016 and 2017 followed by extreme rainfall events. This study was carried out to identify the most appropriate design methodology for a sustainable mitigation of the failed slope. For this, geology and geomorphology of the area were investigated together with resistivity measurements and borehole logs. Laboratory testing was carried out to determine soil type and their strength parameters. The stability of the slope was analyzed using GEOSLOPE and to identify the triggering factor for failures, rainfall data was used separately.

The failed cut slope, which is located in a broad valley, has 300 to 350 at the upper slope above the crown and 100 to 280 at the toe region that is ended up with stream and paddy field. The slope is situated on an escarpment and the major rock type found is massive charnockite. Resistivity studies shows significant variations along the axis of the cut slope indicating very wide variation in soil matrix and water saturation. Borehole logs shows seven different soil layers in the subsurface profile and based on the soil classification, area is consisted of silt with very high plasticity clay fines (MV) and sandy silt (MS). According to stability analysis, the obtained slip surface at saturated condition is coinciding with the possible slip surface identified from the subsurface soil profile. And it also reveals that the existing safety margin for section A (FoS=0.943) is not adequate with the saturated condition and further that for the section B (FoS=1.110) is stable. It is found that lowering of the water table causes to increase the FoS up to 1.454 but in achieving the acceptable design factor of 1.5, retaining structures are to be introduced. According to the analysis it can be approached by introducing reinforced retaining wall at the toe of the road cut causing to increase FoS to1.686. The decided countermeasures also applied for section B, which causes to increase FoS to 1.704. It is recommended to seal the tension cracks with a clay rich impermeable material, minimize the rain water infiltration and surface runoff by introducing a cut-off drain with four cascade drains having 1 m width, and lower the groundwater table by application of five numbers of long horizontal gravity drains. Further, it is proposed to stabilize the toe of the cut with a 2.5 m high and 138 m long reinforced retaining wall. The requirement of further horizontal drains will have to be decided by monitoring the water level fluctuation.

Keywords: Infiltration, Road cut failures, Stability analysis, Surface runoff