3.6 D-Slope Analysis

D-slope analysis is a technique to identify the risk level based on G-rating determination and Instability Potential. Table 11 shows the risk level where all slopes except C2 have potential to fail due to occurrences of wedge, toppling and planar failures. Only slope C1 shows low risk of failure while other slopes (C2, C3, C4 and C5) show no risk due to no failure and less than 0.4 value of G-rating value.

Table 11: Result of risk level of rock slopes in the study area

Slopes	G-Rating	Instability Potential	Type of Failures	Risk Level	Category
C1	0.47	Yes	Wedge Failure	Low Risk	III
C2	0.44	No	None	No Risk	IV
C3	0.38	Yes	Wedge Failure	No Risk	I
C4	0.35	Yes	Toppling Failure	No Risk	I
C5	0.32	Yes	Wedge and Planar Failure	No Risk	I

3.7 Mitigation Suggestions

Based on a study, there are suitable mitigation methods to prevent slope failure to occur (Table 3) (Hussaini, 2002). Each proposed mitigation methods are depending on the risk level achieved by the slopes. Slope C1 is classified as low risk which no immediate action but is suggested to make inspection on the stream system and vegetation on the exposed area to reduce the instability potential. As for other slopes, no suggestion is needed for there is no risk of slope failure to occur (Table 12).

Table 12: Mitigation suggestions proposed based on the risk level

Slopes	Risk Level	Category	Mitigation Suggestions
C1	Low Risk	III	• To inspect the stream system • To plant vegetation on the exposed area of the slope • No immediate action needed
C2	No Risk	IV	No suggestion
C3	No Risk	I	No suggestion
C4	No Risk	I	No suggestion
C5	No Risk	I	No suggestion

4. Conclusion

Modified D-Slope comprise of G-rating determination and Potential Instability using kinematic analysis, with additional of laboratory analysis (porosity and strength analysis) and microfabric observation (micro-petrographic and micro-fractures index) to assess the slope stability. G-rating determination show slope C1 and C2 have value more than 0.4 (0.47 and 0.44 respectively), while other slopes have value less than 0.4 which indicates no risk of failure. Slope C1 and C3 show wedge failures, C4 with toppling failure and C5 show both wedge and planar failures which indicate the potential instability of slopes except for slope C2 with no failure shown. Based on modified D-Slope analysis, slope C1 is classified as Low Risk (III) and other slopes as No Risk (IV and I). Mitigation suggestions are depends on the risk level of the slopes. Slope C1 (Low Risk) is suggested to inspect the stream system and plant vegetation on the exposed area of the slope as no immediate actions needed. Other slopes (C2, C3, C4 and C5) have no suggestion for mitigation as been assessed as No Risk.

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