

ABSTRAK

ANALISIS PENGARUH PENURUNAN MUKA AIR TANAH TERHADAP KESTABILAN LERENG BERDASARKAN KLASIFIKASI MASSA BATUAN DI PIT 4 PT. X, DAERAH SEUNAGAN, KECAMATAN SUKA MAKMUE, NAGAN RAYA, ACEH

Oleh
Rindang Isnaini Khairunnisa'
NIM: 111220011
(Program Studi Sarjana Teknik Geologi)

Kestabilan lereng merupakan aspek krusial dalam operasi tambang terbuka karena berhubungan langsung dengan keselamatan pekerja dan keberlangsungan produksi. Salah satu faktor utama yang memengaruhi kestabilan lereng adalah keberadaan air tanah, di mana tekanan air pori akibat muka air tanah yang tinggi dapat menurunkan tegangan efektif dan kekuatan geser massa batuan sehingga berdampak pada penurunan faktor keamanan lereng. Penelitian ini bertujuan untuk mengetahui kondisi geologi daerah penelitian, menganalisis kestabilan lereng pada berbagai kondisi muka air tanah, serta membuktikan pengaruh penurunan muka air tanah terhadap faktor keamanan lereng di Pit 4 PT X, Daerah Seunagan, Kecamatan Suka Makmue, Nagan Raya, Aceh. Analisis kestabilan lereng dilakukan menggunakan kriteria keruntuhan *Generalized Hoek-Brown* dan metode kesetimbangan batas *Morgenstern-Price* dengan enam variasi ketinggian muka air tanah dari 100% hingga 50%. Hubungan antara muka air tanah dan faktor keamanan diuji secara statistik menggunakan *Analysis of Variance* (ANOVA) dan analisis grafik linearitas. Daerah penelitian tersusun oleh litologi batulempung, batupasir, batulanau, dan batubara dengan struktur geologi berupa kekar tarik. Nilai RMR berkisar antara 43–62 dan GSI berkisar 38–57. Hasil analisis kestabilan lereng menunjukkan bahwa pada kondisi muka air tanah jenuh (100%), nilai faktor keamanan keenam sayatan berkisar antara 1,252–2,646 sedangkan saat muka air tanah diturunkan hingga 50%, nilai faktor keamanan meningkat menjadi 2,404–3,837. Hasil uji ANOVA menunjukkan nilai F hitung (446,07) jauh lebih besar dari F tabel 5% (2,6) sehingga hipotesis nol ditolak dan grafik linearitas menunjukkan hubungan berbanding terbalik. Disimpulkan bahwa penurunan muka air tanah berpengaruh signifikan terhadap peningkatan faktor keamanan lereng.

Kata kunci: faktor keamanan, kestabilan lereng, muka air tanah, massa batuan

ABSTRACT

ANALISIS PENGARUH PENURUNAN MUKA AIR TANAH TERHADAP KESTABILAN LERENG BERDASARKAN KLASIFIKASI MASSA BATUAN DI PIT 4 PT. X, DAERAH SEUNAGAN, KECAMATAN SUKA MAKMUE, NAGAN RAYA, ACEH

By

Rindang Isnaini Khairunnisa'

NIM: 111220011

(Geological Engineering Undergraduated Program)

Slope stability is a crucial aspect in open pit mining operations because it is directly related to worker safety and production continuity. One of the main factors affecting slope stability is the presence of groundwater, where pore water pressure due to high groundwater levels can reduce the effective stress and shear strength of the rock mass, thus impacting the reduction of the slope safety factor. This study aims to determine the geological conditions of the study area, analyze slope stability under various groundwater level conditions and prove the effect of groundwater level decline on the slope safety factor in Pit 4 of PT X, Seunagan Area, Suka Makmue District, Nagan Raya, Aceh. Slope stability analysis was carried out using the Generalized Hoek-Brown failure criteria with the Morgenstern-Price limit equilibrium method, with six variations of groundwater level heights from 100% to 50%. The relationship between groundwater levels and safety factors was tested statistically using Analysis of Variance (ANOVA) and linearity graphic analysis. The study area is composed of claystone, sandstone, siltstone, and coal lithologies with a geological structure in the form of tensile joints. The RMR values ranged from 43–62 and the GSI ranged from 38–57. The results of the slope stability analysis showed that under saturated groundwater conditions (100%), the safety factor values for the six sections ranged from 1.252–2.646, while when the groundwater level was lowered by 50%, the safety factor values increased to 2.404–3.837. The ANOVA test results showed that the calculated F value (446.07) was much greater than the 5% F table (2.6), so the null hypothesis was rejected and the linearity graph showed an inverse relationship. It was concluded that the reduction in groundwater level had a significant effect on increasing the slope safety factor.

Keywords: safety factor, slope stability, groundwater level, rock mass