

**IDENTIFIKASI DAN UPAYA MITIGASI LONGSOR
DI RUAS JALAN RANTAU PANDAN KABUPATEN MUARO BUNGO**

TESIS



**PROGRAM STUDI MAGISTER TEKNIK SIPIL
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TESIS

*Diajukan Sebagai Salah Satu Syarat Penyelesaian Studi di Program Studi Magister
Teknik Sipil, Departemen Teknik Sipil, Fakultas Teknik Universitas Andalas*

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ABSTRAK

Tanah longsor merupakan salah satu permasalahan geoteknik yang dapat mengganggu fungsi infrastruktur dan keselamatan pengguna jalan, terutama pada daerah dengan kondisi lereng curam, tanah berbutir halus, serta intensitas hujan yang tinggi. Ruas jalan Rantau Pandan, Kabupaten Muaro Bungo, merupakan salah satu kawasan yang mengalami kejadian longsor berulang sehingga diperlukan kajian terhadap karakteristik tanah, tingkat kestabilan lereng, dan upaya mitigasi yang sesuai. Penelitian ini bertujuan menganalisis sifat fisis dan mekanis tanah, menentukan tingkat kestabilan lereng berdasarkan nilai faktor keamanan (Safety Factor/SF), serta memberikan rekomendasi teknis mitigasi pada lima lokasi penelitian. Metode penelitian meliputi observasi lapangan, pengambilan sampel tanah terganggu dan tidak terganggu, serta pengujian laboratorium berupa kadar air, berat isi, berat jenis, analisis ukuran butir, batas Atterberg, dan uji geser langsung. Tanah diklasifikasikan menggunakan Unified Soil Classification System (USCS), sedangkan kestabilan lereng dianalisis melalui metode bidang datar terbatas, bidang datar panjang, dan bidang datar panjang dengan aliran air, kemudian dibandingkan dengan hasil analisis perangkat lunak GEO5. Hasil pengujian menunjukkan kadar air sebesar 12,464–47,898%, berat isi 17,481–21,317 kN/m³, berat jenis 2,629–2,715, kohesi 12,75–39,24 kN/m², dan sudut geser dalam 11,310°–19,290°. Tanah penyusun lereng didominasi kelompok ML (Silt with Low Plasticity) dan sebagian CL (Clay with Low Plasticity). Hasil analisis menunjukkan bahwa nilai faktor keamanan cenderung menurun ketika pengaruh aliran air diperhitungkan. Kondisi paling kritis terjadi pada Lokasi 5 dengan nilai SF 1,23 berdasarkan perhitungan manual dan 1,18 berdasarkan GEO5, lebih rendah dari nilai minimum 1,25. Hasil ini menunjukkan bahwa keberadaan air menjadi faktor penting yang memengaruhi kestabilan lereng. Upaya mitigasi yang direkomendasikan berupa pengendalian air melalui sistem drainase, penanaman vegetasi, pemeliharaan lereng, serta pemantauan berkala, dengan Lokasi 5 menjadi prioritas penanganan.

Kata Kunci: Tanah Longsor, Stabilitas Lereng, Faktor Keamanan, GEO5, Mitigasi Longsor.

ABSTRACT

Landslides are geotechnical problems that may disrupt infrastructure performance and threaten road-user safety, particularly in areas characterized by steep slopes, fine-grained soils, and high rainfall. The Rantau Pandan road section in Muaro Bungo Regency has experienced recurring landslides, requiring an assessment of soil characteristics, slope stability, and appropriate mitigation measures. This study aims to analyze the physical and mechanical properties of the soil, determine slope stability based on the Safety Factor (SF), and provide technical mitigation recommendations for five investigated sites. The research methods included field observations, disturbed and undisturbed soil sampling, and laboratory testing consisting of water content, unit weight, specific gravity, grain-size distribution, Atterberg limits, and direct shear tests. The soils were classified using the Unified Soil Classification System (USCS), while slope stability was analyzed using finite planar failure, infinite-slope failure, and infinite-slope failure with water flow approaches, followed by comparison with GEO5 analysis. The results showed water contents ranging from 12.464–47.898%, unit weights from 17.481–21.317 kN/m³, specific gravities from 2.629–2.715, cohesion values from 12.75–39.24 kN/m², and internal friction angles from 11.310°–19.290°. The slope materials were predominantly classified as ML (Silt with Low Plasticity), with several samples classified as CL (Clay with Low Plasticity). The stability analysis demonstrated that the safety factor generally decreased when the influence of water flow was considered. The most critical condition occurred at Site 5, where the safety factor reached 1.23 from manual calculation and 1.18 from GEO5 analysis, both approaching or falling below the minimum requirement of 1.25. These findings indicate that water is a major factor controlling slope stability. Recommended mitigation measures include drainage improvement, vegetation establishment, slope maintenance, and periodic monitoring, with Site 5 requiring priority treatment.

Keywords: *Landslide, Slope Stability, Safety Factor, GEO5, Landslide Mitigation.*