

INTISARI

Studi Kelayakan Bendungan Bodri bertujuan mendukung ketersediaan air pertanian dan pengendalian banjir di Kabupaten Kendal. Salah satu komponen utamanya adalah terowongan pengelak, yang memiliki tantangan khusus berdasarkan karakteristik geologi yang berada pada daerah tersebut. Selain itu, hasil studi kelayakan tersebut belum merencanakan secara detail tentang desain geometri terowongan, metode penggalian, sistem penyangga terowongan, geometri dan analisis kestabilan lereng portal terowongan. Penelitian ini bertujuan mengevaluasi kondisi geologi teknik untuk mendukung perencanaan terowongan, termasuk merekomendasi diameter bukaan terowongan, metode penggalian, sistem penyangga dan analisis stabilitas lereng rencana portal terowongan. Kondisi geologi dianalisis melalui pemetaan geologi permukaan, deskripsi inti bor, pengujian laboratorium, dan penilaian kualitas massa batuan dengan metode RMR dan GSI. Satuan litologi lokasi penelitian yang ditemukan terdiri dari satuan perselingan breksi andesit-batupasir tuffan, satuan breksi andesit dan endapan pasir-kerikil dari Formasi Penyatan dan Kaligetas, yang memiliki pelapukan dan kondisi diskontinuitas beragam. Perancangan diameter bukaan terowongan dilakukan dengan analisis hidrolik menggunakan debit banjir kala ulang 25 tahun (Q25) melalui metode *Level Pool Routing*, menghasilkan diameter efektif yang dipilih untuk rekomendasi desain adalah 5 meter dengan elevasi banjir tertinggi +143,69 m, di bawah elevasi cofferdam +147 m. Analisis kestabilan lereng portal menggunakan *Limit Equilibrium Method* menunjukkan lereng aman terhadap gempa. Metode penggalian yang direkomendasikan dengan tahapan *top heading* dan *bench*, sementara sistem penyangga menggunakan kombinasi *rock bolts* dan *shotcrete*, dengan variasi jarak dan ukuran berdasarkan segmen terowongan. Penelitian ini memberikan acuan teknis untuk perencanaan detail pembangunan Bendungan Bodri.

Kata kunci : Terowongan Pengelak, Bendungan Bodri, Geologi Teknik, *Level Pool Routing*, *Rock Mass Rating*.

ABSTRACT

The Feasibility Study of Bodri Dam aims to support agricultural water availability and flood control in Kendal Regency. One of its main components is the diversion tunnel, which presents specific challenges due to the geological characteristics of the area. Furthermore, the feasibility study has not yet detailed the design geometry of the tunnel, excavation methods, tunnel support systems, and the geometry and stability analysis of the tunnel portal slopes. This research aims to evaluate the engineering geological conditions to support tunnel planning, including recommendations for tunnel opening diameter, excavation methods, support systems, and stability analysis of the planned tunnel portal slopes. The geological conditions were analyzed through surface geological mapping, core sample descriptions, laboratory testing, and rock mass quality assessment using the RMR and GSI methods. The identified lithological units at the study site consist of intercalated andesite breccia-tuffaceous sandstone, andesite breccia units, and gravelly-sand deposits from the Penyatan and Kaligetas Formations, exhibiting varying weathering degrees and discontinuity conditions. The design of the tunnel opening diameter was conducted using hydraulic analysis based on a 25-year return period flood discharge (Q25) through the Level Pool Routing method. The selected effective diameter recommended for the design is 5 meters, with a maximum flood elevation of +143.69 m, below the cofferdam elevation of +147 m. Portal slope stability analysis using the Limit Equilibrium Method indicated that the slopes are stable under seismic conditions. The recommended excavation method involves the top heading and bench stages, while the support system utilizes a combination of rock bolts and shotcrete, with variations in spacing and dimensions based on the tunnel segments. This study provides technical guidelines for the detailed planning of the Bodri Dam construction.

Keywords : Diversion tunnel, Bodri dam, Engineering geology, *Level Pool Routing*, *Rock Mass Rating*.