

PERENCANAAN KOLAM RETENSI SEBAGAI UPAYA PENGENDALIAN BANJIR DI WILAYAH KECAMATAN SANGKAPURA PULAU BAWEAN

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ABSTRAK

Abstrak- Kecamatan Sangkapura di Pulau Bawean merupakan wilayah rawan banjir akibat curah hujan tinggi, perubahan tata guna lahan, dan kondisi topografi yang dilalui tiga sungai utama. Analisis hidrologi menggunakan metode Gumbel berdasarkan data curah hujan maksimum harian selama 10 tahun menghasilkan curah hujan rencana kala ulang 20 tahun sebesar 219,93 mm/hari. Debit banjir rencana dengan metode rasional pada 4 DAS berturut-turut adalah 13,03 m³/s, 19,56 m³/s, 8,70 m³/s, dan 21,69 m³/s, dengan volume total 564.341,41 m³. Kapasitas sungai berdasarkan persamaan Manning meliputi Legung Tete 90,61 m³/s, Legung Tete B 127,4 m³/s, Gunung Mas 61,4 m³/s, Saluran 1,5 m³/s, dan Gudeg 156,14 m³/s, dengan volume total 524.525,12 m³. Kebutuhan efektif kolam retensi sebesar 42.285,05 m³, direncanakan tiga unit berkapasitas 15.000; 15.000; dan 21.450 m³. Gabungan kapasitas sungai dan kolam retensi mencapai 575.975,12 m³. Dimensi pintu air hasil perhitungan orifice adalah 3,40 m; 1,00 m; dan 3,70 m. Faktor keamanan lereng sebesar 4,84 > 1,5 menunjukkan desain layak secara teknis dan efektif mengurangi risiko banjir.

Kata kunci: Curah Hujan, Debit Maksimum, Luas Area, Kolam Retensi, Gumbel

DESIGN OF RETENTION PONDS AS A FLOOD CONTROL MEASURE IN SANGKAPURA SUB-DISTRICT, BAWEAN ISLAND

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ABSTRACT

Sangkapura Sub-district on Bawean Island is highly vulnerable to flooding due to high rainfall intensity, land-use changes, and topographic conditions traversed by three main rivers. Hydrological analysis was conducted using the Gumbel method based on 10 years of maximum daily rainfall data, resulting in a design rainfall of 219.93 mm/day for a 20-year return period. The planned flood discharge calculated using the Rational Method for four watersheds was 13.03 m³/s, 19.56 m³/s, 8.70 m³/s, and 21.69 m³/s, with a total volume of 564,341.41 m³. The river capacity, determined using Manning's equation, was 90.61 m³/s for the Legung Tete River, 127.40 m³/s for Legung Tete B, 61.40 m³/s for Gunung Mas, 1.50 m³/s for the drainage channel, and 156.14 m³/s for the Gudeg River, with a total volume of 524,525.12 m³. Based on the analysis, the effective storage requirement of the retention pond was 42,285.05 m³. The design consists of three retention ponds with capacities of 15,000 m³, 15,000 m³, and 21,450 m³. Combined with river capacity, the total storage reached 575,975.12 m³. The outlet structure designed using the orifice equation produced gate dimensions of 3.40 m, 1.00 m, and 3.70 m. Stability analysis showed a slope safety factor of 4.84 (>1.5), indicating that the retention pond design is technically feasible and effective in mitigating flood risk in Sangkapura Sub-district.

Keywords: rainfall, peak discharge, watershed area, retention pond, Gumbel method.