ABSTRAK

Sakkot Matua Gong Hasibuan. NIM 5193550046: Evaluasi Sistem Drainase Dan Desain *Underdrain Box Storage* Di Jalan Letda Sujono Kota Medan Menggunakan *Software Storm Water Management* Model (Swmm 5.2)

Genangan yang sering terjadi di Jalan Letda Sujono, Kota Medan, menunjukkan bahwa kapasitas sistem drainase eksisting belum mampu mengalirkan debit limpasan secara optimal akibat tingginya intensitas hujan. Penelitian ini bertujuan mengevaluasi kinerja drainase eksisting menggunakan EPA SWMM 5.2, menganalisis efektivitas penerapan *Underdrain Box Storage* (UBS) dalam mengurangi genangan, serta mengevaluasi modifikasi dimensi saluran sebagai alternatif penanganan banjir. Penelitian menggunakan pendekatan deskriptif kuantitatif dengan data primer berupa dimensi dan elevasi saluran hasil survei lapangan serta data sekunder berupa curah hujan harian maksimum periode 2016–2025 dari Stasiun BMKG Wilayah I, Stasiun Klimatologi Sampali, dan Stasiun Meteorologi Maritim Belawan. Analisis hidrologi meliputi metode Polygon Thiessen, analisis frekuensi, uji kesesuaian distribusi, metode Mononobe, *Alternating Block Method* (ABM), dan metode Rasional, sedangkan analisis hidrolika dilakukan menggunakan EPA SWMM 5.2. Hasil penelitian menunjukkan bahwa kondisi eksisting masih mengalami luapan pada 20 *node*. Penerapan UBS mampu menurunkan durasi genangan sebesar 32%, volume genangan 17%, dan *Flooding Loss* 16,53%, meskipun beberapa titik luapan masih memerlukan optimalisasi. Modifikasi dimensi saluran menjadi lebar 1,5 m dan tinggi 1,5–2,0 m berhasil menghilangkan kondisi *overflow*. Model simulasi memenuhi kriteria valid dengan *Surface Runoff Continuity Error* sebesar −0,18% dan *Flow Routing Continuity Error* sebesar 0,16%. *Nilai Flooding Loss* berhasil diturunkan dari 138,466 × 10^6 L menjadi 48,804 × 10^6 L, atau mengalami penurunan sebesar 64,75%. Di sisi lain, *External Outflow* meningkat dari 121,523 × 10^6 L menjadi 212,103 × 10^6 L, atau meningkat sebesar 74,54%. Dengan demikian, UBS efektif dalam mengurangi genangan, sedangkan modifikasi dimensi saluran memberikan kinerja yang lebih optimal dalam meningkatkan kapasitas sistem drainase di Jalan Letda Sujono, Kota Medan.

Kata Kunci: Sistem drainase, EPA SWMM 5.2, *Underdrain Box Storage*, Limpasan, Drainase perkotaan.

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ABSTRACT

Sakkot Matua Gong Hasibuan. NIM 5193550046: ***Evaluation Of Drainage System And Design Of Underdrain Box Storage On Jalan Letda Sujono, Medan City Using Storm Water Management Model Software (Swmm 5.2)***

Frequent flooding on Jalan Letda Sujono, Medan City, indicates that the capacity of the existing drainage system has not been able to drain runoff discharge optimally due to high rainfall intensity. This study aims to evaluate the performance of existing drainage using EPA SWMM 5.2, analyze the effectiveness of the implementation of Underdrain Box Storage (UBS) in reducing flooding, and evaluate channel dimension modification as an alternative flood management. The study uses a quantitative descriptive approach with primary data in the form of channel dimensions and elevations from field surveys and secondary data in the form of maximum daily rainfall for the period 2016–2025 from the BMKG Region I Station, Sampali Climatology Station, and Belawan Maritime Meteorology Station. Hydrological analysis includes the Thiessen Polygon method, frequency analysis, distribution suitability test, Mononobe method, Alternating Block Method (ABM), and Rational method, while hydraulic analysis was carried out using EPA SWMM 5.2. The results of the study indicate that the existing condition still experiences overflow at 20 nodes. The implementation of UBS was able to reduce the duration of inundation by 32%, the volume of inundation by 17%, and the Flooding Loss by 16.53%, although some overflow points still require optimization. Modifying the channel dimensions to a width of 1.5 m and a height of 1.5–2.0 m successfully eliminated all overflow conditions. The simulation model met the valid criteria with a Surface Runoff Continuity Error of −0.18% and a Flow Routing Continuity Error of 0.16%. Thus, UBS is effective in reducing inundation, while the modification of the channel dimensions provides more optimal performance in increasing the capacity of the drainage system on Jalan Letda Sujono, Medan City.

Keywords: *Drainage systems, EPA SWMM 5.2, Underdrain Box Storage, Runoff, Urban drainage.*

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