

Wilayah Manokwari di Provinsi Papua Barat berdasarkan data United States Geological Survey (USGS) tercatat pernah terjadi gempa tahun 1944 berkekuatan 7,6 M_w yang berjarak sekitar 5 km dari Kota Manokwari, Papua Barat, salah satu akibat gempa bumi adalah terjadinya bencana likuefaksi. Bencana ini berpotensi terjadi pada Lokasi penelitian di Rencana Pembangunan Alih Trase Jalan Akses Bandara Rendani yang memiliki muka air tanah yang dangkal dan tanah berupa endapan sedimen lepas. Penelitian bertujuan untuk menilai ancaman bencana likuefaksi dan usulan mitigasinya untuk area rencana alih trase. Penyelidikan likuefaksi dilakukan menggunakan 20 titik data *Standard Penetration Test* (SPT) sehingga kedepannya diharapkan dapat menjadi pertimbangan saat perencanaan desain infrastruktur yang akan dibangun

Penelitian dilakukan dengan menentukan nilai PGA di lokasi penelitian berdasarkan analisis probabilistik, deterministik dan nonlinear (DEEPSOIL V7). Analisis *Factor of Safety* (FS) dilakukan menggunakan *simplified procedure* (Boulanger dan Idriss). Berdasarkan nilai FS tersebut, dilakukan perhitungan *Liquefaction Potential Index* (LPI), *Ground Failure Probability* (PG) dan *Liquefaction Severity Index* (LSI). Analisis *post-liquefaction* juga dilakukan untuk mengetahui nilai perpindahan lateral (LDI) dan penurunan tanah/*settlement*. Pada lokasi rawan terhadap potensi likuefaksi, analisis nilai kenaikan tekanan pori akibat beban gempa dilakukan secara elemen hingga (*Finite Element Method/FEM*) menggunakan Plaxis 2D, kemudian memberikan usulan mitigasi menggunakan *stone column* saja maupun dengan penambahan *wick drain/ Prefabricated Vertical Drain* (PVD) pada lokasi yang berpotensi likuefaksi.

Nilai PGA yang digunakan berasal dari analisis probabilistik menggunakan LINI Bina Marga sebesar 0,686g. Analisis potensi likuefaksi, menunjukkan nilai LPI menunjukkan sangat rendah hingga sangat tinggi dengan PG sangat rendah hingga sangat tinggi. Hasil analisis LSI menunjukkan terdapat potensi kerusakan tidak terlikuefaksi hingga sedang. Tanah berpotensi terlikuefaksi banyak dijumpai pada bagian Utara dan Selatan (darat) dari lokasi penelitian Analisis *post-liquefaction* menunjukkan nilai LDI hingga 535,83 cm dan penurunan tanah hingga 61,30 cm di titik BH-04. Pada titik bor BH-09 yang dianalisis dengan Plaxis 2D menunjukkan kenaikan tekanan pori sebesar 0.751 pada lapisan tanah pertama (0–4 m) dan sebesar 0,830 pada lapisan kedua (4–10 m), sedangkan BH-13 pada kedalaman 10-16 m mengalami kenaikan sebesar 0.948. Berdasarkan kondisi likuefaksi yang terkonfirmasi, maka mitigasi likuefaksi diusulkan. Penurunan nilai *settlement* sebesar 32,59% dari kondisi awal dengan pengimplementasian *stone column* dan sebesar 86,05% ketika dikombinasikan dengan *wick drain/ Prefabricated Vertical Drain* (PVD).

Kata kunci: Likuefaksi, Bandara Rendani, *Settlement*, *Stone Column*, PVD

Based on data from the United States Geological Survey (USGS), Manokwari area in West Papua Province had an earthquake in 1944 with 7,6 Mw magnitude around 5 km from Manokwari City, West Papua. One of the effects of the earthquake was the occurrence of a liquefaction disaster. This disaster potentially to occur at the research location in the Rendani Airport Access Road Development Plan which has a shallow groundwater level and loose sediment deposits. The study aims to assess the threat of liquefaction disasters and mitigation proposals for the planned route area. Liquefaction investigations were carried out using 20 Standard Penetration Test (SPT) data and hoped that it can be considered when planning the design of infrastructure to be built in the future.

The study was conducted by determining the PGA value at the research location based on probabilistic, deterministic and nonlinear analysis (DEEPSOIL V7). Factor of Safety (FS) analysis was conducted using a simplified procedure (Boulanger and Idriss). Based on the FS value, the Liquefaction Potential Index (LPI), Ground Failure Probability (PG) and Liquefaction Severity Index (LSI) were calculated. Post-liquefaction analysis was also conducted to determine the lateral displacement (LDI) and settlement values. In locations prone to liquefaction potential, pore pressure increasement analysis due to earthquake loads was carried out using finite element (Finite Element Method/FEM) with Plaxis 2D, then providing mitigation proposals using stone columns alone or by adding wick drains/Prefabricated Vertical Drains (PVD) at locations with liquefaction potential.

The PGA value from a probabilistic analysis using LINI Bina Marga of 0.686g used in this research. Liquefaction potential analysis shows the LPI value is very low to very high with very low to very high PG. The results of the LSI analysis show that there is potential for non-liquefaction to moderate damage. Potentially liquefied soil is often found in the North and South (land) of the research location. Post-liquefaction analysis shows an LDI value up to 535.83 cm and settlement up to 61.30 cm at BH-04. At the BH-09 analyzed with Plaxis 2D, it shows an increase in pore pressure of 0.751 in the first soil layer (0–4 m) and 0.830 in the second layer (4–10 m), while BH-13 at a depth of 10–16 m experienced an increase of 0.948. Based on the confirmed liquefaction conditions, liquefaction mitigation is proposed. The decrease in settlement value was 32.59% from the initial condition with the implementation of stone columns and 86.05% when combined with wick drain/Prefabricated Vertical Drain (PVD).

Keyword: Liquefaction, Rendani Airport, Settlement, Stone Column, PVD