

INTISARI

Penelitian ini dilakukan di Formasi Pamaluan, Pulaubalang, dan Balikpapan, dari Cekungan Kutai, yaitu kawasan konsesi pertambangan PT.Trubaindo Coal Mining, di Muara Lawa, Kabupaten Kutai Barat, Provinsi Kalimantan Timur. Tujuan penelitian ini, yaitu (1) mengkaji hidrogeologi dan pemodelan airtanah alami; (2) mengkaji, memodelkan, dan memprediksi perubahan pola aliran airtanah dan kuantitas airtanah dampak penambangan aktif dan penutupan tambang terbuka; (3) mengkaji dan memprediksi dampak aktivitas penambangan batubara tambang terbuka terhadap kualitas air (permukaan dan airtanah) dan memodelkan pola penyebaran kontaminan dalam airtanah.

Penelitian ini melakukan kajian kondisi hidrologi, geologi, hidrogeologi, perubahan tata guna lahan, mineralogi-geokimia batuan, dan tipe/kelas genetik air permukaan dan airtanah di kawasan tambang. Kondisi hidrologi diketahui dari analisis DAS dan daerah tangkapan hujan dari dua stasiun penakar hujan. Analisis geologi dan geometri lapisan batuan/akuifer berasal dari data eksplorasi/survei permukaan, 50 pemboran inti bawah permukaan, dan analisis 20 sampel konsentrasi TDS dari sumur bor bekas pemboran. Analisis karakteristik akuifer ditentukan dari uji pemompaan, yaitu empat lokasi *single well*, dua lokasi *multiple-well*, dan empat lokasi dengan metode *slug test*. Analisis mineralogi dari empat sampel batuan untuk petrolografi dan 11 sampel untuk XRD. Analisis geokimia 17 sampel batuan dengan uji statik PAF/NAF. Selain itu, dilakukan analisis kation-anion utama untuk penentuan tipe/kelas sampel air permukaan dan airtanah yang tersebar di tujuh lokasi, yaitu dua air sungai, tiga airtanah, satu air *pit*, dan air kolam pengendapan.

Hasil penelitian menunjukkan, lokasi penelitian berada di daerah struktur Sinklin Lampanan dengan sumbu yang membentang dari timur laut menuju ke barat daya dan *dip* 16–20°. Hidrogeologi daerah penelitian masuk dalam Tipologi Sistem Akuifer Batuan Sedimen Terlipat yang terdiri dari tujuh lapisan akuifer yang berselang-seling antara akuitar dan akuifer, serta lapisan dasar berupa akuiklud dengan kategori akuifer setengah tertekan. Daerah model penelitian dibatasi oleh batas air permukaan (*river boundary*), yaitu Sungai Lawa (batas timur) dan Sungai Perak (batas barat), serta batas pemisah airtanah (*no flow boundary*), yaitu perbukitan homoklin di utara dan selatan. Hasil pemodelan *Visual Modflow* menyimpulkan bahwa pola aliran airtanah mengalir dari utara, selatan, dan timur menuju ke barat. Penambangan tambang terbuka yang memotong akuifer mengakibatkan pembelokan pola aliran airtanah terfokus ke *pit/void*, meningkatkan kuantitas *zone budget* airtanah, dan munculnya air asam tambang (AAT). Sumber kontaminan AAT berasal dari air *pit* dan kolam pengendapan yang ditandai tipe/kelas air alkali-sulfat akibat batuan PAF, yang mengandung mineral pirit, teroksidasi dengan air dan udara. Kontaminan AAT mengalir mengikuti pola aliran airtanah pada penambangan aktif hingga penutupan tambang. Jadi, kajian hidrologi, geometri lapisan batuan/akuifer, batas hidrogeologi, elevasi *head* hidrolika, konduktivitas hidrolika, dan morfologi, sangat mempengaruhi pola aliran airtanah, kuantitas, dan kualitas airtanah pada kondisi alami dan dampak tambang terbuka.

Kata kunci: hidrogeologi, aliran airtanah, *pit* tambang, Muara Lawa

ABSTRACT

This research is conducted in several rock formations, which is particularly enclosed by Pamaluan, Pulaubalang and Balikpapan formation, from Kutai Basin, in the area of the mining concession PT.Trubaindo Coal Mining, Muara Lawa, West Kutai Regency, East Kalimantan Province. The objectives of this study are: (1) to assess the hydrogeology and groundwater modeling in natural conditions; (2) to model the impact of changes in groundwater flow patterns and quantity of groundwater on the open-pit coal mining and mine closure; and (3) to assess the impact of open-pit coal mining activities on water quality and to model the pattern of spread of contaminants in groundwater.

This research study of hydrology, geology, hydrogeology, land use changes, mineralogical-geochemical rock, and the types/classes of various kinds of water samples (mine, surface and groundwater). The hydrology condition is known from the analysis of watershed and catchment area from two rain gauge stations. Analysis of geology and geometry of the bedding rock comes from surface exploration, fifty-hole drilling below the surface and analysis of TDS concentrations derived from seventeen samples of groundwater at former drill wells drilling. Analysis of aquifer characteristics are determined by methods of pumping test, i.e. four locations for a single well, two locations for a multiple-well, and four locations for a slug test. Mineralogical analysis of four rock samples for petrolografi and eleven samples for XRD. Geochemical analysis of seventeen samples of rock with the static test PAF/NAF. In addition, anion and cation analysis to determine the class/type of surface water, mine water, and groundwater in the area scattered research.

The research's result demonstrates that the study sites located in Lampanan syncline structure that extends from the northeast to the southwest and rocks dip from 16 to 20°. The hydrogeological study area included in the Typology Folded Sediment Rock Aquifer System consisting of seven layers of the aquifer that alternating between aquitards and aquifers, and the base layer in the form of aquicludes, which are included in the semi-unconfined aquifer. Regional research model bound by river boundary at the Lawa River (eastern boundary) and the Perak River (western boundary), and the groundwater divided (no flow boundary) in homocline hills in the north and south. Groundwater modeling results that the groundwater flow pattern flowing from east to west. Mining resulting deflection pattern of groundwater flow toward the pit/void, increasing the quantity of groundwater zone budget, and the emergence of acid mine drainage (AMD). AMD sources of contaminants come from the pit water and settling ponds water characterized the class/type of alkali-sulfate water, which caused PAF rocks containing mineral pyrite oxidized water and air. AMD flow pattern in accordance with the flow of groundwater in mining to mine closure. Thus, the study of hydrology, geometry layers of the rock/aquifer, head elevation, hydrogeological boundaries, elevation head hydraulics, hydraulic conductivity, and morphology, greatly affect the pattern of groundwater flow, quantity and quality of groundwater in the natural condition and an open pit coal mining impact.

Keywords: hydrogeology, groundwater flow, open pit mining, Muara Lawa