

Electrical Resistivity Imaging (ERI) of faulting and subsidence at an abandoned coal mine in the Walloon Coal Measures, Queensland, Australia

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As urban and suburban areas expand into previously unoccupied sites, the problem of accurately determining the locations of abandoned mine workings and the possible effects of fault reactivation on surface subsidence becomes more important. Here, we present the results of DC electrical resistivity imaging (ERI) surveys above an abandoned coal mine in the Jurassic Walloon Coal Measures of the Clarence-Moreton Basin, Queensland. Objectives were to: (1) locate the surface entrance to a coal mine access shaft, (2) determine the extent of the mine workings, (3) determine if the workings are open, partly- or fully-collapsed, (4) locate the possible existence of a high angle fault delineating the western extent of the workings. Coal seams were mined underground by the bord-and-pillar technique at the site until the first half of the 20th century to within ~20 m of the ground surface. This has led to ground settlement post-abandonment, with an additional hazard of this stress-redistribution being the possible reactivation of steeply-dipping faults known to pervade the coal measures. After an initial site reconnaissance, desktop study and modelling, it was determined that existing mine plans, maps and records were poorly kept and inaccurate, making a satisfactory geotechnical risk assessment prior to land development and construction difficult. The 2D ERI transects, coupled with boreholes, identified lateral zones of moderate-high resistivity that are interpreted to be partly-collapsed workings. The second key feature identified was a reverse fault that delineated the western edge of the mine workings. The key outcome is that for abandoned mine risk assessment to be optimised, careful integration of geophysical data and direct testing needs to be made.