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GENERATING HYDROGEOLOGICAL MODELLING INPUT DATA FROM LABORATORY AND FIELD TESTS FOR FLY ASH MONOLITH DEPOSITION IN COAL MINE BACKFILLING, MPUMALANGA, SOUTH AFRICA.

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Generating hydrogeological modelling input data from laboratory and field tests for Fly Ash monolith deposition in coal mine backfilling, Mpumalanga, South Africa.

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Abstract: Large volumes of fly ash are generated by the coal-fired power stations and are currently disposed onto waste dumps, with limited space. Therefore, a need for an alternative ash disposal method arises. Limited studies has been conducted to understand the hydraulic behaviour of fly ash under different backfilling conditions over time. Of specific importance is the uncertainty of that hydraulic behaviour. Consequently, this study focuses on generating input data to model different fly ash backfilling scenarios to determine its influence on the receiving environment. Fly ash from two power stations (Ash1 and Ash2) in Mpumalanga were assessed. In the laboratory, Darcy up-flow column tests were conducted with acid mine drainage on ash pre-cured to 40, 50 and 60% moisture content. Field tests were conducted through the application of auger hole infiltration tests on different ages of fly ash on existing ash disposal dumps to determine hydraulic conductivity changes with time. The laboratory and the field results are used as input for the numerical model scenarios. The test results showed: 1) Laboratory hydraulic conductivity values for early time (1st week) ranges between 0.1 – 0.5 m/d and decreases over a 20 week period to 0.001 – 0.007 m/d.; 2) Ash1 shows a consistent relationship between curing moisture content and hydraulic conductivity. 3) Ash2 however, showed a more inconsistent relationship that may be due to the heterogeneous particle size distribution causing preferential pathways; 4) Field tests results showed reducing hydraulic conductivity values ranging between 0.2 – 0.9 m/d for freshly dumped fly ash and 0.01 – 0.5 m/d for 20 years old fly ash; and 5) fly ash initially neutralizes AMD (pH-2.5) to pH-11. Some acidification from pH-11 to pH-4 is observed throughout the testing. The hydraulic behaviour of fly ash are driven by geochemical processes along the flow path.

***Keywords**:* Acid Mine Drainage; Hydraulic Conductivity; Darcy Column Tests; Infiltration Tests
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