Identifying Mineralisation Within the Sunrise Dam Gold Mine Using Geomechanical Targeting Technology

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Drill targeting within mine sequences can be difficult, particularly when mineralisation is located in narrow structural corridors, shear-zones, fracture systems and/or veins. Structural analysis and interpretations can be very useful in aiding the understanding of the geology, building a three-dimensional model and its deformational history. However, even with this knowledge targeting is always difficult. Understanding how deformation events have affected the rock units and consequent structure development, is key to highlighting structural targets for investigation.

Here, we use the currently accepted geological model for the Sunrise Dam Gold Mine (SDGM) in Western Australia, to develop a three-dimensional mesh representing the main architecture of the deposit. A 3D hexahedral model was developed and subjected to boundary conditions to simulate the main D4 deformation event (NE compression), most likely to have been responsible for the high grade steeply orientated mineralisation domains. Initial models were run for sensitivity analysis, and the known positions of ore lodes were used as validation for several input parameters. The parameter validation strongly suggested that mineralisation was a) closely related to areas of increased shear strain in the adjacent shear zones, and b) failure state (both shear and tensile) within the volcaniclastic packages and more competent intrusives, which often displayed volumes of increased pore fluid pressure.

The geomechanical modelling of the system has highlighted several key target areas that localise shear strain, increased pore fluid pressures and tensile failure. Shear strain localisation in and around the more competent intrusive rocks appear to be important, even from early stages of the modelling. The structural architecture accommodates most of the movement within the system, however, this has accommodated partitioning of strain into lithological units such as the volcaniclastic units and intrusive bodies, where there is a good correlation with areas of tensile failure, high pore pressures and known ore bodies.