The Buck Reef West (BRW) Au deposit (~0.4 Moz production) is in the >5 Moz Ravenswood gold field in north Queensland, Australia. The deposit is within the Ravenswood Batholith, predominately comprised of Early-to-Middle Ordovician granitoids (Macrossan Igneous Association), Silurian to Devonian granitoids (Pama Igneous Association), and minor Carboniferous to Permian intrusive and volcanic rocks (Kennedy Igneous Association). The majority of Au mineralisation in north Queensland is related to the Kennedy intrusions.

The BRW deposit is hosted in Devonian tonalite. The ENE-trending Buck Reef Fault (BRF) is the dominant feature in the deposit. It is a sub-vertical fault zone >2 km long. The structure has a complex history, with both dextral and sinistral movements.

The mineralization at BRW has two styles. Approximately 20% of the Au occurs in the BRF, whereas the remaining 80% occurs in veins cutting across the fault. The breccia ores occupy ~400 m of strike length of the BRF, where the fault is up to 20 m wide, and ~300 m down dip from current surface. The breccia is mostly matrix supported, with sub-angular to sub-rounded clasts of tonalite, with minor clasts of quartz. The clast size varies significantly, from ~0.1 to ~200 cm. The size generally becomes larger away from the mineralized zone. The cement is mainly composed of chlorite, pyrrhotite, lesser very fine-grained quartz, carbonate, pyrite, marcasite, sphalerite, and minor chalcopyrite and arsenopyrite. Away from mineralized zone, the cement is mostly carbonate with only minor sulfides. The clasts and tonalite immediately adjacent to the BRF typically have strong chlorite alteration, with minor epidote, sericite, and sulfides (pyrrhotite, pyrite). Gold grades broadly correlate with sulfide abundance, up to ~20 g/t.

The veins cut across the BRF over a ~400m strike length, where the breccia-style ores occur. The veins have variable density, but in general are grouped into three broadly N-S lodes. The lodes are up to 1000m long, dip moderately to the east and cut the BRF at roughly 100m intervals. The lodes are centred on major fault veins up to 1m wide with minor veins on their sides. Veins with other orientations form a broad stockwork in the vicinity of the lodes. The veins are narrower where they cut the breccia ores and wider immediately outside of the breccia zone/fault. The veins are composed of mainly quartz, pyrite-marcasite, pyrrhotite, +/- carbonate, sphalerite, chalcopyrite, arsenopyrite, and minor galena, and Bi-sulfosalts. The Au grade in the main lodes is typically >30g/t Au, and is generally correlated with the abundance of sphalerite-arsenopyrite-Bi-sulfosalts. The veins have narrow halo of strong sericite and chlorite alteration, typically < 5m, beyond which the alteration is much weaker. There are also minor narrow (1-4mm) barren quartz-epidote veins with a red hematite dusted albite and chlorite halos, which are earlier than the mineralized veins. These veins are found throughout the area, but are generally absent immediately around the BRF. Barren, late calcite veins cross cut all earlier phases.
The unusually abundant pyrrhotite indicates reduced conditions. Analytical work is being undertaken to infer the genesis.