

REGIONAL GEOLOGY AND MINERALISATION, KINDEE DISTRICT, NEW ENGLAND FOLD BELT, NEW SOUTH WALES, AUSTRALIA**Pablo Lara**Department of Environmental Sciences, University of Technology, Sydney,
PO Box 123, Broadway NSW 2007

Email: sporting79@hotmail.com; Supervisor: Prof. Evan C. Leitch; thesis submitted in fulfilment of the requirements for degree of MSc (Master of Sciences) in July 2001

The geology of the Kindee district, Mid-North Coast region, New South Wales, is dominated by a conformable sequence of Upper Devonian – Carboniferous rocks. The oldest unit, the Bitter Ground Volcanics, comprises mostly submarine lavas. The overlying succession is, in stratigraphic order, the siltstone dominated laterally equivalent Birdwood and Cowangara formations, the thicker bedded Rollans Road Formation, the Kindee Conglomerate, the Nevann Siltstone, thickly stratified sandstones of the Pappinbarra Formation, the Hyndmans Creek Formation and the paralic Mingaletta Formation. All but the last unit show sedimentary structures typical of mass flows and probably accumulated in relatively deep water. In the Triassic the Hillview Granodiorite and associated dykes were emplaced within the central part of the Kindee district and the Werrikimbe Volcanics, filled a caldera in the north.

The stratified sequence has been folded into NNW trending near horizontal folds associated with west-dipping thrusts and slaty cleavage during an earlier episode of deformation. Subsequently NNW-NW striking sinistral transcurrent faults transected the Kindee district, accompanied by the development of steeply plunging folds and large anticlockwise rotation of some fault-bounded blocks.

Both the Hillview Granodiorite and the Werrikimbe Volcanics are calcalkaline. The Hillview Granodiorite is notable for its relatively high Al_2O_3 and Na_2O and low K_2O and is compositionally distinct from the Werrikimbe Volcanics the dacites of which contain less SiO_2 and higher CaO , MgO and K_2O . Silicic dykes mostly have compositions similar to the Werrikimbe Volcanics. Rb (Y + Nb) trace element diagrams of the Hillview Granodiorite are in accord with the interpretation that the intrusion was emplaced in a region with a substantial continental crust and is a component of a magmatic arc.

The stratified rocks were affected by burial metamorphism that led to the development of mineral assemblages typical of the prehnite-pumpellyite facies. Subsequently rocks in the central part of the district underwent static thermal metamorphism over an area much larger than can be accounted for by outcropping granitic rocks.

Minor epithermal mineralisation occurs within the Kindee district, principally in the 'Northern anomaly' and marked by the presence of pyrrhotite, pyrite, chalcopyrite, molybdenite, marcasite, arsenopyrite, ilmenite, and rutile. Mineralisation occurs mainly in veins and small stockworks and is associated with alteration of the adjacent country rocks. Mirolitic quartz-molybdenite veins are present in the Hillview Granodiorite. Fluid inclusion studies indicate low temperatures and two aqueous system, $H_2O - NaCl$ for the veins in the hornfels, and $H_2O - NaCl - CaCl_2$ for the Hillview Granodiorite. The mineralisation is similar to that which forms during the latter stages in a porphyry environment.

The rocks of the Kindee district are closely comparable with those of the Tamworth Belt of the western New England Fold Belt and support the interpretation of the Hastings Block as a displaced fragment of the latter. Devonian and Carboniferous rocks accumulated adjacent to an active magmatic arc, assumed to be the continuation of that then found close to the western margin of the Tamworth Belt and associated with west directed subduction. Activity on this arc ceased in the latest Carboniferous but underthrusting further east in the Late Permian - Triassic is manifest by the Hillview Granodiorite and the Werrikimbe Volcanics.