INTRODUCTION

Background

The study area is located about 280 kilometres northwest of Sydney between the towns of Mudgee and Gulgong in central New South Wales (Fig. 1). The area comprises a series of north-south striking hills and gently undulating low hill lands that are used for a variety of agricultural pursuits including sheep and cattle grazing and grape growing. The latter activities are restricted to the poorer quality soils developed on sedimentary sequences with gentle slopes.

The area lies within the Dubbo 1:250,000 geological sheet which is currently being re-mapped by the New South Wales Geological Survey as part of the National Geoscience Mapping Accord. The work undertaken in the study forms part of this regional mapping program and the results will be incorporated into the new Dubbo 1:250,000 geological map.

The Mudgee-Gulgong district was an important gold mining centre in the late1800’s and Gulgong in particular was one of the richest deep lead gold areas in New South Wales. Official recorded production for the Gulgong area between 1870 and 1927 (Jones, 1940) was 555,205 ounces. However true production figures from the field are thought to be closer to 1 million ounces. Several reef mines were worked in the area, notably the Red Hill, Gulgong and Mariner mines, however the majority of the gold production (96%) was derived from the deep leads.

The Early Tertiary Gulgong deep leads are located principally to the south and southeast of the township of Gulgong and are, in part, capped by Tertiary basalts. The Gulgong Granite, located about 16 kilometres to the southeast of Gulgong, was historically thought to be the hard rock source for the Gulgong deep lead gold.
Fig. 1. Location of study area.
Ground magnetic surveys over the deep leads conducted by Rayner (1940) showed that the deep leads drained north in a radial nature from the area to the south of Gulgong and not from the granite as previously thought. This area was later mapped by Offenberg et al., (1971) who showed it as an Early Devonian intermediate volcanic unit that was named the Burranah Formation.

Since the original mapping and compilation of the Dubbo 1:250,000 geological sheet by Offenberg et al. (1971), and a minor update by Matson (1973) for the metallogenic sheet, there has been little thesis work in this area and only minor exploration activity.

The Lachlan Fold Belt is currently the focus of a major exploration effort by mining companies searching for magmatically related copper and gold deposits. The main geological environment for this effort is large subvolcanic intrusive complexes associated with mantle-derived Ordovician shoshonitic volcanic rocks.

During the early stages of mapping, the Burranah Formation was found to be Late Ordovician in age. This was initially based on an interpretation of a bright red (high potassium) response on the radiometric image. The response also suggested the formation may be shoshonitic in character. Interest was heightened when a detailed inspection of limestone clasts from a debris flow unit within the Burranah Formation provided rare examples of several typically Late Ordovician corals. The debris flows in these instances are contemporaneous with the development of the volcanic pile. The significance of this finding clearly upgraded the prospectivity of the Burranah Formation and highlighted the need to further understand and characterise this unit and the nature of any mineralization.
Research Aims, Objectives and Methodology

Aims

The aim of this research project is to produce a new regional-scale geological and structural framework for the Mudgee-Gulgong district and a preliminary depositional model for the primary gold mineralization.

The study focuses on the Late Ordovician Burranah Formation. This unit is regarded as the most poorly understood, yet the most prospective and is therefore the subject of detailed mapping, geochemistry and mineralization studies.

Objectives

1. Produce a revised stratigraphy and detailed regional geological map of the Mudgee-Gulgong district.

2. Focus on the Burranah Formation and characterise its geological setting, its geochemical character and possible tectonic setting.

3. Review the structural history of the area with particular reference to the Burranah Formation.

4. Establish the nature and controls of the primary gold mineralization. Propose a preliminary genetic classification for each of these deposits and a depositional model for the district.
Methodology

Mapping of the area was carried out using 1:25 000 scale colour aerial photographs. The photographs were interpreted for areas of possible outcrop (elevated areas of residuum, colluvium or outcrop) which were followed up with detailed ground checking, particularly within the Burranah Formation and in areas of mineralization. Actual outcrop throughout the area is poor and averages about 20 to 30 per cent of the total area.

Mapping in the area was greatly assisted by enhanced computer images of airborne radiometric and magnetic data. Landsat TM data was evaluated but was found to be of little value due to the extent of cultivation and pasture improvement. Because of the poor outcrop, the structural framework for the area is based largely on an interpretation of the magnetic data with support from field observations.

Two series of maps were produced: a 1:50,000 scale fact map (Fig. 3, map pocket) and a 1:50,000 scale interpretation map (Fig. 4, map pocket). The interpretative map represents a synthesis of the geological data together with the results from the interpretation of radiometric and magnetic data sets. The interpretation map represents the first thorough synthesis of new geological and geophysical data for this comparatively poorly known area and represents a significant component of this research project. The new interpretation for this part of the Lachlan Fold Belt differs markedly from the existing published map (Matson, 1973).