Laterite geochemical database for the western Yilgarn Craton, Western Australia

by

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Abstract

This Record is the final release of a 53-element dataset for approximately 3150 laterite samples (59-element dataset for selected samples) from the western Yilgarn Craton. Samples were taken at a nominal 9-km spacing on an approximately triangular grid, with each sample comprising about 1 kg of ferruginous nodules and pisoliths from lateritic residuum, lag formed from lateritic residuum, or of ferruginous gravel contained in locally derived colluvium. Some authigenic pisoliths and nodules formed in depositional regimes might have been included inadvertently.

The laterite geochemical database is designed to provide a regional geochemical framework at a sample spacing sufficiently close to recognize regional geochemical trends and major lithological differences. The wide-spaced sampling may also provide an indication of broad geochemical dispersion patterns from mineralized systems. However, the 9-km spacing was not designed to detect individual geochemical halos, for which 1-km or 500-m spacing is more appropriate. The sample spacing is wide enough to cover a substantial part of the Yilgarn Craton and still provide useful data for exploration and environmental purposes.

There are several significant results of the sampling completed in the southwest and northwest quadrants of the Yilgarn Craton. These include: a) increased Au abundances in the northeast part of the sampling area that cluster around known gold deposits; their extent might mean more widespread mineralization in these areas; b) the chalcophile element index (CHI6*) illustrates potential for Au and base metal mineralization in the westernmost part of the Yilgarn Craton; the pegmatophile PEG4* index shows a regional northwest trend north of the Saddleback greenstone belt; c) chromium abundances in nominally granitic terrain might indicate mafic–ultramafic remnants outside the known greenstone belts; d) a regional Hg anomaly (as yet unexplained) trends northwest over more than 500 km.

This final report, together with the release of the digital analytical data as a database, provides information about the sampling strategy, preparation methods, analysis, and some new element-distribution patterns with significance to exploration.

KEYWORDS: Archean, Yilgarn Craton, Western Australia, laterites, geochemistry.

Introduction

Background

The main objective of the laterite geochemical database is to stimulate mineral exploration in the Yilgarn Craton. Data for the western Yilgarn Craton (the 'survey area') are intended to demonstrate the feasibility and value of low-density geochemical maps of the whole Yilgarn Craton and adjacent terrains, using a consistent sample medium.

This Record accompanies the final release of 'laterite'* geochemical data from the western Yilgarn Craton. Data for the southwest Yilgarn Craton was released in February 2006 as an interim report (Cornelius et al., 2006). There was strong interest by industry in the first release and within four weeks of this release, approximately 25 exploration licences covering some 20 000 km^2 were applied for, representing an approximate three-fold increase in pegging compared to the month preceding the data release.

Statistical examination of laterite geochemistry data from the CSIRO–AGE database (Smith et al., 1992; Geological Survey of Western Australia, 1998), covering the southwest Yilgarn Craton, demonstrated that low-density sampling (9 × 9-km spacing or one sample per 70 km^2) can outline regional geochemical trends (Cornelius et al., 2001) that are of value to the mineral exploration industry. This has important implications for mineral exploration as most of the western Yilgarn Craton can be sampled at this spacing because there are small remnants of lateritic residuum, even in largely eroded terrains. In colluvial–depositional terrains, ferruginous

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* The term 'laterite', as used in this Record, refers to lateritic residuum (ferruginous duricrust, nodules, and pisoliths), lag formed from lateritic residuum, and nodules and pisoliths that have become part of colluvium in the context of laterite geochemistry. Some of the materials classified here as lateritic residuum might have experienced local transport of about 100–200 m, or might have formed in sediment.