

REGOLITH BENCHMARK ATLAS, GAWLER CRATON, SOUTH AUSTRALIA

VOLUME I AND VOLUME II

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ABSTRACT

Transported regolith and deeply weathered basement, together conceal large tracts of prospective crystalline basement (cratonic and geosyncline rocks) in South Australia, and that cover forms a major exploration impediment for much of the Gawler Craton. Interpreting and understanding that cover sequence (the regolith) has proven to be problematic for many explorers over the last several decades. To help overcome this impediment South Australian regolith research over the last eleven years has involved PIRSA Geological Survey in tandem with the Cooperative Research Centre for Landscape Environment and Mineral Exploration (CRC LEME) agencies (CSIRO Exploration & Mining Division and Geoscience Australia) and included several exploration companies with a number of Honours student projects. Since October 1996 there have been many collaborative regolith studies carried out over the Gawler Craton, western Stuart Shelf, Adelaide Geosyncline and the Curnamona Craton. Combined, those investigations now offer the possibility for a more regional understanding and presentation of regolith cover for significant portions of the afore mentioned prospective terranes. This Atlas focuses on the Gawler Craton.

In geology a Type Section is really just another name for a Geological Benchmark. However, regolith profiles commonly involve weathering zones that variably transgress geological boundaries. Therefore the term "type section" has been avoided for this new Atlas in preference for regolith benchmark. A methodology for the Atlas is drawn from examples used in pedology and geomechanics where data are presented from drillholes and/or excavations to form key reference columns or benchmark profiles. Each benchmark provides a well located representative reference column that has been fully described and examined by a number of regolith methods (*i.e.* materials logging, petrology, assay, PIMA, XRD, *etc.*). A key feature of all benchmarks described herein is that all drilled samples and other specimens are readily available for visual or microscopic inspection, or perhaps further analysis where warranted, through PIRSA's Glenside Drillcore Storage Facility.

Three types of regolith exposure can form a Benchmark, those include: Type 1 – natural outcrop; Type 2 – drilled samples; and Type 3 – human made excavations (road and rail cuttings, tunnels, borrow pits, pipeline or cable trenches, quarries, costeans and mines, *etc.*). Profile complexity and/or depth limitations, can be partially overcome within a specific locality by compiling a composite profile by utilising two of the three of the locally available Types (*i.e.* 1 + 2, or 1 + 3, or 2 + 3).

Representative benchmarks are sited within well studied locations, and those studies have been summarised for the Atlas. Each selected profile has a tabulated summary of data, source papers-reports, and profile photo(s) + log(s) + assay plots, and the following if available: petrology, PIMA, XRD mineralogy, and dating. Accounts of the weathered *in situ* (residual) regolith and transported regolith, as well as, the geochemistry and suitable sample media, are provided for each benchmark. Most locations have at least two representative benchmarks but a few have three or four.

Benchmarks can augment new in-field studies within a relevant location or tenement area; or can assist with more thorough evaluation of proposed investigations from an office—laboratory context. They also provide a training opportunity for geological staff unfamiliar with regolith, its terminology and/or its appropriate sampling for assay. Such training may involve accessing samples at PIRSA's Glenside Drillcore Storage Facility; or in-the-field, using the nearest benchmarks for comparison with natural outcrop, excavated exposures and/or drilled samples on/from the area or tenement under scrutiny.

Benchmarks in this Atlas are presented within a cratonic domain or a defined region for ready comparisons. For example: **Volume 1** covers Benchmarks 1-20 within the Harris Domain, the Central Gawler Gold Province (includes Earea Dam Goldfield) and Yorke Peninsula (includes the Poona and Wheal Hughes Cu-Au Mines). **Volume 2** covers Benchmarks 21-33 from the Christie Domain (including the Challenger Gold Mine).