

**GEOCHEMICAL ORIENTATION SURVEYS
AND REGOLITH GEOLOGY IN THE S.W.
ARUNTA PROVINCE, NORTHERN TERRITORY
(ARGOS PROJECT)**

Volume 1

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Before commencing a geochemical survey over a large area of the SW Aruntas, The Northern Territory Geological survey contracted CRC LEME to establish optimum procedures for this survey. This report presents the outcomes of this Project, which commenced in September 1999, was completed in February 2000 and was led by Dr I.D.M. Robertson.

The agreement between the parties allowed public release of these reports when the Northern Territory Geological Survey released the regional survey data. This was accomplished in October 2001 with release of Dunster J.N. and Mügge, A.E. Stream sediment survey of Western MacDonnell Ranges – statistical and GIS-based interpretation. Northern Territory Geological Survey, Digital Information on CD Package DIP 2001-002. It is intended that publication of the report will be an additional factor in transferring technology to aid the Australian mineral industry.

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PREFACE AND EXECUTIVE SUMMARY

The Northern Territory Geological Survey is planning a geochemical survey over a large area of the SW Arunta Province for calendar year 2000, to be carried out by a contractor. To make this effective and relevant to the exploration industry it was considered necessary to complete an orientation study that would establish the parameters of the survey and would take the regolith into account. Three main approaches were used with the following results: -

- Interpretation of regional maps and satellite images was used to delineate the major regolith provinces that required distinct exploration sampling strategies.

Maps at 1:750 000 scale and associated spectral images, covering the SW Arunta Province and surrounding terrains (an area about 460 km x 160 km), were produced. These showed two main terrains, 'erosional' and 'depositional'. The erosional terrain could be subdivided into metamorphic and igneous bedrock areas and areas with bedrocks of sediments of the Amadeus and Ngalia basins. The depositional terrains include areas of Tertiary and Quaternary cover. The depositional terrain appears to have filled a previously deeply eroded basement and some parts are likely to be quite thick, forming a severe impediment to exploration. There are also some thin, 'perched' depositional terrains as remnants on higher parts of the erosional terrain. Relict terrains are comparatively scarce and do not occur on the Arunta Province metamorphic rocks in the mapped area.

- Small areas around known mineralisation were investigated with stream sediment geochemical surveys. This was to establish the elements that best indicated the mineralisation, the best sampling and analytical procedures, how distant downstream the mineralization can be unequivocally recognized, and to provide guidelines for optimal sample spacings and for the regional geochemical survey as a whole.

Two orientation areas were chosen in collaboration with the Northern Territory Geological Survey; the Winnecke Goldfield and the Oonagalabi base metal prospect. Both areas lay outside the main survey area as i) there is little known significant mineralisation within it, and ii) much of the area is on aboriginal ground and access had not been negotiated at the time.

At Winnecke, stream sediment anomalies have been muted by dilution by detritus from the Heavitree Quartzite. Only in one creek, Coronation Creek, where the detritus is locally derived, was the response significant. Gold, Bi, Sb and W show the mineralisation; principally Au in the fine fractions (<180 μm). At Oonagalabi there is a distinct Au, Bi, Cd, Cu, Pb, Sn, W, Zn signature in all fractions; principally Cu, Pb, Zn Au and Bi. Geochemical anomalies are restricted to the first- and second-order creeks and do not persist into the third-order creeks. Recommendations were drawn up for the main survey.

- Detailed maps were prepared of the surroundings of the orientation surveys so they could be viewed in their regolith-landform settings.

Planation and incision are important at Winnecke. Coarse fluvial deposits on the quartzite ranges suggest an ancient landscape to the south at a similar level. Incision shifted much material south, through gaps in the quartzite ranges, leaving a highly dissected terrain of low relief. Dilution by quartz-rich detritus presents a problem for stream sediment geochemistry. At Oonagalabi, dissection has left low hills and erosion plains, surrounded by high ranges and mountains. Here, minerals in stream sediments are directly related to the lithologies. At Mt Heughlin, fluvial action in a large palaeodrainage once dominated the southern part of the area, leaving terrace deposits and remnants of

massive valley-type silcrete and ferricrete. The fine facies were silicified but coarse materials remained unconsolidated.

To the north, weathered detritus from the gneissic hills fills creeks that drain to the alluvial plains. Minerals in stream sediments here can be directly related to their source rocks; outside these hilly areas, they are diluted by fluvial detritus from the Amadeus Basin.

Transfer of the techniques of stream sediment sampling and of detailed regolith mapping to staff of the Northern Territory Geological Survey was achieved by working with them in the field. Finally, results were compiled into this report, with maps and digital information.

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