

Mineral resource potential mapping — a new mapping product to assist land use planning



R Stuart Robertson (Geological Survey of South Australia, PIRSA)

Introduction

The Geological Survey of South Australia has developed a mineral resource potential mapping (MRPM) system to assist land use planning in relation to significant mineral resource and mine operation areas. The mapping is particularly relevant to planning of residential and other developments that are incompatible with mining operations without appropriate separation distances, but will also assist with a wide range of other land use planning matters. Construction materials are a particular focus but industrial, metallic, energy and gem minerals are also considered.

The system categorises areas according to their interpreted mineral resource potential and suggested planning response. The mapping has already been used in consideration of mineral resources for the preparation of *The 30-Year Plan for Greater Adelaide* and in other planning matters. Mineral resource potential maps at 1:50 000 scale are now available as PDFs for most of the Greater Adelaide region (Figs 1, 2).

Adelaide region resources and development planning

The Adelaide region has excellent geological resources of construction materials (Pain 2001; Pain and Johnson 2002; Harvey 2010). Neoproterozoic (Adelaidean) and Cambrian metasediments uplifted in the Cenozoic to form the present Mount Lofty Ranges are the source of hard rock resources for road construction and concrete aggregate for metropolitan Adelaide (e.g. Linwood Quarry shown in Fig. 3). Fault-bounded Tertiary basins provide construction and filling sand and brick-making clay. Industrial minerals, such as Cambrian marble used in soda-ash production, sand for glass manufacture and weathered shale for cement production are important for local manufacturing industries. Copper, lead, zinc and gold mining in the Adelaide region were historically important and metallic mineral exploration and development is undergoing a revival. The Angus Mine, near Strathalbyn, is now producing Pb, Zn and Ag and development of the Kanmantoo Cu–Au deposit is planned.

Urban development has already ‘sterilised’ some significant mineral resources close to the city and put pressure on some operating quarries. Problems faced by quarries relate both to the encroachment of residential development and visibility on the fault scarps (Hills Face zones) that provide a backdrop for much of Adelaide. Partly in response to these pressures some construction material operations have been established further from the city. An example is the mining of a significant proportion of Adelaide’s coarse construction sand from a Tertiary



Figure 1 Index map of 1:50 000 mineral resource potential maps available December 2010.

palaeochannel on northern Yorke Peninsula, about 130 km by road from the city centre. Greater transport distances impose a considerable cost and environmental penalty on construction materials. Even these more distant sources are under threat from conflicting land uses, including growth of regional centres and change of land use from rural to hobby farm/residential. Paradoxically, urban growth relies on the availability of construction materials at reasonable cost.

Mapping

MRPM translates a range of geological and resource information into GIS polygons with a straightforward three-level categorisation of resource potential and suggested planning response as summarised below:

- *Category 1 – High mineral potential and/or current operation.* Full planning protection required from incompatible development. Key or significant mineral

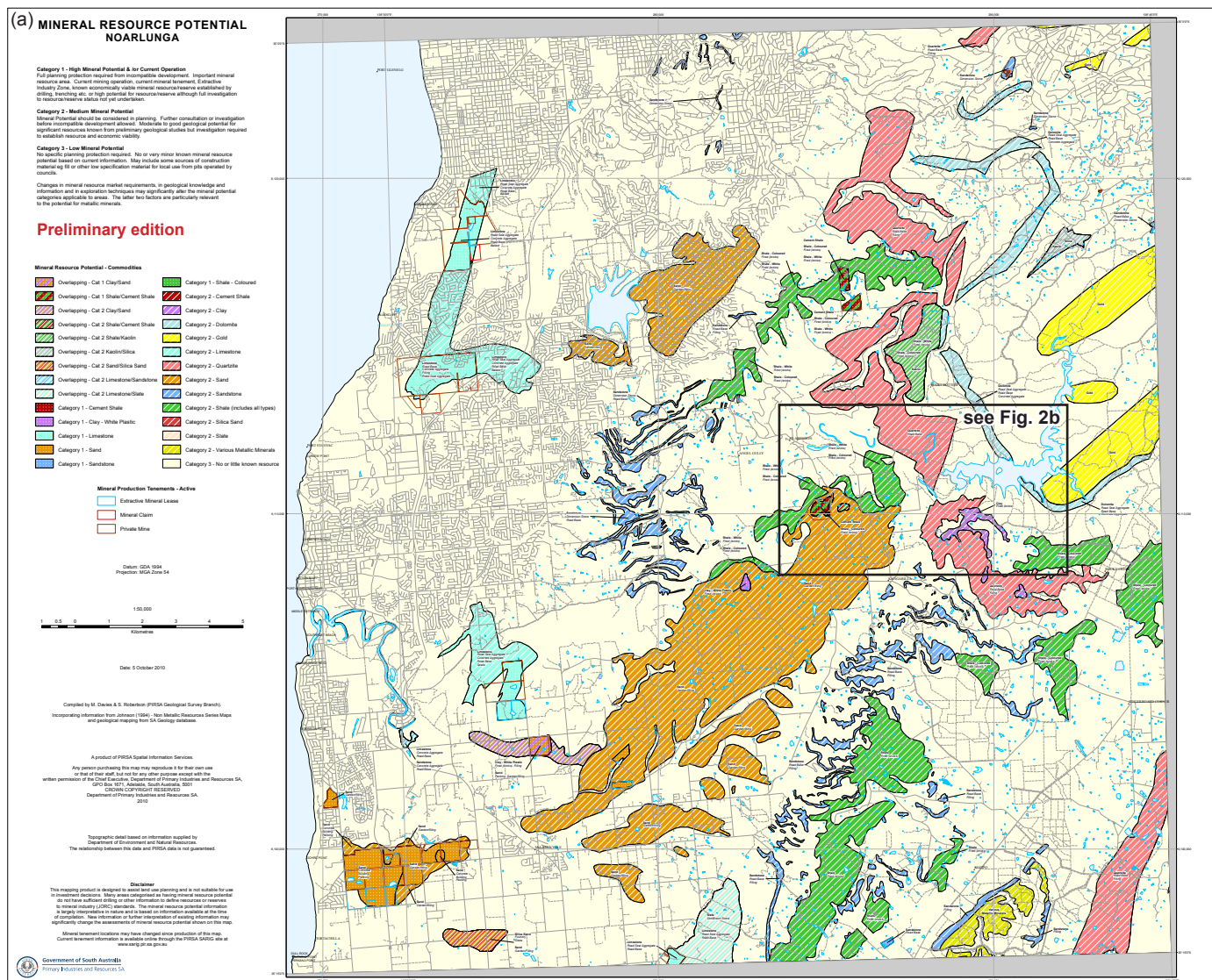


Figure 2 (a) Noarlunga, mineral resource potential, South Australia 1:50 000 Geological Atlas Series Map, sheet 6627-IV. **(b)** Enlargement.

resource areas including current mining operations, most current mineral production tenements, established economically viable mineral resource/reserve or areas with high potential for resource/reserve.

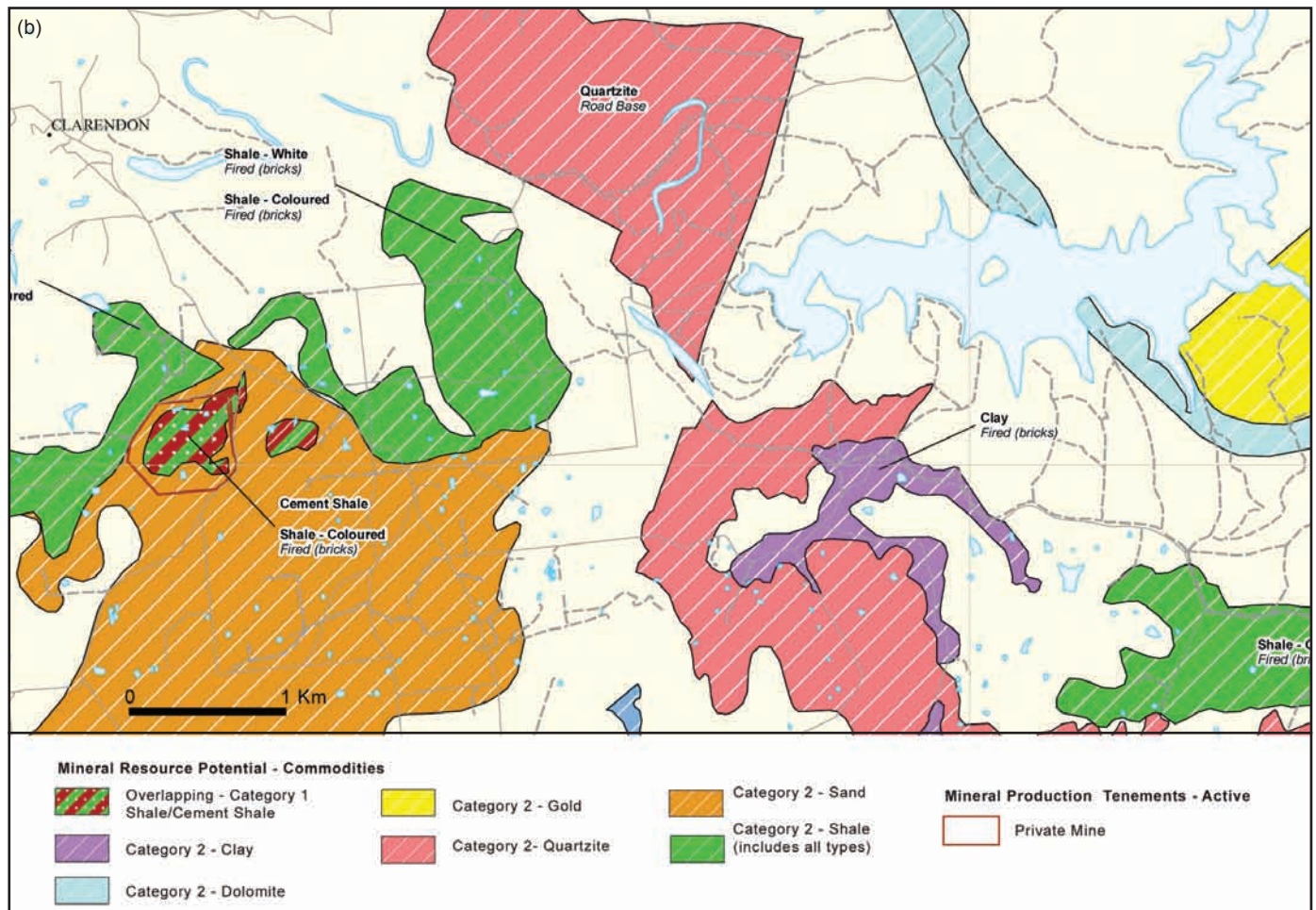
- **Category 2 – Medium mineral potential.** Mineral potential should be considered in planning. Further consultation or investigation required before incompatible development allowed. Moderate to good geological potential for significant resources known from preliminary geological information.
- **Category 3 – Low mineral potential.** No specific planning protection required. No or very little known mineral resource potential based on current information.

The compilation uses geological mapping (usually the Surface Geology 100 000 GIS layer available in SARIG) and mineral resource information from departmental and some company reports. The category polygons have attribute information attached on potential commodities, uses, sources of spatial data and key information references for the resource areas. Some new polygon boundaries are interpreted by the map authors where appropriate.

Very few areas, even Category 1 areas, have sufficient drilling or other sampling information to define resources or reserves to Joint Ore Reserve Committee (JORC) standards. The maps are interpretations of resource potential, limited by availability of information, and are not suitable for use in investment decisions. Inherent in these limitations is the likelihood that significant resources have been missed

by the mapping. Nevertheless resource mapping has become essential to make the sterilisation of important mineral resources less likely. Some areas of geological resource potential shown on the maps are already unavailable because of urban development and other constraints.

In preparation of the new MRPM data, extensive use was made of unpublished information in the Non-metallic Resource Map series prepared for the Department of Mines and Energy South Australia (now PIRSA) by consultant resource geologist Peter Johnson in 1994. This map series was essentially a precursor to the MRPM although metallic potential was not considered. PIRSA Spatial Information Services produce and manage the MRPM GIS data and maps from compilations prepared by the Geological Survey.



Future work

The MRPM will be periodically updated as new information becomes available. In addition to the Greater Adelaide area, mapping will be undertaken progressively in various regional growth areas of the state. Map compilation is underway for the northern Yorke Peninsula area. Current treatment of metallic, diamond and energy mineral potential is regarded as rudimentary and there is scope to improve this with open file company exploration information and interpretation of numerous other geoscientific datasets.

References

- Harvey WG 2010. *Hardrock extractive minerals for metropolitan Adelaide – strategic review, Summary version*, Report Book 2010/19. Department of Primary Industries and Resources South Australia, Adelaide.
- Pain AM 2001. Construction materials for metropolitan Adelaide. *MESA Journal* 21:8–10. Department of Primary Industries and Resources South Australia, Adelaide.

Pain AM and Johnson PD 2002. Summary of a strategic review of sand, clay and shale resources for metropolitan Adelaide, Open file Envelope 10724. Department of Primary Industries and Resources South Australia, Adelaide.

Copies of the MRPM 1:50 000 maps will be available in early 2011 for purchase from PIRSA Customer Services, phone +61 8 8463 3000, email <PIRSA.CustomerServices@sa.gov.au>, for \$20 plus postage and handling.

Further information is available through SARIG <www.sarig.pir.sa.gov.au> including the SA Geodata (mineral deposit, drillhole) and PIRSA Georeference datasets. It is intended that the maps will be available for free download in PDF format from the Databases, Publications and Reports page.

For other queries contact Stuart Robertson, phone +61 8463 3055, email, <Stuart.Robertson@sa.gov.au>.



Figure 3 Linwood Quarry showing the view north to crushing plant and Adelaide city area. The quarry is located ~15 km SW of Adelaide CBD and produces limestone for aggregates, road base and rail ballast. (Photo 408319)