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MINERAL RESOURCE ASSESSMENT OF THE YARROL PROVINCE, CENTRAL QUEENSLAND

Compiled by M Scott

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INTRODUCTION

The Yarrol assessment area is shown in Figure 1. The area is roughly centred on the Mount Morgan township and extends from Ridgelands in the north to Monto in the south, and from the Gogango Overfolded Zone in the west to the coastline in the east, focussing mainly on the western side of the Yarrol Fault. The assessment area covers all or parts of the following 1:100 000 sheet areas — Rookwood (8851), Ridgelands (8951), Rockhampton (9051), Mount Morgan (8950), Bajool (9050), Gladstone (9150), Biloela (9049), Calliope (9149), Monto (9148) and a small portion of Scoria (9048). The main regional centres are Rockhampton, Yeppoon, Biloela, Gladstone, Monto and Mount Morgan.

Historically one of the main industries of the area has been mining, but currently most of the large mines like Mount Morgan and Mount Chalmers, and almost all of the goldfields have ceased production except for small miners. Gladstone is increasingly becoming an industrial centre and major port.

The assessment of the potential for metal-bearing deposits in the Yarrol Province draws together results of the Geological Survey of Queensland (GSQ) data acquisition programs that include: regional scale geological mapping (at 1:100 000 scale), mineral occurrence mapping, and modelling of regional airborne geophysical surveys and regional exploration geochemical data. A solid geology interpretation was not available, however, the only significant cover in the region is the Tertiary basins where depths generally exceed the 350m economic cut-off used in this assessment. Basin fringes, where cover shallows to within the economic cut-off, have been interpreted to suggest likely underlying geology (Tertiary Basins and Tectonic Setting — Figure 2). The report provides summaries of the various data in a number of forms, including tectonic maps and suggestions as to how the geological evolution of the region relates to possible mineral resource occurrences. Various sections of the text provide overviews of the main data types used in the analyses, how these data were interrogated and/or integrated and the key interpretations. Information on Native Title and Estates/Forested Crown Land is included as provided by Native Title and Indigenous Land Services, Department of Natural Resources, Mines and Water and the Environmental Protection Agency:

The text is divided into seven sections:

Section 1 — Regional evaluation units (REU), lithofacies and tectonic history

Section 2 — Known mineral occurrences and deposit models

Section 3 — Geophysical interpretations, intrusive bodies and boundaries at depth

Section 4 — Delineation of permissive tracts

Section 5 — Regional geochemical interpretations

Section 6 — Prospective ground: porphyry and volcanogenic massive sulphide deposits

Section 7 — Grade and tonnage models and estimates of the number of undiscovered deposits.

The focus of the report is on identifying the types and possible locations of metal bearing deposits in the assessment area. It is important to recognise that the assessment has used regional scale digital datasets and as such provides the basis for future more detailed assessments. In terms of the exploration industry, this assessment is intended to facilitate successful exploration and to provide an integrated product delivering a range of information types necessary to assess and target broad are of potential mineralisation (including current tenement information, landuse, and Native Title). Analyses of prospectivity are used to support the identification of areas that are considered likely to have either porphyry type or volcanogenic massive sulphide (VMS) mineralisation, potentially the most economically significance deposit types in the assessment area. The scale of the analysis is not intended to target mineralisation at prospect scale but to provide information for the exploration industry to target tenement acquisition. In terms of landuse decision-making, by providing both the results of prospectivity analyses and estimates of the

Figure 1 Locality Plan

number of undiscovered deposits, the results of the assessment can be used to provide a prediction of future exploration activity. It should be recognised that the estimates of deposit numbers that may be present are provided with levels of uncertainty that reflect in part the limitations of the regional scale data used. The overall aim of the study is to draw together and provide geoscientific information in that can be used to help plan economic development, consider alternative uses of land, and plan exploration.

The assessment considers the following deposit styles:

- Porphyry type (Cu-Mo-Au)
- Skarn and Replacement (Carlin-style)
- Intrusive-related veins (mesothermal gold-quartz, polymetallic)
- Podiform chromite
- Epithermal (quartz-adularia, quartz-alunite)
- Nonintrusive-related veins (low-sulphide gold-quartz veins, mesothermal, metamorphic, listwanites)
- Cu-Zn volcanogenic massive sulphide
- ZnPb(Cu) volcanogenic massive sulphide
- Volcanogenic manganese
- Basaltic copper
- Gold on flat faults
- Lateritic nickel.

The USGS quantitative assessment process (Singer, 1993a) is adopted because it allows the use of a variety of modelling techniques and consequently can be applied to a variety of data types that may also vary in quality. The three fundamental parts of the quantitative assessment process involve:

1. Identification of permissive ground — the delineation of potentially mineralised tracts as distinct from barren ground. Permissive boundaries are defined so that the chance of deposits of the type being delineated occurring outside the boundary are negligible.

2. Grade and tonnage models — used to derive the mineral endowment of undiscovered deposits in the assessment area

3. Estimation of the number of undiscovered deposit — provide a measure of the favourability of the existence of the deposit type as well as reflecting the uncertainty of what may exist. Estimates that are made need to be consistent with grade and tonnage information.

Deposit models form the basis of the assessment process. It is recognised that applying models involves categorising and simplifying natural systems and thereby introduces additional uncertainty. In some cases, further field investigations or laboratory analysis are required to better assign a 'most likely' deposit style to a particular occurrence or mine. Estimates of deposit size and amounts of metal are made using global (Cox & Singer, 1986) and Australian grade and tonnage models (Ozpot, in preparation).

Computer-based prospectivity analysis using pattern recognition techniques was introduced to the assessment process to support estimates of deposit numbers for volcanogenic massive sulphide (VMS) and porphyry type deposits. The modelling identifies areas with characteristics suggesting that they are not simply permissive (ie have the chance to host economic mineralisation), but also are favourable for the occurrence of these deposit types. The distribution of areas favourable for VMS and porphyry type deposits was examined using probabilistic neural networks (PNN). Weights of evidence (WOE) was applied in a separate analysis of VMS favourability.

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