RB 769

DEPARTMENT OF MINES
SOUTH AUSTRALIA

KITTICOOLA MINES

APPRAISAL

ADELAIDE

Mannum

by

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Map S.9800 Location Diagram Scale 4 inches/1 mile

27th April, 1972

Rept.Bk.No.769
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ABSTRACT

Kitticoola Mine is situated within the outcrop of the Palmer Granite near the Palmer Fault. Copper bearing sparingly auriferous sulphides occur in lodes following a conjugate fracture pattern. Early workings, dating from 1844, exploited enriched secondary oxide material. Sulphide ore could be explored by diamond drilling as already recommended in 1953. Oxide remnants are extensive and suitable for in situ leaching. More widespread disseminated ores are not impossible.

The mine is shut down, in decrepit and ill-run condition. Departmental assistance could be given in development, but managerial safeguards would be necessary.

INTRODUCTION

Appraisal of the mine was carried out following a request for Departmental assistance in diamond drilling by the leaseholders, Sturts Meadows Prospecting Syndicate No Liability. Reports of recent exploration were provided by the syndicat earlier departmental reports were examined and a one day inspection of the mine carried out.

Kitticoola Mine is situated two miles south-south-west of Palmer in County Sturt, Hundred of Tungkillo, Section 960, Block 33. It lies about forty miles from Adelaide by road, at the eastern margin of the Mount Lofty Ranges, adjacent to the trace of the Palmer Fault. The land is privately owned, with mineral rights alienated from the Crown. Since 1970 the mine has been in the hands of Sturts Meadows Prospecting Syndicate No Liability, who were previously part

owners with John McIlwraith Pty. Ltd. The syndicate has an agreement with the landowner for mining rights, current until 30th April, 1992.

The mine was visited on April 6th in the company of Mr. H. Edwards, a mining engineer engaged by the owners a short time before they terminated active operations, and Mr. L. Nixon of L.G.B. Nixon and Associates, Consulting Geologists. At the time of the visit the mine had been shut down for about eighteen months, it was flooded up to an estimated five feet above the floor of the 300ft level at Wooton Shaft.

The purpose of the visit was to assess the quality of available data and to form an opinion of the remaining potential of the mine.

HISTORY

There are no records of the earliest prospecting and development work at Kitticoola but traces of old pits and trenches are widespread. The Australian Mining Company was formed in 1845 to work the mine, which it did until 1852. Reedy Creek Mining Syndicate worked from 1890 to 1897, and the Port Lincoln Copper Company from 1908 to 1918. Kitticoola Gold Mines operations date from 1933 to 1937 and were renewed more recently. "Tributing" was carried out intermittently between these periods of more regular work.

The Masterman and Baker lodes have been worked more or less extensively down to the 240ft. level. Other lodes have been worked sporadically. Earlier writers estimate total production as nearly 300,000 tons of ore, but no precise figures of tonnage or grade are available.

Six exploratory diamond core holes were drilled by the Department of Mines between 1935 and 1938, when this work was curtailed at the request of the holder of the mineral rights. The results of this drilling are shown in the relevant Mining Reviews 63, 65, 66, 67, 68.

More recently McPhar Geophysics carried out an I.P. survey over Kitticoola for Mines Exploration Pty. Ltd. (?) and later, in 1970, another one for Sturts Meadows Prospecting Syndicate. Following the second I.P. survey, four surface and five underground diamond drill holes were made by Westgate Drilling Co. R.W. Fidler of McPhar Geophysics reported on this work in 1971.

R.L. Thompson, an Honours Student of Adelaide University, worked on Kitticoola in 1970, but his report has not been seen by the writer.

Finally, in 1972, L.G.B. Nixon and Associates reported on the property. Mr. Nixon has advised the writer that this investigation and report was made to a strictly limited budget, after he had been asked to assess McPhar's results. The relevant underground mapping was carried out by Mr. R. Barrett, a student of Adelaide University who, although meticulous, had not before worked underground. Mr. Nixon's part in the investigation was limited. It is unfortunate that mention of these constraints is omitted from their report.

Departmental reports include those of Jack (1914), which gives a concise account of the Kitticoola workings and mineralisation, and of Hughes (1955) which summarised the mine geology and recommended further diamond drilling. Hughes' report includes a complete list of departmental references.

GENERAL IMPRESSIONS

Seldom has the writer had cause to form such an unfavourable impression of the general competence of any mining operation as is now the case at Kitticoola. Recent exploration, development and mining work are characterised alike by a complete lack of system or of informed technical guidance.

Early work on the property appears to have been in accord with good practice, early reports were lucid. Jack (1914) quotes Lowe (an early manager?) in warning against confusion between lode walls and nearly parallel later strike faults. This had already led to loss of the lode on various drives and to the deviation of the lower part of the Masterman Shaft into the hanging wall. Hughes

(op.cit), although he did not recognise the division between the Baker and Masterman Lodes which is implied by Jack's assay data, drew attention to the plunge of richer ore down what may be called the Masterman ore shoot. He proposed diamond drilling to explore and develope this.

These warnings and recommendations have of late been completely ignored in favour of an ill-chosen scatter of futile I.P. work. The directions of potential continuation and extension of the lodes remain as untested today as they did forty years ago.

GEOLOGICAL SETTING

The mine lies within the outcrop of the Palmer Granite, an elongated body some 3½ miles long and 3/4 mile wide, near its southern extremity. The Palmer Granite is Lower Palaeozoic in age (490 ± 15 m.y.b.p.) and conforms to the structural grain of the enveloping Kanmantoo metasediments. It is associated with granite gneiss and (?) migmatites which suggest granitisation origin.

The lodes at Kitticoola comprise the Baker, Masterman, Critchley and Back Lodes, striking north-north-east with a fairly regular dip of about 60° to the west; the Hagan Anstey and Cullingworth Lodes, striking west-south-west with a northely dip, but alternating between steep and flat portions after the style of a flight of steps; lastly the Horne and Cottage Lodes strike approximately north-west, and dip steeply to south-west and north-east respectively.

The Baker and Masterman Lodes are the largest and most significant past producers, where contiguous they appear locally to have reached a combined width of 30ft. The Anstey and parallel lodes are probably mainly significant for the thickening effect their junctions may have on the Baker and Masterman Lodes. The Anstey junction in particular appears responsible for the north-west plunging Masterman ore shoot. The Horne and Cottage Lodes are relatively narrow and have not been worked extensively. The nine lodes form a rude conjugate pattern, apparently related to shear movement on the nearby Palmer Fault, and

modified by the variations in rock competence between the relatively brittle Palmer Granite and the surrounding metasediments. If assay data were available, it would probably be possible to relate mineralisation to lode attitude, and to establish by careful mapping sequences of mineralisation and fracturing.

The granite county rock in the mine area is a medium grained biotite-adamellite. Kaolinisation is common in the neighbourhood of the lodes but seems more closely related to barren late fractures than to those carrying mineralisation.

The lode material comprises granite debris, quartz, calcite, dolomite/ankerite, specular hematite, pyrite and chalcopyrite. In the oxidised zone the sulphides are mostly absent, their place has been taken by limonite with more or less malachite, azurite, cuprite, tenorite (?) and native copper. Traces of bornite and chalcocite have been reported below the water table, suggesting that some secondary sulphide enrichment has taken place. Gold was apparently widely distributed in the oxidised ores where the highest values were associated with the Masterman Lode. There is a suggestion that gold and pyrite are associated, but although this seems probable, data to confirm it are lacking. A little disseminated sulphide is reported in the granite and gneiss cut by Mines Department diamond drill holes Nos. 2 and 3. The associated granite is mostly described as "calcareous" and it is uncertain whether these disseminated sulphides and calcareous matter are introduced "lode material" or the sulphides are of primary origin.

DISCUSSION

There is little doubt that the mine's early success was due to the presence of "rich bunches' of oxidised ore above the 240ft. level. Its subsequent failure combined difficulties of treating sulphide ores with inefficiency and ineptitude in following the ore bodies and in development work.

Hughes suggests that some 10,000 tons of oxidised ore remain in the upper part of the Masterman Lode. Taking the whole mine the figure must be considerably greater, but it seems quite certain that to re-open and secure the

upper part of the workings with a view to mining this material would be prohibitively expensive and impracticable. Its recovery by in situ leaching appears both practicable and attractive. The present mine-water standing in the lower part of the mine appears richly cupriferous. In the recent mill, flotation has been combined with heap leaching and a certain amount of cement copper produced.

The grade of underlying primary sulphide ore is so far only suggested by the intersection in the Mines Department diamond drill hole No.2, which assays slightly less than 1% copper over 10ft. from 351'2" to 361'2". This intersection lies outside the limits of the conjectured richer ore shoot, in a region where strike faulting has probably "stretched" and impoverished the lode. It is possible that the grade may be better further north, but this can only be demonstrated by diamond drilling as suggested by Hughes.

It is pertinent to consider whether the copper and gold values were derived locally from the Palmer Granite, or from more distant sources by way of the Palmer Fault. The Fault, from the numerous mines and mineralized showings located along its trace, has clearly been an important channel for the supply and/or circulation of mineral bearing fluids. Both extremities of the Palmer Granite show some evidence of mineralization and the granite itself is emplaced in, and may well be formed from, sediments which carried more-or-less extensive syngenetic mineralization.

The Kitticoola lodes are small and narrow features on a regional scale. Their importance is purely local, but their interest centres upon the much wider bearing which local studies may have on the possibility of the development of extensive disseminations of sulphides in, or associated with, the granitic rocks of the area.

RECOMMENDATIONS

1a. The probable continuation of better grade sulphide ore, both in the footwall of the present northerly development workings on the 360 and 420ft. levels, and as a north-westerly plunging ore shoot, has already been recognised

by Hughes (1955) and appropriate drilling recommendations are included in his report. (The description in his text of the westerly dipping Masterman ore shoot as having a north-easterly instead of a north-westerly plunge is surely an error in transcription).

b. The broken and caved remnants of largely oxidised ore lying above the 300ft. level are probably amenable to treatment by in situ leaching and the mine appears ideally situated for the conduct of large scale in situ leaching experiments.

A number of private leaching ventures have been carried out in the State and many of the small disused mines are potentially suitable for in situ leaching. Although laboratory research has been undertaken, there appears to be a lack of controlled field scale or full scale testing. Kitticoola operations could remedy this.

2. In view of the record of performance of Sturts Meadows Prospecting Syndicate, it would plainly be imprudent to expend public moneys on the investigations outlined above, without provision of effective controls to ensure that the work was competently carried out, and that the results were directed towards bona fide mining operations.

Without some such measure of departmental control it would be impossible to recommend assistance to the Syndicate. The mineral rights of Kitticoola are alienated from the Crown and are likely to remain so for at least the next three years. Such control as exists under the terms of present Special Mining Leases is therefore ruled out. The Mining Act (1971) is understood to provide for assistance "upon such terms and conditions as may be determined by the Minister" and it would not appear impossible for acceptable and effective terms to be agreed between the Department and the Syndicate.

3. On the larger scale it is recommended that the Department should carry out a detailed geochemical survey of the whole of the Palmer Granite. This would seek to determine whether a recognisable pattern of copper mineralization could

be linked to the geometry of the granite, or with that of the fault system. Such a survey might form the first stage of a regional study of base metal trends across geological time and thus prepare the way for an intergrated search for porphyry coppers and similar large scale low grade deposits in South Australia.

JG-S:MFV
27th April, 1972

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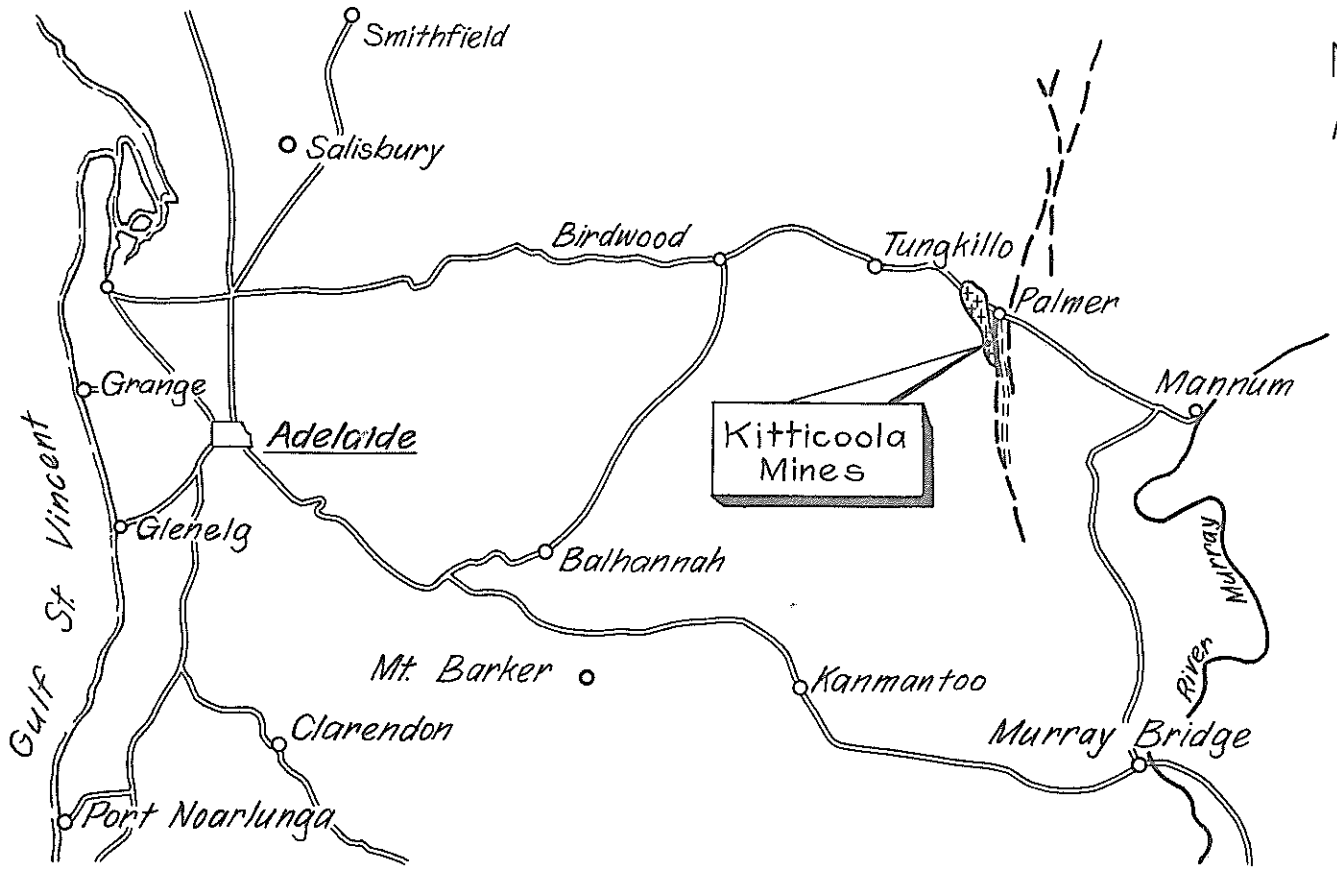

Scale in Kilometres

10 0 10 20 30 40

10 0 10 20

Scale in Miles

Legend

Palmer Granite

Palmer Fault Zone

METALLIC MINERALS SECTION	**DEPARTMENT OF MINES — SOUTH AUSTRALIA**	Scale: 1in. = 8miles
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