Rpt.Bk.No. 67/64
G.S. No. 4093

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
MINERAL RESOURCES DIVISION

THE DOME ROCK COPPER MINE

OLARY PROVINCE

by

K.R. WARNE
GEOLOGIST
METALLIC MINERALS SECTION

16th October, 1968.

D.M. 442/68

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ABSTRACT

The Dome Rock copper occurrences have been worked intermittently from three separate workings since 1918 by various mining groups and syndicates. Rich oxidised ores have been extracted from the Day shaft and Meehan shaft workings, and primary sulphide ores have been mined from above the 220 ft. level in Day shaft. Total recorded production amounts to 126 tons of copper from dressed ore of approximately 20 per cent grade.

Copper mineralisation occurs in three small independant lenticular ore-bodies as replacements of particular beds in axial planes of steep pitching folds or on overturned limbs of anticlinal drag folds. The deposits are considered to be of epigenetic origin and intimately related to the granites outcropping to the west of the mine. The copper lodes appear to be limited by granite at depth as well as laterally. Recently dug exploratory trenches have failed to reveal any extensions to the existing lodes.

The life of the mine is limited to the period required to stope out the 1,100 tons of oxidised ore of approximately 11 per cent copper content in the Day shaft workings. If precautions are taken during stoping operations to prevent the admixture of waste rock, it should be possible with careful selection to produce saleable ore containing greater than 10 per cent copper.

INTRODUCTION

Following a request for geological assistance, an inspection of the Dome Rock mine area was made in the company of P.G. Miller (Senior Geologist) on 17th April, 1968.

The property is currently being worked by a syndicate registered as the Dome Rock Pty. Ltd. which holds a 40 acre mineral claim (M.C. 3371) and an 8 square mile special mining lease (S.M.L. 172), both centred about the principal mine workings.

During May, 1968, geological and tacheometric surveys were conducted over the mineral claim area. The objects of this investigation were to survey and map the new development work and to review the economic potential of the deposit.

The field party consisted of a geologist (K.R. Warne), a surveyor (N. Edwards) and a geological field assistant (C. Lyon). Time spent in the field amounted to three and a half days. Work was hampered by a fall of 2½ ins. of rain.

LOCATION AND ACCESS

Dome Rock mine is situated on Boolcoomatta Station, about 8 miles north-west of Boolcoomatta homestead, which is itself 18 miles north-west of Mingary, a siding on the Adelaide-Broken Hill railway, about 284 miles from Adelaide.

A graded track branching from the Adelaide-Broken Hill highway from Mingary provides access to the mine, via Boolcoomatta homestead. This track is prone to rapid deterioration during wet weather, especially at the Conartra Creek crossing near Boolcoomatta homestead.

GEOGRAPHY

The copper deposits lie on a flat pediment on the north-eastern flank of an east-west trending range of low residual hills, which roughly demark the northern limits of the hilly region of the Olary Province. The district is one o:

subdued mature topography. The physiography has been controlled by the geology, and the topographic highs are associated with the more resistant granite and ironstone formations, while the softer sedimentary rocks occupy the plain country. Dome Rock, a well-known land mark in the district, is a prominent ironstone mass, located about 1¼ miles north-northwest of the mine.

The main drainage channels are the Boolcoomatta and Oonartra Creeks which meander inland across the sandy plain country to the north.

The mine itself is located on the northwestern side of a low rounded ridge which rises 45 ft. to 50 ft. above the level of the surrounding country. In the mineral claim area, bedrock is poorly exposed and is generally covered with debris consisting largely of ironstained pebbles of sandstone, quartz and slate. On the northwestern side of the claim chiastolites are strewn over the surface following the degradation of mica schists.

CLIMATE, RAINFALL AND VEGETATION

The climate is of a semi-arid type with a low rainfall averaging about 8 ins. per annum, falling mainly in the winter months.

There is no permanent surface waters in the claim area. Water from a dam constructed on a tributary to the Oonartra Creek, 2 miles south of the claim, is at present used for domestic purposes at the mine, and could provide a limited supply for future mining operations. Underground waters in the region have generally proved to be too saline, both for human consumption and for stock. Groundwater level in the mine workings stands at approximately 200 ft. below the surface. At the time of the survey the water level in Day shaft was measured at 180 ft. below the shaft collar.

The vegetation consists dominantly of salt bush with occasional stunted trees on the hill slopes and small drains. There are no good stands of trees in the immediate vicinity of the mine and timber for any future mining operations will have to be brought into the area.

PREVIOUS INVESTIGATIONS

The early mining history and subsequent development of the Dome Rock mine has been fully dealt with in Departmental publications of Mining Reviews by reports from Winton (1918, 1921, 1930), Jack (1923) and Pearson (1927).

Dickinson (1942) carried out a comprehensive detailed examination of the mine and extended his investigations to interpolate the regional geological structures over an area of approximately two square miles in order to gain a complete understanding of the mine geology. He postulated that the deposits were of hypogene origin and intimately related to adjacent invading granites. Because of its remote location and the limited extent of the lode material, Dickinson concluded that it was highly improbable that the mine would develop into a profitable concern and that it offered no encouragement for future exploratory expenditure.

The mine was visited by King during his investigation of the mineral resources of the Olary Province, undertaken in conjunction with a regional mapping programme of the district (Campana and King, 1958). He briefly described the mine and suggested the mineralization occurred as a replacement of particular beds.

The Department (E. Moorcroft, 1961) conducted an electromagnetic survey in the immediate vicinity of the mine workings with the purpose of checking the geophysical equipment and of locating any extensions of the mapped lodes. A broad anomaly was obtained over a ferruginous sandstone bed, with several small anomalies developed close to the granite

contact as mapped by Dickinson. No anomaly could be directly correlated to indicate any extensions to the existing lodes.

After examination by Nixon (1961) the gossanous ferruginous sandstone was described as the surface expression of a sedimentary horizon rich in authigenic pyrite.

REGIONAL GEOLOGY

The geology and mineral resources of the Olary Province have been described by Campana and King (1958).

There are two fundamental groups of terrain in the region:-

1) The crystalline formations of the basement, named by Mawson (1912) as the Willyama Complex, consisting of a metamorphic series comprised of phyllites, schists, quartzites, calcsilicates, paragneisses and amphibolites which have been affected in varying degree by later widespread granitisation, and are unconformably overlain by -

2) The little-altered sediments of the Adelaide System consisting of conglomerates, slates, quartzites, tillites, siltstones and minor dolomitic layers of the Torrensian and Sturtian Series, embracing formations of the Burra and Umberatana Groups.

The granitised metasediments have in many places been intruded by granite and associated pegmatite and aplite bodies.

Regional structural outlines consist of a set of folds having an east-northeast orientation, which are crossed at a high angle by a set of parallel axial flexures oriented north-west. Campana concluded that the structure

of the region is controlled by three orogenic cycles of Precambrian, Early Palaeozoic and Tertiary age.

LOCAL GEOLOGY

The rocks in the mine area are considered to be of Lower Proterozoic age and consist of a metamorphosed sedimentary sequence intimately invaded by intrusive granitic rocks. This sequence has been correlated by King (1958) with the Ethiudna Group of the Willyama Complex.

A comprehensive detailed account of the general geology about the Dome Rock mine has been forwarded by Dickinson (1942). Included in his investigations was a study of the mine stratigraphy and a description of a sedimentary sequence , roughly estimated to have a total thickness of 1,650 ft., accompanies his report.

Rock types observed in the mine area consist of a conformable sequence, dominantly of slates and sandstones, which are mentioned below in order from the youngest to the oldest.

Sandstone: Low isolated outcrops and limited weathered exposures in partly filled old prospecting trenches of a tough dense fine - to medium-grained sandstone occur within a synclinal structure immediately to the north of the Crawford shaft mine workings. This unit has been estimated to be greater than 200 ft. thick and represents the youngest rock in the basement complex covered by the survey.

Blue Slates: A zone of well-cleaved blue-grey slates, estimated to be 400 ft. thick forms the main horizon in the mine area. It is of particular importance as the copper occurrences are generally present in favourable horizons or structures within it or on its margins.

The slates show much variation in grain size and are not particularly well bedded. Near granitic contacts the rock has been altered to micaceous schist as a result of contact metamorphism. Andalusite (chiastolite) is often associated with the schist.

Banded Sandstone: Immediately below the blue slates is an irregular zone of banded grey-white feldspathic sandstone. The rock is generally well cleaved in the central portion of the claim - here a pale-green clayey material lines the cleavage and bedding planes. At the southern end of the claim the rock tends to a dense massive white-brown quartzite rock and is strongly jointed.

Ferruginous Sandstone: These rocks generally conform to the prominent ironstained ridges in the area. In places the outcropping ferruginous sedimentary masses are soft and friable and have a gossanous honeycomb appearance; in others the rock is silicified and quartzitic.

The ferruginous character of these rocks was considered by Dickinson to be of epigenetic origin and probably related to the granites. However, mineragraphic studies by Williams and Edwards (1960) indicate that "the gossan samples all consist essentially of transported limonite and limonitic stained chalcedonic silica. Some give clear evidence of being formed from angular (finely brecciated?) pyrite cemented by chalcedonic silica; others consist of transported limonite, almost certainly derived from the oxidation of pyrite in a neutral host rock. Only one specimen contains traces of box-work that could be related to chalcopyrite. The gossan represents oxidised pyritic seams or lodes relatively rich in pyrite. These pyritic seams may contain a little chalcopyrite, but in the evidence of the specimens examined, the primary copper sulphide ores would not be of economic grade".

This led Nixon (1961) to conclude that the gossanous material is a surface expression of a sedimentary horizon rich in pyrite. The sulphides are thought to be authigenic and hence of relatively low temperature. Spectrographic analyses of a sample collected by Nixon in the vicinity of the copper lodes gave the following result:

Element	Result (ppm)
Copper (Cu)	1000
Lead (Pb)	15
Zinc (Zn)	200
Cobalt (Co)	30
Nickel (Ni)	20
Chromium (Cr)	120
Vanadium (V)	100
Manganese (Mn)	1000
Silver (Ag)	1
Gold (Au)	5
Arsenic (As)	400
Molybdenum (Mo)	200

Gritty Sandstone: Below the ferruginous sandstone is a zone of fairly uniform grain size, which has been estimated to be 300 ft. thick. Such factors as sub-angular fragments and coarse grain size in some beds are suggestive that this rock unit is of conglomeratic origin.

Granite: Coarse-grained feldspar-quartz-muscovite granite outcrops on the western side of the claim area. This rock is considered to be intimately related to the copper mineralisation in the area. Granite veinlets have been mapped by Dickinson in the lower levels of Day and Meehan shafts. Thin veinlets of coarse-grained feldspar-quartz-muscovite pegmatite have been exposed in shallow trenches adjacent to the main open cut working.

Quartz: Small isolated patches of white "buck" quartz occur near the margins of the granite along the north-western edge of the claim area. Smaller veinlets, ranging from 2 ins. to less than ¼ in. in width, have been observed in some of the recently dug prospecting trenches. No copper mineralisation is associated with the quartz occurrences.

The accompanying plan 68-637 incorporates geological mapping by Dickinson; slight modifications have been made following the mapping of the recently dug trenches in the mine area.

In the mineral claim area the rocks strike in a north-easterly direction (N50° -60°E) and dip steeply (60° - 90°) to the south-east. On a broader scale the sediments have been buckled into a series of asymmetric folds which have been controlled by two directions of folding. The main folds trend toward the northeast, N50 - 60°E, which parallels the well developed cleavage in the slatey rocks in the mine area. Bedding-cleavage relationships indicate that these folds are overturned to the northwest. A second direction of folding (cross-folds) has been recognised in a northwesterly direction N45°W, and is most pronounced in a "tortured" zone near the central portion of the claim area, where granite has intruded an anticlinal cross-fold.

MINERALISATION

The copper deposits in the Dome Rock mine area are considered to be of epigenetic origin and appear to be intimately related to the granite occurrences outcropping west of the mine. Mineralising solutions probably gained access to the sediments along channels formed by minor faults or favourable rock horizons.

Copper mineralisation occurs mainly within or on the margins of a zone of blue-grey slates as three separate ore-bodies, which are isolated from one another in the form of lenticular masses, and have been exploited by three principal shafts, namely, Day, Meehan and Crawford shafts. These deposits are essentially pencil-like, steep-pitching patches of ore, which generally conform to the stratification of the sediments. They appear to be localised by minor drag fold structures on the overturned limb of a major N50° - 60°W anticline in a zone of N45°W anticlinal crossfolding. The crossfold is now largely represented by granite. Dickinson classified the deposits into two types:

(a) Ore bodies occurring on the overturned limb of anticlinal drag folds:- Day shaft ore-body.

(b) Ore bodies occurring on particular rock contacts at the axial planes of steeply pitching folds:- Meehan shaft ore body.

Day Ore-body: The Day shaft ore body, located at the southern end of the claim area, has been exploited by two shafts to a depth of 220 ft. and by a shallow open cut working. In plan, the lode is conformable with the surrounding slates and bulges occur in it where local drag folds and flexures are present. Alteration, chiefly silicification, for 5 - 10 ft. on either side of the lode, is common. Exposure of ore materials in the open cut working indicate that the lode is of lenticular habit, extending for a length of 110 ft.and attaining a maximum width of 6 ft. It dips southeasterly at 65° and pitches south at 80°. The width of the lode tends to progressively diminish with depth. On the 130 ft. level the average width is 3 ft. 6 ins. and on the 220 ft. level the lode averages 2 ft. in width. The lode is of fairly uniform composition, consisting mainly of oxidised ore minerals to a depth of 200 ft., which roughly coincides with the present water table level. Below 200 ft. sulphide ores become dominant.

The gangue materials include slate, clay, a little calcareous rock and quartz.

An examination of the lode material on the 130 ft. level indicated that further work is required to define the north-eastern and south-western extremities of the lode. To the north-west the drive has been terminated where it connects with an underlay shaft, and the lode here is approximately 3 ft. 6 ins. wide. In the south-western face of the drive the lode is less than 1 ft. wide and appears to be lensing out toward the south-west.

The best exposures of ore minerals in the mine area are seen in the Day shaft workings. Oxidised ores consist chiefly of chalcocite, cuprite and covellite. Other secondary minerals include native copper, azurite, malachite, chrysocolla, chalcanthite and olivenite. Previous sampling has indicated that the oxidised ore approximates a grade of 11 per cent copper.

The sulphide ores consist chiefly of chalcopyrite and pyrite occurring in a gangue of brecciated and silicified slate. Analyses have indicated that the chalcopyrite and pyrite are present in the ratio of four to one. White cobaliferous pyrite and traces of leaf gold adhering to manganiferous partings have also been reported from the Day shaft workings. The majority of the sulphide ore above the 220 ft. has been stoped out and proved to be of 7 per cent grade. A sample collected from the face of the drive when the 220 ft. level was being developed assayed 11.9 per cent copper, and a grab sample of ore raised from the 220 ft. level assayed 7.9 per cent copper.

Mineragraphic studies of ore materials from Day shaft have been carried out by the C.S.I.R.O. (1960). Three groups of samples selected from ore parcels obtained from the 130 ft. level gave the following results :

"Group 1. In hand specimen the samples look deceptively barren, consisting of soft weathered rock, in places weakly impregnated with malachite, azurite and possibly calcite. In polished section the samples are found to be heavily impregnated with native copper and cuprite, occurring as strings of minute granules 0.1 mm to 0. 5 mm across. These minerals occur with patches of malachite fringing small areas of limonite. The specimens contain up to 10 per cent copper (by weight).

Group 2. The specimens consist of alternate light greenish and dark grey bands, each about 1 cm. wide. The light greenish bands are impregnated with blebs and short seams of native copper and a little associated cuprite. The dark bands are heavily impregnated with chalcocite, some of which contain residual pyrite. It is clear that the chalcocite represents pyrite replaced in situ. At the margins of the bands there is some intermingling of native copper with the chalcocite. The native copper and cuprite appear to have developed by oxidation of former chalcocite, to the accompaniment of bleaching of the rock.

Group 3. A specimen consisting chiefly of chalcocite with a ragged seam of pyrite. All stages of replacement of pyrite by chalcocite are seen".

A number of fragments collected from 30 ft. below the 130 ft. level were also examined. "These specimens contain an abundance of pyrite, somewhat dull and fine-grained in appearance, occurring as kernels to carbonate and sulphate copper minerals. The pyrite masses are up to 5 cm. across and occur as angular patches associated with dark limonitic stained chalcedonic silica. Polished sections reveal that the pyrite is rimmed and veined with chalcocite and a little covellite, which have replaced the pyrite to varying degrees. Joints in the

fragments are encrusted with malachite films and some limonite. No traces of primary copper sulphides were observed. Some fragments are rich in chalcanthite which occurs in seams 2 mm. - 3 mm. thick and 2 cm. - 3 cm. long with lesser amounts of malachite, atacamite, chrysocalla and cuprite. The chalcanthite itself may have been formed as a result of post mining oxidation.

As a result of their investigations, Williams and Edwards (1960) conclude that the abundance of pyrite in the ore provided conditions suitable for the concentration of copper as chalcocite in the zone of secondary enrichment. However, the amount of chalcocite formed appears relatively small; and the subsequent formation of carbonate and sulphate copper minerals is not intense. This gives the impression that the amount of copper in the leached ore above the 130 ft. level was not great, and the primary ore was of relatively low grade.

Meehan Orebody: Meehan shaft ore-body is located in the central portion of the claim area, approximately 860 ft. north-east of Day shaft. The lode lies on a slate-sandstone contact on the axial plane of a drag fold which pitches nearly vertically. At the surface the lode is of similar dimension and composition as the Day shaft ore-body. When the deposit was first exposed, Winton described the lode as consisting of "more or less silicified, iron-stained slate" in which oxidised and secondary copper ores occurred as irregular masses. No quartz was associated with the ore material. A vertical shaft sunk initially to exploit the rich secondary ore was later deepened to 210 ft. Ore material has been stoped out for a length of 28 ft. from the 60 ft. level to the surface. Ore minerals extracted from this area consisted chiefly of cuprite and chalcocite, a little chrysocolla and atacamite with minor malachite and azurite. Below the 60 ft. levelthe main lode was no longer

seen and copper occurrences where restricted to narrow veinlets and stringers of copper carbonate minerals. Samples collected by Pearson (1926) from the north-western and south-eastern faces of the drives on the 100 ft. level gave assays of 1.4 per cent copper and 0.9 per cent copper respectively. On the 200 ft. level a number of small mineralised veinlets were encountered in the drive to the north-west but no copper values were associated with the drive to the south west. No primary copper sulphide minerals have been recorded from these workings. Faint stainings of erythite have been recorded from the workings during the initial stages of development.

Crawford Orebody: The Crawford shaft ore-body is located at the northern end of the claim area and lies within the zone of blue-grey slates. At the surface the lode has been recorded to be approximately 30 ft. long and have a maximum width of 3 ft. It dips at 65° towards the southeast and has been exploited by a shaft to a depth of 70 ft. Apart from the intersection of a small rich patch of oxidised ore, reported to have a grade of 22 per cent copper, at a shallow depth, the copper content in the lode rapidly diminished with depth. Short drives cut on the 70 ft. level failed to show indications of mineable ore and no stoping of the low grade material was warranted.

Evidence of the proximity of granite at relatively shallow depth is indicated from Dickinson's mapping of the underground workings from Day and Meehan shafts. Lenticular masses of granite and pegmatite penetrate the sediments in Day shaft near the 220 ft. level and in the crosscut on the 220 ft. level, imparting a schistose character to the adjacent slates. In Meehan shaft the ore body has been mapped as lensing out on a small granite dyke. Pegmatite occurrences have also been mapped in the shallow prospecting trenches

on either side of the open cut near Day shaft. The copper lodes appear to be limited by the granite at depth as well as laterally. The inferred presence of granite at shallow depths in the Dome Rock mine area deters from the chances of profitable deep development of the known small ore-bodies and restricts the possibilities for larger ore bodies at greater depth.

SURFACE WORKINGS

Besides the Day and Meehan shaft deposits, several small pits and trenches have revealed other patches of copper mineral. Mapping and sampling of these prospecting openings have given no indication of any extension of the existing lodes. However, relatively high assays were obtained from samples collected over narrow widths in the exploratory openings west and north of Meehan shaft. In a quarry immediately west of Meehan shaft, strongly malachite-stained slates have been revealed in the northern and eastern walls, and three parallel narrow malachite seams have been exposed in the southern face. To the north of the quarry malachite staining appears to continue in a zone which has been intersected in a trench and two pits. Further prospecting in this area by additional trenching could define a zone of low grade copper carbonate ore which could be incorporated in an acid leach beneficiation scheme pending advantageous feasibility tests. The chances of this zone developing into another high grade lode are small.

Thin lenticular veins or seams of siliceous ferruginous lode material have been exposed in two pits near the eastern margin of the banded sandstone horizon. Copper minerals, malachite and chrysocolla, occurring as finely crystalline aggregates and encrustations, line small vughs and crevices within the ironstone. Two samples collected over widths of 1½ ft. from a pit near Crawford shaft gave

assays of 0.94 per cent and 0.93 per cent copper. Two samples collected in working south-east of Meehan shaft over widths of 6 ins. assayed 8.3 per cent and 4.0 per cent copper. However, the narrow, discontinuous nature of the veins indicates that the ferruginous lode material is of little value and warrant no further exploration.

Pale green staining occurring in cleavage and bedding planes within the zone of banded sandstone is prominent in the mine area between Day and Meehan shafts and is probably due to the presence of olivenite - a rare copper arsenate $Cu_3 As_2O_8 Cu(OH)_2$ of secondary origin.

The positions of all the workings and sample locations are shown on plan No. 68-637.

MINE WORKINGS

The principal workings comprise three shafts, namely Day, Meehan and Crawford shafts, together with numerous small pits and trenches, along a zone extending for 2,400 ft. in a north-easterly direction. At the time of the survey, Day shaft workings were the only underground openings accessible. As the water level currently stands at 180 ft. below the shaft collar the workings below the 130 ft. level could not be examined.

Underground Workings

Day Shaft Workings: A well timbered vertical shaft sunk to a depth of 220 ft. intersected lode material at 40 ft. Crosscuts have been cut at the 130 ft. and 220 ft. levels to intersect the lode. Total development on the 130 ft. level consists of 18 ft. of crosscutting and 90 ft. of driving. On the 220 ft. level total development consists of 60 ft. of crosscutting and 80 ft. of driving.

An open cut working located 80 ft. north of Day shaft has been developed for the purpose of extracting oxidised copper ores from the main lode. This working has an average width of 15 ft. and extends for a length of 140 ft. in a northeasterly direction, attaining a maximum depth of 25 ft. From the centre of the open cut, a shaft has been sunk on the underlie of 65° to follow the lode material down-dip, and makes connection with the drives from Day shaft on the 130 ft. and 220 ft. levels.

All stoping operations in the Day shaft workings have been performed from openings adjacent to the underlie shaft. Above the 130 ft. level a block of oxidised ore has been extracted from a 60 ft. long stope extending from the 40 ft. level to the surface. Small tonnages of ore have also been won from a 30 ft. long stope at the northern end of the 130 ft. level. Above the 220 ft. level sulphide ores have been removed from a 30 ft. long stope to a height of 50 ft.

Day shaft is equipped with a 40 ft. high timber (oregon) head frame and an air-driven winch provides haulage in the shaft. On the 130 ft. level, tracks have been laid to a chute by the underlie shaft and a truck of approximately 1 cu.yd. capacity is available for underground transport of broken rock. The workings are currently being cleaned in preparation for further mining operations.

Meehan Shaft Workings: Meehan shaft, located 860 ft. northeast of Day shaft, was originally sunk to exploit a rich deposit of secondary ore that was stoped for a length of 28 ft. from the 60 ft. level to the surface. The vertical shaft was continued to a depth of 210 ft. Underground development consisted of :-

1) 22 ft. of driving on the 60 ft. level.

2) 40 ft. of driving and 90 ft. of crosscutting on the 100 ft. level.

3) 30 ft. of driving on the 220 ft. level.

At present these workings are not accessible and considerable work is required to make the shaft safe for re-entry.

Crawford Shaft Workings: Crawford shaft is situated at the northern end of the claim, approximately 695 ft. northeast of Meehan shaft. The shaft was initially sunk on an underlie of 65° to 16 ft. and then deepened to a vertical depth of 70 ft. Only a small amount of development was done from this opening and stoping of the low grade ores was not warranted.

Surface Workings

A small open cut working has recently been dug to open the ground approximately 70 ft. north-west of Meehan shaft, and has attained a maximum depth of 10 ft. The lengths of the southern and eastern walls are 60 ft. and 15 ft. respectively. A sloping track provides access into the workings from the north.

Three drill holes were noted in the northern portion of the area mapped. Each hole has been drilled at an inclination of 60° towards the north-west. No information has been obtained regarding the reasons for the drilling or the results.

A plot of all mine workings, including trenches and pits, is shown on plan 68-637.

ORE RESERVES

Total production recorded from the Dome Rock mine up to the close of 1940 comprised a yield of 126.23 tons of copper from dressed ore of approximately 20 per cent grade.

Since this date the dumps adjacent to Day shaft have been exploited but production figures are not available.

Due to the remote situation of the mine and the limited extent of the lodes, mining must necessarily be restricted to the highest grade portions of the lode material. Even with prospective cheap transport, the material mined should yield over 50 per cent of saleable ore of 10 per cent copper content or better to give a reasonable expectation of a margin for profit. Under these conditions the life of the mine is limited to theperiod required to stope out the oxidised ore material from Day shaft workings. As no underground work has been performed since Dickinson's report, his estimates of ore reserves still stand and are summarised below.

Location	Tons	Grade per cent
Day shaft workings		
(a) Above 130 ft. level	830	11 (approx.)
(b) Above 220 ft. level	270	11 (approx.)
	1,100	11 (approx.)

If care is taken in stoping to prevent the admixture of waste rock it should be possible with careful selection to produce saleable ore containing greater than 10 per cent copper.

Additional reserves are available in the dump about Day shaft. Large fragments of chalcocite/cuprite ore have been handpicked from this material by the present owners of the mine. This dump was sampled by Dickinson and was found to approximate a grade of 11 per cent copper. It is estimated that over 600 tons of material is available in this dump.

BENEFICIATION

Preliminary laboratory-scale beneficiation tests were carried out by Weir (1958) on bulk samples totalling 3 cwt., said to be representative of partially oxidised ore from the Day shaft workings. A microscopic examination of the material after heavy-liquid separation showed the sample consisted predominantly of pyrite with 10-15 per cent chalcocite and covellite, quartz and calcareous rock with inclusions of malachite, micas containing inclusions of pyrite and haematite, and clays encrusted with malachite and iron oxides.

A summary of the laboratory tests is given below:-

Wilfley Tabling: Using ore crushed to 10 mesh, this method gave practically no upgrading. The slimes fraction carrying 23.5 per cent of the total copper.

Flotation: Fatty acid flotation gave little upgrading and the concentrate obtained could not be cleaned further. Xanthate flotation of the sulphide fraction, in conjunction with activating agents for the oxidised copper minerals gave better results, but slime losses accounted for 65.5 per cent of the total copper and 6.3 per cent of the copper was lost by solution in the water.

Poor recovery of the copper minerals was attributed to the complex nature and excessive sliming characteristics of the ore. In view of the poor results obtained, Weir concluded that leaching appeared to be the only feasible method for economic treatment of an ore of this type.

The economics of an acid leach beneficiation process is dependent on the acid consumption per ton of crude ore. Analyses of samples collected by Winton (1921) showed the (CaO + MgO) contents of ore materials from Day shaft and Meehan shaft workings to be 16.11 per cent and 4.63 per cent respectively. As carbonate materials are

associated with the ores it is advisable that trial feasibility tests be made before acid leaching practices are attempted at the Dome Rock mine.

Copper is at present being won from the Day shaft workings by precipitation process involving chemical reaction of cupriferous mine waters with scrap ribbon iron, in a vat of approximately 200 gallons capacity. The procedure adopted has been to allow the reaction to proceed for 5 - 6 hours, before returning the mine waters down the shaft and washing the sponge copper from the scrap iron into smaller collecting bins. The copper sludge is then shovelled into 44 gallon drums and later spread for drying. At the time of the survey several drums of crude copper cement were on hand at the mine. Trial samples of this material have been reported to assay 66-67 per cent copper.

CONCLUSIONS AND RECOMMENDATIONS

Exploratory trenches recently dug in the Dome Rock mine area have failed to reveal any extensions to the known lodes. Any exploration or development scheme in the area is primarily handicapped by the fact that the known lodes have no length of any consequence. It is concluded that the life of the mine is limited to the period required to stope out the 1,100 tons of oxidised ore from the Day shaft workings. This ore has been estimated to approximate a grade of 11 per cent copper. Using careful stoping methods to prevent the admixture of waste rock it should be possible with careful selection to produce saleable ore containing greater than 10 per cent copper.

On the 130-ft. level in the Day shaft workings, further work is required to define the lateral extent of the main lode. It is recommended that attempts be made to continue the development of the drives to the north-east

and south-west to determine the limits of the lode.

The production of copper cement by precipitation from acidic mine waters in the Day shaft workings should be continued and attempts should be made to increase the output by installing additional reaction vats.

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K.R. Warne per JMM

KRW:CC:JMM
16.10.68

K.R. WARNE.
GEOLOGIST
METALLIC MINERALS SECTION.

APPENDIX 1

ANALYTICAL REPORTS

AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

ANALYTICAL REPORT:- Australian Mineral Development Laboratories.

REPORT AN3511/68

LOCALITY:- Dome Rock Copper Mine, Clary Province.

Sample Mark	Width	Copper per cent
A1048/68	0'E - 8'E (8')	0.64
1049	0'E - 7'E (7')	0.10
1050	0'E - 11'E (11')	0.02
1051	3'E - 3'6"E (6")	8.3
1052	7'E - 7'6"E (6")	4.0
1053	1'6"E - 3'E (1'6")	6.9
1054	0'E - 2'6"E (2'6")	7.9
1055	0'E - 1'6"E (1'6")	0.94
1056	2'1"E - 3'6"E (1'5")	0.93
1057	8'6"W - 10'6"W (2')	2.3
1058	26'W - 27'6" (1'6")	7.0
1059	Day Open Cut, main lode (2')	4.4
1060	Meehan Open Cut: N face (3'9")	6.3
1061	Meehan Open Cut: E Face (6")	7.8
1062	Meehan Open Cut: S Face (6")	13.0
1063	Meehan Open Cut: 12'6"E - 16'E (3'6")	0.21
A1064/68	Fines from 130' level, Day Shaft	7.7

ANALYSIS BY: C. Holland

OFFICER IN CHARGE, ANALYTICAL SECTION: A.B. Timms.

P.A. YOUNG
Direction.


REGIONAL GEOLOGICAL MAP
DOME ROCK MINE (M.L. 3371)
S.M.L. 172
LEGEND
Alluvium of creeks and plains
Shallow rock waste deposits of the pediments. Bedrock at very shallow depth.
STURTIAN SERIES (ADELAIDE SYSTEM) Principally slates with quartzite, limestones and tillites.
TORRENSIAN SERIES (ADELAIDE SYSTEM) Principally slates with numerous thin limestones and sedimentary magnesites and lesser sandstones.
LOWER PROTEROZOIC (WILLYAMA COMPLEX) Schists, gneisses, migmatites and quartzites.
Amphibolitized metasediments, banded in part.
Pegmatite dykes.
Principally massive granite.
SCALE
MILES 0 2 4 6 8 10 12 14 16 18 20 MILES
Geology by R.C. Sprigg, B. Campana, K. Summers.
LOCALITY PLAN
DOME ROCK COPPER MINE
Pt. Augusta
Yunta
Broken Hill
Whyalla
Pt. Pirie
SPENCER GULF
GULF ST VINCENT
Morgan
Murray River
Renmark
ADELAIDE
Tailem Bend
K.I.
N.S.W.
VIC.
SCALE IN MILES
0 10 20 30 40 50 100
LEGEND
LOWER PROTEROZOIC (WILLYAMA COMPLEX)
Sandstone
Blue Slates with intercalated Sandstone beds
White-grey feldspathic Sandstone
Ferruginous Sandstone
Sandstone with subordinate coarse-grained grits
Slate - well bedded (ribbon stone)
IGNEOUS ROCKS
Granite
Quartz
Copper lode
Limit of rock unit
Limit of outcrop
Bedding
Inclined
Vertical
Jointing
Inclined
Vertical
Drag folding
Anticlinal fold axis
Shaft
Pit
Trench
Quarry
Dump
Claim peg
Survey station
D.H. Drill hole
A1059/68 Sample location
Contour (2ft intervals)
Creek
SCALE
FEET 100 50 0 100 200 300 400 500 FEET
METRES 50 40 30 20 10 0 50 100 150 METRES
N
ML 3371
CRAWFORD SHAFT
MEEHAN SHAFT
Underlie Shaft
DAY SHAFT
Winder House
Shed
SOUTH SHAFT (22')
Old Camp
D.H.
Geology after S.B. Dickinson

DEPARTMENT OF MINES — SOUTH AUSTRALIA

DOME ROCK COPPER MINE
OLARY PROVINCE
GEOLOGICAL PLAN OF MINE AREA
AND ENVIRONS

METALLIC MINERALS SECTION	GEOLOGIST	Drn. K.R.W.	SCALE: As shown
		Tcd. R.H.	68-637 FL
		Ckd. L.V.W.	
Director of Mines	SEN. GEOLOGIST	Exd.	DATE: 10 Sept. 1968