RE-APPRAISAL OF KAPUNDA MINE

Report by

B.P. Thomson, M.Sc.

Senior Geologist
Geochemistry Section

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA

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SUMMARY

Bedded sulphide mineralisation has been recognized in the carbonaceous felspathic siltstone host rocks of the Kapunda ore body environment. Evidence for lateral secretion origin for the ore veins is advanced. The new data enable recommendations to be made for further mapping and diamond drilling at the Kapunda Mine.

LIST OF PLANS

		Plan No.
Fig. 1	Plan of Kapunda Mines Scale 1" = 100' (after S.B. Dickinson 1944)	L 61-98
Fig. 2	Plan of Portion of Hundred of Kapunda. Co. Light, showing proposed prospecting areas. Scale 1" = 40 chains	S 2903
Fig. 3	Diagram showing form of bedded disseminated mineralisation and evidence of lateral secretion in cross cutting vein.	S 2911

INTRODUCTION AND HISTORY OF MINING AND EXPLORATION

The first reported discovery of copper in South Australia was made at Kapunda in 1842. Between 1844 and 1912, when active mining ceased, the Kapunda mines produced 60,000 tons of ore for a yield of 13,500 tons of copper, worth £44,120,000 at the current price of copper. The bulk of production was prior to 1878 when the carbonate and secondary sulphides were mined. Mining was carried out to a maximum depth of 400 feet in the main Kapunda group of mines; the workings have now apparently caved. The limit of secondary enrichment was between 100 and 300 feet vertical depth.

A large proportion of the higher grade ore was obtained from cross cutting vein like bodies dipping steeply north. Dickenson (G.S.S.A., Bulletin No. 21, 1942) mentioned that at least 29 separate veins were worked, besides numerous small branch veins. The intervening rock between the veins was generally mineralized and was in places stoped. The grade of this mineralization in the primary zone is uncertain.

DRILLING OF KAPUNDA COPPER MINES COMPANY

Between 1906 and 1907 the Kapunda Copper Mines Company drilled 10 percussion holes and 3 diamond drillholes.

Five percussion bores penetrated the "kaolin body" immediately west of the open cuts at a depth of 40 to 153 feet below the surface; the following table shows the results of this drilling -

TABLE (after Dickinson: 1944)

Bore No.	Total Depth	Kaolin Zone			Copper grade %
		Depth from	Depth to	Thickness	
1	217.3	50	120	70	0.5
2	120	60	107.5	47.5	1.25
3	185	102	170	68	1.18
7	187	40	70	30	0.6
8	231	153	170	23	0.5

A possible tonnage of 300,000 tons of 0.8% copper was indicated. The three diamond drill holes were designed to test the grade of primary mineralization. Results were not conclusive because of core loss. Weak sulphide mineralization was proved to extend to 750 feet vertical depth. Following is a summary of

the core logs

NO. 1 D.D.H. (Vertical

Depth (feet)	Description
Surface - 500	0.25% Cu. approx. average
500 - 750	Dark slate, with pyrite and trace Cu.
	Total depth 750 feet.

NO. 2 D.D.H (inclined 65 degrees to east)

Depth (feet)	Description
Surface - 145	Average approx. 0.25% Cu.
145 - 175	Kaolin average approx. 1.5% Cu.
175 - 240	" " " 0.5% Cu.
330 - 340	Approx. 3.5% Cu. (Tratten lode?)
340 - 371	Clayey ground, average approx. 2.0% Cu.
371 - 400	?
400 - 405	Lode (?) siliceous, 2.5% Cu.
405 - 470	Siliceous rock, trace Cu.
471 - 478	No core, sludge and water lost. (Hart Lode?)
478 - 500	Quartz and pyrite, 1.25% Cu.
500 - 576	Hard sandstone, no Cu.
576	No samples (Dunston lode?)
576 - 750	Soft blue slate. No Cu.
	Total depth 750 feet.

NO. 3 D.D.H. (inclined 60 degrees to east)

Depth (feet)	Description
200 - 370	Cu values.
405	" "
475	No core or return water
489	Piece of ore (?) vuggy quartz with pyrites.
	Total depth 500 feet.

STRUCTURAL INTERPRETATION - S.B. Dickinson (1944)

In 1944 S.B. Dickinson published (Bulletin No. 21, G.S.S.A.), a summary of history and records of mines with a surface map and structural interpretation of the mine. Dickinson considered the Main Kapunda group of mines to be worked out and of no further interest. He recommended several drill holes in the Hillside Mine area to the south; if these proved successful he recommended more drilling further north in the east Kapunda mine area. The drilling was not done.

Dickinson attributed the Kapunda ore body to primary hypogene hydrothermal mineralisation followed by supergene enrichment. Dickinson pictured the mineralisation to have been introduced into two sets of steep dipping joints. One set was thought to have a N.W. - S.E. strike and a steep N.E. dip. The other set of joints was believed to strike NNE and dip west at 60 to 80 degrees.

The N.E. dipping set was believed to be correlated with a north east dipping ore zone, marked by bleaching and kaolinization. Recent observations show this correlation and interpretation to be incorrect; the ore zone is marked by the bedding planes which strike north 10 to 20 degrees west and dip west at 30 to 50 degrees.

The second set of joints does appear to control the attitude of the individual ore shoots as outlined by Dickinson with the exception of the main lode which may be in a bedding plane.

LATER WORK

The revival of interest in the Burra area initiated by M.D. Garretty in 1951 prompted also some interest in the revival of Kapunda Mines. Geophysical survey was deferred until a regional map commenced by Mr. S.B. Dickinson in that year was more advanced.

A regional map, the Kapunda 1 mile sheet was completed by A.R. Coats in 1956. Coats' mapping showed that the Kapunda mines were Located on the western flank of a regional domal structure in the Sturtian Interglacial Beds and close to a felspathic siltstone member called by Coats the Kapunda Arkose.

A regional gravity and magnetic traverse through Kapunda (Seedsman, Geophys. Rept. 4/55, G.S. 344, D.M. 41/55) showed magnetic highs close to the Kapunda mine stratigraphic position. A study of the recently compiled aeromagnetic map however does not reveal any regional anomalies in this area.

The writer visited the Kapunda mines on 1st and 2nd of December, 1960, with R. Coats and M.N. Thomas of the Zinc Corporation Ltd. A recent visit was made on 26th September 1961 with a visiting geologist. The main open cut and Dutton open cut were examined in detail.

NEW INFORMATION

(1) Lithology: The host rock for the mineralisation in the Dutton and main open cut is weathered and leached carbonaceous felspathic siltstone, and not arkose.

In places deeper in the open cut the original dark colour is preserved between fractures on joint planes. The exposed surfaces of the rock are constantly fretting due to exudation of sulphate derived by weathering of disseminated sulphides in the rock.

(2) Disseminated Mineralisation: Close examination of the faces of the open cut on freshly scraped surfaces shows clearly that lines of ferruginous boxworks after sulphides occur in the bedding planes of the siltstone. Isolated pockets of weathered sulphides outline in minute detail small scale sedimentary structures such as cut and fill structures and lobe casts in sandy beads. These are all features of syngenetic mineralisation. The character of the original sulphide is unknown but is presumed to be in part cupriferous.

(3) Lateral Secretion: Evidence of lateral secretion was obtained by examining small silica veinlets cutting the bedding planes of the siltstone. (see fig. 3).

It was noted that patches of coarse boxworks after sulphides were scattered in the veins, but the disseminated sulphides in the bedding planes of the claystone were absent within a zone of an inch or more on either side of the veins. This evidence together with the extremely low metamorphic grade

of the sediment, absence of igneous rocks, chalcedonic character of the silica, suggests that a lateral secretion process has operated in response to stress conditions in the environment, possibly at an early stage in post consolidational history of the sediments. This could account for the control of ore shoots on steep west dipping fractures.

REAPPRAISAL OF ORE CONTROL

A simpler structural picture now emerges of a succession of carbonaceous siltstones dipping west at 30 to 50 degrees and striking N.N.W., intersected by a steep westerly dipping set of fractures striking N.N.E. which causes local migration into steeply dipping ore pipes of disseminated bedded sulphides in the siltstone.

The earlier diamond drilling was probably too far up dip to the east. The percussion drilling was probably not deep enough to test the bottom of the zone of weathering and the primary zone. The grade of the primary mineralisation in the siltstones away from locally mined areas is of possible interest, although it is expected to be low. If sufficient tonnage is present a mineable grade may be proved for a large open cut or block caving operation.

RECOMMENDATIONS

1. Re-examination of surface exposures using Mr. S.R. Dickinson's 1 inch to 100 feet fact plan, with a view to locating stratigraphic markers and noting disseminated mineralisation and sedimentary structures.

2. Following 1, it is recommended that at least two drill holes should be drilled below the zone of weathering (i.e. below 300 feet) on a section north of the main open cut (see fig. 1).

The holes should overlap in section so that the stratigraphy can be traced from hole to hole.

3. It is recommended that the Mines Department secures the land covering the extension to the south and west in depth of the favourable beds (see fig. 2).

B P Thomson

B. THOMSON
SENIOR GEOLOGIST

BPT:ACK
16/10/61

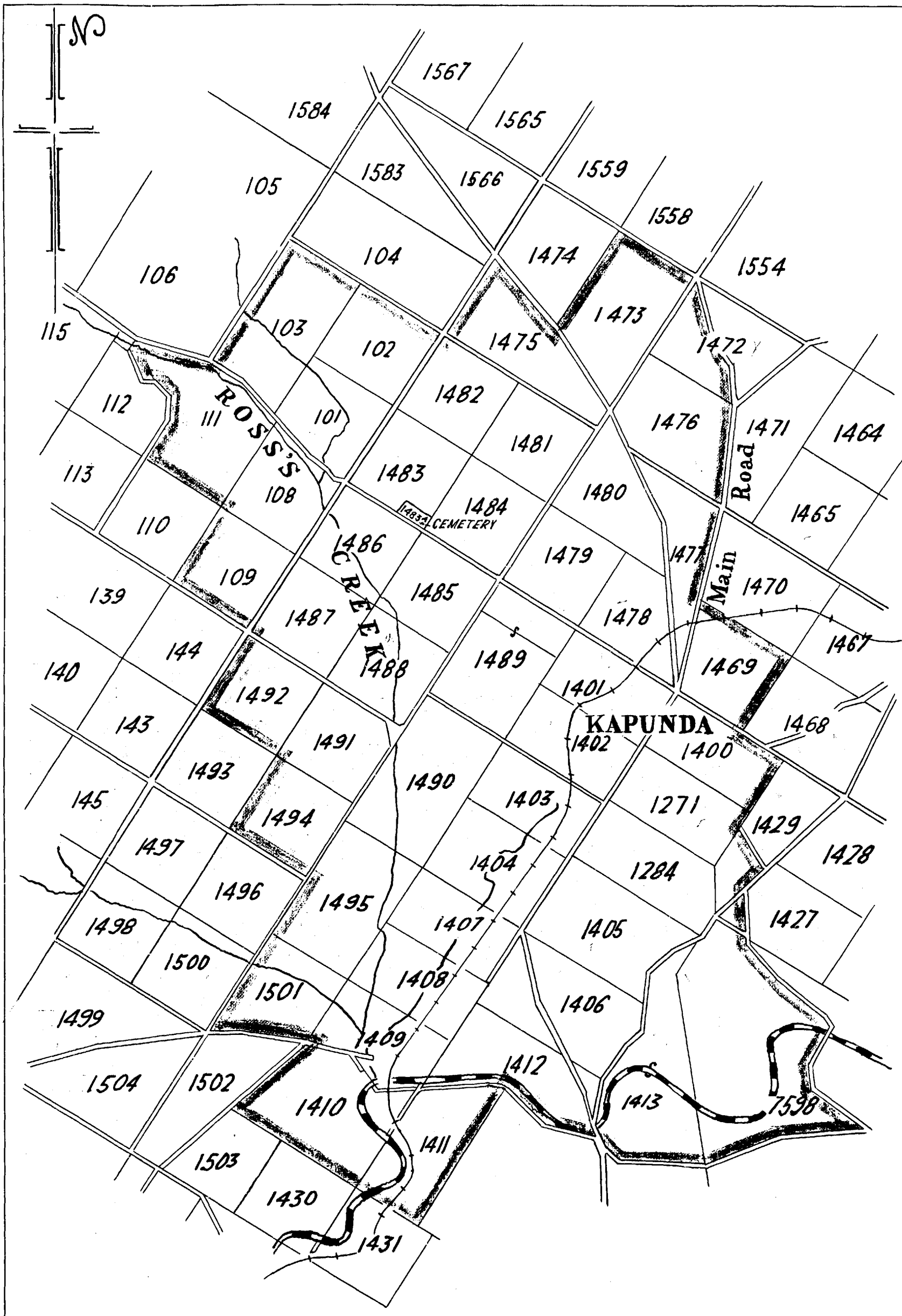

FIG. 2

To accompany report by B. Thomson.

S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.	PLAN OF PORTION OF H^D. KAPUNDA C^O. LIGHT SHOWING PROPOSED PROSPECTING AREA	D.M.	Scale 40chns to 1"
		Tcd. G.W.		Req.	S2903
		Ckd.			GK5
Director		Exd.			Date 12-10-61

200—6.60 7701

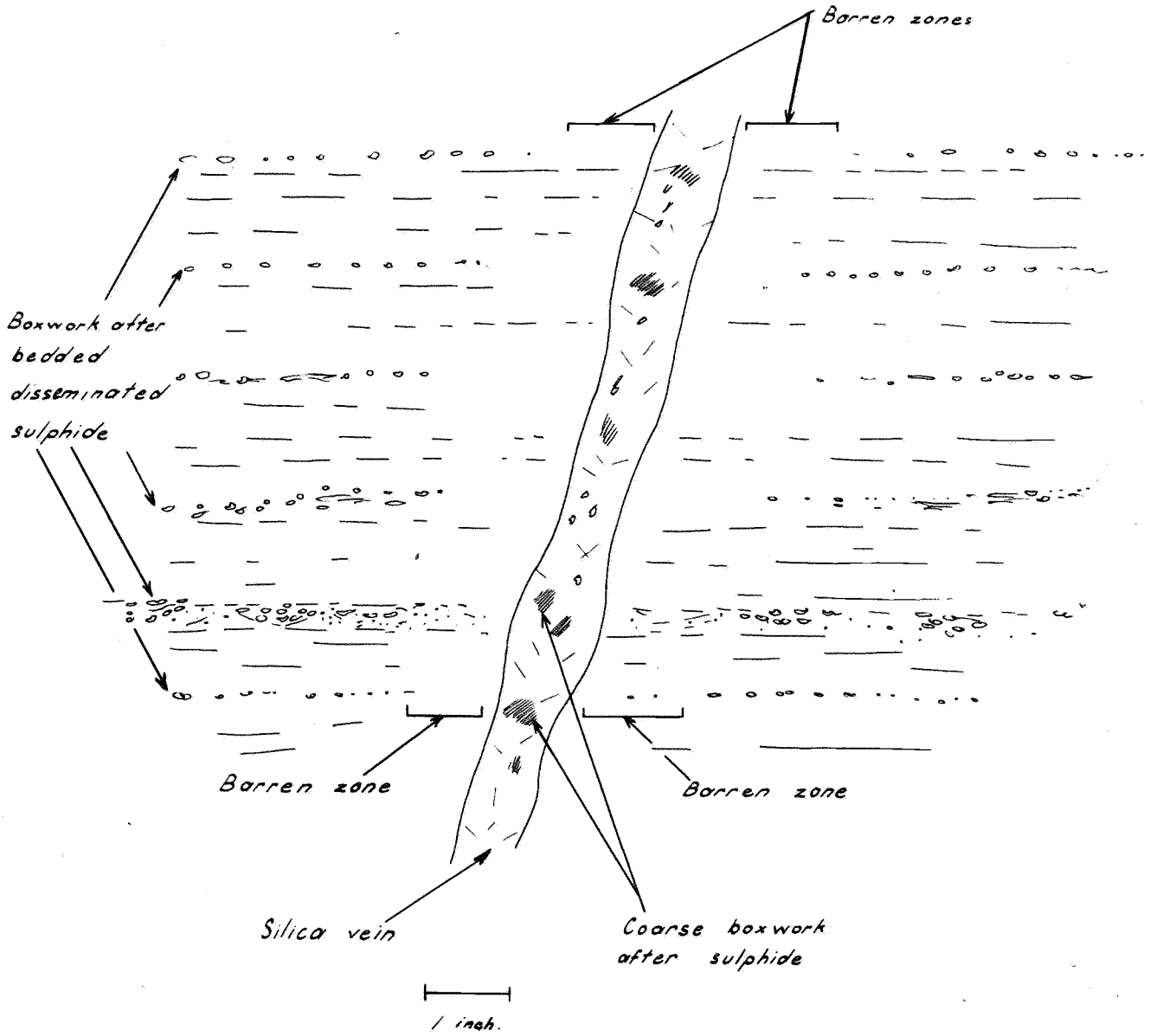

Diagram showing form of bedded disseminated mineralisation in laminated interglacial silt stone at Kapunda Mines and evidence of lateral secretion in vein formation.

FIG. 3

To accompany report by B. Thompson

S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.		D.M.	Scale
		Tcd. B.G.	KAPUNDA MINE	Rec.	S 2911
Director		Ckd.			Date 16-10-61
		Exd.			

LEGEND

- Stoped ground (in plan projection)
- Open cuts
- Strike & dip of bedding — 40°
- Lode
- Zones of mineralization/kaolinization
- Workings (with depth) — 240'
- Extrapolated bedding strike lines

SCALE

Feet 100 50 0 100 200 300 400 500 Feet

KAPUNDA MINES

GEOLOGICAL PLAN SHOWING WORKINGS

19-10-61.

After S. B. Dickinson 1944.

L 61-98
GK 5