

# EL 6/2005 “Cuprona” - Copper Potential

## 1.0 Introduction

A northeast striking belt of abandoned copper mines runs parallel to (offset to the west) the Cuprona-Natone hematite iron trend.

At the southern end of the belt are the Woodstock and Rutherfords abandoned mines. In the centre on either sides of the Blythe River are the Commonwealth and North Commonwealth with the Cuprona Copper King mine and Evans workings on the eastern slopes, and at the northern end are the Edwards, Smiths and Bramichs lodes. The most significant of these is the Copper King mine.

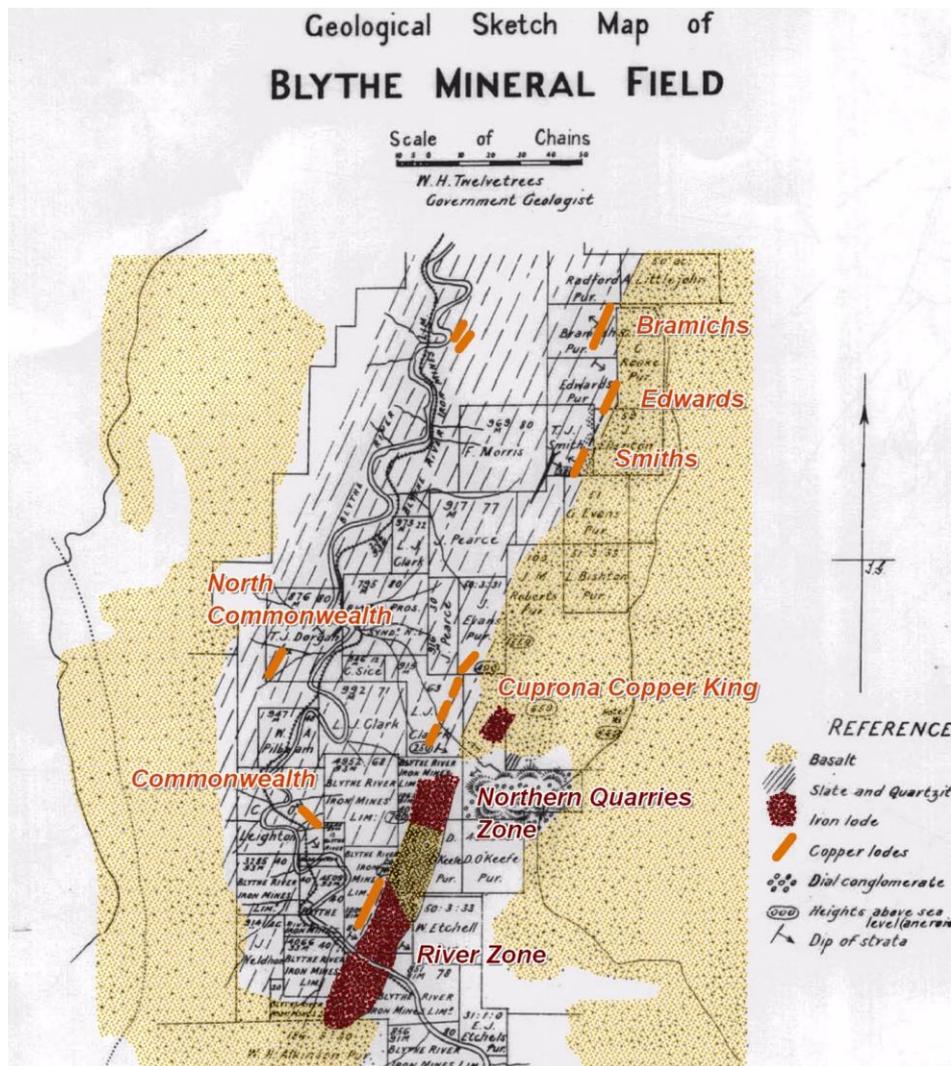


Figure 1.1: Blythe Mineral Field showing copper and iron prospects – north and central area, after Twelvetrees, (1905)

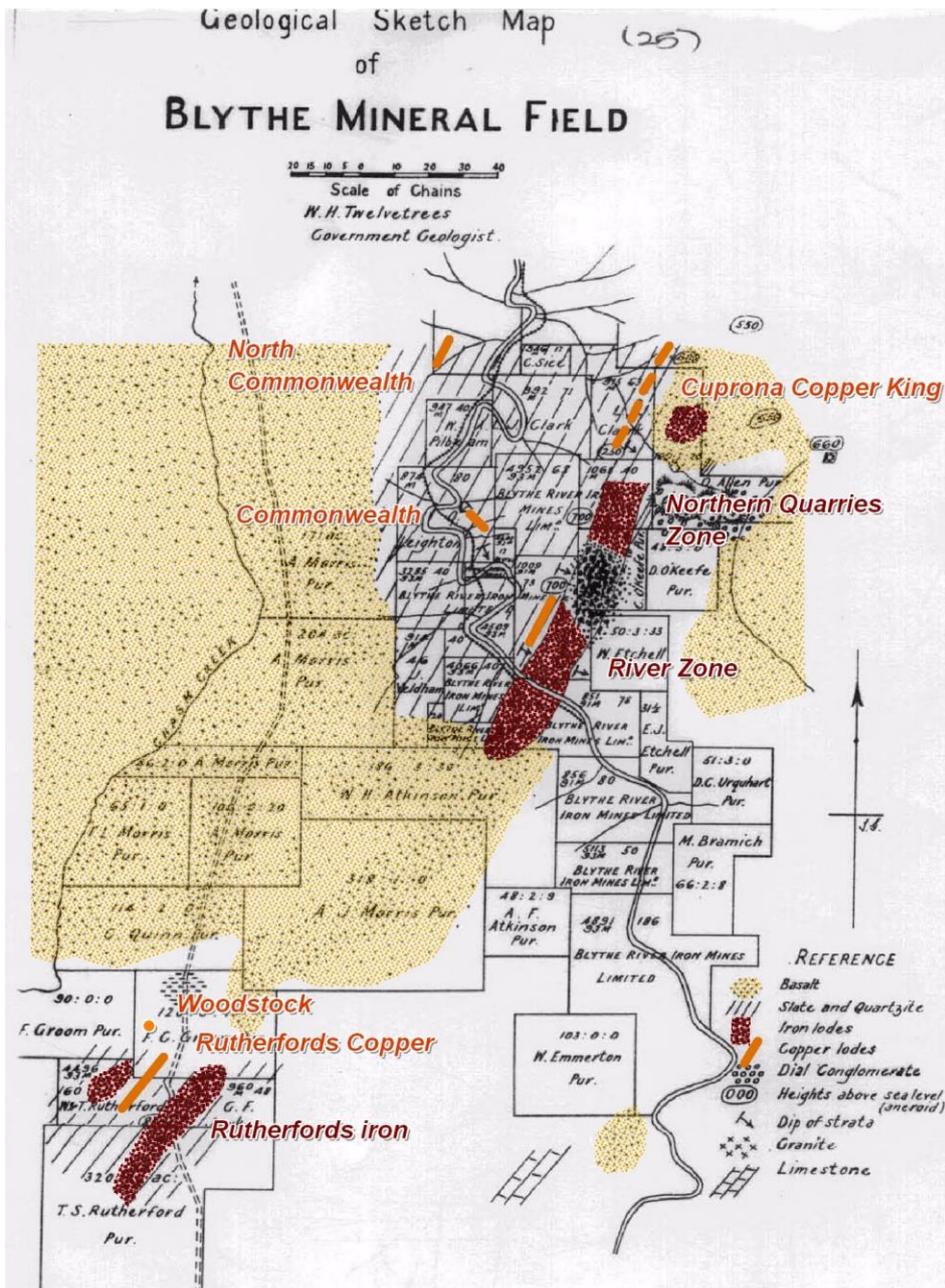


Figure 1.2: Blythe Mineral Field showing copper and iron prospects – central and south area, after Twelvetrees, (1905)

This intent of this report is to summarise the early mining and recent exploration history and discuss the potential for further copper mineralisation.

## 2.0 Geology

The copper lodes are hosted in slates and sandstones of the Burnie Formation. The Burnie Formation here consists of multi-deformed Proterozoic metasediments which strike northeasterly. In the mine area they dip moderately to steeply to the northwest.

The copper lodes occupy shear zones which cut across lithological boundaries, striking northeasterly and dipping steeply southeasterly. Whilst the Copper King Shear Zone is the major copper bearing shear, there are other parallel mineralised shears.

As Twelvetrees (1905) note "though the line of mineralisation right through from Rutherford's is a long one, it does not follow that one and the same lode continues through without interruption. It is more likely that the lode shoots tail out and separate ones start, not exactly on the same line, but on parallel lines, the whole, however, forming a mineralised belt which is continuous all through these mining sections.

Regarding the copper mineralisation in the Copper King mine an anonymous geologist in Butler (1970) states that "In old reports the ore zone is described as sub-vertical, dike-like, 30' in width, and part of an intermittent line of copper mineralisation running NE to the coast and SW towards Devonian granite. The lode material is variable in nature, mainly consisting of massive quartzose rock with veins of copper-bearing ore at intervals. Elsewhere it consists of chalcopyrite in a gangue of slate, with veins and patches of quartz and siderite and disseminations of pyrite. Oxidation to cuprite, native copper and carbonates is common. Payable ore is mainly confined to the footwall (west (sic) side) and in places occurs in the graphitic slate outside the footwall."

Twelvetrees (1905) visited the Copper King mine during its operation and provides descriptions of the lode as exposed in the workings at the time. He states that the 100' long No.2 tunnel, "driven 31' across the lode formation" (in a westerly direction) was "the only place in the mine where the full width of the lode has been proved." "Some seams of copper ore occur at the immediate entrance to the tunnel ... some nice-looking red and black oxides of copper show in this seam. The ... tunnel passed through alternate bands of hard rock and black copper ore. For 11 feet the lode matter intersected was poor, but afterwards about 10 feet of gossanous material came in and yielded the ore which is piled outside (12 tons at 7% Cu). The adit has been driven right through the lode channel to the graphitic slate country on the east wall." "Towards the end of the drive the lode is carried along the east wall, showing some copper stains and oxidised ore. A cross-cut east is necessary to tap the richer part of the lode." (Twelvetrees, 1905)

In the Upper (No.1) Tunnel, a narrow crosscut tunnel driven west 100', the lode "has been carried the width of the drive but extends outside the west wall for at least 23 feet." "The formation as disclosed in this cross-cut consists of massive quartzose rock with veins of copper bearing material at intervals." (Twelvetrees, 1905).

Twelvetrees (1905) summarises saying "The line of lode is a persistent one, and of considerable width, nearly half a chain. The formation must not be looked as payable all through this width. The footwall portion seems to be that in which payable ore is most largely developed, though at the same time there are bands of ore elsewhere in the formation which will make frequent cross-cutting necessary. The ore deposition partakes of the irregularity which characterises most lodes, but the large quantities of oxidised ore indicate the probability of a strong pyritic lode at depth."

Regarding the nature of the copper mineralisation in the Rutherfords and Woodstock mines Gee (1977) states "the deposits are similar to those of the Copper King Mine, and consist of isolated veins of quartz containing pyrite and chalcopyrite. The veins penetrate quartzite and slate of the Burnie Formation within a 100 m wide NE-trending zone.

The lodes near the surface are capped with limonitic gossan and in the shallow adits Nye (1941) recorded supergene alteration with bleaching of the slate adjacent to the lodes and development of

secondary covellite and sulphate ... The lodes are generally narrow and discontinuous, ranging in strike from 040° to 320° and dipping steeply west.” (Gee, 1977).

Thomas and Henderson (1943) summarised the geology as follows. “The gossanous outcrops extend along a belt of fracturing which trends north east. Along these fractures copper lodes, with a little gold and silver, have been formed. The occurrence of these gossans in isolated patches points to a lack of continuity of the ore bodies and their development as lenses as the intersection of the fracture systems. This is corroborated by the exposures in the underground workings.” (Thomas and Henderson, 1943).

### 3.0 Mining and Exploration History

It appears that copper was discovered in the area in the early 1900's.

The most significant abandoned copper mine is the **Copper King mine** in the centre of the belt. The location of this and other mines in the centre and northern part of the belt are shown in figure 1.

The mine operated between 1904 and 1917 producing 1331 tons of ore between 1904 and 1909 grading 16.7% Cu (Butler, 1970).

At the time of his visit in 1905, Twelvetrees saw a 150' Lower Adit, 100' Upper Adit and a smaller adit with another adit on the line of lode a few hundred feet to the north.

Subsequent work saw the mining of a main shaft to 150' deep, now filled in, and another smaller shaft 100' north reportedly on good showings. It is unknown at this stage as to the amount of underground development. This may be ascertained by researching newspapers of the day who often reported on such details.

The mine has been investigated by a number of companies. In Quest Exploration investigated the mine in 1965/66 and considered re-opening it.

In 1966 the Department of Mines drilled 4 shallow diamond drill holes for 286.3m into the Copper King shear on three sections. Two holes hit the lode, a third does not appear to have done so and a fourth was deliberately targeted away from the lode. Intersections of the lode are described as sludge in two of the holes.

Pickands Mather carried out a programme of gridding and soil sampling in 1970.

An anonymous Pickands Mather geologist (?) in Butler (1970) states that 31,800' of gridding had been completed, 157 soil samples collected and 16 stream sediment samples taken. Two lines were read for ground magnetics (4N and 8N) and the grid was reportedly covered with a 'Broadside' EM survey (14000' surveyed). The results of this EM survey have not been sighted. A 200ppm copper soil anomaly corresponds with the old mine workings (see figure 3.1)

Butler also (1970) shows a design for a drill hole to intersect the lode 150' below the creek level. The hole was not drilled.

In 1988 CW Davis investigated the mine with some limited sampling (Whitehead, 1988). They also re-assayed the Department of Mines drill core with best result 2.1m down hole at 0.25% Cu in CK2.

The **Evans** workings lie 400m north of the Copper King mine where a 20' adit cross-cuts slates (Twelvetrees, 1905). It is not clear as to whether the adit intersects the Copper King line of lode. Mapping in Whitehead (1988) shows the Copper King shear turning more easterly at its northern end away from Evans workings.

The **North Commonwealth** mine (Twelvetrees, 1905) consisted of a surface cut and an 80' adit. The former intersects slates with pug seams and a 2'-18" wide quartz vein at its end. The tunnel intersected quartzites and pyritic black slates.

The **Commonwealth** mine consists of a 280' adit driven to intersect a lode outcropping on the hill and a shaft on the lode which consists of "indurated slate and quartzose rock traversed by parallel veins of quartz, crossed in all directions by veinlets of the same mineral." (Twelvetrees, 1905). At the entrance a pyritic seam was intersected with a few similar seams intersected further in.

At the northeastern end of the field are Edwards, Smiths and Bramichs workings.

At the abandoned **Edwards** mine, also along strike from the Copper King, an adit has been driven 40' intersecting a "soft seam of soft slate" (Twelvetrees, 1905) at the tunnel entrance before passing through quartzite then back into slate. A little chalcopyrite has been got in the adit with a surface cut to the south exposing native copper.

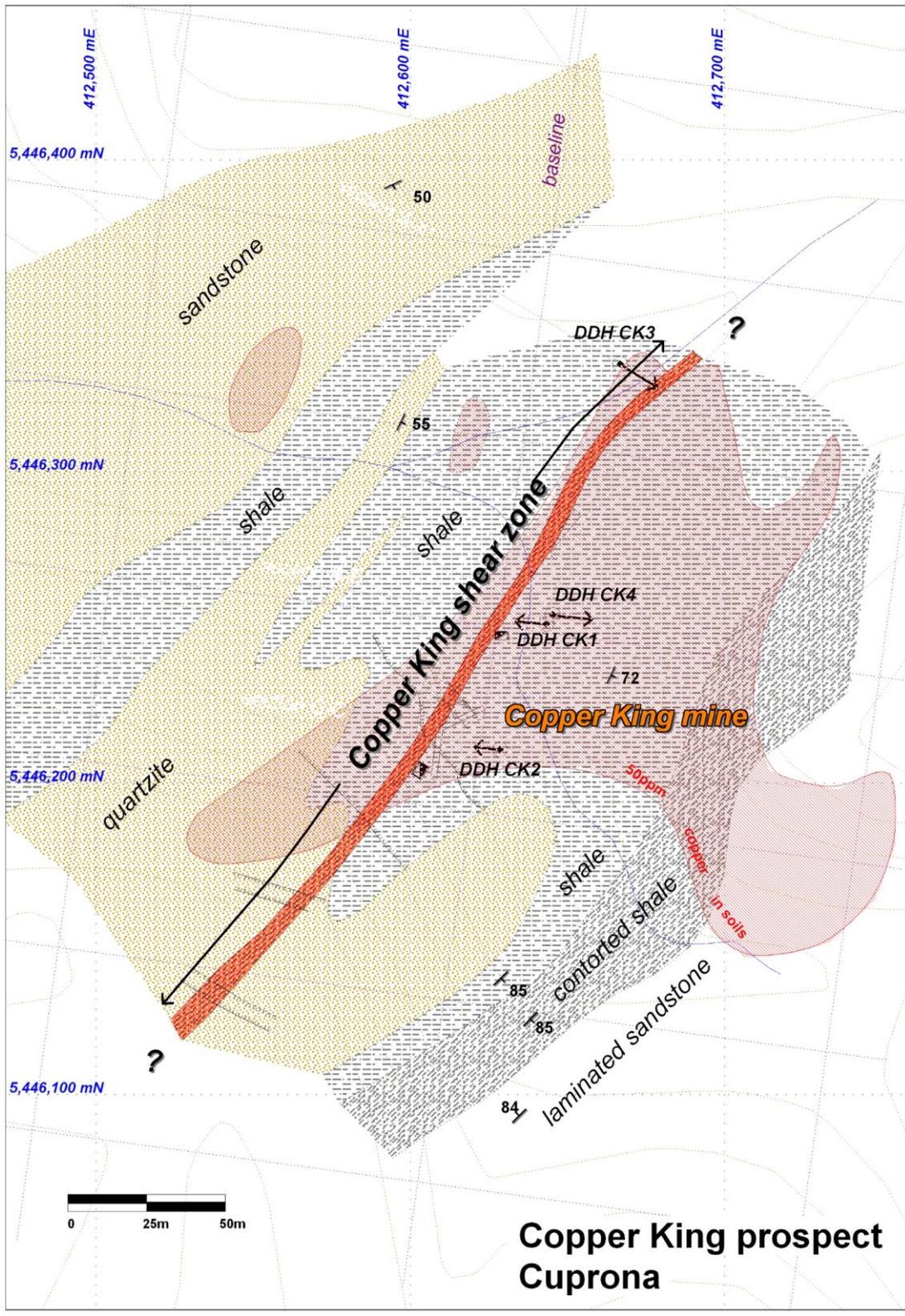


Figure 3.1: Copper King mine summary showing geology including Copper King shear zone, Department of Mines drill holes CK 1 to CK4 and 200ppm copper in soil anomaly from Whitehead (1988)..

At **Bramichs** an 18' adit completed in 1904 targeting splashes of copper in slate seen in the creek intersected splashes of chalcopyrite in black slates but no strong lode structure. "No body of ore has been discovered, but a good deal of mineral is scattered through the rock in these workings, and it may well be that there is more ore in the neighbourhood." (Twelvetrees, 1905)

**Smiths** workings consisted of surface cuts across a lode intersected in one cut as 11' in width with "1 foot of quartz on the footwall, succeeded by soft puggy slate in patches, graphitic slate containing lumps of dense iron pyrites, and dark slate with curved laminae, measuring with the quartz 4 feet in width. Seven feet of hard micaceous rock underlies the footwall quartz, and outside this slate again with veins of quartz and pyrites. The puggy slate 10 the lode is also vemed with quartz. A little copper pyrites is present, associated with carbonate of iron and quartz." (Twelvetrees, 1905)

At the southwestern end of the field are the Rutherfords and Woodstock abandoned mines (locations in figure 2).

At the time of his visit in 1905 the **Rutherfords** copper mine (ca. 1900; Twelvetrees, 1905) consisted of a 150' tunnel and a smaller shaft with cross-cuts at 16' and 32'. A main shaft had commenced and was at 99' with a cross-cut at 95' and 70 tons of ore was at surface. Twelvetrees (1905) reported that "in addition to about 7% copper the ore carries 3½ ozs. silver per ton".

Twelvetrees (1905) describes lode widths of 1' to 3', averaging 12"-18". The ore is chalcopyrite and a black copper oxide and the lode strikes northeasterly, dipping northwesterly.

The **Woodstock** copper mine was visited by Henderson (1941) who mapped and sampled the old partly collapsed old workings on behalf of L.J. Clark who was undertaking prospecting operations.. He described the workings as on "a series of sub-parallel lines of mineralisation which occupy a zone 200 feet wide, striking in a general north 40 east direction. Another zone occurs about 150 feet further west."

In the No.1 prospect workings a 21' trench and 20' drive and 13' cross-cut intersecting hydrothermally altered slates with 5' assaying 0.9% Cu (Ag 3dwt, 9grs; Au tc).

The No.2 prospect consisted of a 60' trench with an adit extending off it to a shaft. Here "the 'lode' consists of a narrow fissure which strikes north 70 east with a high south eastern dip of 87°. Some silicification of the wall rock has taken place, this 'hard ore' consisting essentially of pyrite with a little chalcopyrite and pyrrhotite in a siliceous gangue only extends for a little over a foot on each side of the fissure." "Channel samples cut on each side of the fissure indicate the grade of the partly oxidised ore in this prospect.

<u>Reg No.</u>	<u>Sample No.</u>	<u>Section width</u>	<u>Location</u>	<u>Assay result</u>
785	2	4'6"	NW side fissure	1.5% Cu; 6gr Au; 12dwt, 6gr Ag
786	3	3'6"	SE side fissure	2.3% Cu; 3oz, 0dwt, 6gr Ag; 4gr Au

representing 1.85% copper over an eight-foot section" (Henderson, 1941).

In the No.3 workings a 4' section assayed 0.2% Cu, 4oz, 14dwt and 17grs silver and 9grs gold. (Henderson, 1941).

In 1943 Thomas and Henderson (1943) reported sampling the lode in the No.2 prospect with a 10' lode chip sampled and 2.4% Cu assayed (repeating a previous assay of 1.5% Cu). Thomas and Henderson (1943) states that "developmental work in No..2 prospect has proven (over a length of 60 feet open to the north) the presence of a lode which widens from four feet to about fifteen feet wide in a northerly direction." "The following are the departmental records of the assays on portions of this lode:-"

<u>No.</u>	<u>Sampler</u>	<u>Percentage Copper</u>	<u>Width of Sample</u>
2 & 3	Q.J. Henderson	1.85	8'
N3	P.B. Nye	3.1	7'6"

T1	D.E Thomas & Q.J. Henderson	1.5	10'0"
T2	D.E Thomas & Q.J. Henderson	2.4	20'0" (not true width)

Tasminex explored the Woodstock/Rutherfords area in the early 1970's (Grace, 1972) with a programme of soil sampling, geophysics, backhoe trenching and the drilling of 5 shallow open percussion holes. Only one hole successfully reached its target intersecting 15' @ 0.52% Cu.

The trenching intersected the Rutherfords lode in 4 trenches with best results 5' @ 6.0% Cu and 10' @ 4.45% Cu.

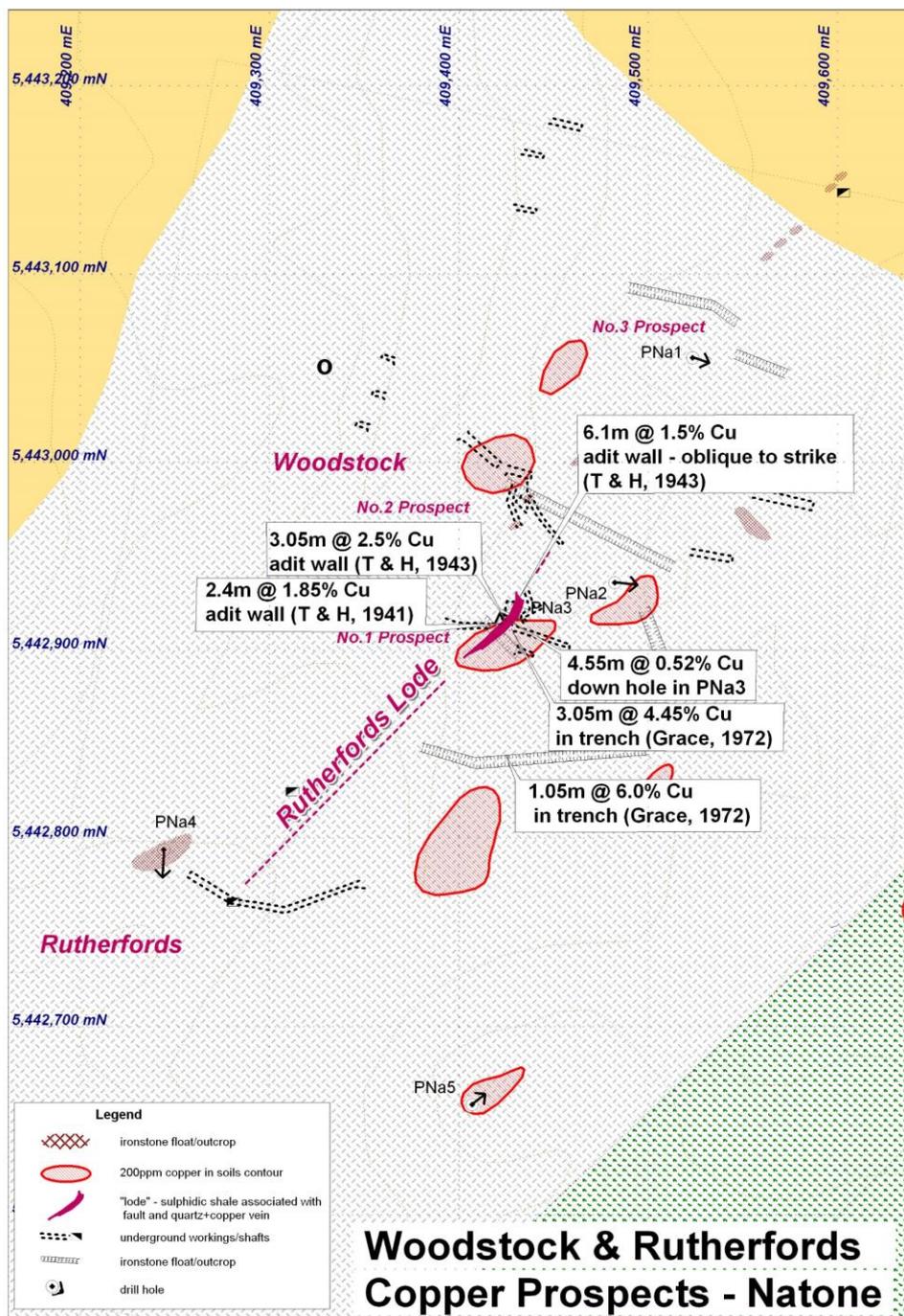


Figure 3.2: Woodstock and Rutherfords copper workings showing summary of better exploration results to date (after Thomas and Henderson, 1943 and Grace, 1972).

#### **4.0 Conclusions.**

The Cuprona-Natone area is prospective for shear hosted copper vein mineralisation with gold and silver credits.

The two main examples known to date suggest the target model to be a lode zone up to 6.4-9.4m wide e.g. Copper King as reported by Twelvetrees (1905), potentially at grades of 3.15% Cu e.g. weighted average of the five Woodstock samples.

The strike extent is undefined but apparently relatively short. Further work is needed before comment can be made regarding depth potential as there is no reason for mineralisation to not continue to depth.

Both prospects have seen very little effective drilling.

Mineralisation is likely controlled in dilational zones along these shears (i.e. flexures, splays and jogs in the fault geometry). Targeting would benefit a more detailed structural mapping of both prospects.

Both prospects lend themselves to EM as a prime targeting tool.

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