

Observations on Porphyry Systems of South East Queensland

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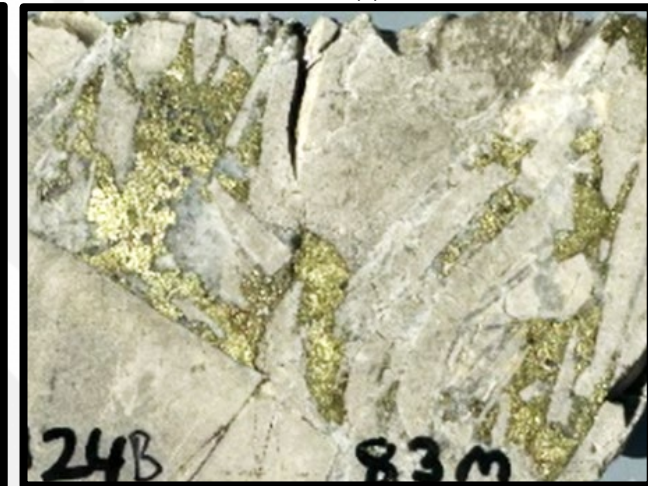
Mineralisation



Peripheral



Outer/Upper



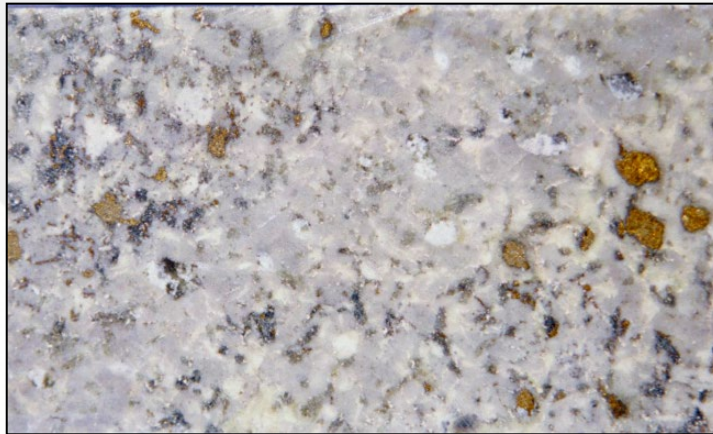
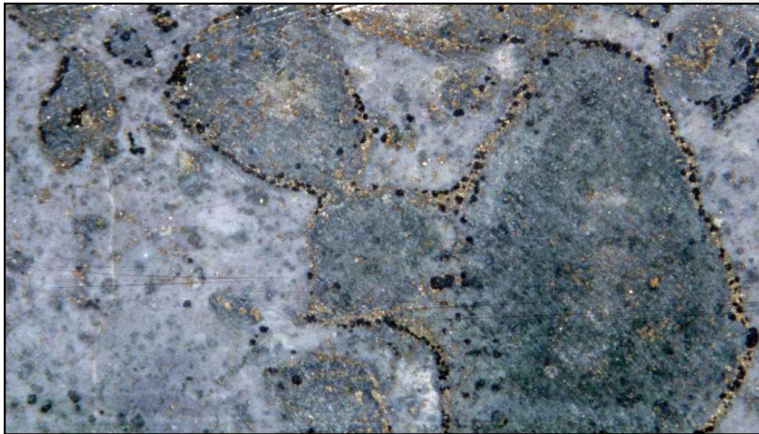
2026 Mineral Systems of Eastern Queensland Workshop

Acknowledgements

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- The support and assistance of the geology group of the DNRMMRRD
- Reference is made to publications from the
USGS, Economic Geology (Prof P M Ashley, D J Horton), CODES studies with reference to Dr Alan Wilson, Prof David Cooke, Dr Phil Blevin, University Queensland and QUT studies
- Special mention company activities by Activex , Aeon Metals and Cannindah Resources (public data all available on GSQ Open data Portal)
- EGRU and Kaylene Camuti

Not all porphyry's initially look like porphyry's



Source: Dr Alan Wilson MEG presentation, 2002

Context

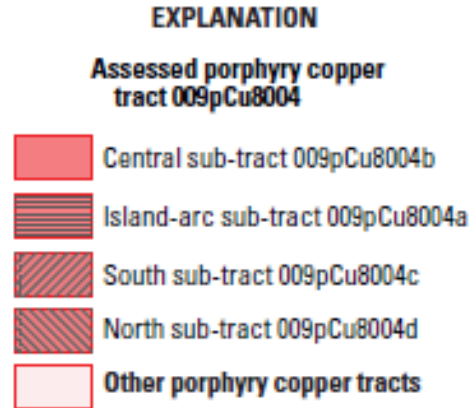
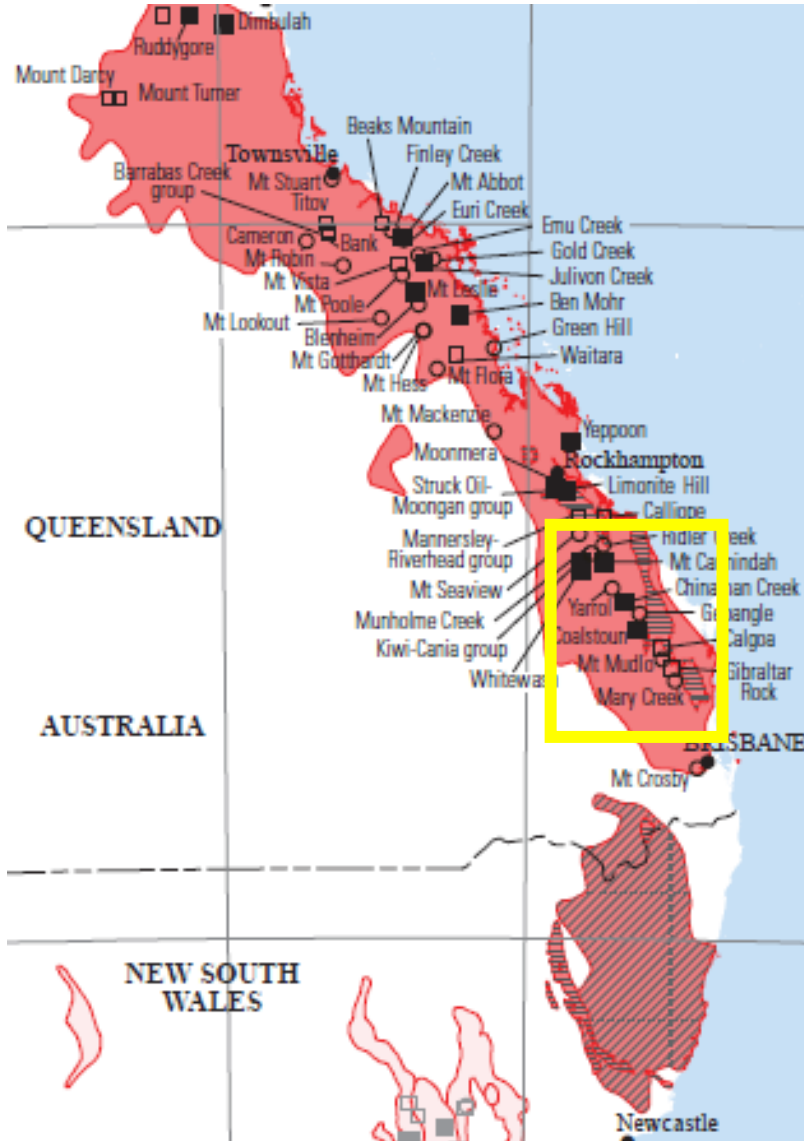
In 1990 the endowment of the NSW Ordovician Porphyry Belt contained ~2Mt Cu metal equivalent (E26).

In 2020 the NSW endowment approached excess of 20Mt Cu metal equivalent (30 years @ 0.6Mt Cu pa discovered and expanding). Discovery rate ~ 3.0Moz's pa equiv.

These changes have been driven by renewed company exploration investment and initiatives, the discoveries are driven by an increased orebody knowledge and targeting criteria, supported by deep drilling and aided by new extraction techniques – the NEW SEARCH SPACE. Porphyry systems can be company generational.

The Triassic of SE Queensland has up to ~1.0Mt Cu reported from historic exploration activities completed in the 1970's and 1980's and has not seen the NEW SEARCH SPACE.

Deposit Location's – South East Queensland



- Porphyry copper deposit; deposits associated with other tracts shown in gray**
- Porphyry copper prospect; prospects associated with other tracts shown in gray**
- Porphyry copper occurrence; occurrences associated with other tracts shown in gray**

Figure E1. Map showing the East Tasmanide permissive tract (009pCu8004) and sub-tracts. Also shown are known porphyry copper deposits, significant prospects, and occurrences in the East Tasmanide tract, New South Wales and Queensland, Australia.

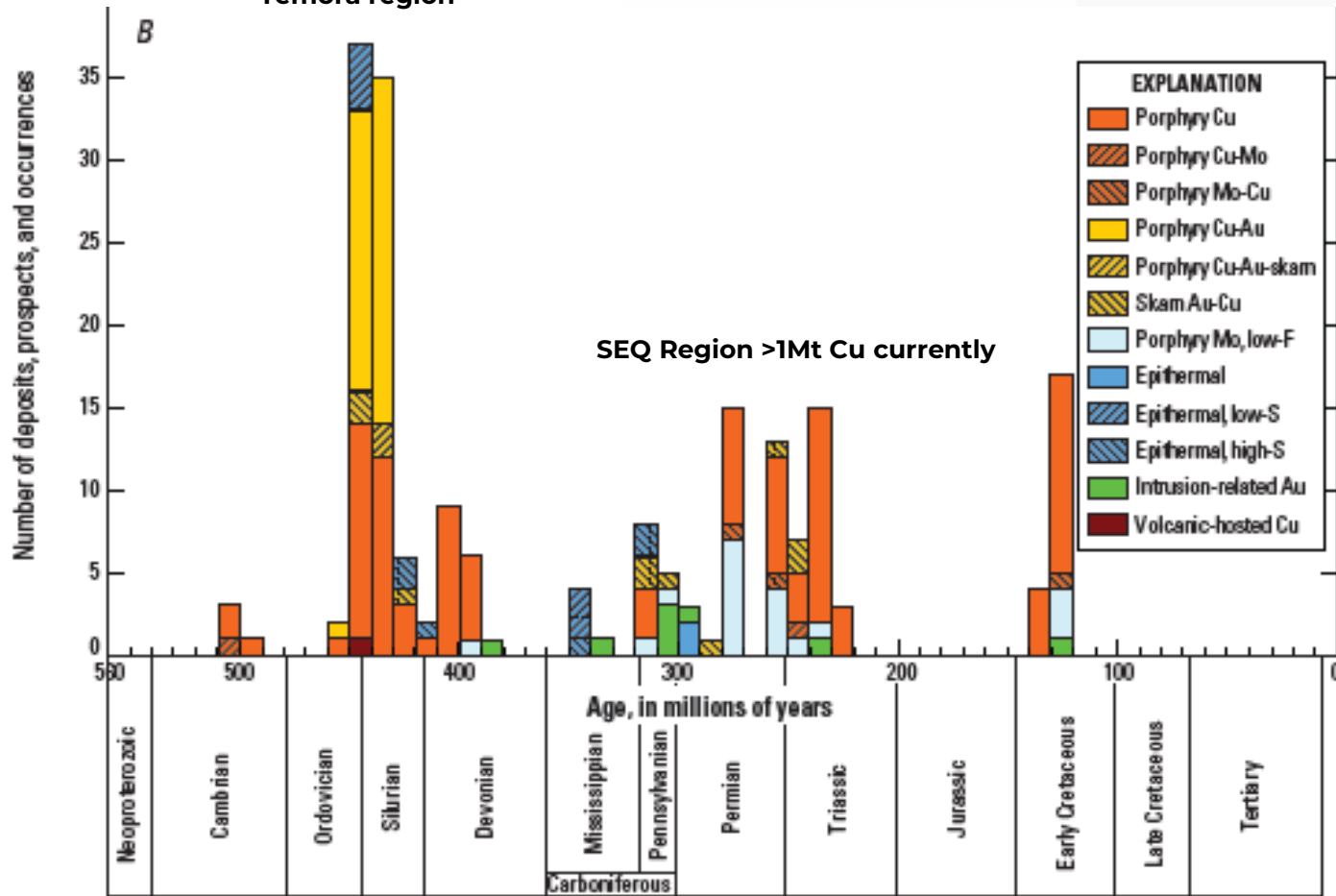
Table A1. Deposits included in the grade and tonnage model for the East Tasmanide and Yeoval tracts, Australia.

[Ma, million years; Mt, million metric tons; %, percent; t, metric tons; g/t, grams per ton; -, no data]

Name	Latitude	Longitude	Age (Ma)	Tonnage (Mt)	Copper (%)	Molybdenum (%)	Gold (g/t)	Silver (g/t)	Contained copper (t)	References
Yeoval	-32.728	148.643	388	12.9	0.38	0.01	0.14	2.20	49,000	Ewers and others (2002), Geoscience Australia (2010)
Ben Mohr	-21.266	148.868	123	20	0.20	-	-	-	40,000	Horton (1978), Ewers and others (2002), Geoscience Australia (2010)
Chinaman Creek	-25.230	151.617	250	200	0.20	-	0.33	-	400,000	Horton (1978), Ewers and others (2002), Geoscience Australia (2010)
Coalstoun	-25.617	151.830	235	80	0.30	-	-	-	240,000	Geoscience Australia (2010)
Dimbulah	-17.097	144.100	275	20	0.25	-	-	-	50,000	Horton (1978), Ewers and others (2002), Geoscience Australia (2010)
Julivon Creek	-20.539	148.299	132	35	0.16	0.01	-	-	54,600	Geological Survey of Queensland (2010)
Kiwi Carpet	-24.664	150.877	225	200	0.15	0.01	-	-	300,000	Horton (1978), Ewers and others (2002)
Limonite Hill	-23.687	150.630	246	100	0.30	-	-	-	300,000	Ewers and others (2002), Geoscience Australia (2010)
Mount Abbot	-20.197	147.950	119	200	0.15	-	-	-	300,000	Ewers and others (2002), Geoscience Australia (2010)
Mount Cannindah	-24.671	151.276	235	17.5	0.65	-	0.16	6.75	120,000	Geoscience Australia (2010)
Mount Leslie	-20.937	148.160	124	20	0.20	-	-	-	41,500	Ewers and others (2002), Geoscience Australia (2010)
Ruddygore	-17.129	144.549	275	10	0.4	-	-	-	40,000	Horton (1978), Ewers and others (2002), Geoscience Australia (2010)
Boobyjan										
Struck Oil	-23.605	150.462	244	100	0.20	-	-	-	200,000	Ewers and others (2002), Geoscience Australia (2010)
Whitewash	-24.807	150.875	237	71.5	0.10	0.04	-	1.19	71,000	Geoscience Australia (2010)
Yeppoon	-22.998	150.694	220	50	0.30	0.01	-	-	150,000	Ewers and others (2002), Geoscience Australia (2010)
Total									2,356,000	
Total, rounded									2,400,000	

Time Space Plot - Eastern Australia Comparison

20Mt CuEq – North Parkes, Cadia, Boda, Cowal district, Temora region



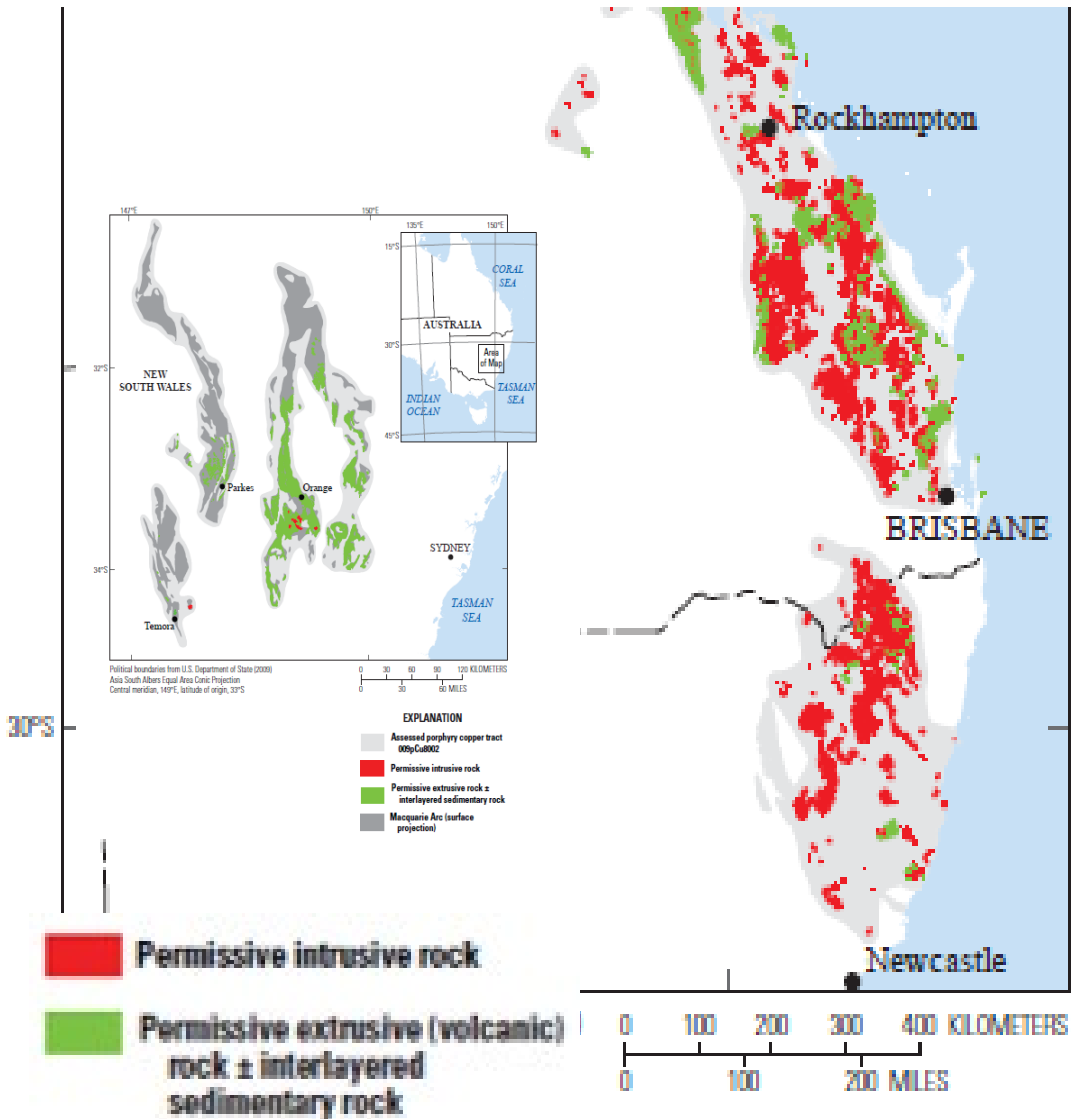
Macquarie Arc

- Macquarie Arc systems have high Au contents
- Mineralisation was developed during a short timeline on the Ordovician Silurian boundary, lots of occurrences
- Close spatial relationship to volumetric volcanics which have calc alkaline to alkaline affinities
- Spatial associated epithermal's in some systems
- Company investment in +Billions \$\$\$

SEQ

- Lower Au contents (currently)
- Mineralisation spans an extended timeline
- Volcanics are not as widespread or volumetric but have calc alkaline to alkaline affinities also
- Spatial relation in location and time to IRGD style mineralisation, LS epithermals also observed
- Company investment in +Millions \$\$\$

SEQ vs Macquarie Arc

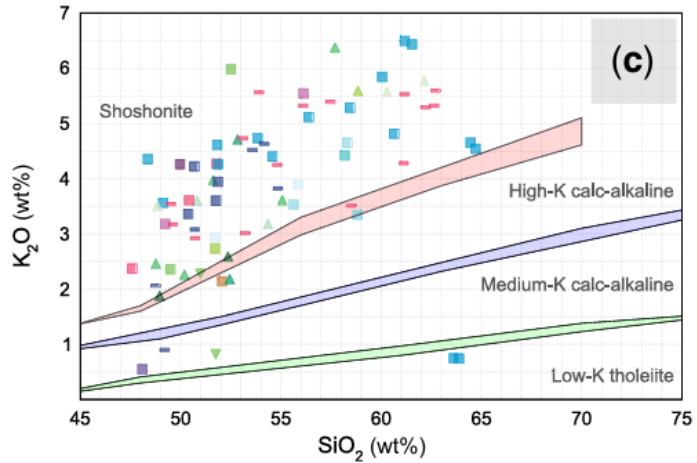


- Both Macquarie Arc and SEQ have similar surface footprint
- Volume of volcanics in Macquarie Arc is significantly greater than volcanics in SEQ. Volume of intrusive plutonic suites in SEQ is greater
- Macquarie Volcanics are predominantly andesitic in gross terms whereas SEQ is more felsic – dacitic
- Majority of Macquarie Arc mineralisation is controlled by a major structure – Lachlan Transverse Zone (historic crustal suture). SEQ has smaller district scale structures identified currently

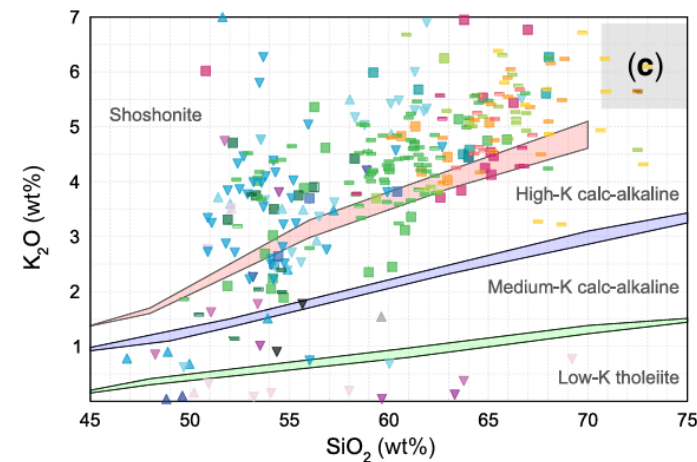
Summary

- SEQ on initial interpretation appears more eroded, extensive faulting by comparison, major sutures not obvious like LTZ

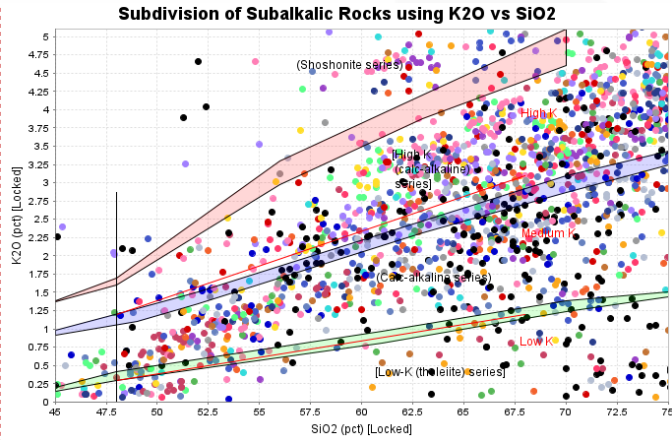
Igneous Geochemistry SEQ vs Macquarie Arc



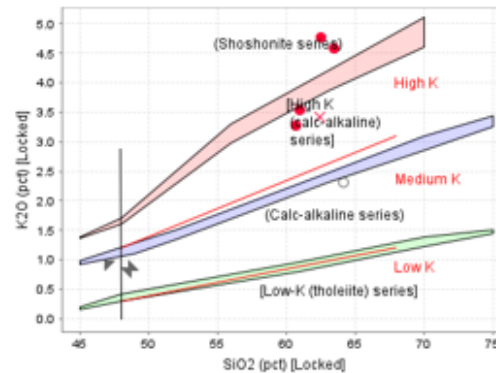
Cadia Complex – trending to Alkaline



North Parkes Complex

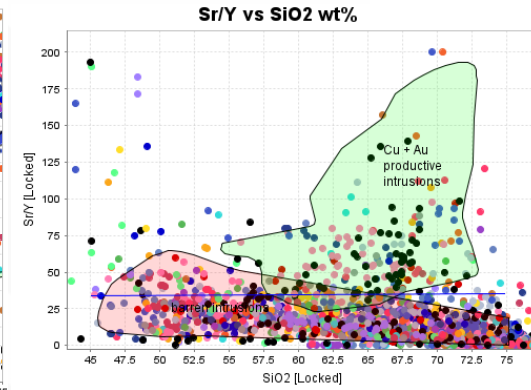


Subdivision of Subalkalic Rocks using K2O vs SiO2

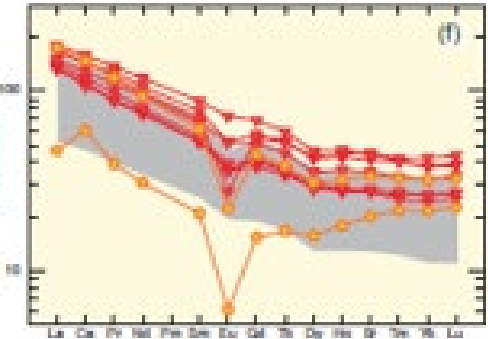


Bivariate SiO₂ vs K₂O to determine alkalinity of samples.

Mt Cannindah - SEQ

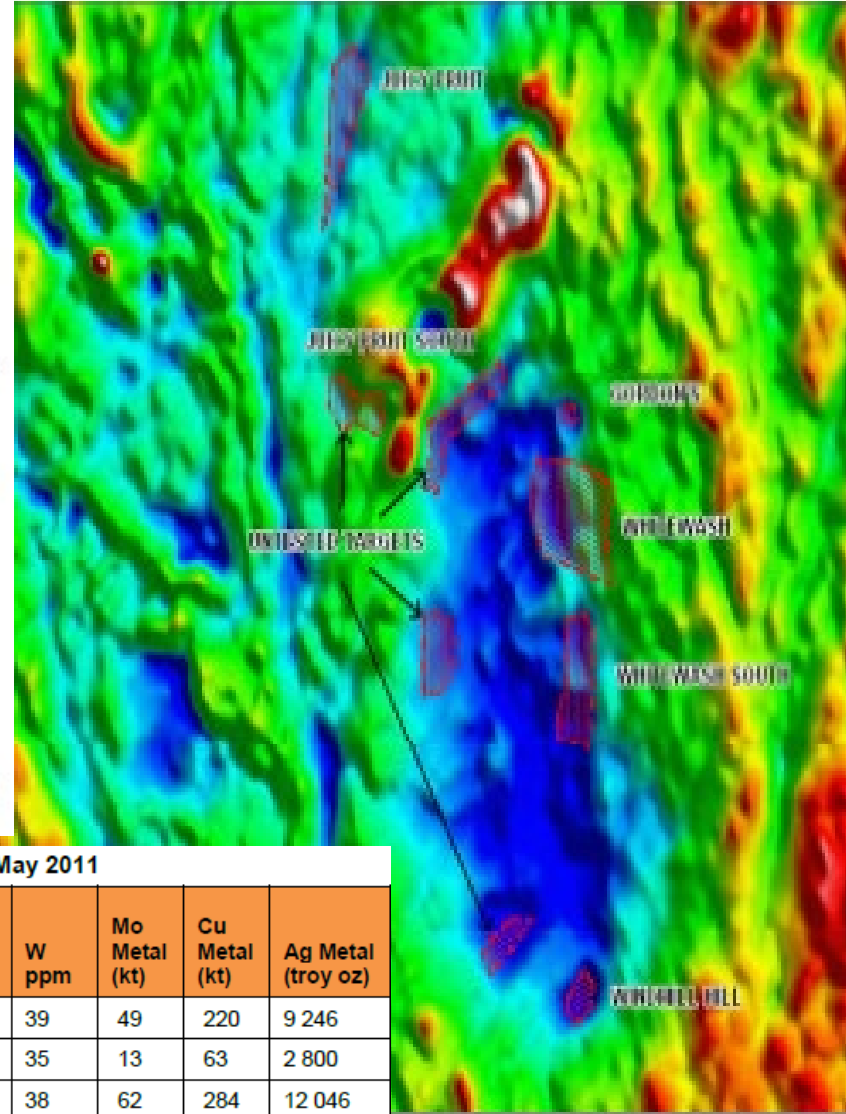
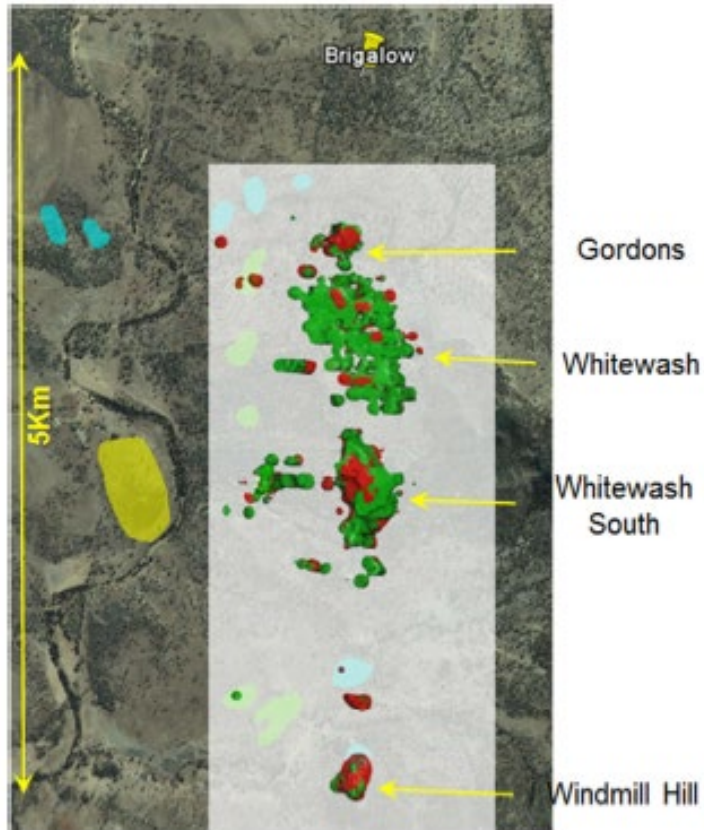


SEQ Volcanics to date



- Majority of Macquarie Arc data is from identified mineral systems – bias?
- SEQ has evidence for the appropriate igneous fertility – early stage more work required, evidence for fertility and alkaline classification on some systems

Whitewash

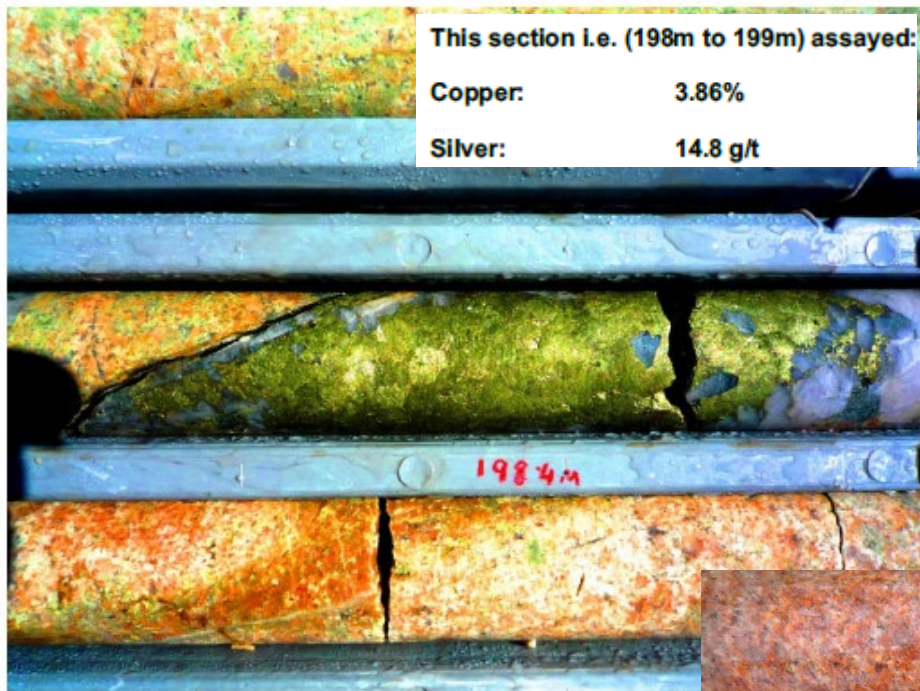


- Large open ended sub economic resource Mo Cu dominated by Mo
- No clear evidence for high grade
- Mineralisation located in the upper or apical regions of hypabyssal granite intrusive complex, on the margins of the intrusive
- Evidence for multiphase intrusives but the majority of the mineralisation is in the “slushy” apical zone
- Drilling tested to depths of 700m
- Mineralisation associated within magnetic low

Greater Whitewash Resource May 2011

Resource Category	MoEq Cut off ppm	Tonnage Mt	MoEq ppm	Mo ppm	Cu ppm	Ag ppm	W ppm	Mo Metal (kt)	Cu Metal (kt)	Ag Metal (troy oz)
Indicated	425	185	615	263	1189	1.55	39	49	220	9 246
Inferred	425	56	569	239	1123	1.54	35	13	63	2 800
Total	425	242	604	258	1173	1.55	38	62	284	12 046

Whitewash – Textures of mineralisation



This section i.e. (198m to 199m) assayed:

Copper:	3.86%
Silver:	14.8 g/t

1984m

Pegmatitic veins

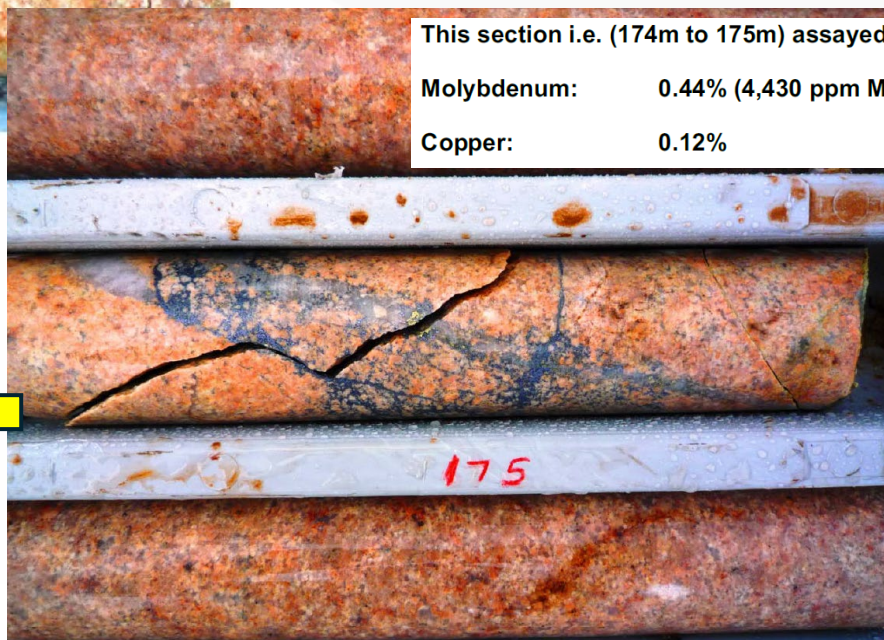


This section i.e. (201m to 202m) assayed:

Molybdenum:	624 ppm
Copper:	0.37%
Silver:	3.5 g/t

Weak minor almost B style veins with diss Mo in cavity

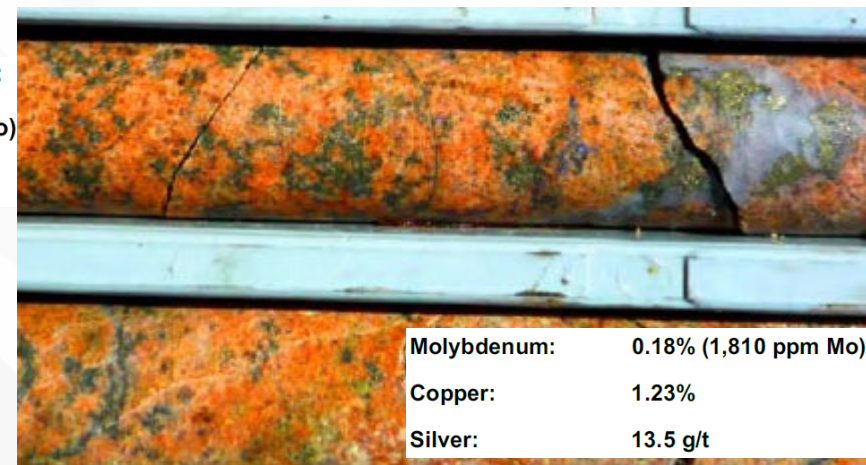
Weak miarolitic cavity's (slush) with late stage moly vn breccia overprint



This section i.e. (174m to 175m) assayed:

Molybdenum:	0.44% (4,430 ppm Mo)
Copper:	0.12%

175



Molybdenum: 0.18% (1,810 ppm Mo)
Copper: 1.23%
Silver: 13.5 g/t

Well developed miarolitic cavity's (slush)



Whitewash

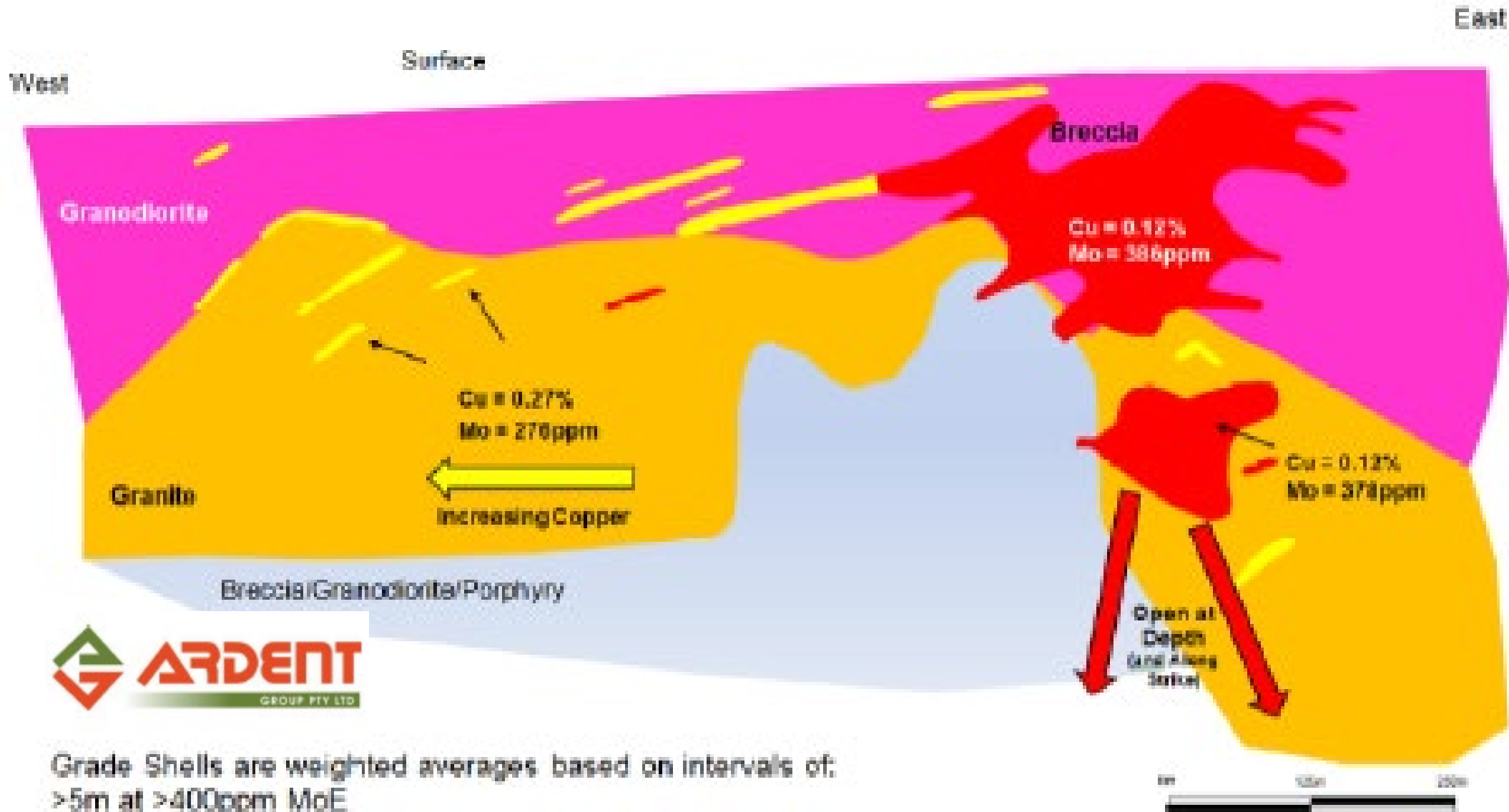


Sheeted translucent quartz veins, multiphase intrusive aplite dyke with wispy A veins, pegmatite



Sheeted Mo quartz veins

Whitewash Model Schematic – Ardent Group



Coalstoun (ref Prof PM Ashley et.al – Econ Geol)

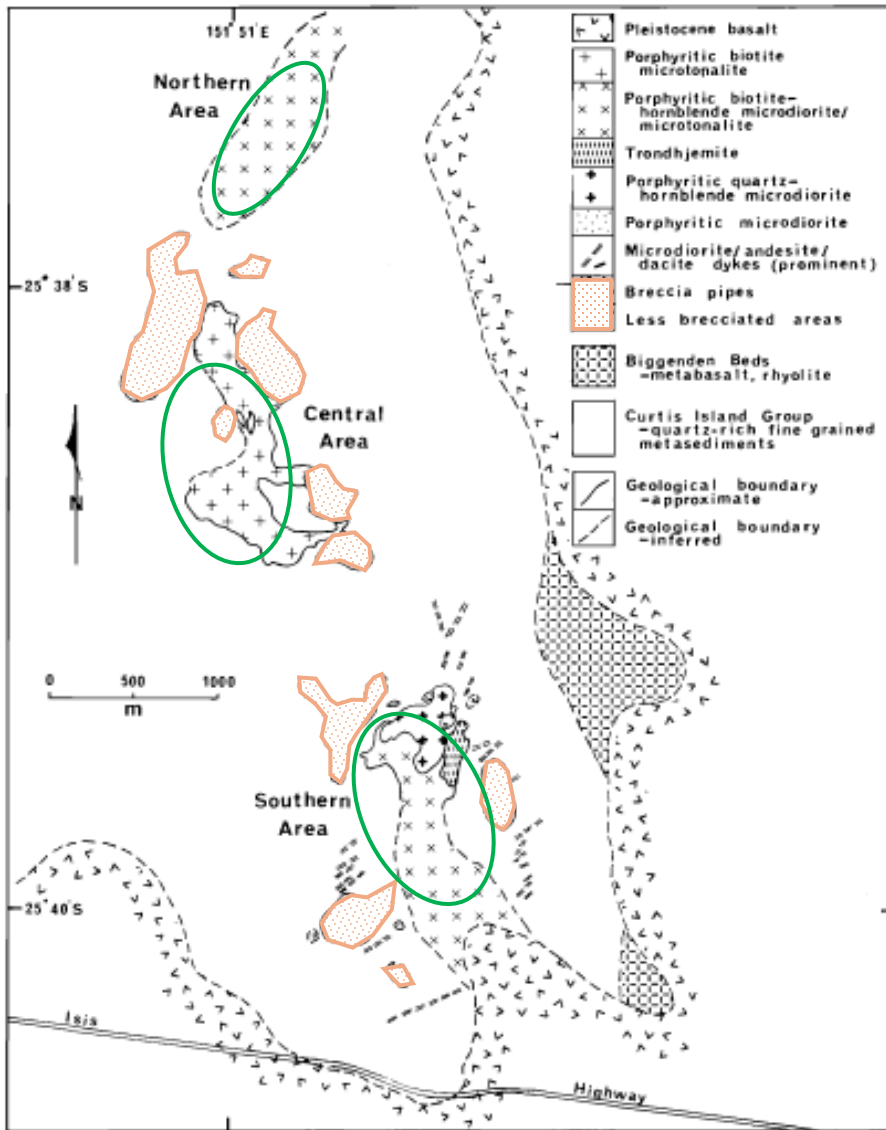


FIG. 5. Outcrop geology of the Coalstoun porphyry copper prospect (modified from Graham, 1975).

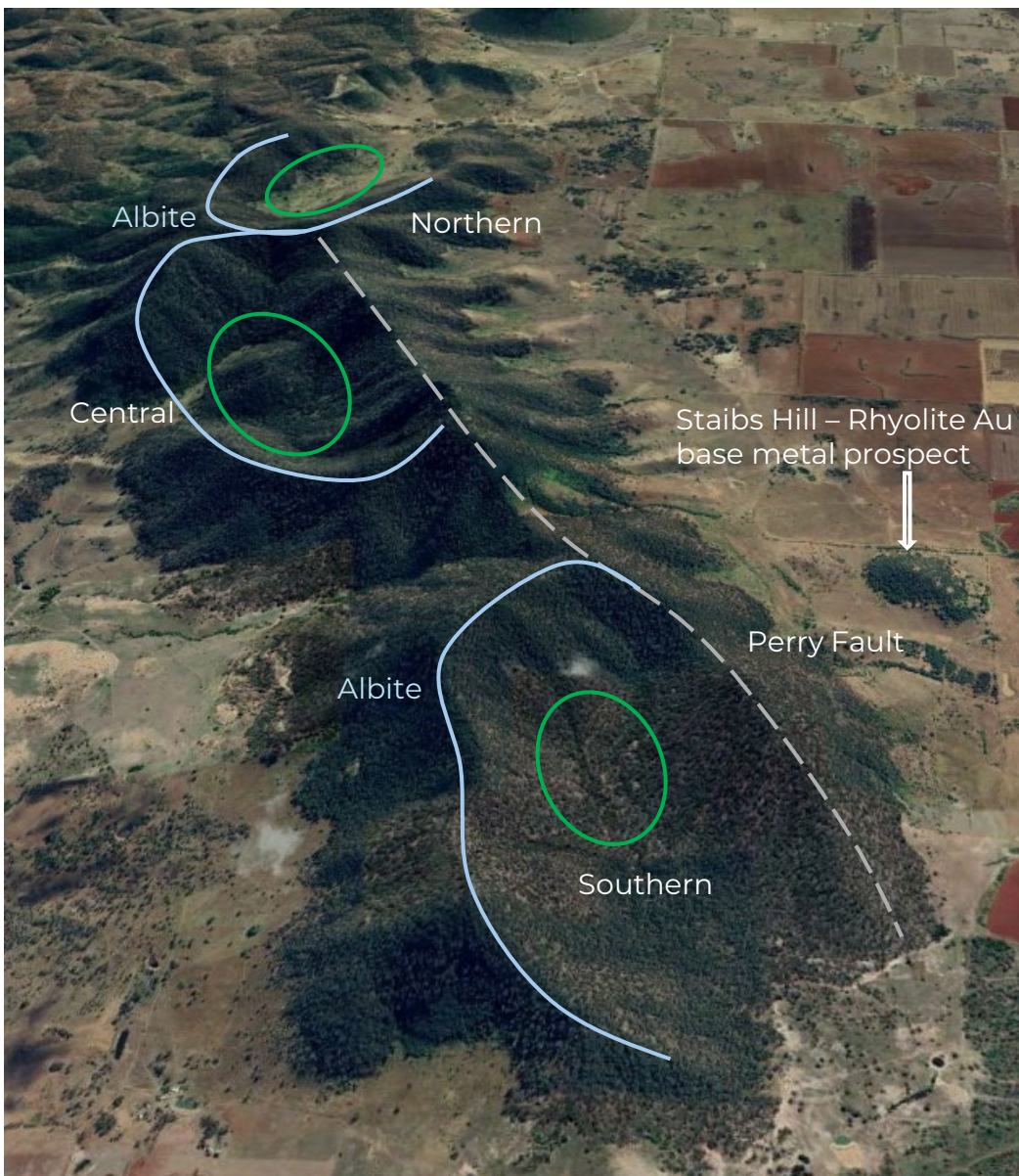
- Discovered in 1960s by Kennecott, evaluated extensively drilled by Esso in 1970's, deep holes by Newcrest in early 2003 - 2012
- 3 intrusive dioritic centres over an area 6km by 3km located on Perry fault system, assoc with Marcella Volcanics (calc alkaline high K), peripheral rhyolite centres Staibs Hill
- Characterised by extensive and volumetric hydrothermal brecciation forming rims or margins to the centres
- Largest porphyry system in SEQ by footprint size
- Classic zoned hydrothermal system Cu Mo core peripheral Zn Pb As +- Au Ag halo
- Alteration typically sericite pyrite but the is hypogene kaolinite, biotite developed at depth
- Volotiles including tourmaline and flourite commonly observed
- Peripheral propylitic alteration well developed and large zone of albite form distinct ridges
- Extensive zones of low grade, no evidence for high grade currently
- Small Au prospects on margins
- Sub economic resource Cu Mo
- Region of younger Tertiary Basalt

Historic Resource – 2015 Activex

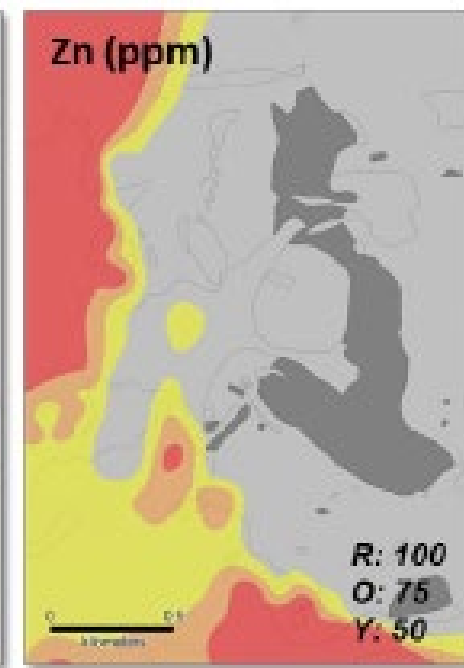
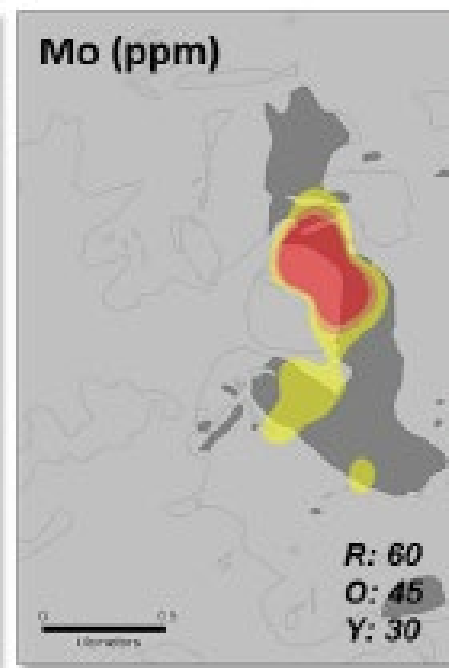
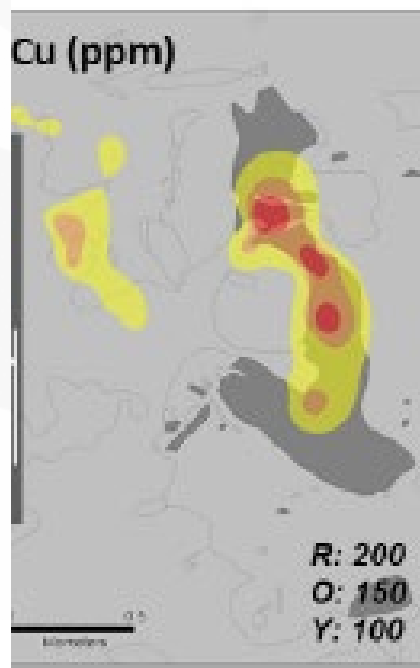
Category	Domain	Tonnes (Mt)	Cu %	Cu (t)
Inferred	Supergene Cu – POX	13.82	0.36	49,458
Inferred	Primary	136.32	0.25	344,338
Inferred	Total	150.14	0.26	393,810

(minor rounding errors)

Geochemistry (Activex)



- Displays classic Porphyry Geochem signature
- Cu Mo geochemistry define the 3 intrusive centres with the Central Zone being the highest order and most significant
- Well developed peripheral Zn halo +/- Pb As
- Eastern side not sampled



Coalstoun Oxidised (Newcrest)



Figure 3 : Supergene Enriched Copper Zone in Partially Oxidised Rock

8m @ 0.28% Cu from 23m

Hole No	Intersection
CDD016	17m @ 0.3g/t Au, 3.16g/t Ag and 0.08% Cu from 500m; and 18m @ 0.19g/t Au, 6.5g/t Ag and 0.14% Cu from 524m
CDD003	93.6m @ 0.18% Cu from 72m; and 453.4m @ 0.24% Cu from 203.9m to EOH; and 12m @ 0.12g/t Au from 463m
DD92CL_5	241.2m @ 0.23% Cu from 20m to EOH
ESSO12	199.1m @ 0.36% Cu from 17.1 to EOH
ESSO13	336.4m @ 0.22% Cu from 40.2 to EOH
ESSO14	391m @ 0.17% Cu from 18.9m
ESSO15	303.2m @ 0.12% Cu from 32.1m
ESSO16	413.6m @ 0.24% Cu from 16.8m
ESSO17	276.2m @ 0.17% Cu from 20.7m
ESSO19	399.3m @ 0.31% Cu from 18.3m
ESSO21	118.8m @ 0.23% Cu from 42.7m
ESSO22	390.7m @ 0.30% Cu from 0m to EOH; Incl 9.1m @ 2.3% Cu from 18.3m
ESSO23	47m @ 0.14% Cu from 27.4m; and 125m @ 0.16% Cu from 91.4m; and 111.9m @ 0.14% Cu from 289.5 to EOH
ESSO25	272.7m @ 0.16% Cu from 39.6m to EOH
ESSO31	371.8m @ 0.18% Cu from 12.2m
ESSO32	407.8m @ 0.27% Cu from 36.6m to EOH
ESSO33	149.4m @ 0.16% Cu from 27.4m
ESSO36	118.9m @ 0.34% Cu from 18.3m; and 213.3m @ 0.23% Cu from 222.5m; and 66.1m @ 0.12% Cu from 463.3m to EOH; and 6.1m @ 1.5g/t Au from 155.4m
ESSO39	170.98m @ 0.14% Cu from 201.16m to EOH

Coalstoun - fresh (Newcrest)

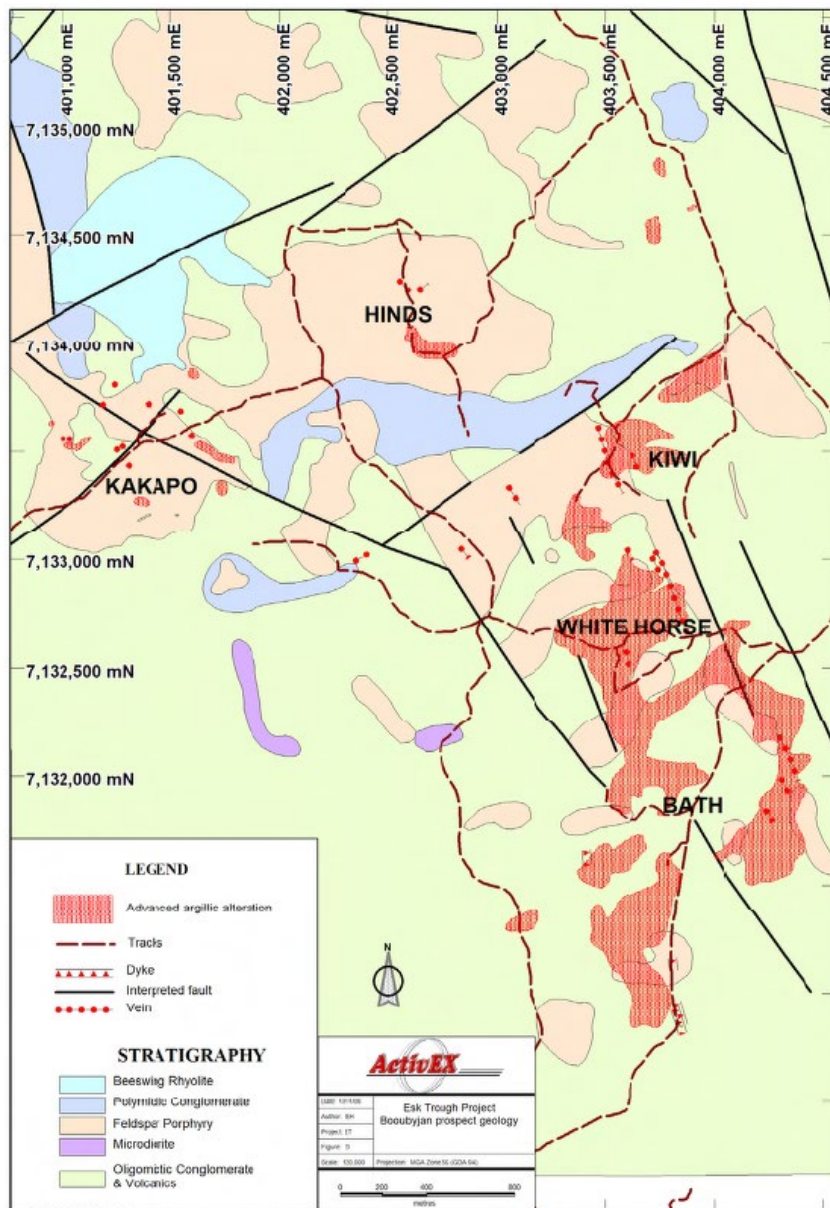


- Sheeted vein array – single phase
- Sericite pyrite quartz pyrite chalcopyrite veins averaging 3%-5% / m
- Deepest hole 800m
- No evidence for multiphase vein activity

Figure 4 : Primary Porphyry Mineralisation

(38m @ 0.64% Cu from 463m)

Booubyjan – Activex (Jose Veracruz et.al)



- High K Calc Alkaline intrusive centre south of Coalstoun on extensions of Perry Fault
- Footprint of system smaller (2km by 2km)
- Dominated by diorite but also includes quartz monzodiorites
- Surface alteration includes well preserved lithocap environ including advanced argillic kaolinite – pyrophyllite - dickite – alunite, Phyllic alteration common, Propylitic alteration is well developed
- Small areas of well developed potassic alteration and quartz magnetite chalco – bornite veining (Kakapo and Hinds)
- Zones of well developed breccia
- Well developed Au in potassic zones (highest of all 235Ma systems)

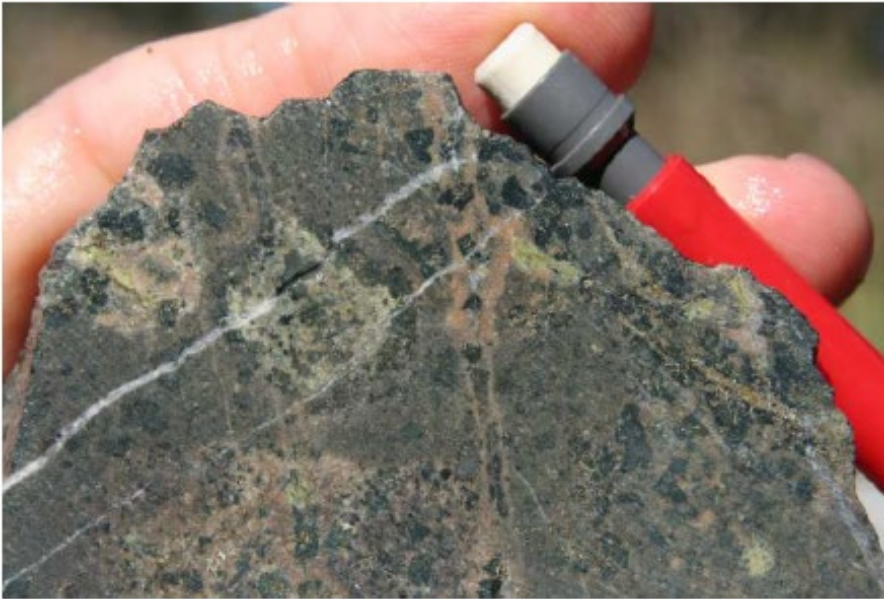


Kiwi Prospect



KAKD1 185m

Booubyjan – these rocks look like Macquarie Arc



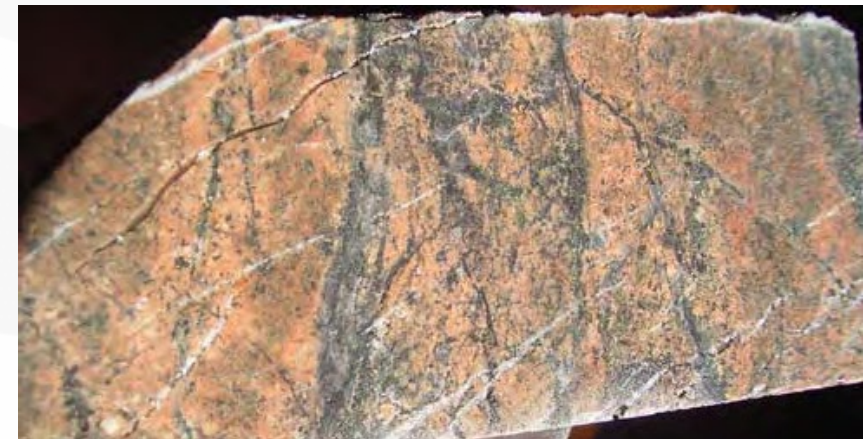
Orthoclase veining OP albite actinolite chlorite, possible clotting of tourmaline DDHABJ004 115.2m (Corbett photo) Cadia East analogue



Feldspar reddening – Ridgeway analogue

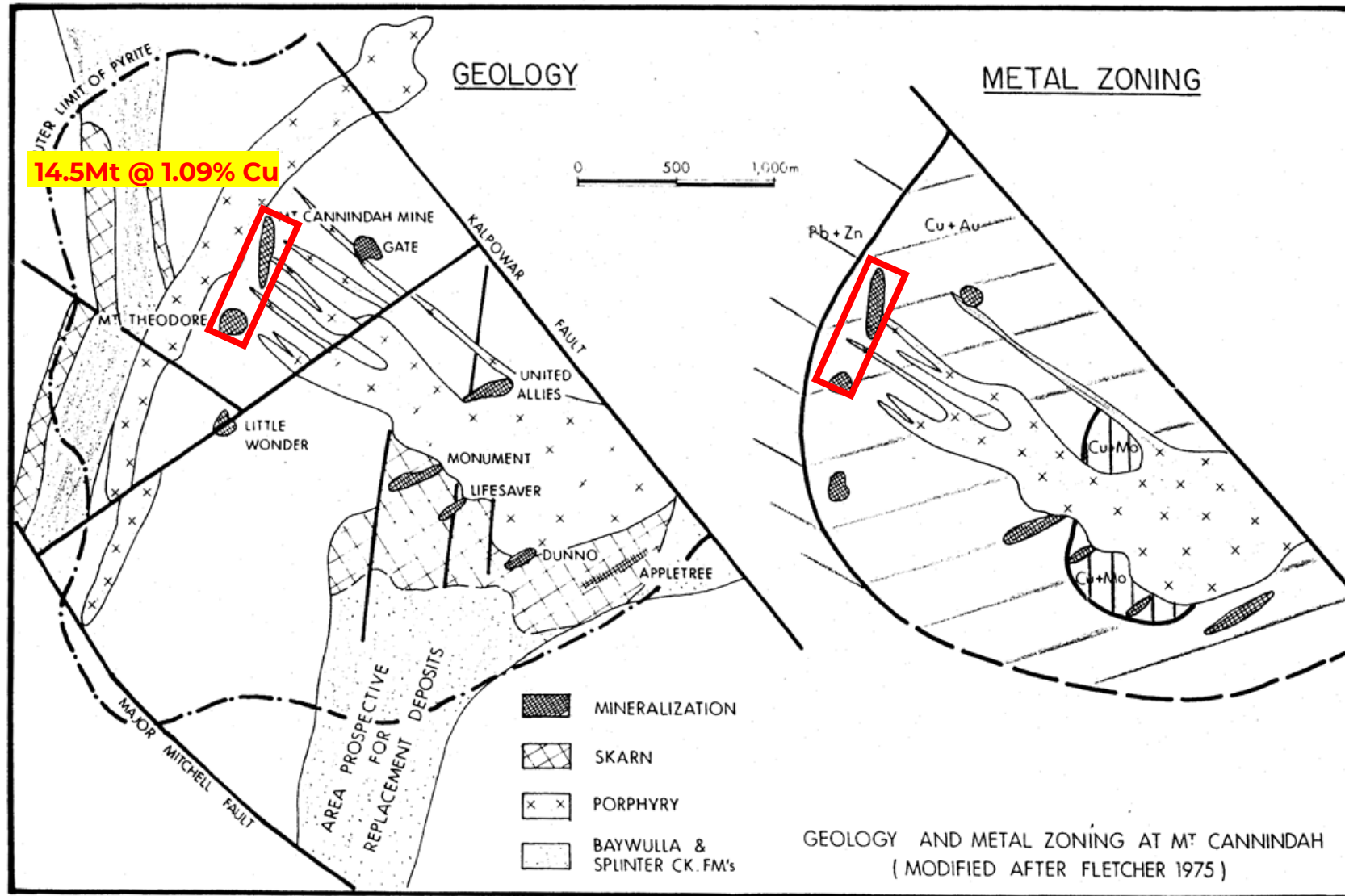


Quartz magnetite veins – Ridgeway analogue



North Parkes E26 analogue

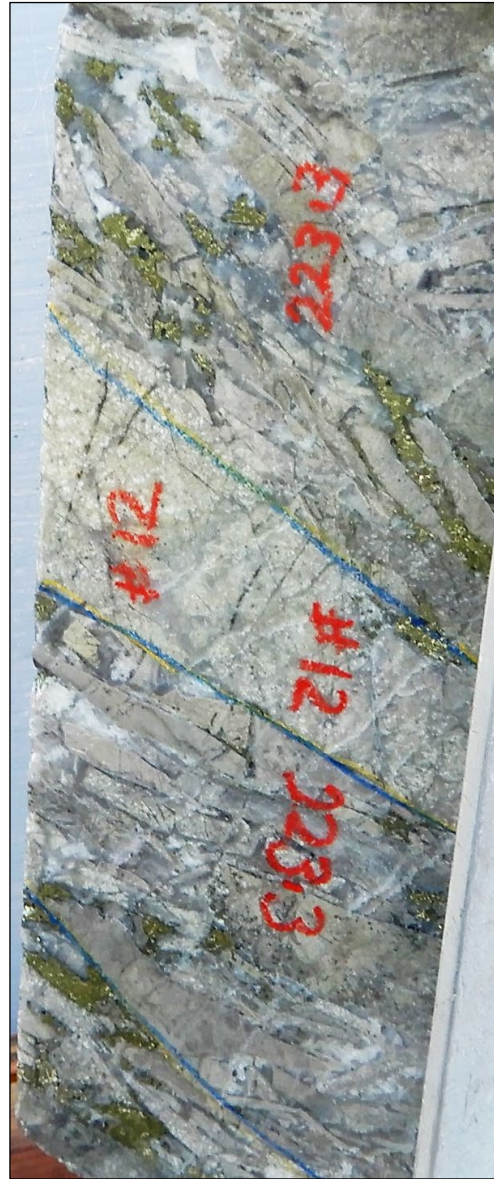
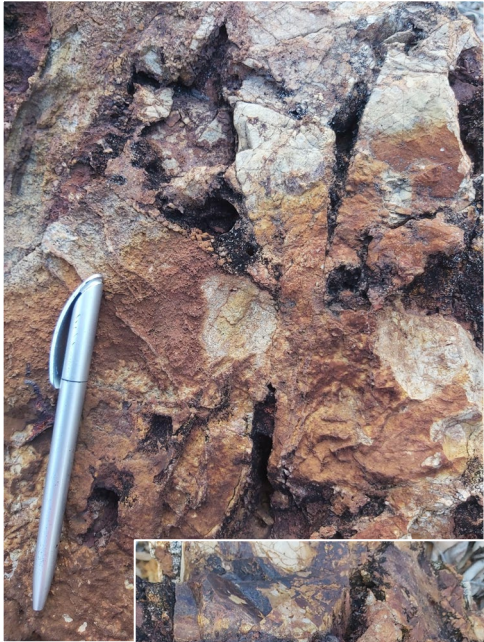
Cannindah System Geology - 1975



- Previous workers have recognised the Cannindah System Zonation typical of many other porphyry related systems
- Existing Cannindah Breccia Cu Au Ag resource is located peripheral to the central component of the system
- Porphyry style alteration and mineralisation is also observed

FIGURE 3

Cannindah Breccia

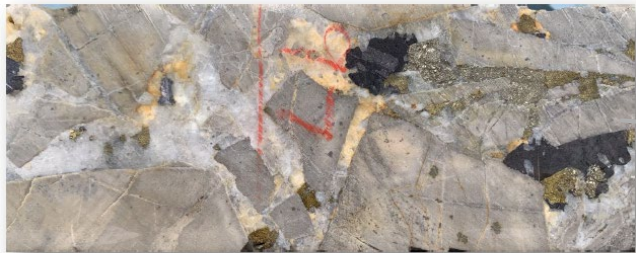


- Upper level described as a shingle / shatter breccia
- Clear strong structural control, orientation of structure may also determine breccia texture and grade
- Breccia localised on major rock rheology contrast
- Deeper levels of breccia column have increasing hydrothermal input defined by less elongate clasts – more rounded
- Early biotite hornfels is a brittle host and can control metal distribution
- Alteration within breccia channel (+100m wide) is chlorite – sericite – carbonate – pyrite – minor quartz (at depth ~ actinolite (Wilson 2023))
- Peripheral albite alteration halo measuring several 100's of metres
- Mo levels increase to the south suggesting system zonation

Cannindah Breccia Schematic (modified from Wilson 2023)



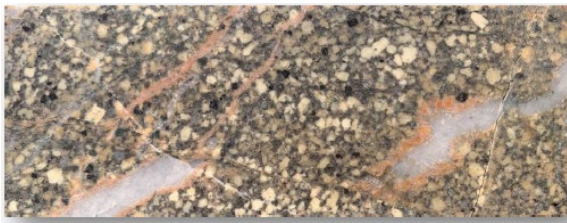
Weakly banded vein of pyrite – quartz – chalcocopyrite – tetrahedrite (black mineral, RHS of photo). 23CAEDD018, 360m.



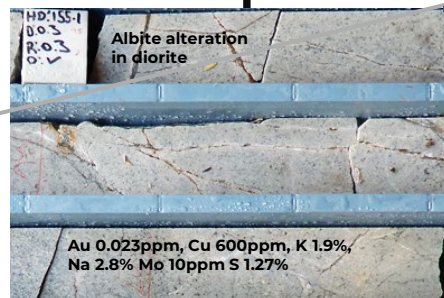
Hydrothermal breccia in which angular clasts of sericite-altered siltstone are cemented by quartz, Fe carbonate, pyrite, sphalerite, galena and minor arsenopyrite. 21CAEDD002, 97m.



Hydrothermal breccia comprising angular to subangular clasts of sedimentary wallrock and two phases of porphyry intrusion cemented by a fine grained mix of quartz and molybdenite with lesser calcite and pyrite. Late infill by coarse grained pyrite is also present. 23CAEDD018, 346m.



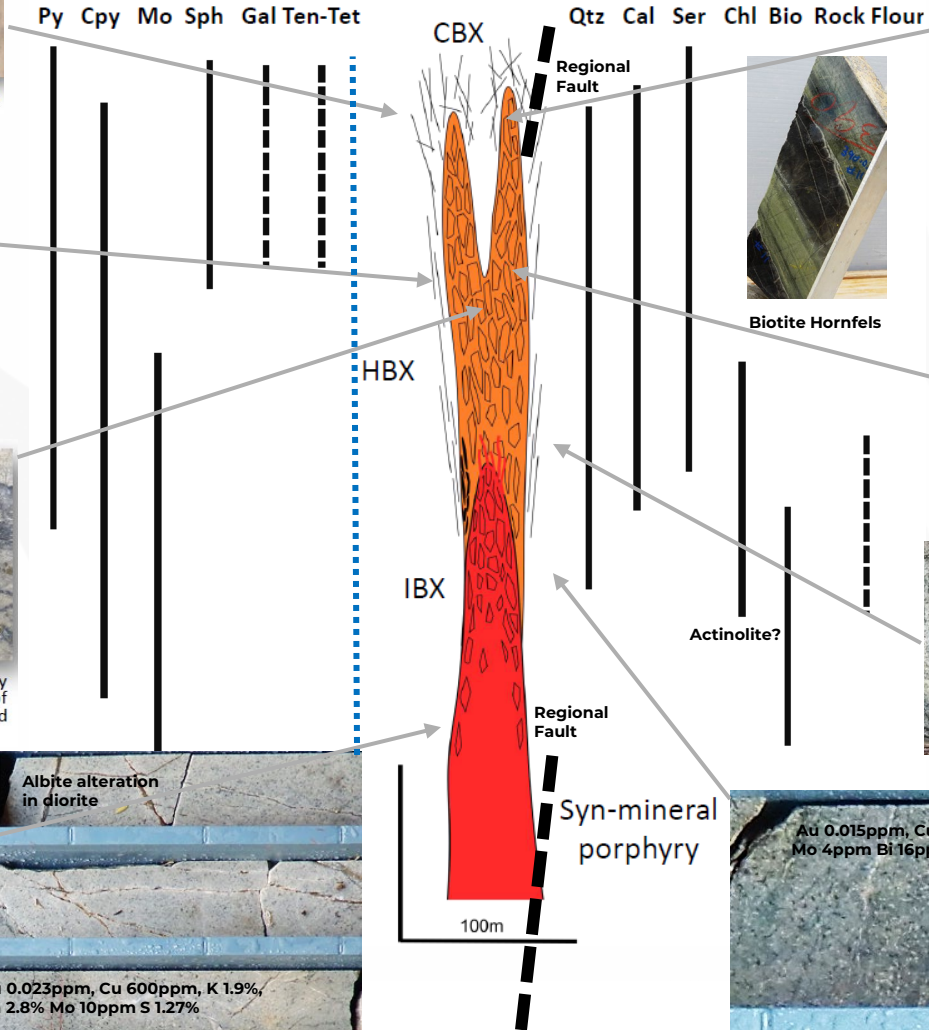
Granodiorite porphyry as above, cut by volumetrically minor aplite dykes with hydrothermal quartz infill. 23CAEDD018, 521m.



HD:155-1
0.03
R.0.3
0.5

Albite alteration
in diorite

Au 0.023ppm, Cu 600ppm, K 1.9%,
Na 2.8% Mo 10ppm S 1.27%



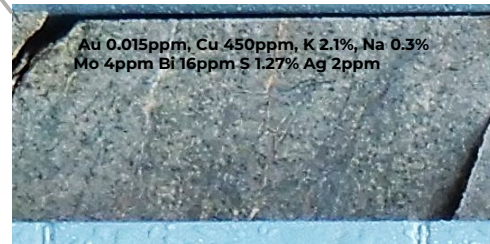
Hydrothermal breccia in which elongate and aligned clasts of sericite altered siltstone and lesser plagioclase porphyry are cemented by pyrite-chalcocopyrite, calcite and lesser quartz. Shingle-type breccia textures are indicative of decompressive shock related to sudden fluid withdrawal. 22CAEDD010, 272m.



Porphyry style "D" vein
pyrite sericite stockwork

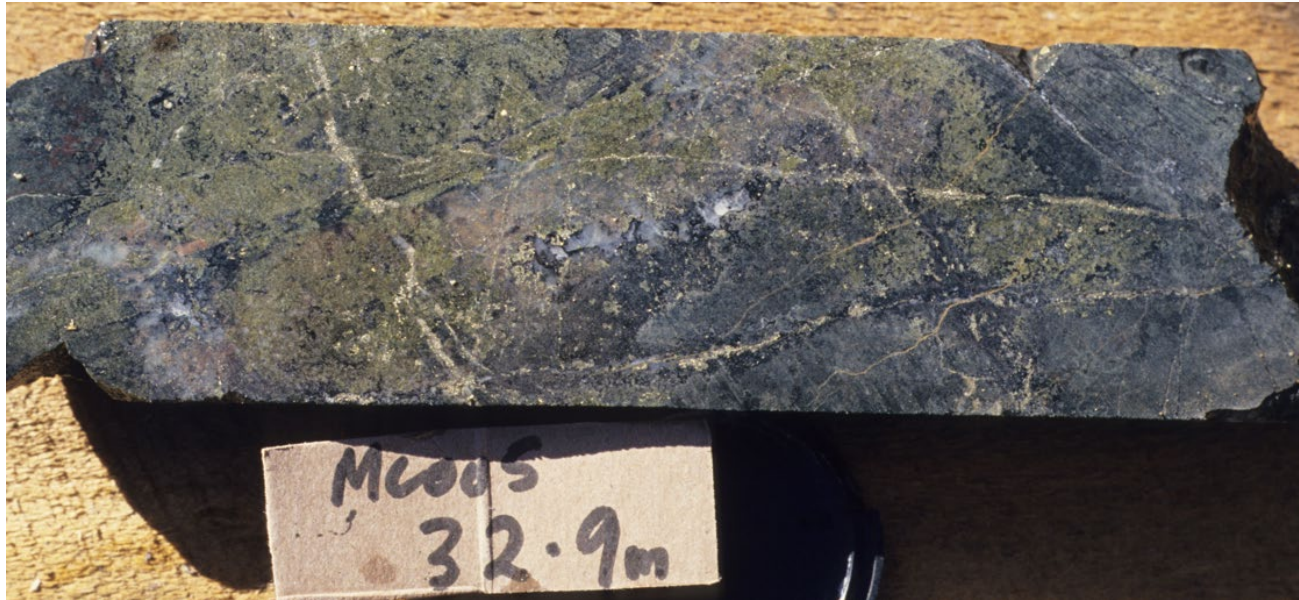


Porphyry style
sheeted
translucent "A"
vein stockwork



Au 0.015ppm, Cu 450ppm, K 2.1%, Na 0.3%
Mo 4ppm Bi 16ppm S 1.27% Ag 2ppm

Southern Target Skarns – underlying porphyry

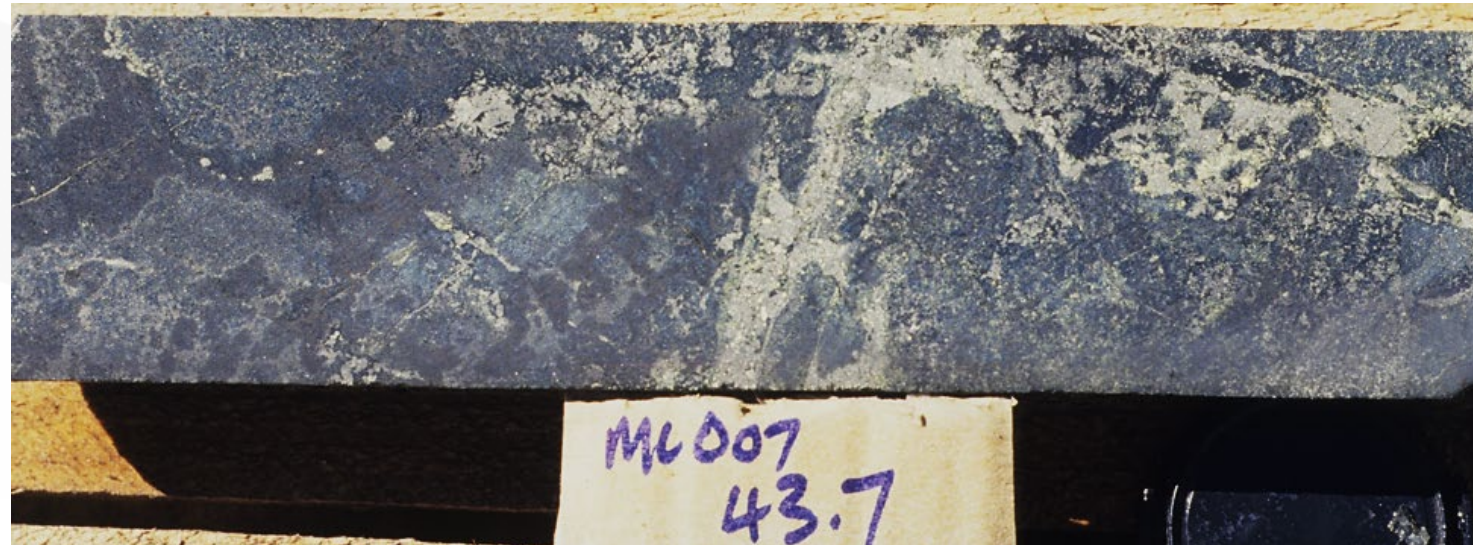


Lifesaver 4600ppm Cu 238ppm Mo
0.056ppm Au 2ppm Ag Epidote garnet
magnetite pyrite skarn

Lifesaver 1950ppm Cu 161ppm Mo 0.16ppm
Au 18ppm Ag Magnetite garnet pyrite skarn



Surface - oxidised
skarn with rare B
veins and C veins
1000 – 6000ppm Cu
0.1 – 0.7ppm Au

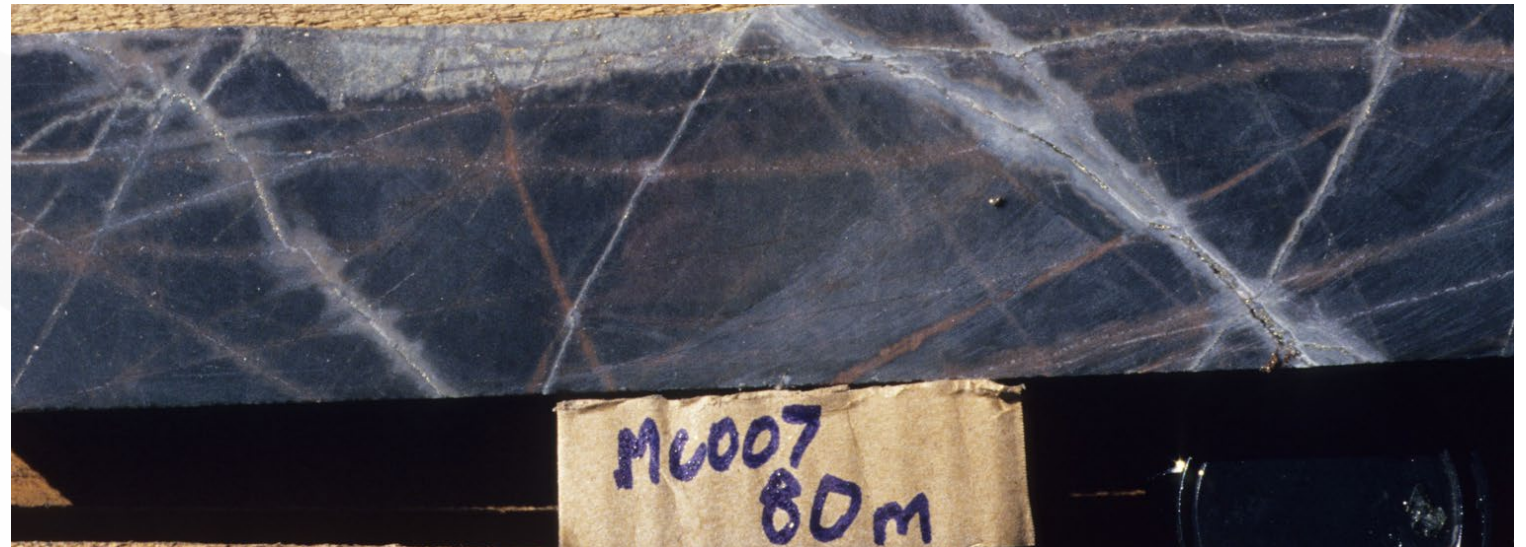


Southern Target – other styles

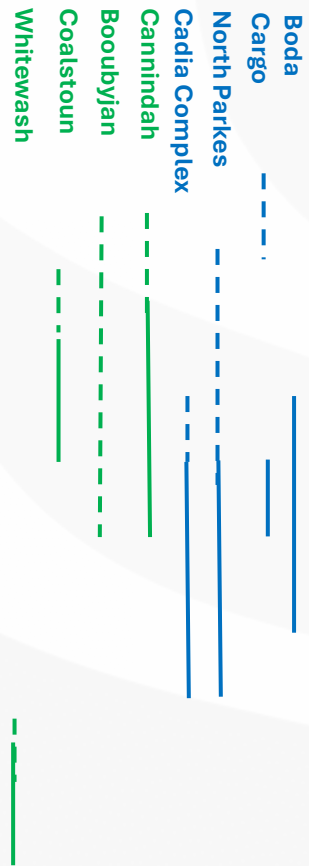
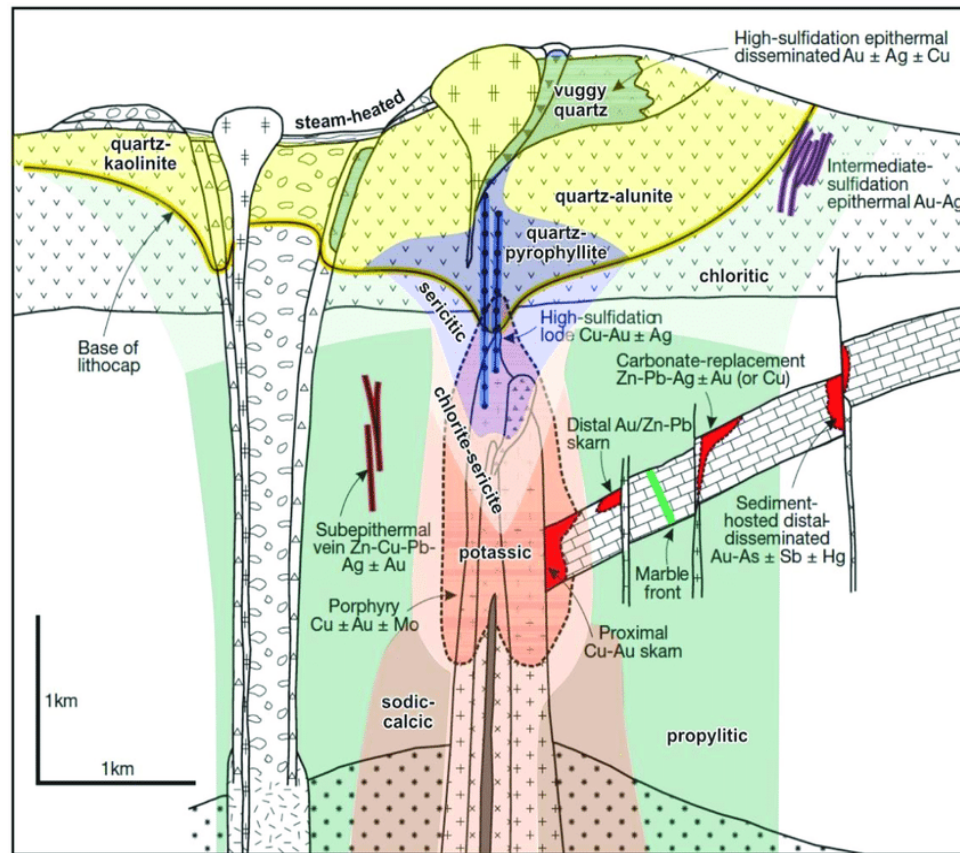


Lifesaver 5600ppm Cu 12ppm Mo 6.4ppm Au high Te veins

Lifesaver 1145ppm Cu 58ppm Mo 0.001 Au orthoclase fract stwk op qtz py ser stwk op biotite hornfels – potential vector towards pencil porphyry centre



Summary and Conclusions



- SEQ has classical porphyry systems with level of erosion ranging from deep to lithocap preservation
- Size or footprint of systems is slightly smaller
- Metal budget dominated by Cu Mo with minor Au
- Geological variations when compared to Macquarie Arc include
 - SEQ volumetric less volcanics, more intrusives
 - Higher degree of structural faulting
 - Litho geochemistry is predominantly Calc Alkaline High K (SEQ) vs High K to Shoshonitic (MA)
- However
 - Macquarie has seen Billions invested and has been studied for 30 years in detail (study bias on deposits)
- **SEQ in 2026 is the Macquarie Arc of 1990**
- SEQ has not seen the NEW SEARCH SPACE
- There is no definitive reason why SEQ cannot host Tier 1 deposits, it just needs investment.

