

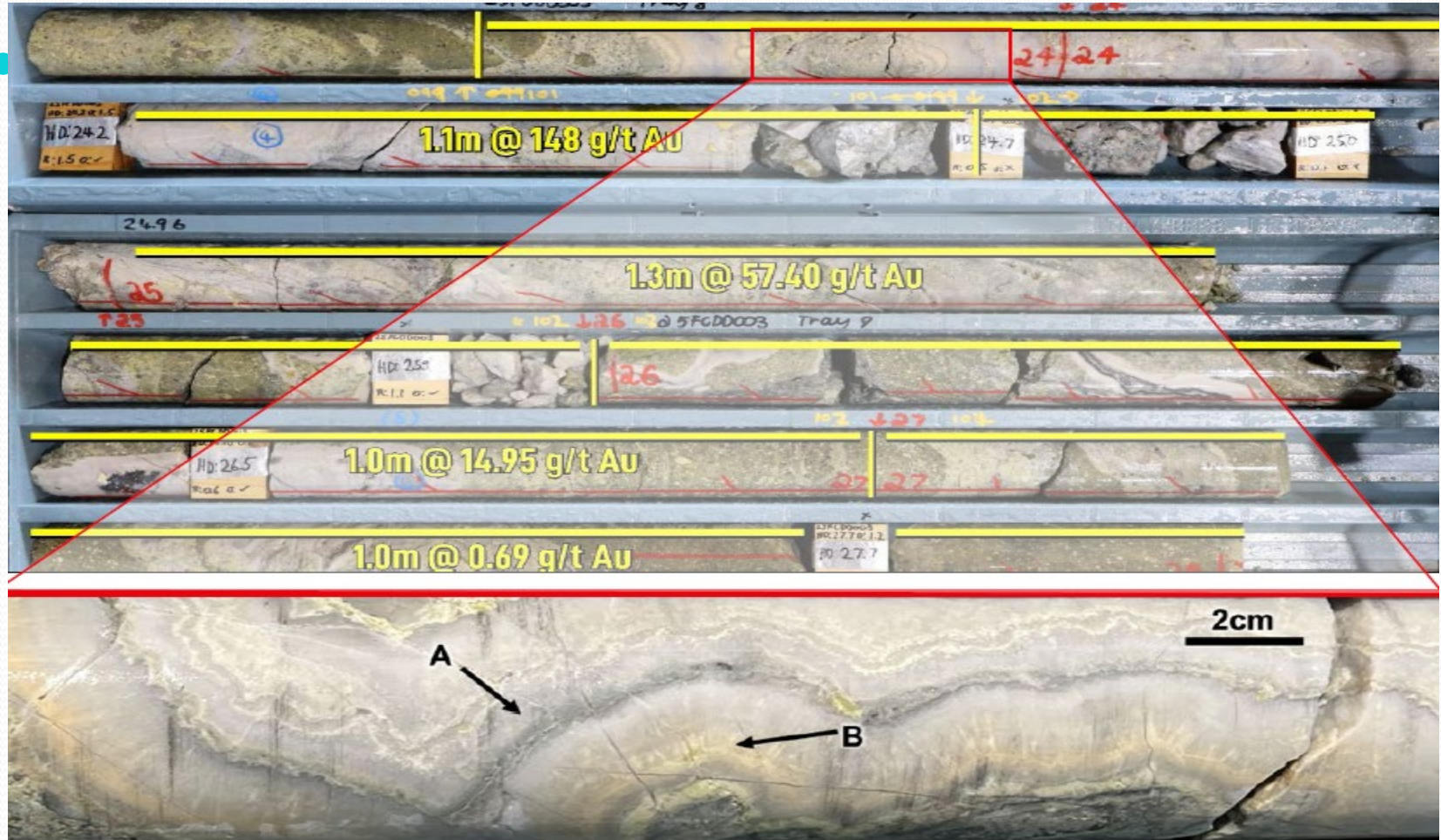
2. Practical Observations of Epithermals (mostly low sulphidation)

Based on Site Visits
and geology/mining knowledge
of Keith Goode:

(most of the experience and knowledge came during site
visits {typically 1 week with a company} under
~25yrs Eagle Research Advisory / ERA;
– ie mostly Australasia, Thailand, Sth America, & Turkey)

2 Epithermals

(classic Colloform from \$SHN Sybil Epithermal)



2a Low Sulphidation Epithermals – typical properties:

- Gold and silver mineralisation, can get native silver.
- Colloform, banding, sometimes get black ginguro
- Vertical or almost vertical typically quartz veins
- Often strike NW/SE or NE/SW (observation)
- Base of a boiling zone, mineralisation to surface
- Can have barren quartz veins on surface
- Can get parallel veins up to ~2.5 – 5km apart (observation)
- Breccias, No 1 target brecciated colloform
- If base metals, high sulphidation & probably refractory (note if As is crystalline, should be non-refractory)

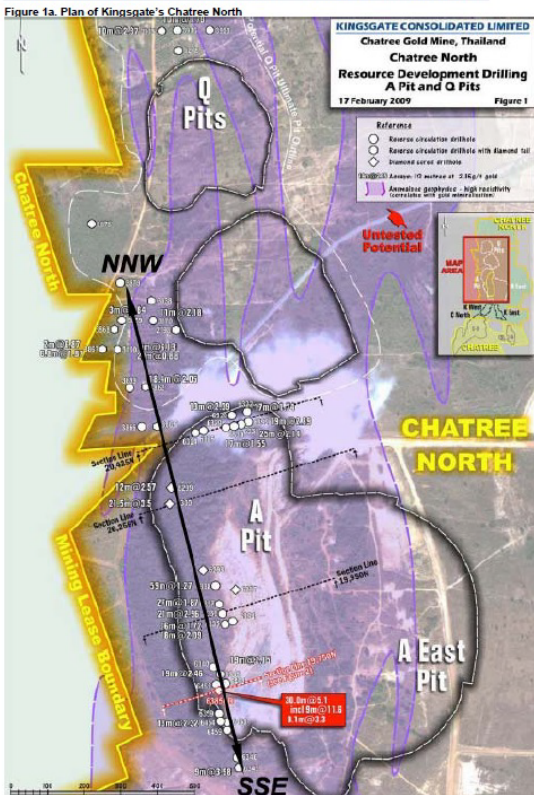
2b Epithermals – Following is what I have observed

- Patterns – NWSE, Lambdas
- Parallel – possibly 2.5 to 5km apart & sinters
- Rolling/offset
- - Cerro Vanguardia determined by endowment
- - drilled after 1200 diamond holes
- - can get gaps and offset
- - also seen Cerro Moro and Cracow
- Terry Leach Table
- Ground Conditions

Patterns – NWSE, Lambdas –

(March 2009 – earth overlain by NWSE & NESW parallelograms,
- lambdas : conventional stub NESW, reverse stub NWSE)

<https://www.eagles.com.au/paydirt/item/mar-2009-nwse-special>



GOODE NEWS

What is so special about NW/SE

No matter where you go in the world, the number of orebodies that we (ERA) have encountered where the feeder structure is or appears to be striking NW/SE or NNW/SSE is simply staggering, especially for gold.

So far this year, Kingsgate at Chatree in Northern Thailand (which we visited in late January 2009), the new mineralisation trend as shown in Figure 1a along the west side of Hill A strikes NNW/SSE (heading for Far Q), and looking back in a SSE direction is in line with KE and D.

Since then, we visited Apex (AXM)'s Wiluna in Northern WA in late February 2009, and observed that the rock units strike NW/SE as does Golden Age, with Calais having formed at the intersection of Golden Age with the East Fault Structure (striking NNE/SSW) in that position. Wiluna in fact could be NW/SE structures feeding into N/S striking structures.

AXM also bought Gidgee for Wilsons and Youanmi. Gidgee's orebodies run N/S except that the best orebody was Kingfisher, and that strikes NW/SE. Gidgee's Wilsons' ore shoots strike...NW/SE. Youanmi's main structure and main pit strikes...NW/SE.

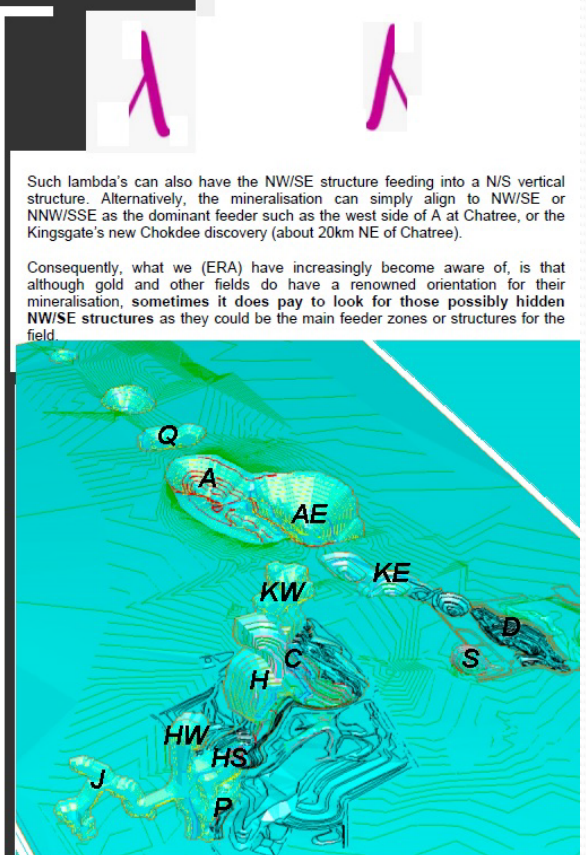
Last year, we visited Mineral Deposits' Sabodala in Senegal, and the feeder structure strikes.....NW/SE, feeding into N/S striking structures. It is not confined to gold mineralisation either, Albidon's Munali nickel mine in Zambia lies within a major NW/SE striking structure.

We remarked to AXM's Mark Bennett (when we were onsite at Wiluna) as to why no matter where you are in the world, the orebodies often strike NW/SE feeding into N/S or NE/SW structures. Mark said that he recalled a paper (thesis?), which showed that the main structures of the earth could be overlain by a lattice of parallelograms (whose sides were orientated NW/SE and NE/SW).

We can recall (quite a few years ago now) a representative of Placer Dome telling us that the key signature that they looked for in aeromag was a reverse (greek, lower case) lambda character. A conventional lambda has a main NW/SE axis with a NE/SW "stub", whereas a reverse lambda has a main NE/SW axis with a NW/SE "stub"

Granny Smith was a reverse lambda as was Sunrise Dam and apparently Wallaby and Red October too. Kingsgate's C-H pit is another classic example with the main H pit striking NE/SW intersecting the C pit striking NW/SE.

However, what we (ERA) are increasingly encountering is either reverse lambdas where the main long axis is NW/SE feeding into a NE/SW structure (resembling more a mandarin "ren" or person character). Such as Sino Gold (SGX)'s Jinfeng (previously called Huangchangguo) gold mine in Guizhou Province, China as shown in Figure 1b, with the main F3 structure feeding into the F2.



Parallel – possibly 2.5 to 5km apart (March 2010 – coincidental observation – & NWSE; sinters at end)

<https://www.eagleres.com.au/paydirt/item/mar-2010-epithermal-trends> s

GOODE NEWS

Do Epithermals usually have at least 2 trends ?

It may be sheer coincidence but we could not help noticing a number of similarities between some epithermal deposits after visiting NQM's Pajingo in September 2009, and NCM/CAH's (Newcrest/Catalpa's) Cracow (also in Queensland) in January 2010, and attending Paydirt's NewGen conference in November 2009 and see Andean present Cerro Negro, with Exeter Resources presenting Cerro Moro.

We have visited both Pajingo and Cracow, but our knowledge of Cerro Negro and Cerro Moro is limited to what we have observed in presentations. It should be noted that the following comments are based purely on observation, not necessarily following any geological theory.

As shown in the plans of all 4 of the examples in Figure 1, aside from all of them appearing to strike NW/SE, at least 2 of them, being Pajingo and Cracow have at least 2 trends.

Pajingo has done very little with their westernmost trend, but perhaps they should as the western trend appears to be better than the eastern trend – that is the case for Cracow; and in presentations appears to be the case for both Cerro Moro and Cerro Negro.

Cracow of course was not aware that it had a westernmost trend, as it was mostly undercover and if anything the historical parts of it, being Roses Pride, Klondyke and Royal Standard were regarded as anomalous to the main (eastern) trend. By coincidence the easternmost trend has usually been discovered first, that was the case for Cracow; for Pajingo it came after Scott Lode but was ahead of Toby; for Andean's Cerro Negro, Eureka came second; and Exeter's Cerro Moro – we don't know which came first.

Interestingly typical average grades appear to be 6 to 7g/t, with a high grade sweet spot often about half-way along the trend as at Pajingo's Vera Nancy which was responsible for that peak production period of 333,000oz achieved in y/e June 2003 when cash costs were ~US\$110/oz on 718,000t @ 14.4g/t recovered.

Golden Plateau was about half-way along the eastern trend of Cracow (admittedly a coincidental dilation jog that affects the eastern but not the western trend) and historically produced about 800,000oz. Cracow has been renowned for its sizeable orebodies or ore shoots along its trends, especially the western trend being individually ~ 300m to 400m long on strike by ~150m to 350m high resulting in Royal's 500,000oz, and Crown's 680,000oz. It is no wonder that nominal 200,000oz sizes seem to very quickly be delineated at Sovereign and Kilkenny.

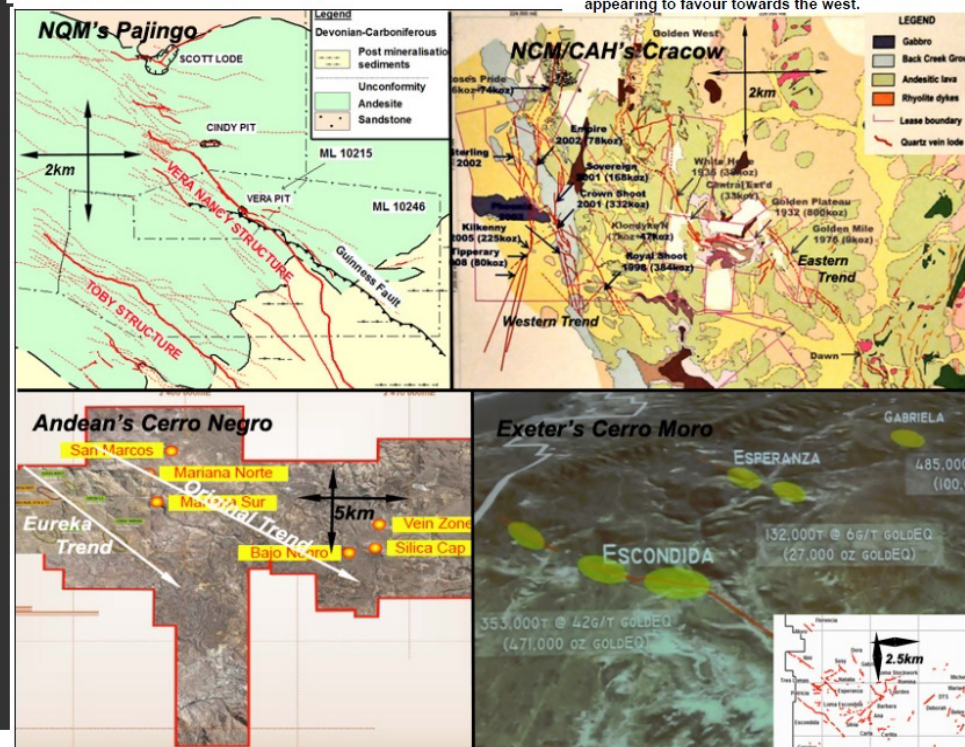
Now as for what Phoenix on Cracow's westernmost trend is going to be is still at an early stage, but initial indications have suggested grades could be >14g/t.

Another similarity that we noticed was between Andean's Cerro Negro and NQM's Pajingo, and that was the presence of sinters at the end of their easternmost trends, for Pajingo it is at the Moonlight discovery, unfortunately deep and not near/at the surface like Andean.

A classic non-geological observation has to be the distance between the trends, being ~2.5km at Pajingo, ~ 2km to 2.5km at Cracow, ~ 2km to 2.5km at Exeter's Cerro Moro and ~5km for Andean's Cerro Negro.

We are not sure about Andean's Cerro Negro, but Pajingo's mineralisation lies within or associated with faults, as does Cracow, and apparently Exeter's Cerro Moro.

Epithermal orebodies are widely discussed and have numerous papers written about them, however, they also appear to have some similarities from a possibly non-geological viewpoint. Consequently, once you have found/discovered your epithermal trend, perhaps a second (probably NW/SE) trend should be looked for ~2km to 5km away, and focused on, with the odds so far appearing to favour towards the west.

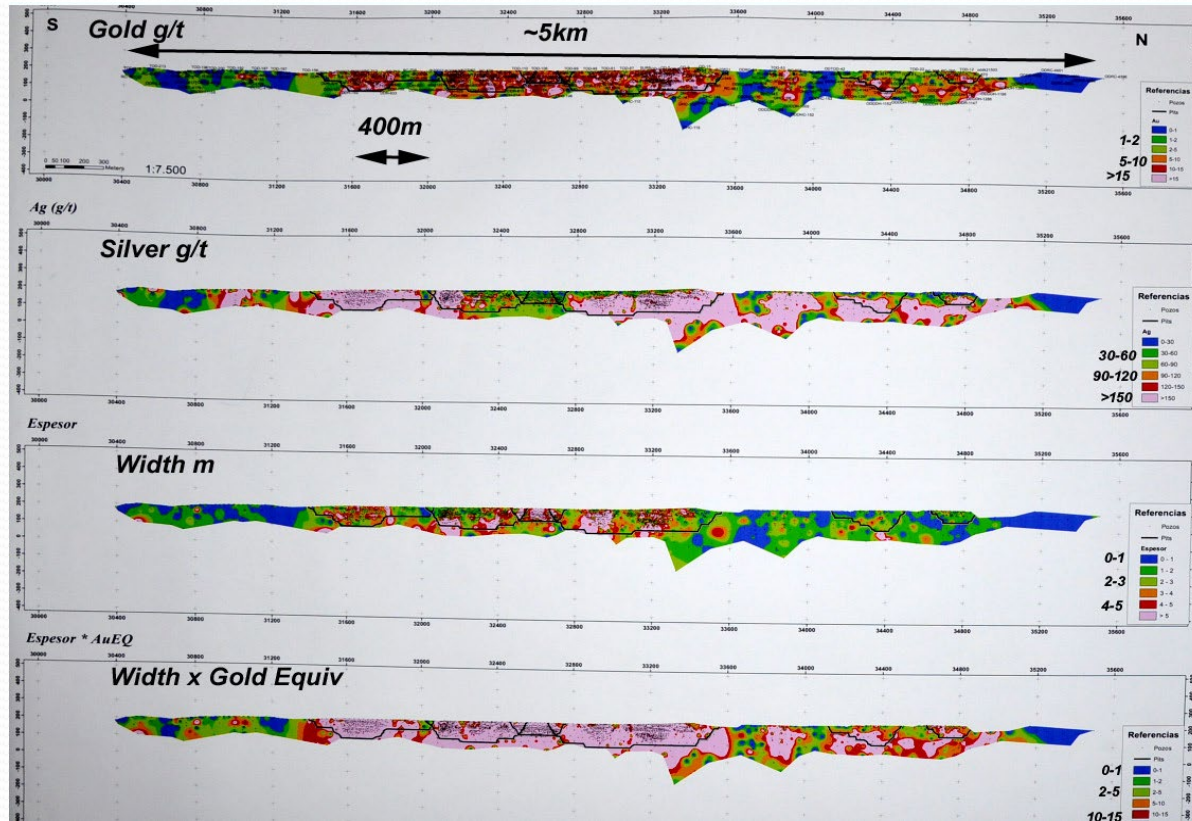


(Site visit - September 2011 – Argentina – Deseado Massif)



Cerro Vanguardia 2

(measured Osvaldo endowment with GSR of 60 for Gold equiv x width – it was opencuts that had been mined and backfilled – because had been interpreted as truncated/pinched/boiling zone ?)



Cerro Vanguardia 3

(CV2 was included in a March 2012 article – which states the pinch out interpretation was found to be incorrect)

GOODE NEWS

Epithermal deposits appear to extend much deeper...

...than previously perceived. As part of our/ERA visit to Extorre (XG)'s Cerro Moro and Mariana's Las Calandrias projects in September 2011, we also visited AngloGold Ashanti's Cerro Vanguardia (CVSA JV). All of these projects and operations are located near Puerto Deseado in the Deseado Massif of Santa Cruz Province in Argentina's Patagonian region.

CVSA have delineated a swarm of veins/lodes over an area of about 15km x 15km, striking predominantly EW in the north, and then NW/SE, with a few veins that are N/S and NE/SW striking too.

The main mining since 1998 has been through open-cuts with average SRs ~27, although underground mining started in September 2010 in the backfilled Mangas pit (apparently re-opening the pit and using the backfilled floor, declining through one of the walls).

With excellent ground conditions in the stopes, CVSA were using a bench retreat sub-level stoping method at Mangas with sub-levels at 15m intervals, individual stopes being 30m on strike for the 2m to 4m wide orebody. There are no rib pillars, just a 5m sill pillar every 60m. Level intervals were going to be trialled at 20m and then possibly 25m from 2012. The ramp was 4.5m x 4.5m with 2 declines at each of Mangas & Osvaldo (increasing to 3 from nearby pits), and increasing the current almost 240ktpa @ 8g/t.

All process water was being generated from the underground mine and the open-cuts and recirculated amongst them (the aquifer borehole water was only being used for drinking in the camp). The plant was achieving ~90% to 95% recoveries on gold (Au) and ~70% to 75% on silver (Ag).

Although the high grades are usually electrum, the feed was being blended through a conventional 3-stage crushing circuit with 5 CIL tanks to a Merrill-Crowe bank of cells (electrowinning trials were expected to occur in 2012). Innovatively the plant has a cyanide recovery circuit (that recovers ~80% of the cyanide).

IP had been used to discover the veins (many were/are hidden) but was found by CVSA to be too broad [target wise] and hence was last undertaken in 2003, with the current main techniques to discover veins being a mixture of ground geophysics and aeromag. CVSA's aeromag plan showed veins on almost everything: structures, mag, demag zones etc. Most of the discoveries in the past year or so have apparently been made near surface (under cover).

The resource model for the manganese-rich Mangas line of pits had its depth profile as having been drawn down from deeper drillhole intersections to date. At CVSA, the main rock-types are ignimbrites and range from fine grained (usually barren), welded (such as at Mangas, grades typically 4 to 5g/t), to the higher grade granosa (such as at Osvaldo, more 8g/t to 10g/t). Very high grade granosa is ~15g/t to 25g/t, ranging up to 60g/tAu & 5kg/tAg (due to the Argentite [a native silver mineral]).

12 03 GMJ epithermal depth Mar 2012.pdf

CVSA have found that the geological perception that epithermal mineralisation in veins/lodes usually pinches out at depth, appears to be incorrect. Deeper intersections at 400m or 600m have shown that the mineralisation may re-open below the perceived "pinch-out" in the near vertical plane of the vein, or the vein undergoes a "roll" on the "pinch-out" and re-opens in the subsequent deeper flat or a displaced further vertical orebody.

Through going underground, CVSA have also found that some of the pits actually have more than one parallel lode, some of which only appear at depth beneath the original pit floors.

Re-interpretation of their original sections has also benefited from the move to applying Aueq x true width instead of simply gold g/t, as shown in Figure 1 of the ~4km long Osvaldo line of pits where the original pits were designed on the basis of g/t gold grade. The revised interpretation of dividing the silver grade by say 50 and adding that to the gold grade, assuming 100% recovery and multiplying by the width produces a section showing significant upside potential. (colouring note: blue is low grade, pink is the highest high grade).

Extorre (XG : listed on the TSX & NYSE) have had similar success at their Cerro Moro discovery, with their individual prospects extending deeper, sometimes after a weakly mineralised (pinch-out?) interval. Some of the veins extend vertically to depths of up to ~400m from near surface such as at their relatively new Zoe discovery. And deeper extensions are being found along the length of their >10km long Escondida to Zoe trend.

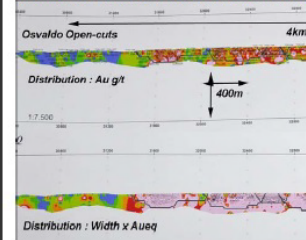
Interestingly Extorre were using the Pajingo model for their Escondida trend to Martina (before their Zoe extension). The mineralisation at Pajingo (now owned by Evolution [EVN]) appears to be truncated at depth along the Vera Nancy trend. But XG have found the Pajingo model to be incorrect for Cerro Moro, as their mineralisation extends deeper (and is still open at depth).

The Pajingo stopes along the Vera Nancy trend were mined from the bottom up and little drilling was reputedly undertaken under them. For that matter it does seem unusual that the epithermal mineralisation at Cracow (also now owned by Evolution) appears to be isolated without some form of deeper link between them.

So based on observation, deeper drilling may be able to extend epithermal mineralisation deeper than previously envisaged, and perhaps historical perceived "pinched-out" areas of epithermal veins need to be revisited.

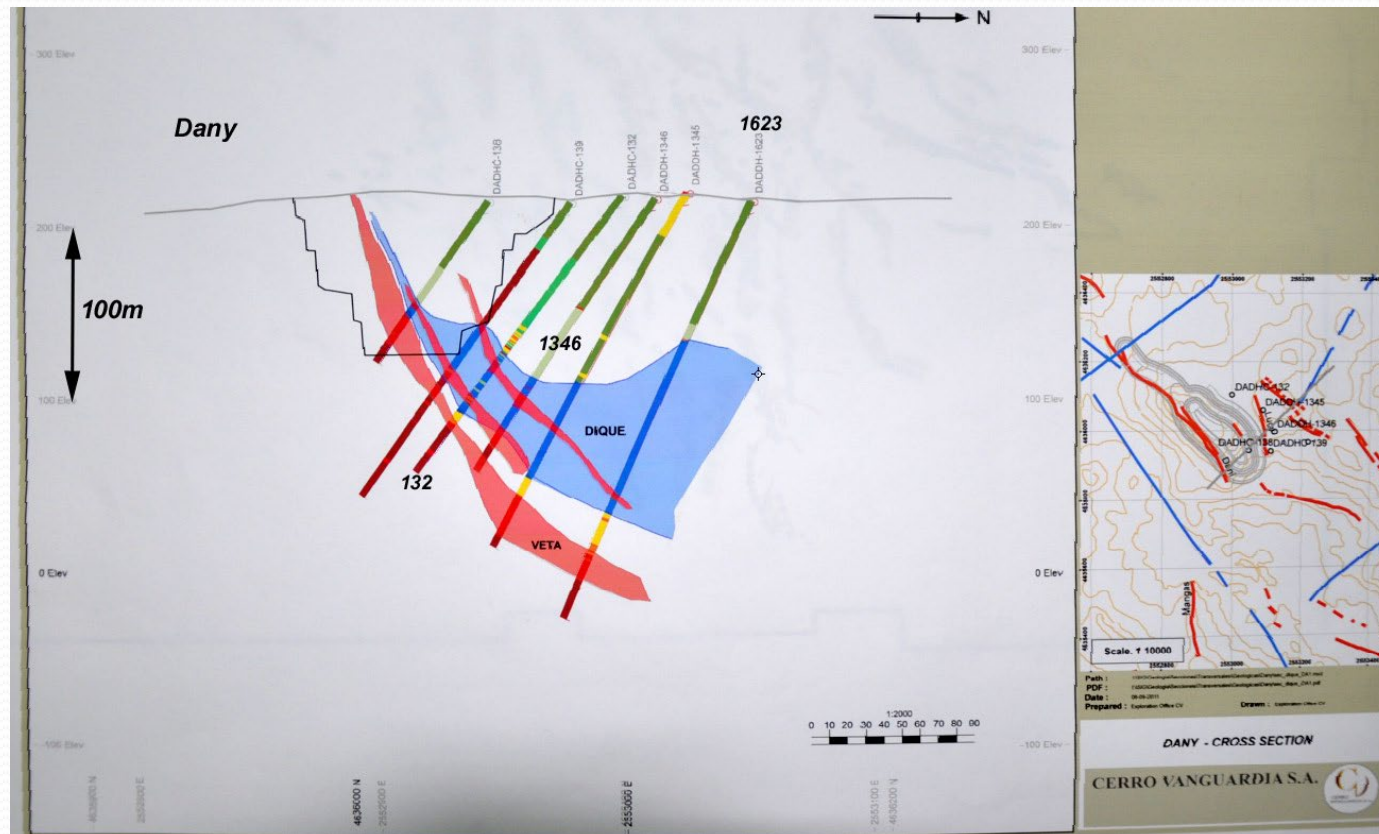
Disclosure and Disclaimer : This article has been written by Keith Goode, the Managing Director of Eagle Research Advisory Pty Ltd, (an independent research company) who is a Financial Services Representative with Taylor Collison Ltd.

Figure 1. Long Sections (looking west) of Cerro Vang



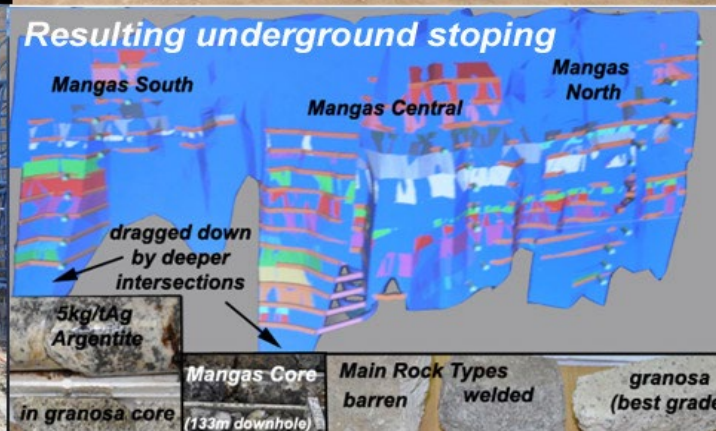
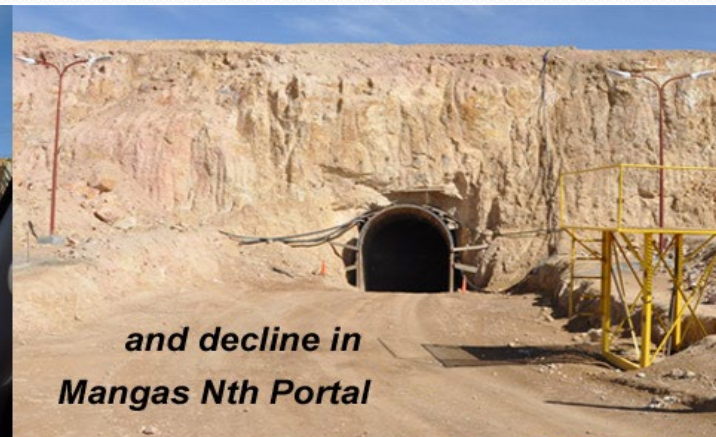
Cerro Vanguardia 4

(Hence diamond drilled – 1200 holes later – found rolled/offset ,
and can get parallel lodes not present on the surface – this section
is Dany)



Cerro Vanguardia 5

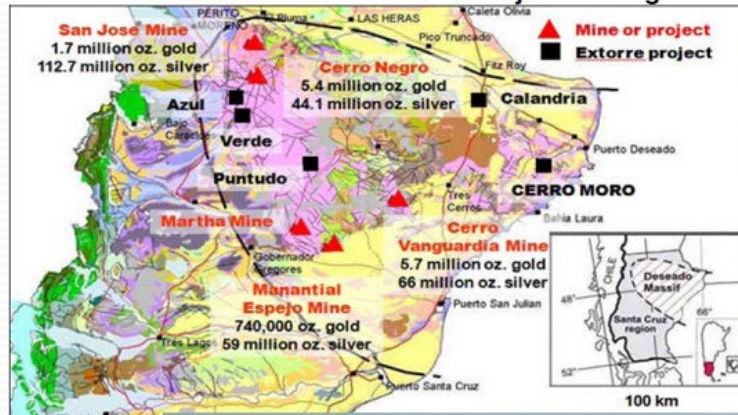
(flatten backfilled floor, decline in (interestingly timbered) and stope underground – drives u/ground were unsupported – ie no mesh)



Rolling/offset – Cerro Moro 1

(Extorre gained an option from CVanguardia covering Cerro Moro etc – believed to be barren – quartz veins on surface assayed v low. The volcano located south of CV in a National Park erupted in the Jurassic and thought responsible for most of the mineralisation)

a. Locations of Extorre's Santa Cruz Projects in Argentina



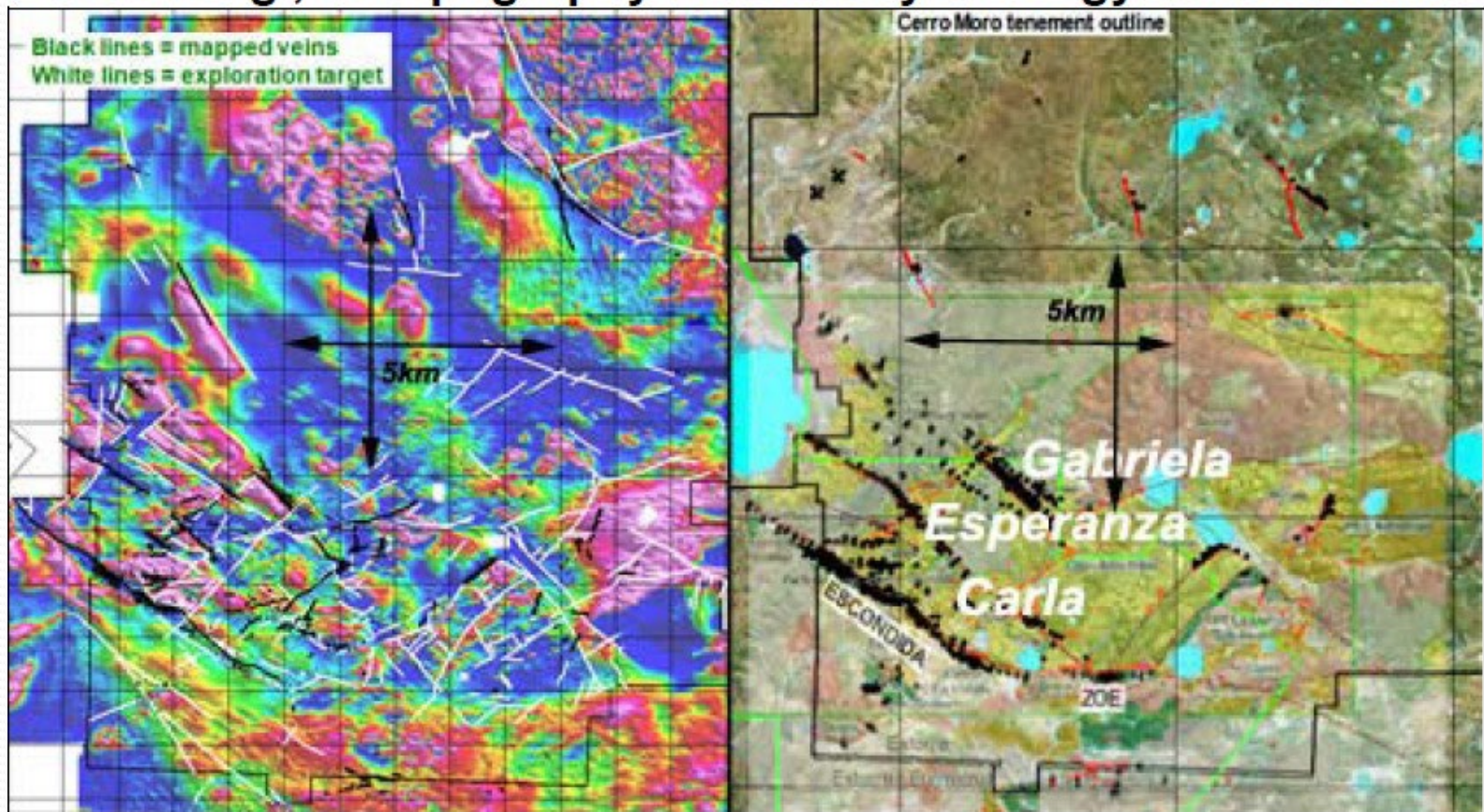
fossilised trees, dinosaur footprints near



Cerro Moro 2

(Mostly NWSE, {note parallel ~2 to 2.5km apart} becoming EW – identified possible NESW swarm)

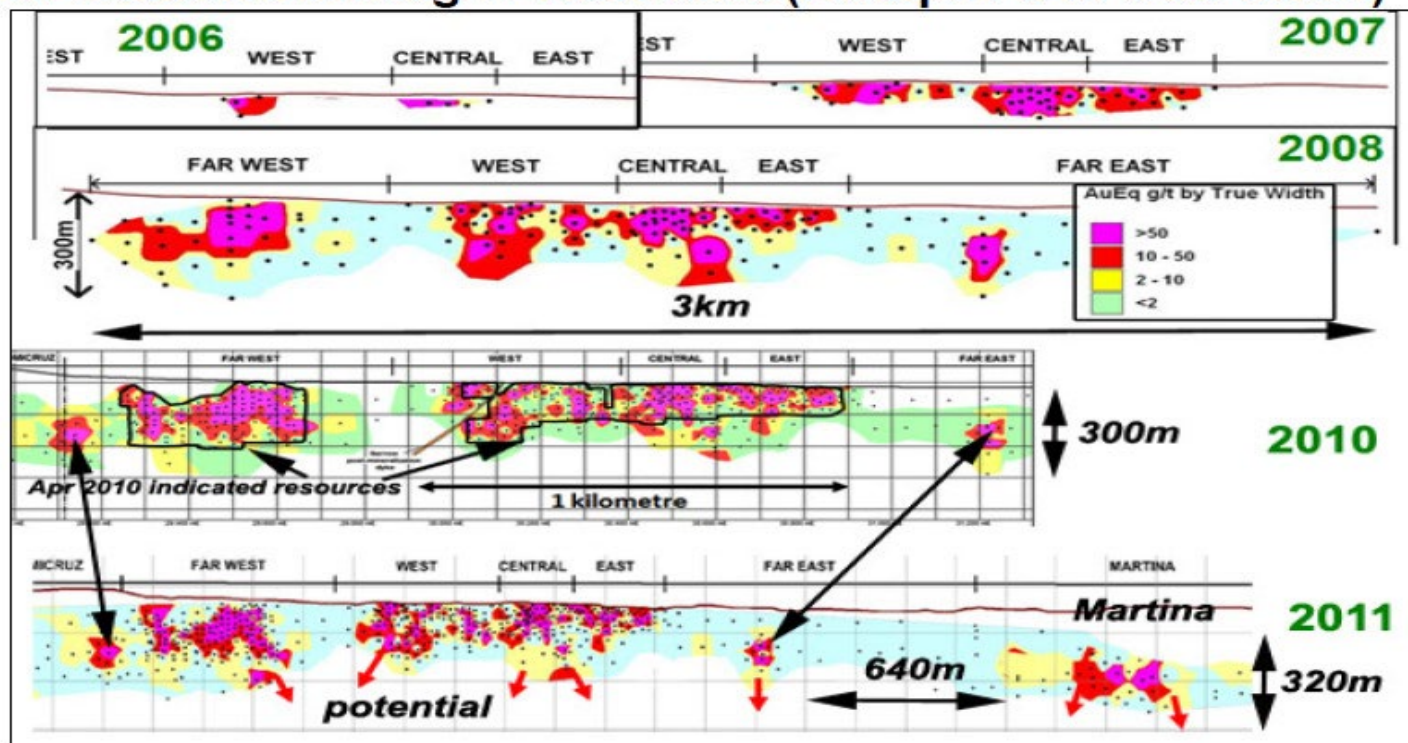
b. Aeromag , & Topography overlain by Geology at Cerro Moro



Cerro Moro 3

(Found a number of the veins barren on surface, actually mineralised under the surface and slightly offset – also use endowment $\text{Auequiv} \times \text{true width m}$)

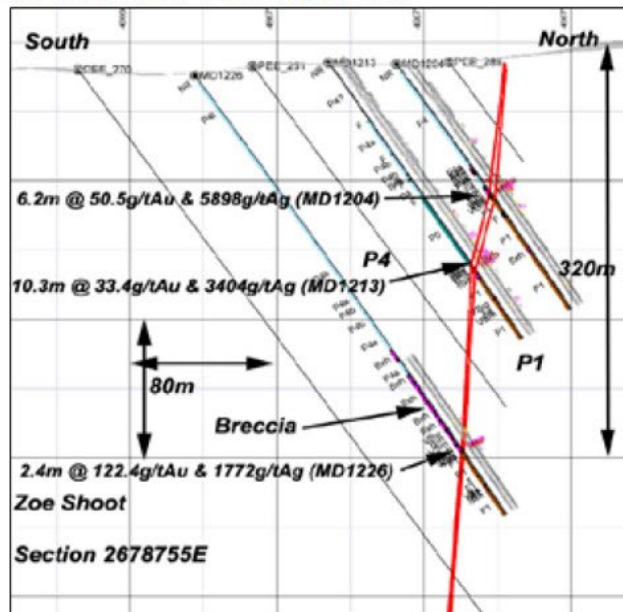
a. Sections through Escondida (Auequiv x m true width)



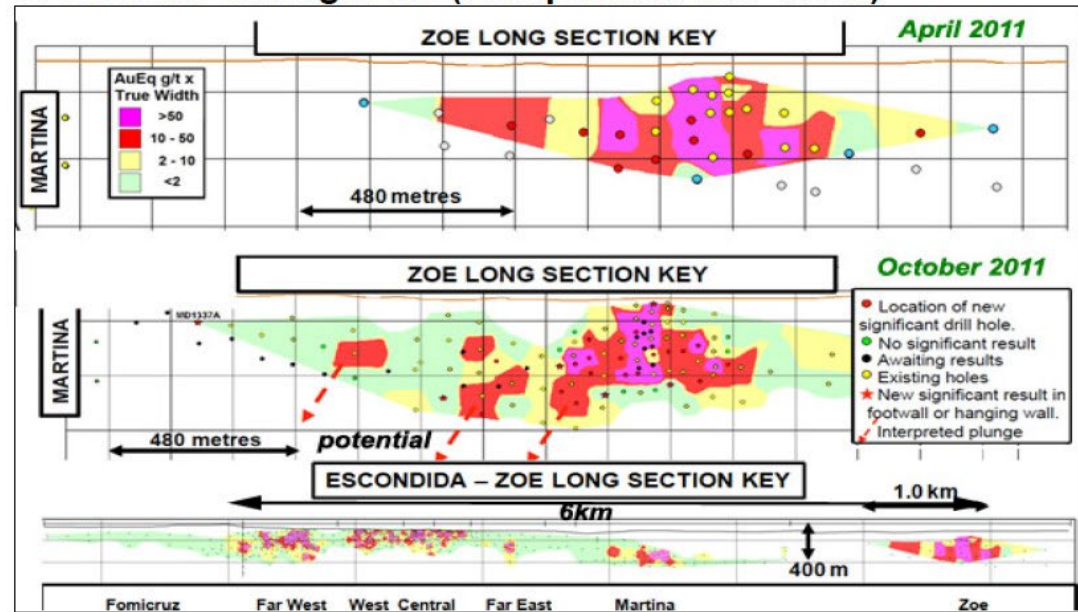
Cerro Moro 4

(Found can get unmineralised gaps in the vein and then drill 30 to 50m deeper, and if necessary another 30 to 50m deeper)

b. Section Across Zoe



b. Sections through Zoe (Auequiv x m true width)



Cerro Moro 5

(Grades were extremely high – like Cerro Vanguardia could occasionally see crystals of acanthite and argentite – can also see what parameters they used for Au equiv)

Drillholes Au/Ag ratio : 50 x	From m	to m	Intersection m	Au Grade g/t	Ag Grade g/t	Au Equiv g/t
Zoe						
MD 1204	89.0	95.2	6.2	50.5	5,898	168.5
including	90.2	93.1	2.9	106.9	12,441	355.7
which includes	90.6	92.0	1.4	227.3	25,428	735.9
MD 1213	136.0	146.3	10.3	33.4	3,404	101.5
including	139.9	143.7	3.8	88.9	8,737	263.6
which includes	142.4	143.7	1.3	171.7	14,321	458.1
Escondida Far West						
MD 216	94.0	103.0	9.0	27.8	1,869	65.2
including	97.9	103.0	5.1	46.7	3,182	110.3
which includes	98.5	99.1	0.6	234.0	13,945	512.9
MD 601	126.0	130.4	3.4	86.2	5,472	195.6
including	128.8	129.3	0.5	433.4	29,451	1022.4

Discussing with Cube Consulting as to how they determine ore resources with such super high grades, "Cube" effectively statistically "domain" the grade for Kriging purposes, as the sections of high grade appear to be reasonably definable within the drill cores. Grades are top-cut statistically according to what "grade-domain" they fit into. Examining the central super high grade drill core of Escondida Far West with Zoe shows them to be surprisingly visually relatively similar and distinctive as shown in Figure 4b.

Cerro Moro 6

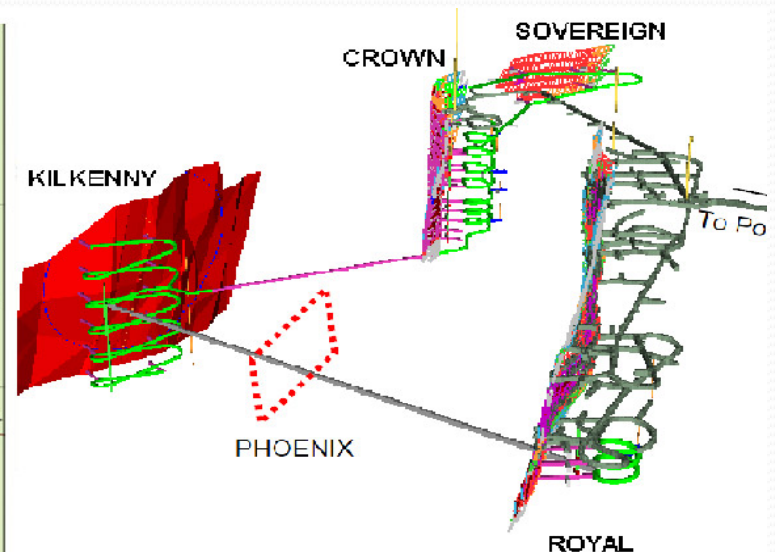
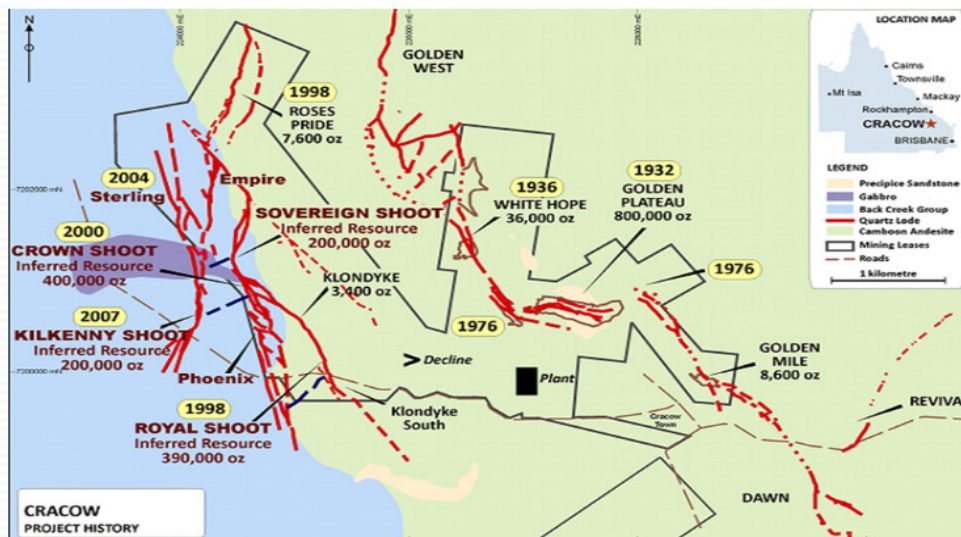
(Some of the core samples – yes silver is in kg/t)

b. Esc Far West and Zoe Super High Grade Drill Core



Rolling/offset – Cracow (QLD) 1

(they [NCM ~2010] insisted when an orebody ended, it was offset / transferred to another structure and the mineralisation continued – but instead what if there are gaps in the mineralisation in the vein)



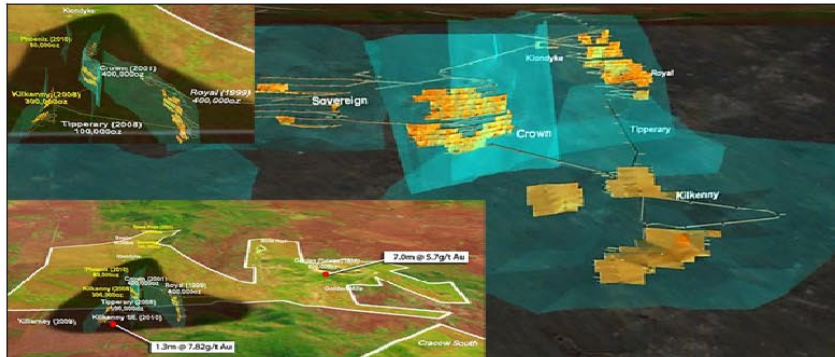
Most of the orebodies occur in defined pods of mineralisation as shown in Figures 10a and 10b as in Crown (200m high x 350m long for ~680,000oz), Royal (350m high x 400m long for ~500,000oz), and the newly defined Empire (~200m high x 350m long). However it is the length of Phoenix that has come as a surprise, currently ~550m long and apparently still open (& ~200m high). Interestingly Roses Pride (see Figure 1b) is also ~550m long, and a decline has started there for possible production at the end of 2011.

Cracow (QLD) 2

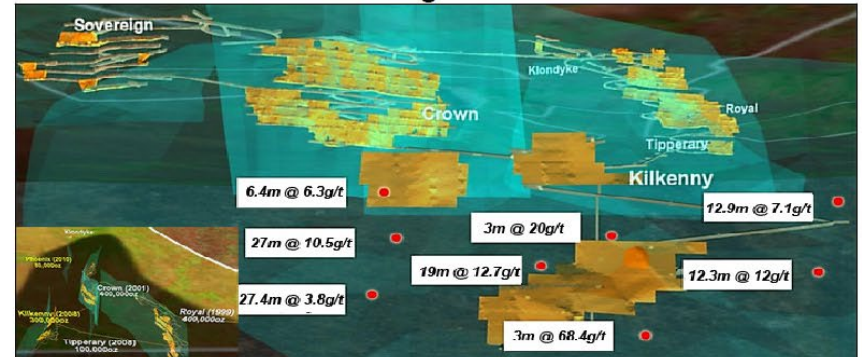
(another view of their modelling)

Figure 10. 3d Schematics of Producing Cracow Orebodies (Phoenix is adjacent to Tipperary)

a. 3d Schematic and Locations of Cracow Orebodies

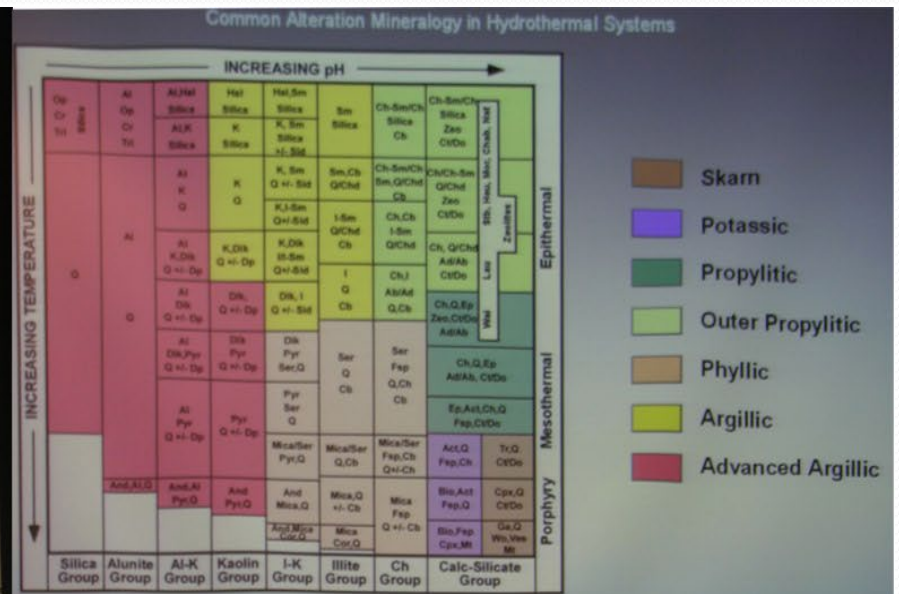
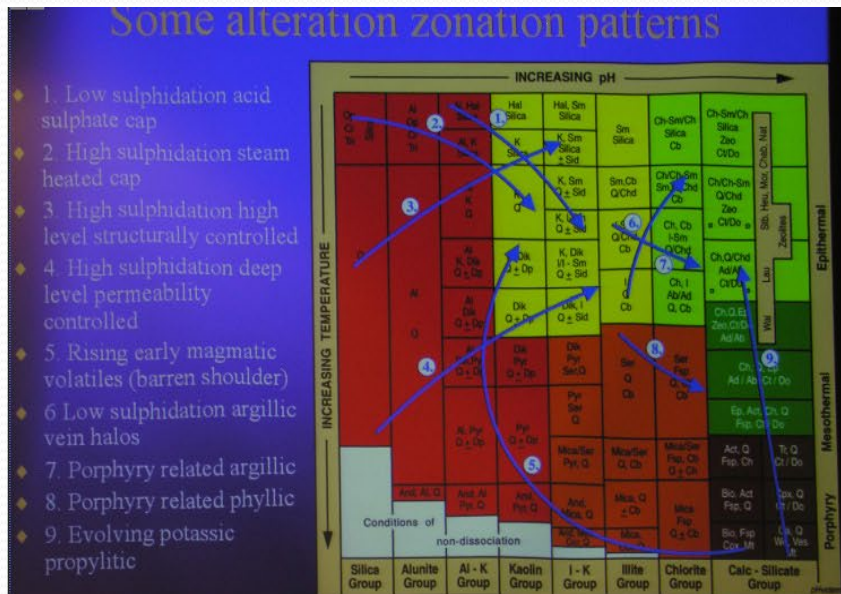


b. 3d Schematic of Producing Cracow Orebodies



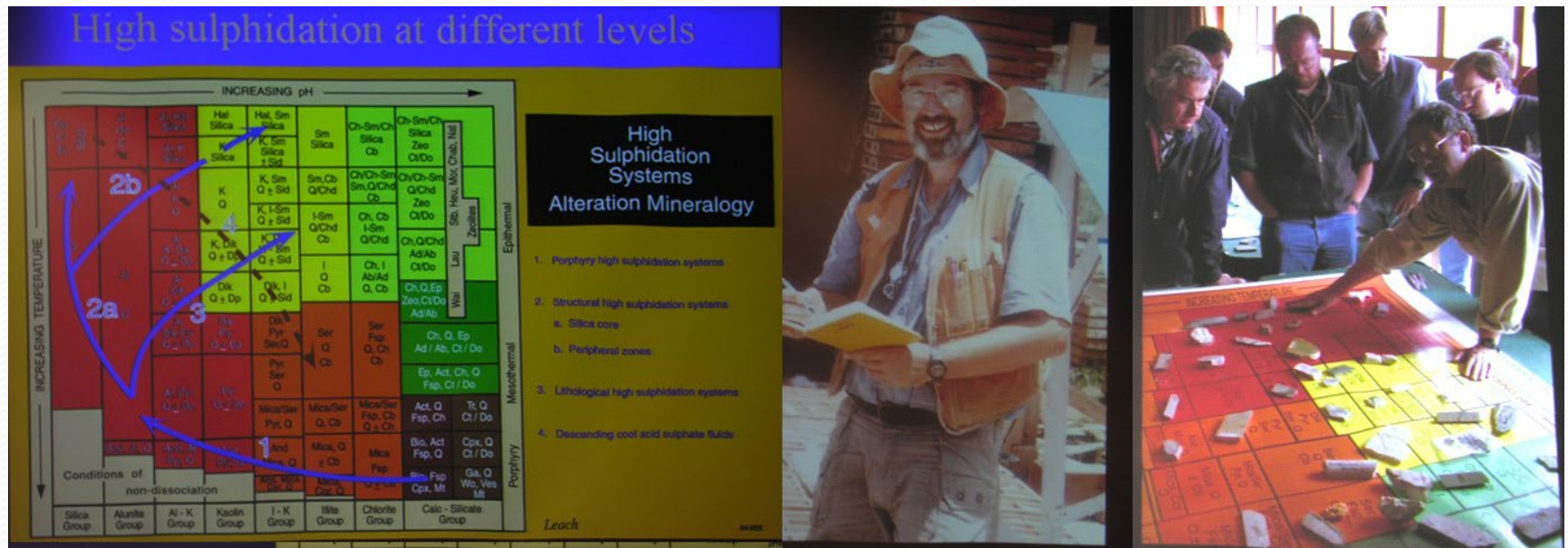
Terry Leach's Table - 1

(Terry Leach died in 2007 and in October 2008, Smedg had a 1-day Symposium with the opening keynote given by Corbett, on his work – I never saw Terry present but had heard about him and his table that could apparently be used to identify where you were)



Terry Leach's Table - 2

(The Table could be used for low or high sulphidation epithermals, and included various specimens displayed on the Table [pity I didn't see because I possibly could have taken more identifiable pics] – the Terry Leach handout and presentation {I took pics} are included on the flashdrive shown in the Appendix).



3 – Appendix – I look in drillcore for ground conditions (aside from geology)

- Whether the core resembles discs – ie taken out and due to pressure, bursts into a series of discs.
- Or ideally comes out as an unbroken length inferring good ground conditions
- Whether the drill core is broken, eg on planes like Auteco's Pickle Crow was possibly inferring why it was not mined, or is rubbly inferring future likely dilution.
- Activity in the drillcore – movement is usually a good sign.