VICTORIA HILL MINING RESERVE

Geological & Heritage Guide

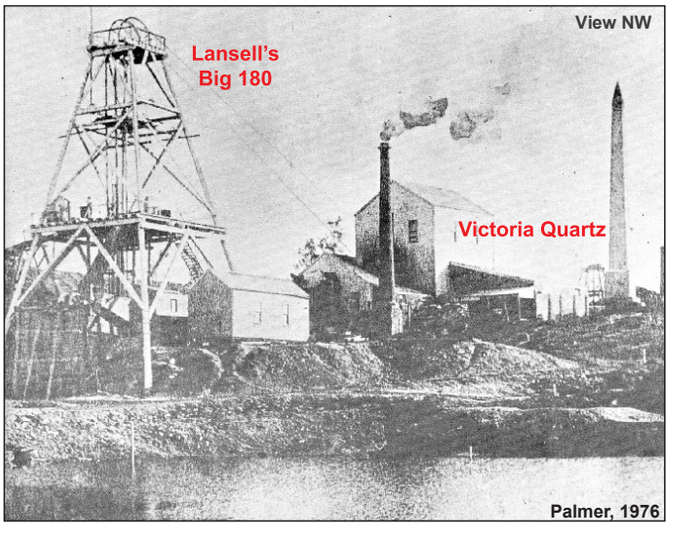
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS

Supporting Geoscientists

HISTORY

Alluvial gold was discovered in Bendigo Creek in 1851. Victoria Hill was used as a hideout for bushrangers until reef gold mining took leases along the hill in 1854. Small open cut & shallow shaft leases were amalgamated into large, deep operations. The last was overcome by water in 1910 while attempting to sink beyond 5,000' (1,500 m). Approximately 500,000 oz of gold was won from Victoria Hill, valued at over $1,000,000,000 today.

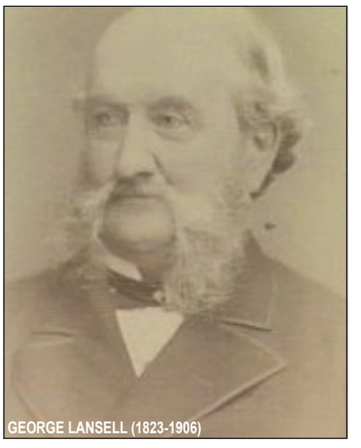
Lansell's Big 180



Purchased & privately owned by George Lansell (1823-1906). The name of the mine came from the 180 yard length of lease. Reported to be the first mine in the world to find payable gold below 2,000' (600 m).

Lansell's Big 180 mine operated from <1871-1907, reaching 3,352' (1024 m). The mine closed due to a sudden influx of hot water after producing 77,708 oz of gold.

George Lansell



George Lansell (1823-1906) was Bendigo's "Quartz King". Very little is known about him or any of his privately owned mines. Lansell was once the richest person in the world, and arguably the most important historical figure in Victoria and Australia. Yet there isn't a Wikipedia page for Lansell.

Lansell was a very tough, ruthless character and a rare genuinely successful mine manager in Bendigo. He was driven out of Bendigo but was later petitioned to return in 1880 to restore the declining industry. Little is known of his methods, he would underhand stope new reefs to prove their value before attempting to sink and work them from below. Lansell was largely responsible for bringing the diamond drill to quartz mining in Australia and sponsored Cornish migration for his mines. The year Lansell died was the last year that Bendigo produced 200,000 oz.

Fortuna Villa

Fortuna Villa was built by the Ballerstedt family in 1855 and purchased by George Lansell in 1871 for £30,000 along with leases including the Big 180. The first stope from the Big 180 returned £180,000. Lansell made extensive additions inspired by architecture around the world, such as Roman baths and the Pompeii fountain. The building included a bullion room and a battery at the rear of the house.

Lansell's Little 180

Palmer, 1976

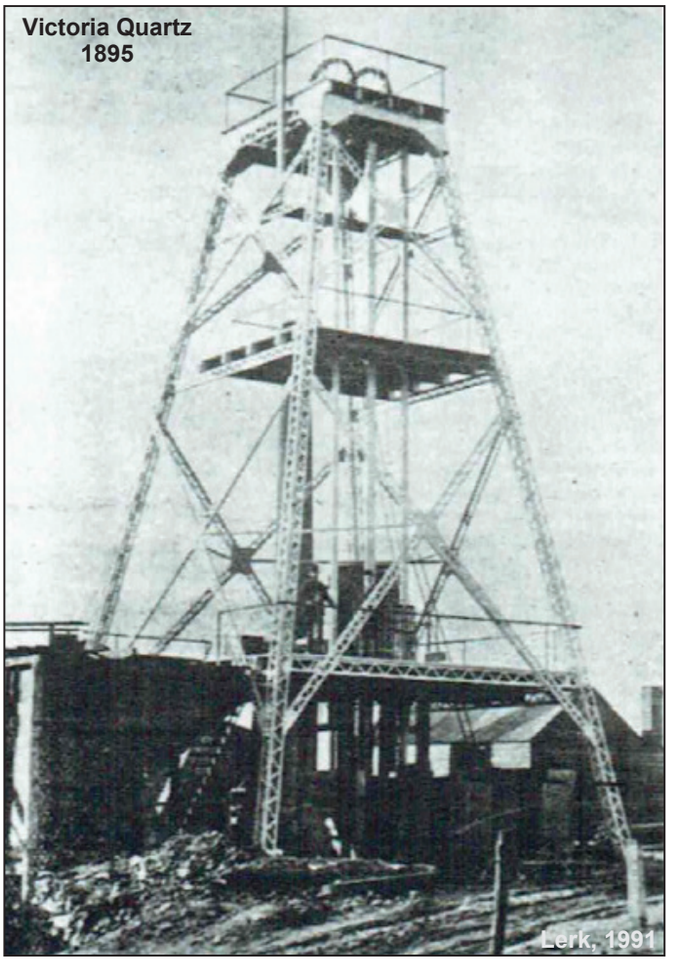
Lansell's Little 180 was on the adjacent Sheepshead line of reef and was visible from Victoria Hill. The mine is notable for being right on the edge of the main highway. Brickwork from the mine remains beside the bus stop by the Loddon Valley Highway today.

Victoria Quartz

The tourist headframe is approximately in the position of the Victoria Quartz gold mine. The headframe (photographed) was the first steel poppet head in Bendigo. The mine operated from <1857-1912 producing 233,499 oz gold. The lease extended only 19 m north and 104 m south of the shaft. Due to the small length, operations were quickly forced to great depths.

Upon hearing of success at around 2,500' (765 m) in the adjacent Big 180 mine, the company sunk and opened on a reef at 2,586' (788 m) in 1896. Upon inspection of the first loads brought to the surface, the stone was considered to be a "white hungry character" and plans were made to continue sinking to the next reef. Overnight rain rinsed the quartz to reveal visible gold. The reef was worked for 2 years at 3 oz/ton.

By the early 1900's the company competed to be the deepest shaft in the world with the nearby New Chum Railway. The company amalgamated with Great Cental Victoria in 1907. Mining along the line had ceased by 1909 and the company was awarded a government grant to sink 1,000' (300 m) to below 5,200' (1,585 m) to locate new reefs and encourage adjacent mines to reopen. The shaft reached 4,614' (1,406 m) before an influx of water spilled in from the adjacent mines and the work was abandoned. Tribute work continued on upper levels until 1912 and the mine closed shortly thereafter.


Victoria Quartz
1895
Lerk, 1991

Australia's first 1 pound note depicting mining in the lower levels of Victoria Quartz

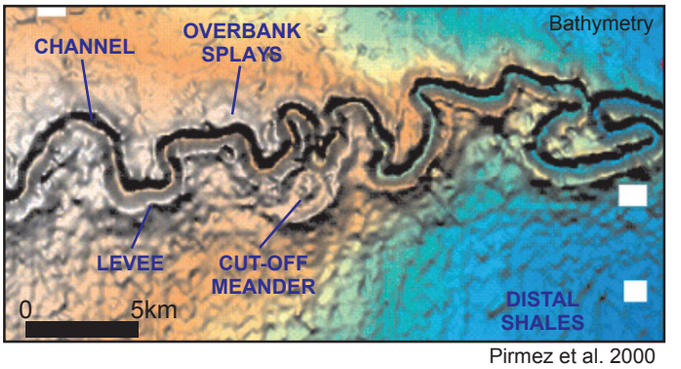

Lerk, 1991

GEOLOGY

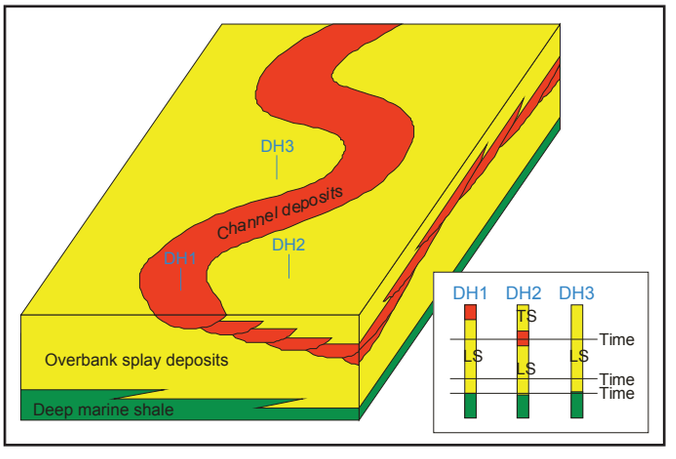
The rocks of central Victoria and the Bendigo area

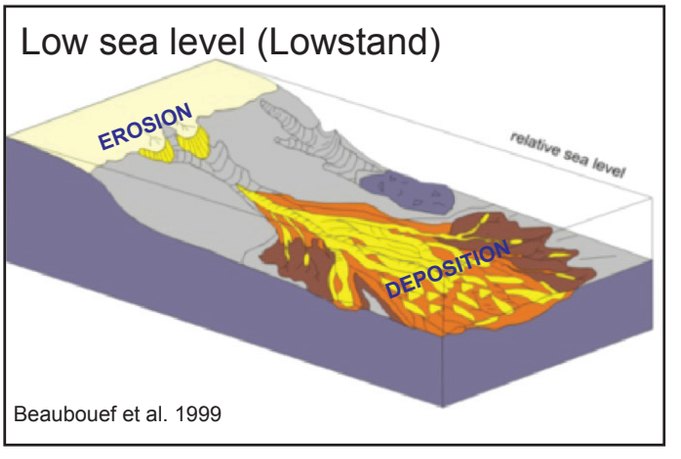
The rocks at Victoria Hill are the same as those that make up the majority of central Victoria. These rocks were deposited at the bottom of the ocean (turbidites) approximately 475 million years ago during the Ordovician Period. Rocks of this age around the world from the Early Ordovician were known as Bendigonian until recently.

Sand and mud was transported by vast underwater channel networks, similar to rivers on the land. Changing climates and sea level dictated when the channels were active. Graptolite fossils (pictured below) can be found in some of the shales.

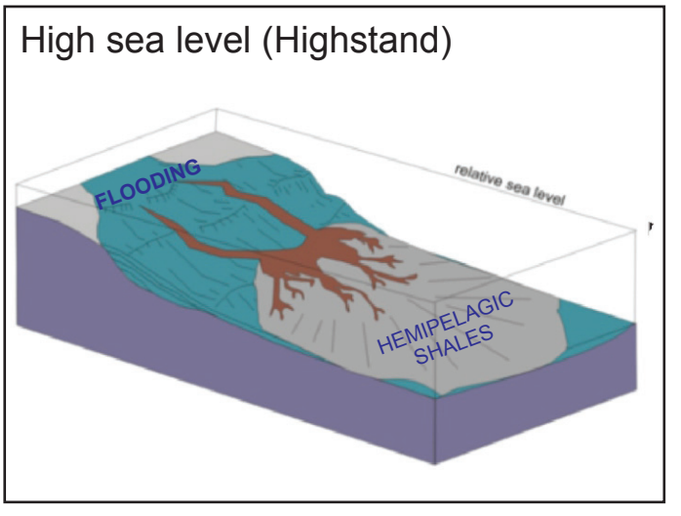


Pirmez et al. 2000

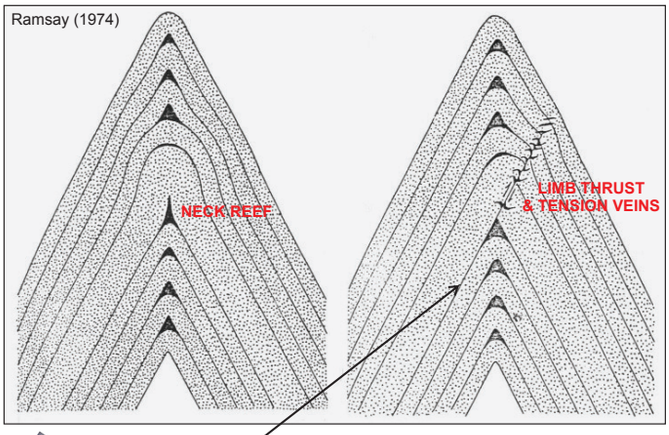


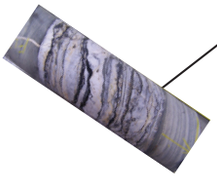


Beaubouef et al. 1999



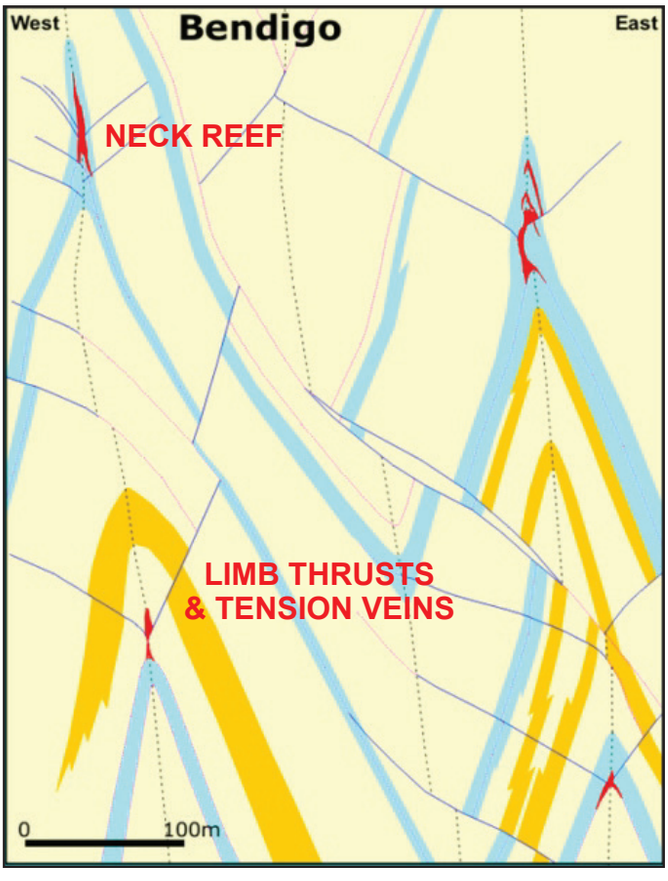
Faults and folds





Laminated quartz (LQ) vein

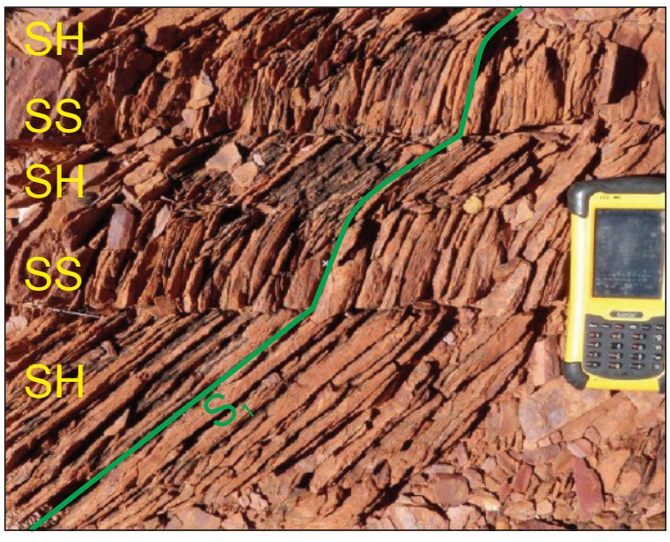
LQ's are bedding parallel flexural slip faults. Multiple laminations represent multiple slip events. LQ's typically develop within thick shales. LQ's provide a vector to structural development and mineralisation at the anticline and the accompanying limb thrust



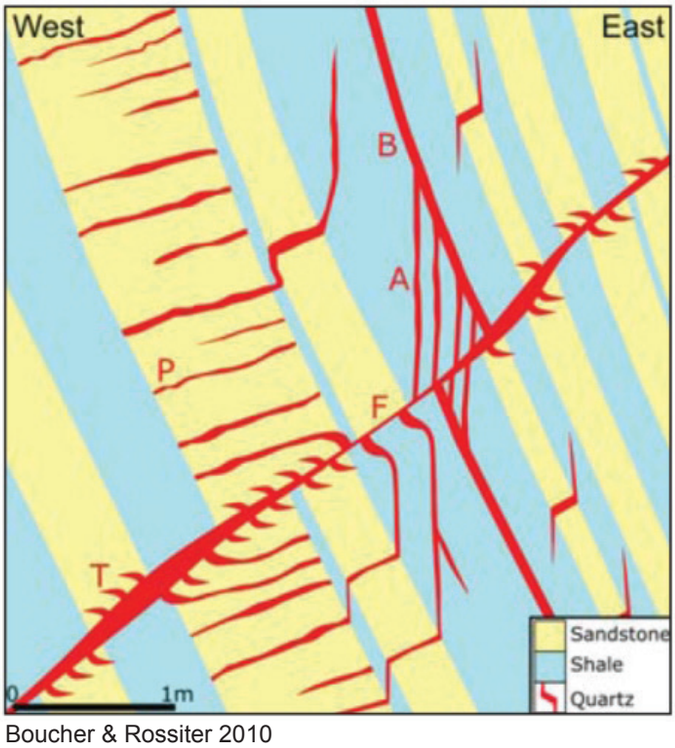
Ramsay (1974) demonstrated how thin, multilayered rocks preferably fold and fault. Folds tend to be upright chevron fold with steeply-dipping limbs, these styles are common throughout Victoria. Flexural slip occurs on the limbs during folding, most commonly in carbonaceous shales and resulting in characteristic laminated quartz (LQ) veins. These developing faults need somewhere to go when they reach the fold hinge. Most commonly they will breach the opposing limb as faults but sometimes they will push upwards and create a neck reef.

Lithological controls on vein development

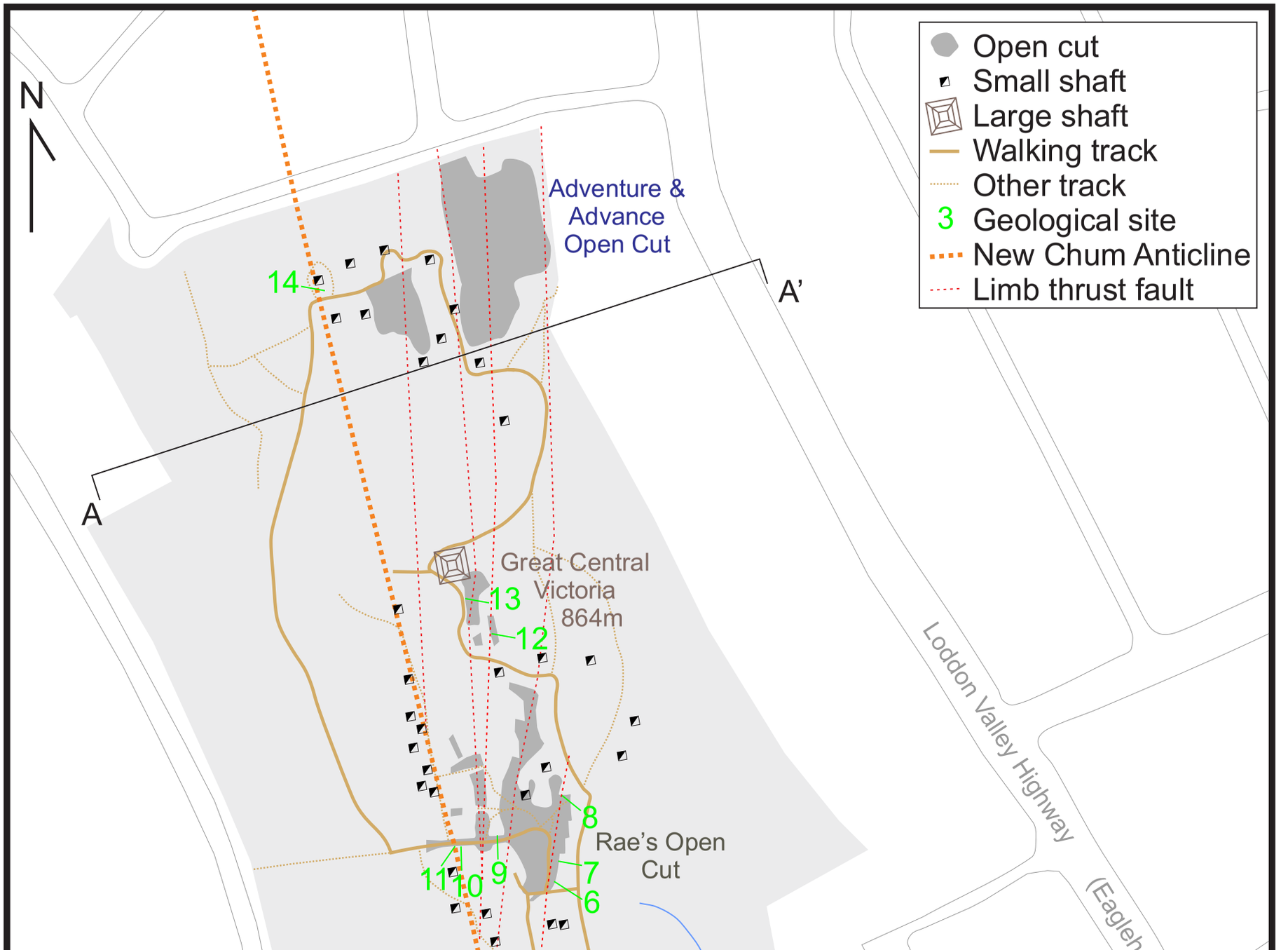
Cleavage develops differently in sandstones and shales. Cleavage will tend to be axial planar in shales (A) but be close to perpendicular to bedding in sands (P), as anastomosing solution cleavage or fracture as radial joints. Solution cleavage most strongly develops close to folds. Quartz infill is common along cleavage planes. Elsewhere quartz will follow bedding (B), faults (F) and tension veins (T) associated with faults. Quartz can additionally infill AC joints (perpendicular to the section below).

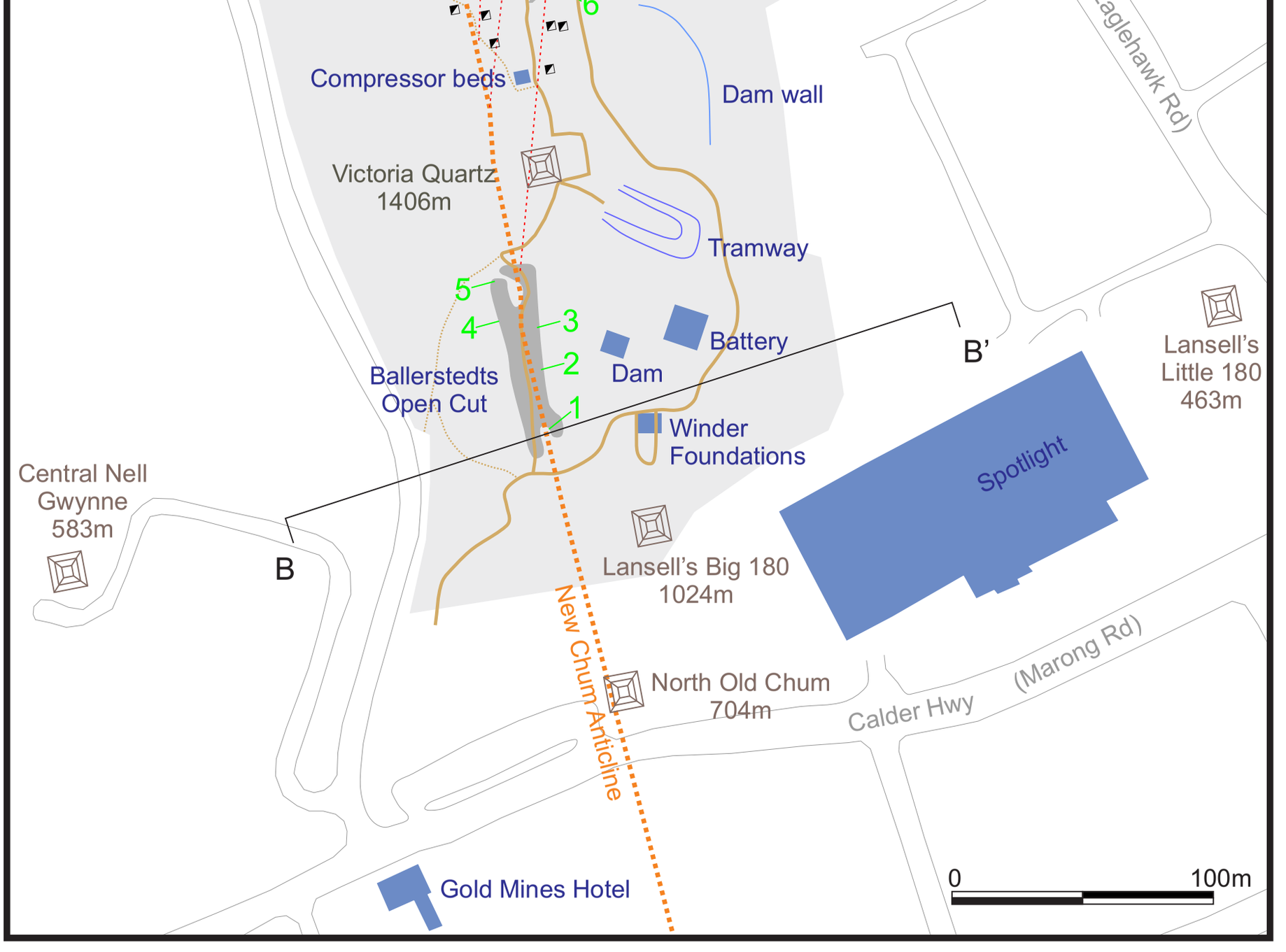


Example of cleavage refracting through interbedded sandstones (SS) and shales (SH).



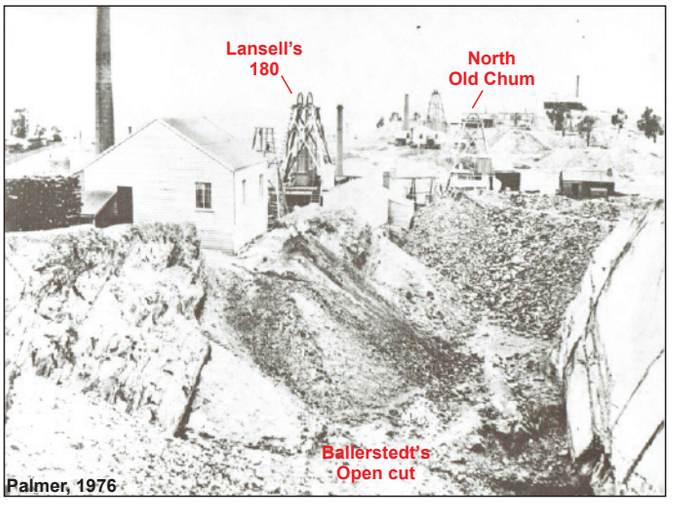
Boucher & Rossiter 2010


N
A
A'
Open cut
Small shaft
Large shaft
Walking track
Other track
3 Geological site
New Chum Anticline
Limb thrust fault
Adventure &
Advance
Open Cut
Great Central
Victoria
864m
Rae's Open
Cut
Loddon Valley Highway
14
13
12
8
11
10
9
7
6


Compressor beds
Dam wall
Victoria Quartz
1406m
Tramway
6
5
4
3
2
1
Ballerstedts
Open Cut
Dam
Battery
Winder
Foundations
B
B'
Central Nell
Gwynne
583m
Lansell's Big 180
1024m
Spotlight
Lansell's
Little 180
463m
New Chum Anticline
North Old Chum
704m
Calder Hwy
(Marong Rd)
Gold Mines Hotel
0
100m

SITE GEOLOGY

Ballerstedt's open cut



View south from Ballerstedt's open cut in the 1880's.

Site 1. Hinge of the New Chum Anticline.

Site 2. Veins exploiting pre-existing structures.
1: Quartz fill on longitutinal joints.
2: Quartz fill on AC joints.
3: Late upright AC joint with quartz fill.
4: Apparent random/folded veins infilling dewatering structures.

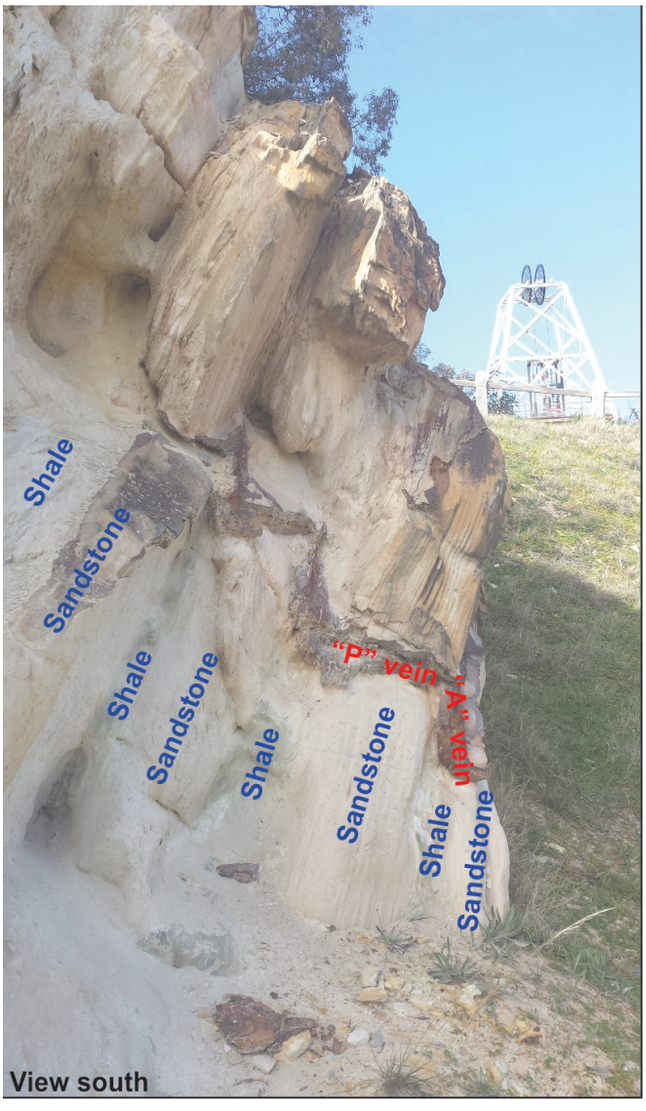
Site 3. Joints, quartz joint and cleavage.
1: Quartz fill and alteration halo associated with a longitudinal joint. The plunge of the vein on the bedding surface represents the shallow plunge of the fold.
2: Quartz fill in an AC joint perpendicular to the plunge of the fold. Intersecting bedding and cleavage surfaces revealing the fold plunge.
3. Bedding/cleavage intersection depicting plunge of fold.

Site 4. Fine grained sandstone. 1: Bedding. 2: Anastomosing solution cleavage.

Site 5. Weathered remnants of a mafic dyke adjacent and parallel to the axial plane of the New Chum Anticline.

Rae's open cut

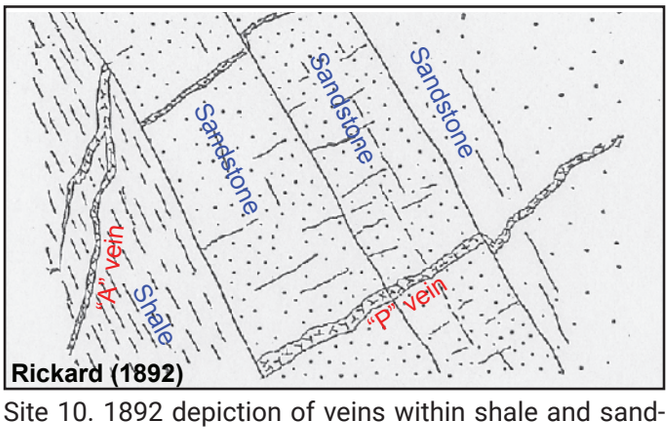
Site 6. Alteration halo of weathered arsenopyrite surrounding a quartz-filled AC joint.



Site 7. Quartz vein refracting across sandstones and shales.

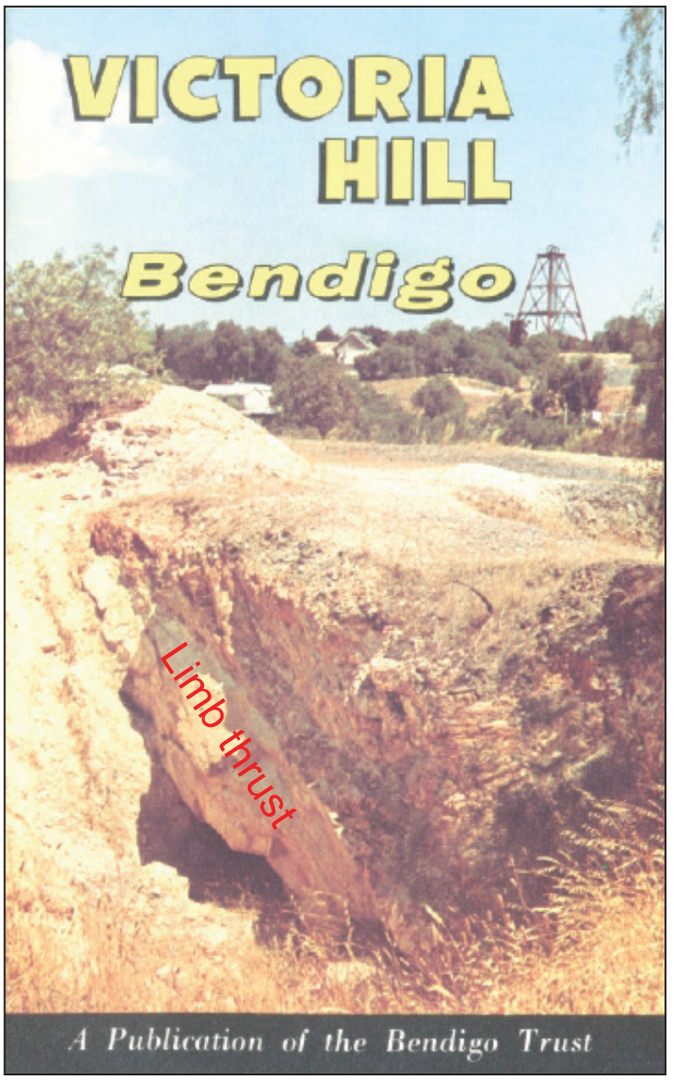
Site 8. Geology of part of the south side or Rae's open cut showing weakly developed limb thrusts faults with very little offset and some quartz veining. Some mine fill on limb thrusts can be seen. The eastern side of the cutting is a thick shaley succession of ripple-bedded silts at the base grading to laminated and massive shale, the latter hosting a 10 cm laminated quartz vein.

Site 9. Sandstone bed with dewatering structure of shale injecting underneath.



Site 10. 1892 depiction of veins within shale and sandstone.

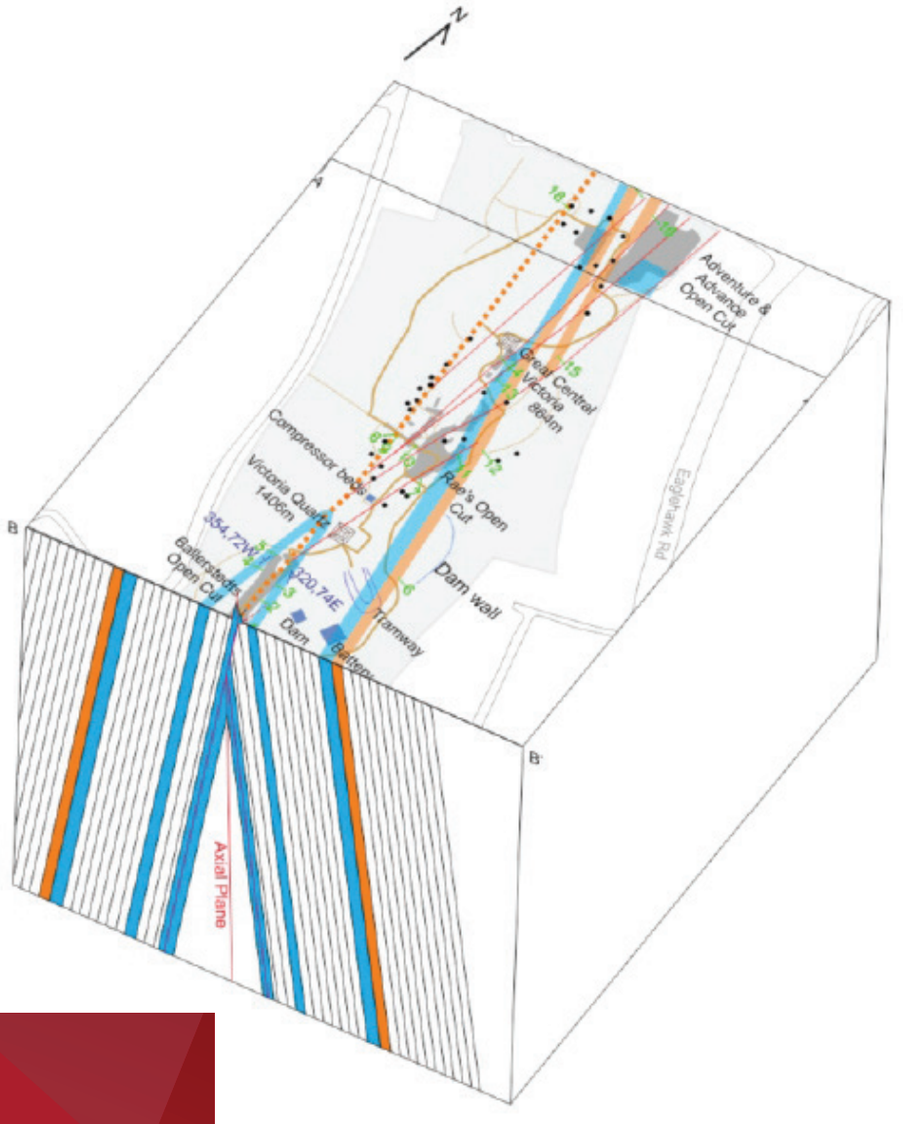
Site 11. 1: New Chum Anticline. 2: Weathered dyke. 3: veins refracting through sands and shales.

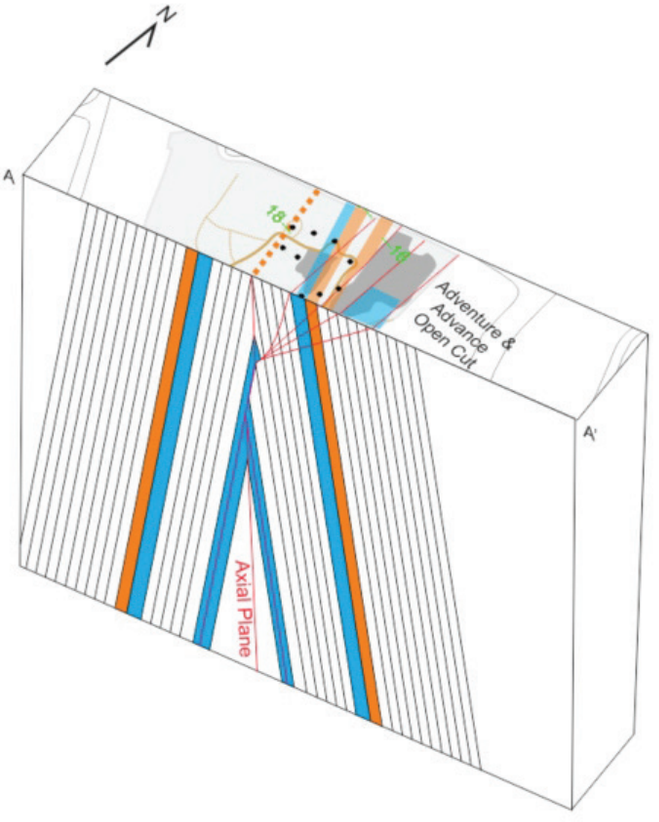


Sites 12 & 13. Limb thrust faults near the Great Central Victoria shaft. Massive quartz on the fault has been left by the miners and they have preferentially mined tension veins adjacent to the fault.

Site 14. Refracting cleavage in sandstone marking the position of the New Chum Anticline.

3D block models of Victoria Hill depicting the gently northerly plunging limb thrust fault system and accompanying workings.





FURTHER READING

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Virtual field trip and Interactive map at www.linex.com.au/Vic_Hill.html
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