



Notes and Discussion

Locating the Eureka Stockade: Use of a Geographical Information System (GIS) in a Historiographical Research Context

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Abstract. GIS methodology was used for the purpose of locating the disputed site of a historically significant battle, which took place in 1854 when miners on an Australian gold field staged an armed uprising against government forces. The route of the first survey of the area (1854) and the earliest known contour map (1856–1857) were overlaid on a modern street grid. Other features such as the vantage points of illustrators and the authors of eyewitness accounts were also incorporated. The resulting composite map was used as the key reference framework for comparing and critically evaluating a large body of primary and secondary written accounts, and for reaching a conclusion concerning the site.

Key words: co-registration, colonial, Eureka Stockade, GIS, gold, historical map, historical site, historiography, history, rebellion

1. Introduction: The Eureka Stockade

The city of Ballarat, population 83,000, lies some 110 km west of Melbourne, capital city of the Australian state of Victoria. Ballarat was established when gold was discovered in 1851, on country formerly used for sheep grazing. In 1854, Ballarat became the site of one of only two armed insurrections in the history of European settlement in Australia. The rebels' "Southern Cross" flag and the memory of their ill-fated stand at the Eureka Stockade are to this day iconic images in Australian political consciousness.

The affair erupted when disgruntled miners rebelled against an autocratic and corrupt goldfields administration and the brutal methods used by the colonial police force to enforce payment of a monthly mining licence fee. They established a defensive stockade among "shepherds' holes"¹ in the locality known as Eureka, where one of the richest "deep leads"² on the Ballarat field was being traced. At dawn on Sunday December 3 1854, police and soldiers stormed the stockade. Taken by surprise, outnumbered and outgunned, the occupants were quickly routed. An estimated 22 were killed and 12 wounded. Casualties on the

government side were 4 killed and 12 wounded. Martial law was declared, and all armed resistance collapsed.

However, there was immediate public outrage against what was seen as a brutal over-reaction in a situation essentially brought about by the actions of the Goldfields Commission and the colonial government. When 13 stockaders were tried for treason in Melbourne early in 1855, all were acquitted to great public acclaim. In the following months, most of the miners' demands were acceded to. The Miner's Licence was replaced by an export duty on gold and a Miner's Right which cost a small annual fee. A system of mining wardens replaced the gold commissioners, and police numbers were cut drastically. The pace of reform was so rapid that within a year, the rebel leader Peter Lalor was representing Ballarat in the state Legislative Council. After the establishment of the Legislative Assembly in 1856, he was elected to that chamber, of which he later became Speaker.

The extent to which the Eureka Stockade debacle was instrumental in precipitating change, and the extent to which change was inevitable and imminent in any case, remains a matter of contention. However, there is no doubt about the preeminent place of the battle in the national psyche. The symbols of Eureka have generally been identified with the political left, but they have also been adopted at times by groups on the radical right. Today, the significance of Eureka is acknowledged by all shades of the political spectrum, being variously characterised and mythologised as the cradle of Australian democracy, as a revolt of free men against imperial tyranny, of labour against a privileged ruling class, of independent free enterprise against burdensome taxation, as an expression of multicultural republicanism, and so on.

However, this enduring if ambiguous legacy was not apparent in Ballarat in the stable and prosperous years immediately following the stockade battle. Most miners, whilst they probably gave the stockaders at least some of the credit for the reforms that followed, were relieved to put the turbulent past behind them. Indeed, Lalor and a number of other stockaders were quick to move on in respectable and profitable new directions. As a result, the event soon faded from public consciousness, and the site was neglected. This neglect was compounded by the fact that the stockade had only an ephemeral existence amongst the clutter of tents, shanties and alluvial workings on newly cleared and rapidly changing terrain where enduring landmarks were few. After the rebels' defeat, the materials used in the construction of the stockade were soon reclaimed for other purposes, and all physical trace of the stockade disappeared. Consequently, when moves were eventually made to erect a monument thirty years on in 1884, some uncertainty was reported as to the exact location of the stockade.

2. The Recent Controversy about the Site of the Stockade

The site of the Eureka Stockade lies in a predominantly residential suburban area, some 2.5 km east of the centre of Ballarat. The Eureka Stockade monument,

erected in 1884, stands in the south-east corner of a commemorative park reserve located on the north side of Eureka St.

The 1970s saw a general awakening of interest in matters of history and heritage in Ballarat. This included the Eureka Stockade affair in all its aspects, including the question of the location of the stockade. A few enthusiasts kept the site issue alive in the columns of the Ballarat *Courier* for 20 years, by which time most interested parties tacitly accepted as fact that the stockade had been located some hundreds of metres west of the monument. In April 1993, this view was endorsed by the Surveyor-General of Victoria.

Soon after, the author happened upon a map of the Eureka area which showed contours, watercourses and deep leads as of late 1856 or early 1857.³ When this map was roughly overlaid on a street plan and an aerial photograph, it was apparent that substantial changes had occurred in the topography of the area, in particular the obliteration of a gully which had run from near the stockade monument in a straight line towards the north-west.⁴ Since eyewitness accounts referred to a gully to the west of the stockade, this evidence obviously warranted further examination. During the following year of intensive research by the author and others, much more documentary, pictorial and cartographic evidence was unearthed.⁵ This body of evidence was assembled and evaluated (Harvey, 1994).

3. GIS Methodology

Since there were no street alignments and only one clearly recorded road (or track) in the Eureka area in 1854, the main locational clues in the accounts of participants and witnesses are in references to the topography. Yet prior to 1993, little attention had been given to the details of the topography in the 1850s in seeking to interpret those accounts. The crucial link was a map surveyed and prepared by John Phillips, Assistant Surveyor, between October 1856 and June 1857, of which a small section depicting the Eureka area is shown in Figure 1.

The whole Phillips map depicts an area many square kilometres in extent. It shows leads, gullies and contours, a number of surveyed streets in the central Ballarat area, and a track designated as "Melbourne road" in approximate alignment with the modern Eureka St. It contains sufficient topographical detail over a wide area to enable it to be accurately overlaid on a 1903 geological map, which also shows surveyed streets in the stockade area. This in turn provides a link which enables the Phillips map to be accurately overlaid on a government plan showing the actual modern street alignments in the neighbourhood of the stockade. The author first did this overlaying by hand and eye, using transparencies prepared on a variable magnification photocopier. Cartographic staff of the State Data Centre, Ballarat later repeated the process using GIS techniques for co-registration of two maps (Toplis, 1993). This confirmed that taken over its whole area the Phillips map matched the modern topographic base to a reasonable degree of accuracy. However, as a result of some local non-linear distortion (not surprising considering the

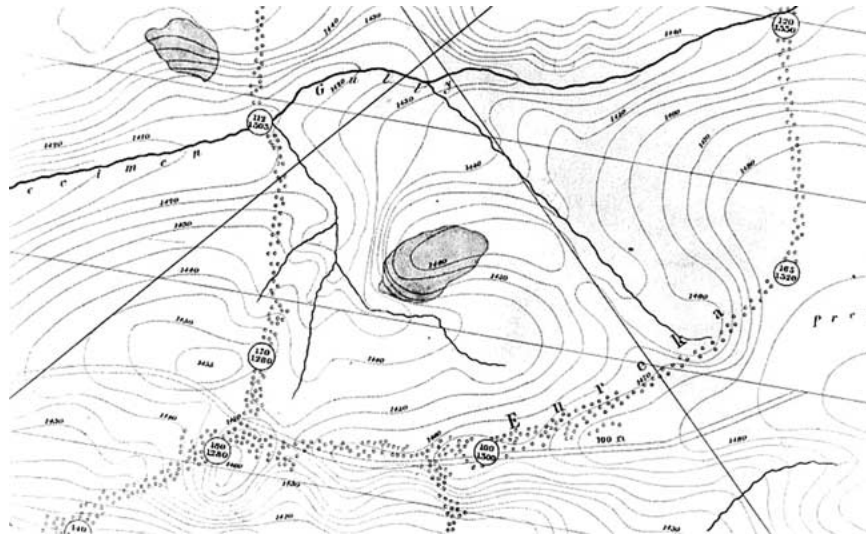


Figure 1. Eureka section of 1856–1875 map prepared by John Phillips.

vintage of the map), the fit produced by co-registration on a global scale resulted in a substantial offset error (i.e. a consistent displacement) of some metres in the localised area of interest around the Eureka Stockade site. The author subsequently used GIS software to perform a more accurate co-registration within this locality, by applying his detailed knowledge of the local street alignments and their relation to key elements of the topography. The process used was as follows.

The modern street boundaries were supplied by the State Data Centre, Ballarat, as a vector GIS layer (i.e. points and lines) with standard co-ordinates based on the Australian Map Grid Zone 54 (AGD 66) projection. The relevant section of the Phillips map was photocopied and scanned to produce a raster GIS layer (i.e. a pixellated digital image). Ground control points (GCPs) were selected on the vector layer, corresponding to the intersections of street boundaries and key topographical features (gullies and ridgelines). Corresponding points were located approximately on the raster layer. The GIS software was then used to “warp” (geometrically transform) the vector layer so that the control points were aligned in both layers. The resulting overlay was visually assessed for overall fit, and the registration was successively improved by adjusting some GCPs and by adding supplementary GCPs, until a good fit was obtained throughout the image.

Because the software used had no raster pixel re-sampling capability, the vector layer was registered to the raster image rather than vice-versa, resulting in noticeable distortion of the standard map grid and the street alignments. To overcome this problem, and also to improve the quality of the display of the various features of the historical map, the elements of the raster image were digitized on-screen and stored in new vector layers as smoothed polylines (contours, tracks, watercourses) and point objects (dotted areas representing deep leads). The raster image was

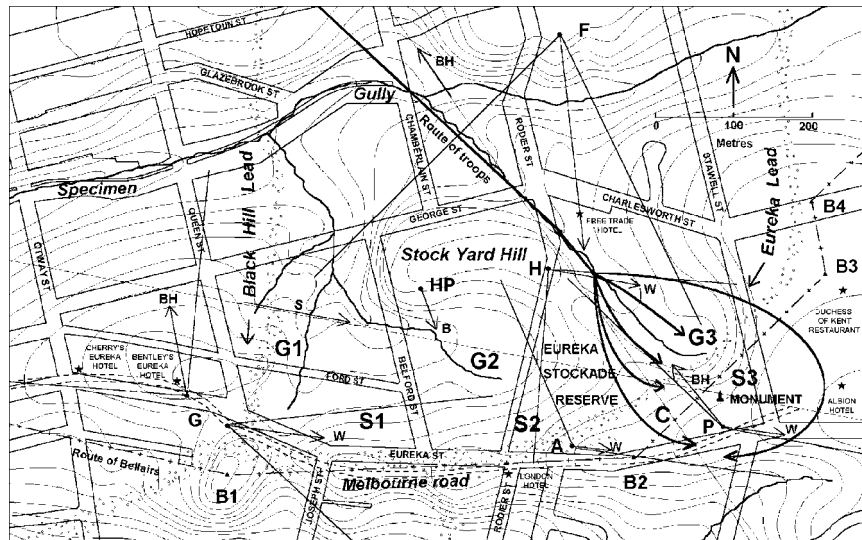


Figure 2. Street alignments and key features overlaid on 1856–1857 Phillips map.

then discarded, and the ensemble of vector layers was displayed using the standard AMG projection.

The resulting overlay of the 1856–1857 map on the modern street alignments was used as the base on which to produce a four-colour display of key points of topography and built structures, vantage points of witnesses and illustrators, and conjectured troop movements (Figure 2 is a monochrome reproduction). Further cartographic evidence in the form of a field book from the first official survey of the area in September 1854 was also incorporated. The body of documentary and pictorial evidence assembled (Harvey, 1994) was extensive and often ambiguous or contradictory, and the GIS map was an indispensable aid for cross-referencing, evaluating and elucidating it.

4. Conclusion

The conclusion reached (Harvey, 1994), was that the Eureka Stockade monument is indeed in the correct location, and that long-held views to the contrary had probably originally arisen as a result of the combined effect of a number of errors, misinterpretations and omissions in secondary material published within thirty years of the stockade battle. Whilst this conclusion may seem unsurprising and anti-climactic, this was certainly not the case at the time, with much emotional and professional investment in the status quo contrary view. There were also very immediate practical ramifications, with regard to the location of a planned interpretative centre. The use of GIS methodology was crucial in establishing an objective basis for discussion and decision making, and whilst not everybody was

persuaded by detailed and technical arguments about perspective, parallax, distance perception and the like, the heat gradually went out of the “further west” campaign.

As a footnote, the Eureka Stockade Centre, which opened in 1998, is located on the western side of the reserve, close to but not on the site of the battle. Archaeological assessment of the location of shepherds’ holes uncovered during building excavations lent indirect support to some key aspects of the arguments of Harvey (1994).

Notes

¹ Shepherds’ holes were the shallow beginnings of mine shafts established in the vicinity of deep leads (see note 2), in order to occupy ground which may become prospective, depending on which direction the course of the lead were to take.

² Deep leads were the meandering gold-bearing courses of ancient rivers, channelled into the bedrock but buried under tens of metres of alluvial overburden deposited after the streams were blocked by lava flows in a comparatively recent geological epoch.

³ The map can be approximately dated by the period of tenure in Ballarat of its creator, John Phillips, and by the known dates of establishment of structures shown and not shown.

⁴ Apart from extensive mining during the 1860s, other contributing factors to this obliteration at various times have been “cut and fill” roadworks, residential development, a railway line, petrol depots, an ornamental lake, a modern swimming complex and a caravan park (all within a few hectares!).

⁵ The possibility of direct archaeological evidence had been considered and rejected because of the ephemeral nature of the stockade and the subsequent major disturbances of the ground in the area.

References

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