

Spatial Information ... the Final Frontier

(To boldly go into 3, 4 or more dimensions).

Jan 2009

This month's topic: Utility Networks

The Queensland Cadastre includes 3D parcels. This is a given, but to date there has not been any pressing need for a 3D Cadastral Data Base. This is set to change with the development of emerging trends as described here.

Tunnel Building

The Clem Jones Tunnel is a major infrastructure development – 3 years, 3,000 million dollars, but in terms of a network it is trivial – 4.8 km with only a few branches.

(<http://www.clem7.com.au/content/2018/Construction>).

There have been discussions over the years about an underground light rail system in Brisbane, which will consist of smaller diameter tunnels (much cheaper per unit length), but will be significantly longer and more complex.

(<http://www.news.com.au/couriermail/story/0,23739,22104567-23272,00.html>)

Looking at the Clem Jones Tunnel, the approach to land/space tenure issues was to adhere to the existing Cadastral registration procedures. As a result, there is a new plan created for every surface parcel, provided that is a property parcel.

The result, as can be seen in Figure 1, is a very large number of subterranean parcels which do not form a continuous network, since there are gaps below every road and at the river. Because the road and river parcels belong to the government, there is no need for the underground extents of the tunnel to be defined. (There is an exception with Shafston Ave, where the tunnel comes to the surface. A cadastral parcel has been created here). The cadastral record of the tunnel is therefore comprised of small volumetric parcels such as that under the Captain Burke Park – Lot 837 (Figure 2), lot 22 on RP197097 (see Figure 3), and all the private property parcels between..



Figure 1 Tunnel running under surface parcels

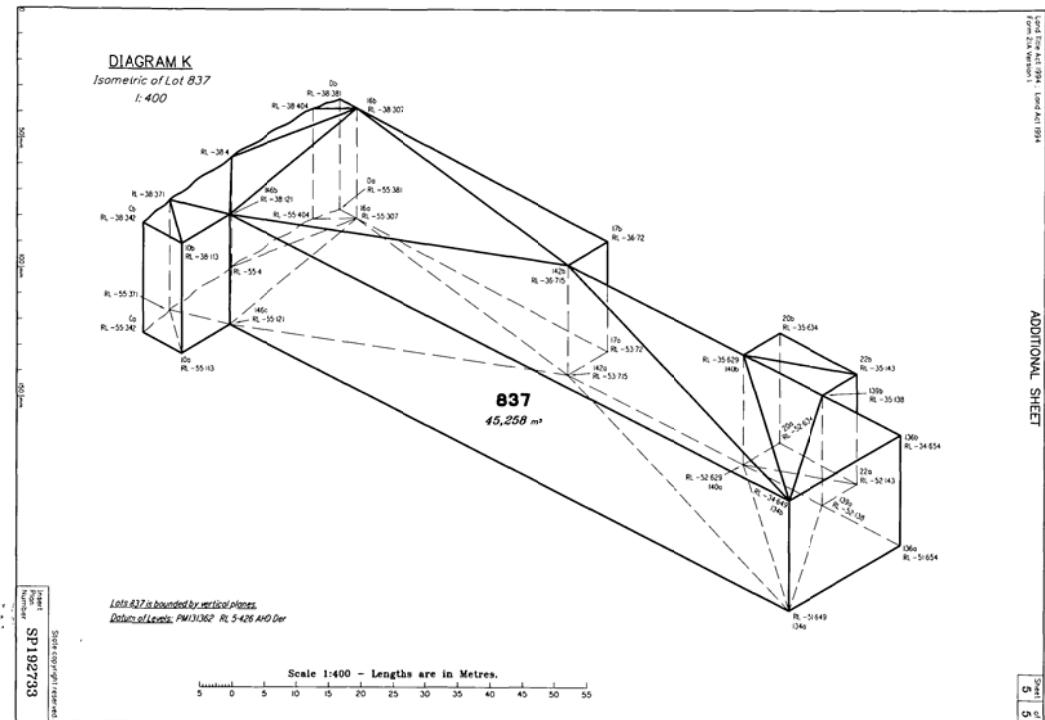


Figure 2 Section of tunnel below Captain Burke Park

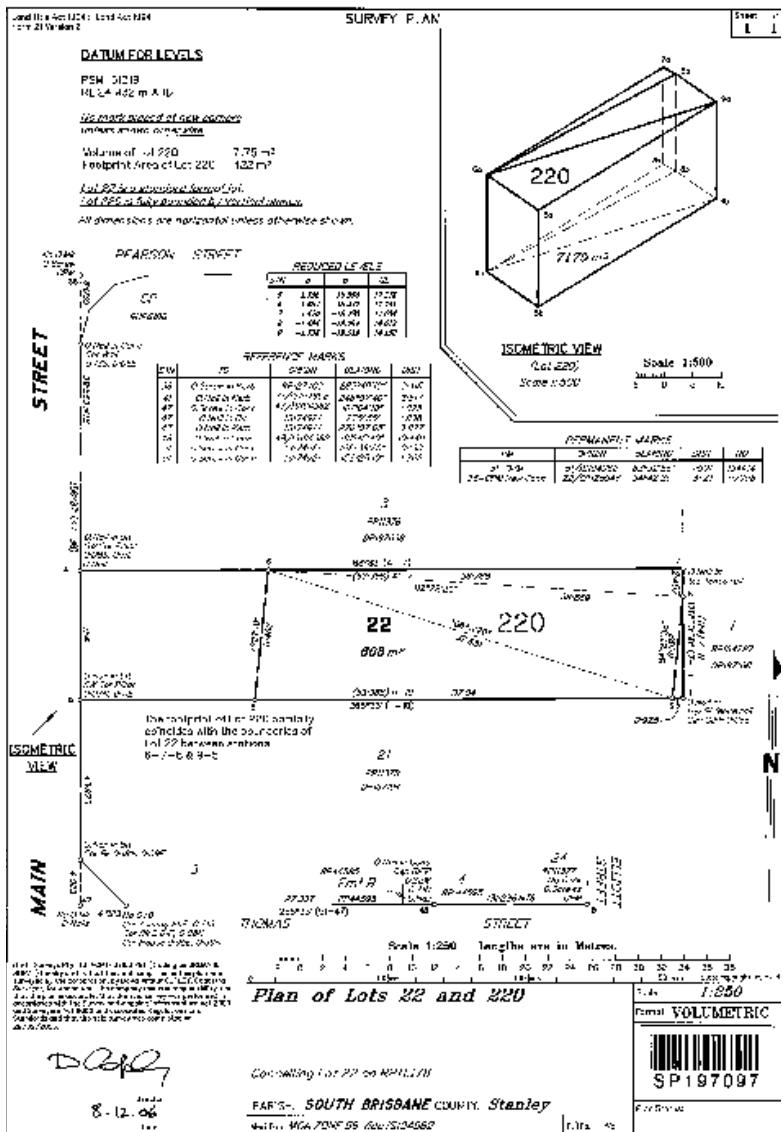


Figure 3 Lot 22 and lot 220 on SP197097

This must have been a costly exercise – to survey, draw and register these hundreds of plans. It seems likely that in the near future, if a large underground network is being developed, pressure will be brought to bear to allow a single plan of the whole tunnel to be registered. (The actual benefit to the public of resurveying the surface parcels is minimal compared to the cost).

When the surface parcels are subdivided in the future, the subterranean parcels will not be affected, and so the constraint that a volumetric parcel is contained within a single base parcel will be broken.

Private Utility Networks

In Australia, until recent times, all utility networks were created and administered by the Government (at one of the three levels). In addition, the vast majority of existing networks are above, below or on non-property parcels – usually within the road easements. Where a network crosses private property, an easement has been created.

There is a trend in Europe and the USA in particular towards private utility networks, and of course, the trend in Australia towards privatisation means that networks that were publicly owned are becoming private. The trend in the Netherlands¹ has reached the point where the Dutch cadastral authority (Nederlands Kadaster) has recently been tasked with administering these networks as cadastral parcels. (This was a definitional change – by law certain utility networks became real estate).

These privatised network sections become a tradable commodity, like any cadastral parcel, and there are cases of speculative construction of underground network real estate in order to profit from the rental of that space.



Figure 4 A street in the Netherlands

Note – large areas of the Netherlands give the impression of being a picturesque medieval village. This is largely because of the complex underground network of utilities. The technology is hidden.

Private Light Rail

These systems are fairly common in Europe, with a prime example being the Docklands Light Rail (DLR) in London. This is partially elevated and partially underground, and is privately owned.

¹ It is easier to cite examples from the Netherlands, since I have contacts in Nederlands Kadaster, but this trend is widespread in Europe.



Figure 5 Docklands Light Rail system

If a Brisbane Light Rail system is ever to eventuate, it will most probably be on a similar pattern to the DLR, and will therefore require a form of land/space tenure above/below ground.

Dial Before You Dig

This is the nearest we have to a registry of networks. It is a voluntary not-for-profit Australia-wide organisation that provides a cross reference to data about underground assets in order to protect those assets and the public safety. It only deals with underground, and does no verification of the data. Consulting “Dial Before You Dig” also provides legal protection to the constructor in the event of a mistake.

Overhead Networks

The big cable roll-out of the recent decade would not have been possible if the cable owners had not been able to simply sling them up on existing power poles. This in effect created a pair of private networks which are primarily overhead.

There was some dispute at the time about rental of the space on the power poles, but no apparent issues presented by the use of the airspace between the poles. Issues will arise as airspace above roads becomes more valuable.

Network Definition

The definition of network in terms of the land surface subdivision pattern is inadequate for the purposes of administering a complex collection of networks.

As can be seen from Figure 1, the defined subsurface parcels do not connect, and therefore do not constitute a network. This means it cannot be used for network tracing, “dial before you dig” (except on private property) etc.

It also creates a maintenance nightmare. If the surface cadastre is adjusted, the subsurface parcels need to be re-assessed and an adjustment applied to them as needed. There is no guarantee that the surface and subsurface parcel adjustments will be the same.

As a sideline, referring to Figure 2, there is a “natural boundary” defined as the high water mark of the river in the definition of the surface parcel. This has been projected down to the boundary of the volumetric parcel. This presumably means that this is an underground “ambulatory” boundary – a very unusual concept.

Crystal Ball

Some time in the next five years, the Department will be presented with a *fait accompli* – the underground (and possibly overhead) network space will be declared to be cadastral parcels, and the Department will be tasked with administering them. This will necessitate a 3D (actually 4D) cadastral database to answer such questions as “which surface parcels are within ... of the ... network?”

This will occur with no prior warning.

Will we be prepared?

Rod Thompson

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