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SURVEY ACCURACY FOR INFRASTRUCTURE AND ROUTE CADASTRAL MODELLING USING 'GEOCADASTRE'

BACKGROUND

The 'GeoCadastre^{TM}' software program has been used in many large infrastructure projects to provide a survey accurate base cadastre where an existing Digital Cadastral DataBase (DCDB) is not of sufficient spatial integrity for the purpose.

The routes of large infrastructure projects (roads, pipelines, cables, transmission lines, etc) usually cross many cadastral boundaries or are located adjacent to and parallel to boundaries as they run within road reserves or other corridors.

The location of those cadastral boundaries are important, generally to ensure the asset is within the correct property as per negotiated legal arrangements.

A survey accurate cadastre can provide coordinate boundary definition information (particularly for GPS use) to undertake most project survey requirements up to final subdivision or easement plan preparation for registration.

It provides an opportunity for desktop design to allow the most cost effective design to be adopted and to minimise land take costs.

As the project progresses, the cadastral model can be upgraded as needed to become the basis for the asset management database, as the location of services and structures are recorded from work as executed surveys.

METHODOLOGY

Survey plans of properties affected by the route, adjacent parcels and survey control with connections to that cadastre are entered into the 'GeoCadastre' program, joined and adjusted.

This provides the route with a Numerical Cadastral Database. The survey accuracy of the database is directly related to the quality (usually relative to age) of the survey plans utilised.

Where a higher level of survey accuracy of the cadastre is required, the GeoCadastre software will provide direction as to where additional survey control will be most effective, thereby minimising survey control fieldwork.

BENEFITS

- A survey accurate coordinated route base cadastre for planning, feasibility and design purposes can be created with minimal or no survey fieldwork.
- Survey boundary definition fieldwork to mark boundaries on the ground may not be required. The cadastral model provides Coordinates of the boundary.
- If the location of the route is not critical for legal or engineering purposes the level of overall survey requirements is significantly reduced.
- The full extent of the route is coordinated within a recognised Geographic Reference System so exact lengths can be determined if necessary for engineering design and fabrication.
- A survey accurate cadastre may be necessary to match recent ortho-rectified aerial photography. Structures documented on cadastral boundaries (fences etc) can then be used as control for ortho-photo mapping.
- The cadastral boundaries will fit exactly with topographical mapping data.
- The model can potentially define the exact amount of land required for resumptions and easements as the exact location of cadastral boundaries can be available at the design stage.
- The opportunity exists for Local Government Departments or the Land Titles Office to enter into an arrangement to supply a project with cadastral plans and other survey information on the basis that the survey accurate cadastral model created is available for updating their own cadastral database. The supply of that information can be a reasonable cost saving for a project.

The real economic benefits of the process cannot be rationalised, other to relate it to insurance or risk management. Project managers would recognise the far reaching extent of the issues following Development Approval and further into the project, where:

- an affected property has not been identified in the Approval
- significant variations on the ground that would in the future unknowingly affect ‘sacred sites’ or environmentally sensitive areas
- the poor spatial quality of existing cadastral databases results in services or infrastructure shown incorrectly in the design and possibly disturbed during construction – ie optic fibre.

CASE STUDIES

Sydney to Melbourne Optic fibre project. (2000)
Trehy, Ingold & Neate - Surveyors

In many rural areas the existing cadastral database showed the project route passing through incorrect properties. This was only evident after the numeric cadastre was created.

The strict project timelines had to cater for Statutory periods regarding landowner notifications and negotiations. Those timelines could have been compromised if incorrect owners were notified as well as other associated issues.

PACIFIC HIGHWAY CONSTRUCTION for RTA NSW – Buladelah, NSW North Coast
QASCO – Aerial Photography

This Project was carried out for the mapping company QASCO as part of the planning for a new highway to by-pass the town on the east. They had produced accurate orthophoto maps of the area and had great difficulty in reconciling the DCDB boundaries with the observed fence lines on the maps.

Most of the Crown Portions were surveyed in the 1880’s, the town plan was drawn up in 1902 and the private subdivisions date from about 1900 to the present time, similar to numerous widening and realignment plans for segments of the Pacific Highway through the town.

The job was assembled in two parts divided by the Myall River as there were no survey connections linking the two cadastres. Plans were not available for some lots and these were then generated by using data from the DCDB supplied by LPI. These lots show up as “digitized” lots in the cadastral data and show large residuals after adjustment. If the DCDB lots are not included, both areas could adjust with the adjustment distance tolerance set to 100mm.

An agreement was made between the parties whereby Great Lakes Council supplied cadastral survey plans & other data free of charge to the project managers in return to the dataset being made available to Council.

RETICULATION, PIPELINE & DAM PROJECTS – Hunter Valley
HUNTER WATER AUSTRALIA

Over ten years ago HWA created a Numerical Coordinated Cadastre for their area of operations (5 Local Government Areas) using the GeoCadastre process. That coordinate model is kept up to date with all new plans entered daily by (1) experienced staff member.

The updated accurate cadastral database is then provided to all sectors of the Corporation (design, repair, maintenance, etc) weekly.

Where new assets (areas of reticulation, rising mains etc) are proposed, usually minimal (or no) control survey is required to provide coordinated cadastre accurate enough for concept and planning purposes. Cadastral survey fieldwork data from the detailed design, works as executed and final subdivision is used to provide extra precision to the coordinate model as development proceeds.

HWA has found when asset projects are to be located in remote rural areas the spatial quality of the DCDB is usually poor. Also, the numeric cadastral model initially created is not of sufficient quality, due to very old cadastral survey information. When some extra fieldwork coordinating cadastral marks is added to the GeoCadastre model, the spatial quality of the model increases greatly and accurate locations of infrastructure or areas of inundation are able to be marked on the ground for early site location review and negotiations with Landholders.

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