Site Profile
The Craigieburn Bypass Construction Project is located approximately 30km north of Melbourne. This strategic addition will create a fast link between the Hume Highway and Western ring road. The project has required the blasting of cuttings, drop cuts, ramps and pre-split walls for bridge abutments along its 17km length. This significant road project in Victoria is due for completion in 2005.

Abi Group are the principle contractor on behalf of Vic Roads. Orica Quarry Services supply bulk product, non-electric and i-kon™ electronic detonators to site. To date, Orica Quarry Services have fired approximately 50 blasts, breaking in excess of 500,000 BCM of blasted material.

The Situation
A unique challenge of the project required the freeway to pass underneath the Melbourne to Sydney rail corridor. This involved the creation of a rail diversion, and subsequent cutting of the railway lines, whilst Orica blasted a cutting for the construction of a railway bridge. Abi Group was also required to build a land access bridge adjacent to the railway bridge. Blasting at this stage was complicated by the presence of several fibre optic cables providing principle communications links between Melbourne and Sydney. This situation was complicated by the proximity of blasting (ultimately less than 5 metres) and the inability to relocate the cables. Additionally, one utility company could not switch over to an alternate cable should blasting damage their cable.

Blasting Issues
Given the discovery of the fibre optics and the need to blast ground at a distance of less than 5 metres, an alternate approach was required. The conventional approach employed bulk delivered explosives and shock tube technology for initiation. Whilst this technology is the bench mark for blasting operations worldwide, complete timing and loading control was vital for managing vibration levels as successive blasts approached the buried cables. The delay ‘scatter’ associated with pyrotechnic detonators meant that only electronic detonators would provide peace of mind in knowing exactly when charges would fire.

Technical Solutions
Faced with the challenge of not damaging or disrupting communication services, Orica employed a number of strategies to prevent damage, and manage risk whilst blasting the final ground. A site law was developed specifically for the area, and prior knowledge of sustainable vibration levels when blasting next to fibre optics, incorporated in the blast design.

Blasts were designed to a maximum peak particle velocity, and also included a factor of safety with respect to vibration levels. Orica’s i-kon™ system enabled engineers to design each blast with precise control over the maximum kilos of explosives firing, and the designed firing sequence. The system thereby allowed triple decking of blast hole with guaranteed single charge firing.

The construction of both bridges required a number of pre-splits to be fired, one of which was less then 5 metres from the cables. Traditional approaches to firing pre-splits involve a minimum of 5-6 blast holes firing instantaneously. The depth of the pre-split (10 metres) and therefore charge loading, meant that a reduced number of blast holes could be fired without exceeding vibration levels. The i-kon™ system once again enabled Orica Engineers to separate blast holes into discreet groups whilst cutting down on charge weights. The absence of delay ‘scatter’ ensured accurate sequencing of all blasts. After initial blasts, the timing was changed in the field following feedback from plant operators, and after loading to improve dig-ability and fragmentation.
Results

All blasts were fired successfully without damaging the fibre optic cables. Blasted material was immediately excavated after firing during lunch breaks: this minimised disruption, and generated a steady volume of material for excavation. Firing sequences could be uploaded into Orica’s Shotplus-i® software whilst on site and print outs generated for the customer. The auto log feature of the i-kon™ system also permitted fast hook ups of detonators even when using triple decked blast holes.

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