INCREASING PRODUCTIVITY THROUGH RISK MANAGEMENT AND TECHNOLOGY

CASE STUDY

THE SITUATION

During construction of a major traffic tunnel under the city of Brisbane, project leaders Thiess John Holland (TJH), sought Orica's advice to excavate 30,000 cubic metres of hard massive volcanic tuff from a critical tunnel portal. The portal was next to a major arterial road, heritage listed buildings, a church and a three story office building. The large areas of rock were too hard for mechanical rock breakers to work efficiently.

The task was complex as it was located in the middle of a busy construction site and a tunnel portal that had to remain open 24 hours a day. Strict vibration limits were imposed on the adjacent concrete soil mix and secant pile retaining walls around the excavation.

To maintain traffic flow on the adjacent main road, blasting could only occur once a week during a 45 minute window, with road closures limited to no more than three minutes. Orica worked with TJH, the Brisbane City Council, police and Main Roads to develop a highly detailed clearance procedure for the area. Managing and reducing the impact on the community and associated works were the major priorities.

SITE PROFILE

At a total cost of $4.8 billion, Brisbane's Airport Link Project was one of Australia's biggest road infrastructure projects. The 6.7 kilometre underground toll road was the first major motorway to link Brisbane city to the northern suburbs and airport precinct, allowing motorists to avoid up to 18 sets of traffic lights.

TECHNICAL SOLUTION

Orica proposed a Rock on Ground service which included blast design, drilling, explosives supply, shotfiring and blast management expertise for a total of twelve blasts. Several conceptual blast designs were modelled using the SHOTPlus™ i Pro program to consider the fragmentation and blast induced vibration of each design.

To maintain efficiency while loading hundreds of kilograms of explosives, Orica's Centra™ Gold bulk explosive was selected as the most appropriate product. This high energy, pumped emulsion blend provided the flexibility and energy required to break the hard massive volcanic tuff. In large volumes it was significantly more cost effective and faster to load than packaged explosives.

Conventional blasting methods would have required firing one small blast every afternoon. The daily disruption to operations, public roads, workers and neighbours have been unacceptable to numerous stakeholders. Orica and TJH worked together to develop a unique method to fire large blasts every four days to reduce the overall number of blast events. The innovative method involved loading blastholes with up to five individual explosive decks with each charge firing separately to control vibration levels.

Blasting in this environment required novel timing techniques to reduce adverse effects on the public and surrounding worksite. The initiation of large, decked blasts were made possible by using the i-kon™ Electronic Blasting System.

THE RESULTS

Twelve blasts were fired on time with no delays, under the management of an Orica Blast Controller, 12 blast sentries, four traffic controllers and four police officers. The project was an outstanding example of Orica's capabilities in:

- Managing the risks of using explosives in a large, busy urban construction project;
- Firing large blasts to reduce disruption to other activities on the site and surrounding roads;
- Using 3D computer blast design software to meet precise excavation tolerances; and
- Precise loading of bulk explosives down to one kilogram, to manage vibration cost-effectively.

All shots were successfully fired and excavated, with vibration and overpressure readings well under the compliance limits.

KEY OUTCOMES

- **NO EXCEEDANCE OF VIBRATION LEVELS**
- **REDUCTION IN NUMBER OF BLAST EVENTS**
- **DELIVERED ON PRECISE EXCAVATION TOLERANCES**

"Controlled blasting was the solution on this project, allowing TJH to improve the productivity of its rockbreakers and excavate this critical site while protecting the sensitive nature of the site surrounds."

Earl Alcon,
Senior Project Engineer
Thiess John Holland