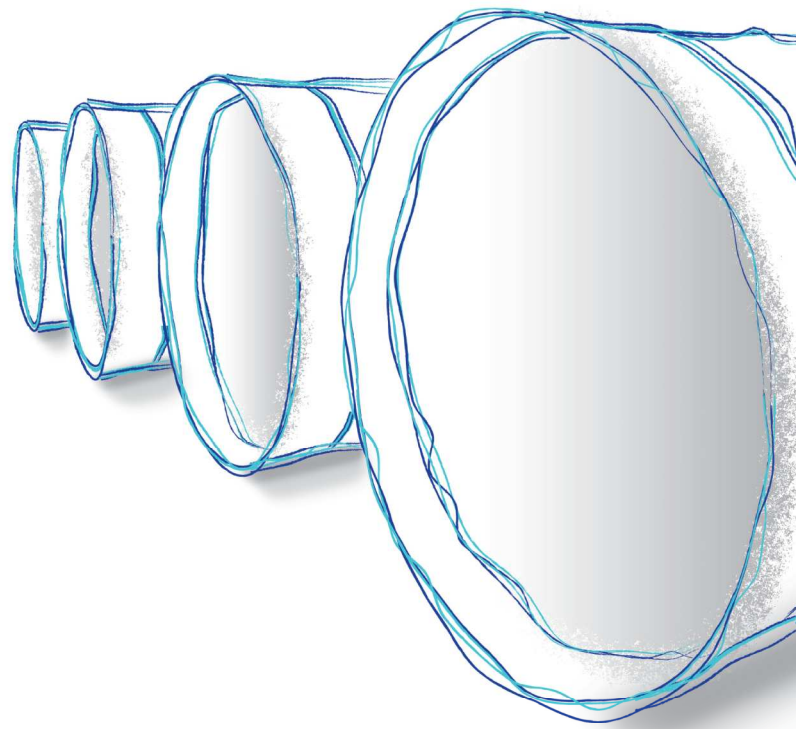




# project factsheet



May 2009

## Tunnelling on the Sugarloaf Pipeline Project

Specialist tunnelling methods are being used to construct the Sugarloaf Pipeline through the Great Dividing Range to avoid a sensitive and difficult to access section. This fact sheet explains the construction process for this section of the Sugarloaf Pipeline.

### Tunnelling activities

A special purpose tunnel boring machine (TBM) will be used to excavate a tunnel, approximately 830 metre long, through mountainous terrain.

TBM's are highly advanced excavation equipment specially designed for the particular geological conditions in which they are used.

An access shaft, measuring approximately 10 metres by six metres, has been constructed at the southern end of the tunnel to launch the machine,

approximately 10 metres below ground. At the northern end of the tunnel where the terrain slopes down, the TBM will emerge from the rock face.

### How does it work?

The TBM uses precast pipe sections to drive the machine and provide immediate ground support. The precast pipe sections are installed in the launch shaft and are pushed forward using a large hydraulic jacking frame. A set of intermediate hydraulic jacking stations are installed at predetermined intervals to evenly distribute the jacking loads during the advance of the TBM. The action here is much like an earthworm.

The TBM is made up of several section or 'shields' which contain hydraulic drives, crushers, an air lock chamber, slurry pumps, and other specialist equipment.

At the front of the TBM is the cutter head which contains a number of steel disks that grind through the ground as the head rotates.

Behind the cutter head is a chamber where the excavated soil is mixed with slurry, which is a fluid, consisting of water, bentonite (clay), polymers, or a combination of both. The slurry acts as a transport medium for the excavated rock, which is pumped back up to the surface.

### What happens to the excavated material?

On the surface, a large Slurry Treatment Plant is used to segregate the clay and rock material before it is loaded into trucks and transported to approved disposal locations. The majority of the excavated material is being disposed of in Old Castella Quarry however some is being reused



for temporary hardstands on other parts of the alignment.

## About the project's TBM

The TBM used on the Sugarloaf Pipeline Project was manufactured in Germany and is a Herrenknecht AVN1800TB with an extension kit to increase the cut diameter of the machine to 2475mm. The machine is equipped with a hard rock cutterhead and is capable of tunnelling through hard rock, excavating and supporting soft ground.

The ground conditions in the vicinity of the KP 41 Tunnel include Silstones, Fine Sandstones and Colluvium Gravelly Clay/Boulders. Based on laboratory testing the average Ultimate Compressive Strength (UCS) of the rock is 150-200 MPa, with a maximum of 250-300 MPa. This is approximately 8-10 times stronger than structural concrete, which has a rating of 32MPa.

The TBM weighs just over 100 tonnes and has an overall length of approximately 16 metres.

The machine was named 'Ollie' after the world's biggest earthworm, the Giant Gippsland Earthworm, which belongs to the 'Oligochaeta class' of worms. It is remotely controlled from the surface and is expected to take 12 to 14 weeks to excavate the tunnel.

## Drill and blast techniques

Due to extremely hard rock in the area, drill and blast techniques were used during the excavation of the TBM Launch Shaft.

This involves using a specialised rock drilling rig to drill holes into the rock, which are then charged with explosives, and detonated.

Blasting operations are carefully controlled and monitored by authorised personnel. A specialist blasting contractor has been employed to undertake and monitor blasting activities in accordance with proscribed

Australian Standards (AS 2187.2—2006, Explosives—Storage and Use).

All blasting activities for the KP 41 tunnel were completed in early March 2009.

## Potential for noise and vibration

Noise and vibration should not be felt during tunnelling activities.

Monitors were placed within the vicinity of the shaft during blasting work to record noise and ground vibration and ensure levels stay within proscribed standards.

## Traffic impacts

During tunnelling operations some localised and short-term traffic disruptions can be expected however the project team will take every effort to minimise these impacts.

To help facilitate the safe delivery of equipment and supplies to the tunnel, the Alliance has constructed right hand turning lanes to help ease traffic impacts around the tunnel launching and reception sites

Other traffic changes will be required during the transport of materials and construction equipment.

Details of current traffic changes are advised via information bulletins, newspaper advertisements, radio announcements and on the project's website.

## Why was this construction method chosen?

The pipejack TBM tunnelling method was chosen as the lowest impact for this section of the pipeline which travels through a particularly steep slope of the Toolangi State Forest.

Controlled blasting was required to excavate hard sections of rock in the TBM launch shaft, which construction machinery could not remove effectively.

This method of excavation will also ultimately reduce impacts on the local

community by reducing the duration of construction activities in the vicinity of properties and hence the amount of time noise and traffic impacts that may be experienced.

## Further information

For legislation and other publications relating to drill and blasting, see:

- Australian Standard 2187.2—2006, Explosives—Storage and Use