



Project name: Amethyst Hydro Tunnel
Client: Amethyst Hydro Limited
Project date: 2010 - 2012

Project description

The 7.7MW Amethyst Hydro power station was commissioned by Westpower in June 2013. The station is situated 5km east of Harihari. Water is taken from a streambed intake high up in the Amethyst River and transported to the powerhouse via a tunnel and penstock (total length of 2.5km), established by Geotech. Amethyst Hydro Limited (AHL) has taken advantage of a small amount of water and a large gradient drop, to generate clean hydro electricity to go back into the local South Westland grid. The majority of the scheme has been constructed in public land administered by the Department of Conservation and particular attention was paid to minimising the environmental footprint.



Geotech's role

Geotech Ltd was the primary contractor onsite with the task of establishing the tunnel, to the satisfaction of the client representative onsite, and to the engineer's specifications.

The project consisted of two key delivery areas - the portal stabilisation, and the tunnelling. The site was challenging, both due to the geology of the rock, poor ground conditions and the trying operating conditions including high water zones and managing water inflow. Portal works required excavation and benching, drilling and slope stabilization (using steel and mesh reinforcing), shotcreting and improvement of ground competency. The scope of the tunnelling works was to construct a 3.5 m wide by 3.8 m high tunnel, with an upward grade of 1:4.4 (approximately 13° rise). The geology of the rock that the tunnel was built through was alpine schist; a metamorphic rock with a dominant weakness plane along cleavage, and due to the location (approximately 2 km from the alpine fault zone) was at times heavily jointed, with clay infilled sheared zones.



Resources applied

Portal stabilization was achieved utilizing a range of experienced staff and support plant and equipment including:

- 3 LHD underground boggers
- 3 tonne, 10 tonne, and a 30 tonne digger, the later 2 with milling heads
- Jumbo underground drill
- Rock bolting equipment
- 10 tonne loader with forks and bucket (with loadrite scales)
- Concrete/shotcrete batching plant
- Concrete mixer
- 20 tonne capacity cement silo





- Robotic and manual shotcreting plants
- Mercedes dump truck
- Loading transfer bin for muck
- 2 ventilation systems (600mm and 1000mm diameter)
- Transformers for tunnel power supply and electrical container
- Sieving analysis laboratory
- HE and detonator magazine

Full workshops, storerooms, drying room, toilets and shower block, 2 crib rooms, and office facilities were also established to support the project.



Innovation and performance

Geotech remained responsive to the changing and challenging nature of the contract, using ongoing shift evaluations to ensure that work practices were amended to best meet the conditions. Geotech also invested in customized machinery and equipment, to provide safer and more efficient work conditions. These included a customised 10 tonne digger fitted with a milling head and a Load Haul Dump (LHD) underground “bogger”. The LH307 was designed and built by Sandvik specifically for use in the Amethyst tunnel.

At break through of the tunnel, Westpower chief executive Rob Caldwell said in a media release *“The Geotech people have done a terrific job in what at times have been very trying conditions”*.

Geotech were also contracted to install a penstock within the tunnel. This contract was awarded at the end of the tunnelling work, and shows the sustained good relationship between the client and contractor at the end of the major tunnelling civil works.



Project value

\$14.2m

Project reference

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