Snowy 2.0

TBM Florence

Engineering
Fact sheet 4

TBM FLORENCE FAST FACTS

LENGTH
143 metres

WEIGHT
2,415 tonnes

Motors to turn the cutterhead when excavating
14 x 350 kilowatts

TORQUE
23.828 kilonewton-metres

WHAT IT WILL EXCAVATE
Headrace tunnel and headrace adit

CUTTERHEAD DIAMETER
11 METRES
(the height of a three-storey building)

14.9km
Total distance to be excavated by this TBM

63
Cutter discs

6
Gantries

Operating gradient
-0.44% to -9.8%

TBM NAMED AFTER
Florence Violet McKenzie, Australia's first female electrical engineer

Manufacturer: Herrenknecht

4.66
Cutterhead revolutions per minute

Special Features

TBM Florence will excavate the headrace tunnel from the Tantangara portal

This TBM can operate in both open mode and slurry mode. While the headrace tunnel will be excavated in hard rock, the variable geology along the alignment includes a volcanic area with naturally-occurring asbestos (NOA) minerals within the rock. To manage the presence of NOA - which is not a regular occurrence in tunnelling - Herrenknecht designed a TBM that is able to switch to slurry mode when the NOA-containing rock is encountered by forward probing. This encapsulates the airborne fibres with water and bentonite within the slurry circuit for treatment at the surface, preventing worker exposure to hazardous airborne fibres.

Florence Violet McKenzie (1890-1982)

Born in 1890, Florence Violet McKenzie (nee Wallace) became fascinated by electricity at a young age, playing with wiring, batteries and light globes. After graduating from Sydney Girls' High School, Florence tried to study for a diploma of electrical engineering at the Sydney Technical College at Ultimo, but was told she couldn't enrol unless she was working in the trade. So she printed some business cards, scanned the newspapers for electrical jobs, scored a contract in Sydney's west, and returned to the college with the proof. She was duly enrolled and became Australia's first female electrical engineer when she graduated in December 1923.

In 1922 Florence opened The Wireless Shop in Sydney's CBD which became the place to be for Sydney's radio enthusiasts. In 1924 Wallace became Australia's first female certificated radio telegraphist, the first Australian woman to take out an amateur radio operator's licence, and she was also the first female member of the Wireless Institute of Australia. She married electrical engineer Cecil Roland McKenzie in December 1924.

In the 1930s McKenzie turned her attention increasingly to teaching other women about electricity and radio. She believed electricity could significantly reduce women's time spent in the kitchen, founding the Electrical Association for Women in 1934 and publishing the first "all-electric cookbook" two years later.

In 1938 McKenzie joined the Australian Women's Flying Club and was responsible for training women pilots in Morse code. With war approaching, McKenzie voluntarily set up a signal instruction school, the Women's Emergency Signalling Corps, initially for women to teach them telegraphy so that they could replace men in this reserved civilian occupation.

But such were her teaching skills that during World War II, over 12,000 servicemen were also trained in Morse code and other signalling techniques. Her expert training of female telegraphists, and by persuading the Naval Board in Melbourne to accept 14 of her operators for the Navy, ultimately led to the establishment of the Women's Royal Australian Naval Service – the WRANS.

Florence Violet McKenzie worked throughout her life to educate and train women. Two days before she died in 1982 she told a friend: "it is finished,