

New tunnelling machine begins digging high speed line under London

April 8, 2024



Construction of the new **HS2** line has reached another key milestone, with the launch of the fourth – and final – machine being used to build the giant Northolt Tunnel beneath the capital.

The 8.4-mile tunnel will run from Victoria Road in Ealing to West Ruislip in Hillingdon – carrying trains in and out of London – and is being constructed by four huge tunnel boring machines (TBMs).

In keeping with tunnelling tradition, the fourth machine is named after a prominent woman – Lady Anne Byron. The name was chosen by the local community around Ealing through a public vote.

Lady Anne Byron was an educational reformer and philanthropist who lived between 1792 and 1860. She established the Ealing Grove School in 1834 – England’s first co-operative school which provided education for the working classes, in an era when it was mainly for the wealthy.

TBM Anne will bore 3.4 miles from Victoria Road in Ealing, near HS2’s Old Oak Common station, to Greenpark Way in Greenford, alongside TBM Emily which launched last month in February.

The other 5 miles of twin-bored tunnels has been under construction since 2022, with TBMs Sushila and Caroline both over halfway through their journey between West Ruislip, on the outskirts of London, and Greenpark Way. The quartet of TBMs are all set to complete their journeys in 2025, when they will be

extracted from the ground through giant shafts at Greenpark Way.

HS2's London tunnels contractor, Skanska Costain STRABAG joint venture, has delivered an extensive programme of work for the TBM to launch at the Victoria Road Crossover Box, excavating the caterpillar shaped box where eventually the trains will cross tracks on their way in and out of Old Oak Common station.

'Anne' is the eighth TBM that has been launched to date across the HS2 project between London and the West Midlands to build the mined tunnels for the trains. In all, almost half of the 65 miles worth of twin-bored tunnels needed for the route has now been excavated.

When complete, HS2 will improve connections between London and the West Midlands, with trains running further north on existing lines. Building a wholly new railway will create quicker and far more reliable journeys, driving economic growth while crucially freeing up space for more local trains on the most congested southern end of the existing West Coast Main Line.

The TBM was manufactured by world-leading experts Herrenknecht in Germany. It is one of 10 machines specially designed for HS2 and the ground through which they will bore. Two remaining TBMs, which will eventually be used to dig HS2's final tunnel between Old Oak Common and Euston, in central London, are still being built.

SCS JV worked collaboratively with Herrenknecht on a cutting edge design that maximises productivity and achieves the highest standards in a tunnelling environment.

The TBM weighs 1,700 tonnes and is 170m in length. The cutterhead is 9.11m in diameter. TBM Anne was lowered in parts into the 25m deep crossover box at the end of last year, where she was reconstructed and prepared for launch.

Malcolm Codling, HS2's Project Client Director for the London Tunnels, said: "HS2 has reached peak tunnelling activity as we focus on delivering the HS2 route between London and Birmingham. The launch of Anne is the culmination of many years of work for the London Tunnels team and a further triumph in British engineering."

The TBM is an earth pressure balance machine which operates like an underground factory. It is effectively a large metal cylinder with a rotating cutting head at the front, which presses against the earth using hydraulic cylinders. Disc cutters and scraping tools within the cutterhead loosen the earth which is then removed using a screw conveyor. The conveyor moves the material through the back of the TBM and out of the tunnel via a conveyor belt.

As the machine moves forward, concrete rings are installed to create the tunnel walls which the machine uses to push off. Each ring has an external diameter of 8.78m, an internal diameter of 8.10m, and is made up of seven segments. Each segment weighs approximately 7 tonnes. For the Northolt Tunnel East, the tunnel drive being completed by TBM Anne, the concrete tunnel ring segments are being manufactured in Hartlepool by STRABAG. A new factory has been established in Hartlepool, and the segments are being brought down to the capital by train, after STRABAG reopened a freight line at the Hartlepool Dock.

The London Clay excavated by the 1,700 tonne TBM will be taken away from the Victoria Road Crossover Box site via a conveyor system, removing the need for local lorry movements. From there, it is transported to HS2's London Logistics Hub at the Willesden Euroterminal site where it is sorted, before being taken by train for beneficial reuse across the UK.

James Richardson, Managing Director for Skanska Costain STRABAG joint venture, said:

"The launch of TBM Anne is a milestone moment in this year of peak activity for the HS2 London Tunnels project. With a quartet of TBMs and over 20 construction sites all making significant progress, we are on course to deliver the high-speed line into central London, creating economic growth and opportunities at every step of the way."

The two final TBMs will construct the Euston Tunnels, taking HS2 trains into central London. They are set to be delivered to the UK later this year and lowered into the underground station box at Old Oak Common ready for launch.

Following the government's Network North announcement in October, alternative funding arrangements for the delivery of Euston station are being considered. However, work is continuing with the preparations and design of the railway between Old Oak Common and Euston.