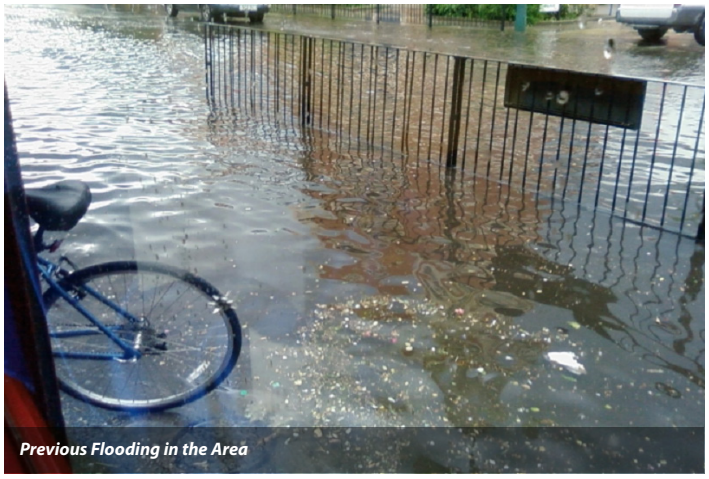
Barhale

Chamberlayne Flood Alleviation

Client:	Thames Water
Location:	Willesden, London
Value:	£6.8m
Duration:	9 Months



Previous Flooding in the Area

Overview of the scope of Work

Intermediate Slab Landing

In Brief...

In order to reduce the risk of internal and external sewer flooding to 36 local properties Barhale were contracted by Thames Water during AMP 5 to install flood alleviation measures in the Chamberlayne Road area of Brent, North West London.

To increase the network capacity, the scheme was originally proposed as a series of open cut sewer upsizing works, however due to time constraints on the programme and the disruption open cut trenches would cause to the area, Thames Water asked their partners to propose an alternative solution. Barhale suggested a micro tunnelling solution in order to provide the following benefits:

- Minimise the disruption to the local roads and residents
- Use the large diameter jacking pipes to maximise the online storage capacity (additional 800m^3)
- Minimise the risk of digging around buried services in the highway
- Shorten programme duration
- Barhale's considerable experience in this field made them the desired contractor for the project

Technical Features...

The scheme involved the construction of:

- 15m diameter, 28m deep storage tank
- 3m diameter, 6m deep reception shaft
- 4m diameter, 17m deep reception shaft
- 5m diameter, 10m deep reception shaft
- 6m diameter, 10m deep drive shaft
- 550m of 1200mm diameter tunnel
- 70m of 600mm tunnel
- 300m of open cut sewer pipe upsizing

The system operates by diverting the combined local sewer flows into the newly constructed storage tank in Tiverton Green through a series of shallow gradient tunnels which will also act as on-line storage until the flood event has passed. Once the flood passes and the sewer flows reduce, pumps are activated within the storage tank to pump the flows back into the main sewer.

Storage Tank Shaft Construction

Barhale excavated the 28m deep, 15m diameter shaft beneath Tiverton Green to accommodate the underground storage tank which, with its storage capacity of 1700m3, will take the excess flows during storm events. The shaft was constructed using underpin methods in two phases; the first phase involved excavating the shaft to a depth of 17m and forming a temporary concrete base to launch the two tunnel drives. Once the tunnel drives were completed, the second phase consisted of breaking out the temporary base and excavating the shaft to the final formation depth. Due to the depth of the shaft two types of segmental ring were used for the construction. The top 23 rings were fibre reinforced; the bottom 5 rings required rebar cage reinforcement to withstand the earth pressures.

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The 15m Diameter Shaft Excavated to Full 28m

School Visit to Site

1200mm Diameter 130m Long Curved Tunnel

Customer Benefits...

The works were completed on time and to budget with no service strikes. Barhale built a strong relationship with the local community, including organising a site visit with pupils from a local Primary School, where pupils officially named the TBM for the drives. Barhale also planted a small orchard of plum and cherry trees as part of an environmental enhancement programme and made a donation towards improvements of the local playground at Tiverton Green.

Analysis of Ground Investigation Report

Through extensive analysis of the ground investigation report, the Barhale team were able to determine that although settlement and bearing capacity issues were not anticipated at formation level, they would be likely at ground level. Subsequently the team was able to closely monitor the settlement records along the tunnel drives to ensure that low settlement tolerances were met and maintained. These low settlement tolerances were not only vital in ensuring Barhale obtained their 3rd party approvals; with 70% of the tunnel construction taking place beneath the highways crossing strategy services, they also enabled the team to achieve high production rates of 15 – 20m per day on all the tunnel drives.

Curved Tunnel Drive

To avoid tunnelling directly beneath Victorian properties on Okehampton Road, a collaborative decision was made between Barhale and their designers, MWH, to incorporate a curved tunnel into the design. The curved tunnel reduced the risk of any structural defects to the properties and removed the need for lengthy 3rd party approval negotiations, which ensured no delay to the programme. To direct the tunnel with pinpoint accuracy, Barhale utilised the services of VMT's Laser-Theodolite-System Tunnel Navigation products. This continuously monitors and identifies the exact position of the Tunnel Boring Machine and displays the deviations with respect to the DTA immediately on the monitor in the operator's control station.