Barhale

North London Heat and Power Project Sewer Diversion

Client:	North London Waste Authority
Location:	Edmonton
Value:	£4.9m
Duration:	18 Months

As part of the enabling works for the construction of an Energy Recovery Facility (ERF) at the EcoPark in North London by the North London Heath and Power Project (NLHPP), Barhale were contracted to divert the Thames Water-owned Chingford and Angel public sewers.

The new energy recovery facility at the Edmonton EcoPark will deal with up to 700,000 tonnes of waste from the seven north London boroughs per year. It will generate efficient, low carbon heat and power to serve the needs of 127,000 homes.

Tunnel A-C1 completed

Simultaneous pipejacking

In Brief...

Drawing on decades of experience delivering similarly complex schemes, Barhale developed an innovative design and construction method for the sewer diversions. This not only accelerated the programme and reduced the cost, but it also minimised the potential disruption to the community and it significantly reduced the environmental impact. Tailored social value initiatives also ensured that the team contributed to the creation of a lasting legacy, as part of the wider project.

Technical details...

To undertake the sewer diversions, Barhale constructed 3no new shafts, 2no new tunnels and 1 guided auger bore.

Shaft A (launching/drive shaft) was located on the North West side of the EcoPark and was 12.5m ID and approx. 11.0m deep. The segmental shaft was constructed using a combination of caisson and underpin methods due to ground geology. It accommodated a permanent 4.0m ID access manhole made of precast segments after the sewer diversions were completed.

Shaft B (reception shaft) was located on the East side of the EcoPark, within the Eastern Road footprint. The segmental shaft was 6.0m ID and approx. 10.8m deep and it was constructed using the underpinning method. Prior to its sinking, a hexagonal cofferdam had been installed and driven into London Clay. The cofferdam provided a sufficiently watertight working space to start the segmental shaft construction at approx. 7.0m below the existing ground level.

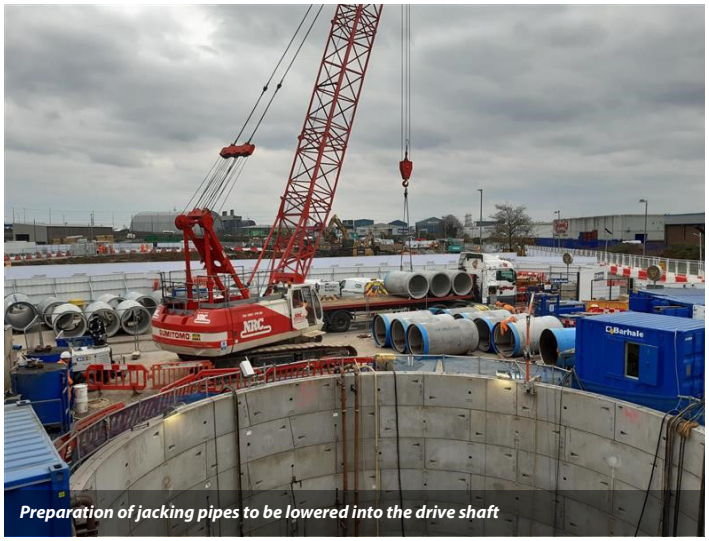
Shaft C1 (reception shaft) was located on the South Side of the EcoPark, close to the site entrance. The segmental shaft, constructed using the caisson method was 4.0m ID and approx. 10.1m deep.

The two tunnels, from Shaft A to Shaft B (140m) and from Shaft A to shaft C1 (210m) respectively were constructed using the pipe-jacking method. The tunnel boring machines (TBMs) were closed pressurized face machines. The tunnel boring machines were installed ahead of the pipes being jacked. Bentonite slurry was pumped through the system and into the closed chamber to provide pressurized support to the excavation face as it was being excavated using mechanical cutters. The slurry (mixed with the excavation cuttings) was pumped to the surface where the excavated material was separated from the slurry.

After completion of the Shaft A to Shaft C1 tunnel, a final connection was driven from Shaft C1 to an existing Thames Water manhole further south. This was a 45m long, 450mm diameter guided auger connection, which crossed approx. 5.0m underneath the Pymmes Brook. A retractable cutter head within a 600mm sleeve was used to complete the drive without the need for a reception shaft.

Once the new 1200mm drives were completed, shaft B and C1 were benched to accommodate the invert levels required to match up the existing Chingford 960mm ID sewer and the Angel 450mm ID sewer. All flows were turned in line with Thames Waters approvals & procedures.

Lowering TBM into Shaft A and preparation for drive



Preparation of jacking pipes to be lowered into the drive shaft

Social Value initiatives...

We helped tackle local unemployment by providing training and work placements to local jobseekers. We provided 12 days training and work placements to 17 job seekers who had been unemployed for over 6 months, some due to the COVID-19 pandemic. Participants attended 10 days' Work Skills Level One training at the College of Haringey and 2 days' work placements on site at Edmonton EcoPark. The course increased participants' interview confidence. It also prepared them for work experience placements and for potential employment in various job roles in the construction industry. Additionally, Barhale employed 2 apprentices during this project, and offered one of them a full-time position with the business.

Innovative Solutions...

We decongested the site, reduced risks and made savings on the programme by redesigning one of the shafts. The original design for Shaft C was at the intersection of three working areas in the Eco Park. This included major civil works for a district-heating scheme for 10,000 homes being built as part of the Meridian Water development. This presented constraints for coordinating several contractors working in close proximity, with a knock-on effect on health and safety, productivity issues and technical risks.

Barhale redesigned the shaft's location with full consideration of traffic flows, site layouts & overpumping equipment needed. The new solution helped decongest the site, while also enabling a full recovery on programme.

The change in shaft location moved the structure away from the existing Thames Water sewer, and enabled the adoption of a more standard, risk-free method of construction (jacking method). The team were also able to turn the flows from the Thames Water sewer system with ease and no disruption to their network.

We saved time, and significantly reduced carbon emission and water usage by simultaneously pipe-jacking the two tunnels. Once the team got Shaft A down to formation level, they undertook ground investigations to check for the feasibility of dual pipe-jacking. They ensured that the solution did not raise the risk of water migration from an existing lower aquifer to an existing upper aquifer and vice versa. Once tests confirmed that the London Clay effectively sealed off the top aquifer, the team pipe-jacked the two tunnels at the same time. This not only accelerated the programme and reduced costs, but it also minimised potential disruption to the community, it allowed third-party contractors to access the site earlier and it reduced environmental impact. We estimate that the solution saved between 50% and 60% on water usage (the equivalent of 50 000l of water), and 9121 kg CO_2e (on 3000l of diesel).

We saved time, costs, and waste while resolving constraints dictated by the alignment of the new pipelines. Joining the Shaft A to Shaft B tunnel with the permanent 4m ID manhole raised challenges as the alignment of the tunnel did not allow for the installation of a straight concrete pipe. Rather than cast the pipe in-situ, as originally envisaged, Barhale worked with a specialist subcontractor to design and fabricate a bespoke pipe. The solution reduced cost by £2368; it reduced time by 4.5 days; and it reduced waste by eliminating the need to use the 8 sheets of plywood, 10 no. of 10x3 timber, 100L of diesel, and the 3 m3 of concrete that would have been required by the in-situ solution.

We addressed overpumping challenges while staying on programme and budget. Barhale promptly developed an effective solution to challenges related to overpumping. Once realising that the flows in the existing sewers exceeded those envisaged in the initial scope, Barhale liaised with Thames Water and IAB to install surge protection measures. These consisted of a flow restrictor to divert any excessive flows into the new 1200mm tunnel. The solution, which fully satisfied our client, enabled the site team to complete the works on the existing assets while staying on budget and programme.