

Eltham Road SPS & Rising Main

renewal of 2.8km, asset life expired, rising main from West Bridgford SPS to Nottingham trunk sewers

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Waste from the catchment of West Bridgford, Nottingham, is transferred through a 533mm diameter cast iron rising main a distance of 2.8km and discharges into the Colwick trunk sewer feeding Stoke Bardolph Sewage Treatment Works. The existing main was asset life expired and had a recent history of bursts close to the River Trent. With Holme Pierrepont National Watersports Centre being only 1 mile downstream, the increasing risk of pollution incidents and potential adverse publicity was used to promote a scheme to replace the rising main.



TBM canal crossing - Courtesy of NMCNomenca

Solution

Using a combination of materials and construction techniques, the solution to ensure continued service for the whole of West Bridgford was to replace an existing sewer with a new 600mm diameter rising main capable of passing sewer current flows of 425 l/s and future flows of 470 l/s.

The 2.8km route required crossings of the disused Grantham Canal, A6011 (Radcliffe Rd), the River Trent, A612 (Daleside Rd) and the Nottingham to Lincoln railway line with final connections into live chambers on 6ft and 8ft diameter trunk sewers. All of the crossings were undertaken using micro tunnel and auger bore no-dig techniques.

Innovation

The majority of the rising main was laid using ductile iron 'Non-anchored Rapid system' or SDR 26 high density polyethylene

(HDPE) butt welded. At the River Trent crossing a method was sought that would ensure the integrity of the main throughout the installation process as entry into the micro-tunnel was not viable to carry out any remedial repairs.

Consultation was carried out with a number of pipe suppliers and the Universal Rapid Ve system from Saint-Gobain was approved, which is equipped with its own anchoring system. The use of anchored joints is based on the principle of distribution of axial forces along the pipeline, eliminating the need for the construction of anchoring blocks. The pipe was connected in sections at the base of the shaft and pulled through on stainless steel rollers attached to the pipe by stainless steel collars.

Sustainability

Sands and gravels extracted during the shaft excavations either side of the River Trent were used as backfill and surround to the



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Rising main in field - Courtesy of NMCNomenca

pipeline installed down the adjacent road. Tarmac Road Planings/ Scalpings from the road surface were provided free of charge to the Nottingham Sea Cadets located adjacent to the River Trent to allow a new extended car parking surface to be constructed.

The arisings from the tunnel excavations were used as backfill material to the shafts.

Excavated material from along the route was reused as either selected excavated backfill where applicable or incorporated into the landscaping requirements along the route. No excavated material was sent to landfill.

Project management & procurement

A peer review for the project was led by NMCNomenca to ensure that the scope of the works was fully understood and required. Input from every member of the project team including STW Service Delivery (the end user) removed entire sections of the project brief and reduced the promoted scope of works valued at £4.1 million to £2.3 million, a saving of 44%.

The works to cross the River Trent were constructed within the flood embankments and necessitating construction works through these. Early discussion was carried out with the Environment Agency to ensure they had a thorough understanding of the work being undertaken and provide expert advice to the team. It was imperative that the integrity of the flood defences were not compromised.

The crossing of Network Rail land was carried out using no-dig techniques and the expertise provided by supply chain partner F&B Trenchless, who provided guidance and advice for the NMCNomenca design coordinator to ensure that all the correct information was supplied first time avoiding any amendments to the application.



Drive shaft to cross the River Trent - Courtesy of NMCNomenca

Close liaison with the Eltham Rd Allotment Society ensured minimal disruption to their plots without removal of mature hedgerows and fruit trees. The works were programmed to be completed outside the main growing season within their access track whilst still maintaining access where required.

A section of the main was laid alongside Nottingham Race Course where it could have had a significant financial impact. Close liaison ensured that any disruption was minimised. and when a race event was being held, construction was suspended to reduce the impact.

Materials

Two significant material suppliers were involved during the design period to stimulate innovative proposals.

GPS PE Pipeline Systems, manufacturers of high density polyethylene pressure pipe, promoted the following savings:

- Demonstration of the savings compared with the use of ductile iron pipe where applicable.
- Procurement of the pipe at the current rate prior to the April price rise saving 11%.
- The use of SDR26 pipe (6 bar rating) rather than the use of SDR17 pipe (10 bar rating).
- Pipe designed during feasibility and delivered to site in 18m lengths (compared with conventional 6m or 12m lengths) reducing the number of on-site welds by 33%.

Saint-Gobain introduced the scheme to the Universal Rapid Ve anchored joint system used to pass the pipework under the River Trent, as well as supplying the pipework installed under highways.

Application of engineering principles and judgement

A number of different techniques were looked at and discounted for crossing the River Trent with the new pipeline.

- A new pipe bridge was discounted due to the costs involved of constructing over a much used navigable river.
- To utilise the existing Lady Bay Bridge would have meant an extension of 2km to the pipeline.
- The use of a specialist marine contractor to dredge in the pipeline was discounted due to the depths of undisturbed silts that lay on the bed of the River Trent. It was surmised that the 1m depth of silts would contain many trapped pollutants due to the cities industrial past giving rise to potential major pollution incidents.

The drive and reception pits for the 1,200mm micro tunnel installed under the River Trent for the pipeline crossing were reduced in depth based on actual ground conditions rather than previous borehole information. A reduction from 17m to 12m and 12m to 11m either side of river saved program time and construction costs.

To avoid major disruption to the residents of a cul-de-sac, 230m of additional 1,200mm diameter micro tunnel replaced 450m of open cut trench across a major arterial route into Nottingham (A612) and the entrance and cul-de-sac of a housing estate. This also negated the requirement to construct 6m x 6m x 7m deep drive pit within the turning head of the cul-de-sac needed to drive the micro tunnel under the railway line as part of the original solution.

Bespoke stainless steel fittings were used for the final connections onto the trunk sewers. This prevented the requirement for full breathing apparatus access into the associated inspection chambers due to the ability to install the fittings from the outside.

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