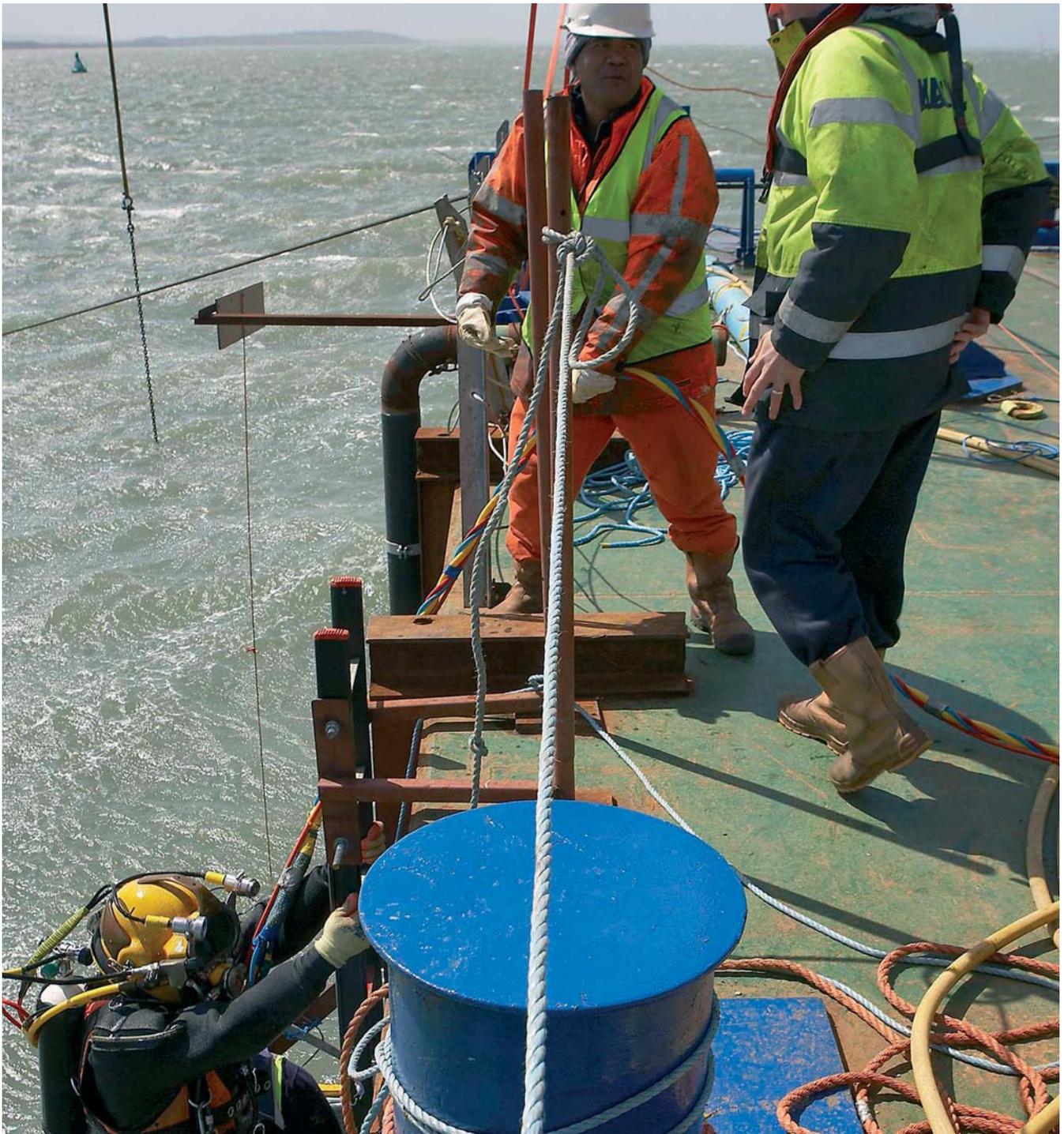


Cross Solent Main

new underwater pipelines bring more water to Isle of Wight

by Michael Yung-Hok IEng, MICE, DMS

The Cross Solent Main project is located in Hampshire and involves the replacement of the two existing 200mm diameter water mains between Lepe, in Hampshire, and Gurnard, on the Isle of Wight, with two new 300mm diameter underwater pipelines. The two existing pipes were laid on the sea bed in 1980 and had reached the end of their intended operational life. One of the pipes was damaged by a ship's anchor in 2003 and 700m of pipeline was replaced. Subsequent pipeline failure analysis had revealed that the physical condition of the existing pipes had deteriorated, giving concern about their continuing ability to withstand the normal pumping pressures associated with water transfer.



courtesy of 4Delivery Ltd



Pipe-laying barge in the Solent

courtesy of 4Delivery Ltd

The Cross Solent Main is a vital component of Southern Water’s water supply infrastructure for the Isle of Wight with a population of around 126,000. Over the course of a year it carries over a quarter of the Isle of Wight’s drinking water needs, and a higher percentage at times of peak demand.

Southern Water’s water resource plan included consideration of whether there were other viable options for meeting forecast water demand on the Isle of Wight after 2012. It was concluded that the only viable option to meet current and future needs in the next 25 years was to augment indigenous sources by transferring water from the mainland through the Cross Solent mains. These proposals were approved by the Director General of Water Services and the Environment Agency.

The additional cost of relaying the Cross Solent water main with a larger 300mm diameter twin pipeline attributable to increasing its capacity from 12MI/d to 20MI/d was between 5% and 10% of the capital cost for the Cross Solent scheme.

Site constraints

There were a variety of site and operational constraints with working in the Solent which is a busy shipping area for both commercial and leisure craft. The area is a designated service corridor and there are many other services in the vicinity including the main supplies of gas, electricity and telecommunications to the Island. There was also potential for ground movement on the Isle of Wight coast, where there is a history of land slips on the cliffs at West Cowes and Gurnard.

The works are also being carried out in the New Forest National Park and the Isle of Wight Area of Outstanding Natural Beauty as well as in the marine candidate Special Area of Conservation (cSAC) and the Solent and Southampton Water Special Protection Area. There were various environmental and planning consents that needed to be obtained and a full Environmental Impact Assessment had to be done to ensure that the best engineering option was used that minimised environmental impacts.

Summary of Scheme

There were three main parts to the project, works in the New Forest, Isle of Wight and Marine Lay, Planning Applications and Applications to Defra (Diagrammatic). Horizontal Directional Drilling (HDD) was used on the mainland at Lepe and Gurnard on the Isle of Wight to keep disruption to residents and the environment to a minimum.

New Forest

A temporary drill rig site was located in the agricultural field immediately north of Lepe Country Park, with associated facilities, and temporary access north of Lepe Country Park with associated facilities, and temporary access off Lepe Road.

Two 560mm diameter polyethylene sleeves were installed by HDD from land to emerge on the seabed below low water mark, involving a drill length of approximately 1200m. The new 300mm diameter water supply pipes were then pulled through each sleeve ready to be connected once the other sections of the pipeline had been completed.

Other works included the construction of an underground flowmeter chamber adjacent to Lepe Road and a permanent control kiosk housing telecommunications and electrical equipment adjacent to the flowmeter chamber, with off road parking for maintenance vehicles. Existing pumps at Mopley Booster Pumping Station were replaced with associated ancillaries and controls.

Isle of Wight

A temporary drill rig site in the field at west Gurnard north of Cliff Farm with associated facilities and access off Rew Street.

Two 560mm diameter polyethylene sleeves were installed by HDD from land to emerge on the seabed below low water mark, involving a drill length of approximately 750m. The new 300mm diameter water supply pipes were then pulled through each sleeve ready to be connected once the other section of the pipeline had been completed.



The pipe-laying barge in the Solent

courtesy of 4Delivery Ltd

Other works included the construction of an underground flowmeter chamber in the field north of Cliff Farm with a permanent control kiosk housing telecommunications and electrical equipment adjacent to the flowmeter chamber. There was also a small amount of work done at Broadfields Reservoir to pipes, valves and fittings.

Marine Lay

The undersea pipes were made by NKT Flexibles, a specialist company in Denmark with an internal PE lining that met the Drinking Water Inspectorate standards.

The pipes are surrounded by several layers of steel reinforcing bands, which means they are flexible but can also withstand the high levels of stresses on the pipeline during the installation onto the seabed.

The pipes came in one continuous length of approximately 2km each, loaded on large 20m reels in Denmark before being transported to the Solent on a barge. In the Solent a lay barge was used to install pipes up to one metre under the seabed using specialist equipment. The pipes were slowly unravelled from the reels and filled with water so they sank to the seabed under their own weight. High pressured water jetting was used to remove sand from under the pipe on the seabed and return it on top of the laid pipes.

Finally, divers connected the pipelines lying on the seabed with connections on the shore line to complete the installation.

During construction, there were several barges manned by specialist contractors working in the Solent to ensure the operation went smoothly.

Before the new pipes could be used they were sterilised by being disinfected with chlorine to make sure that they were clean enough to transfer drinking water.

The existing disused pipes were left in situ to avoid adverse environmental economic and social impacts.

As part of the scheme a major interactive multimedia project was launched on the Southern Water website with webcams video clips, podcasts, blogs and live webchats.

A special webcam was set up to stream images of the barge as the pipes were being laid on the sea bed and a Solent blog, written by members of the project team, updated website users about the progress of the scheme as it happened. Podcasts from some of the specialists gave technical information about different aspects of the project.

The work was carried out by contractors 4Delivery Ltd (4D) and Visser & Smit Hanab (UK) Ltd on behalf of Southern Water. 4D, a consortium comprising United Utilities, Costain and MWH, is carrying out £700m worth of environmental improvement and water quality schemes for Southern Water across Kent, Sussex, Hampshire and the Isle of Wight between 2005 and 2010. Visser and Smit Hanab is a specialist cable and pipelines installation contractor operating both onshore and at sea. More information can be obtained from Southern Water's website www.southernwater.co.uk.

Note: *The Editor & Publishers wish to thank Michael Yung-Hok, a Civil Engineer with 4Delivery Ltd for providing the above article for publication.■*