

New River, Hertfordshire

new lease of life for 400yrs old water supply aqueduct

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Water arising in springs in and around Ware, Hertfordshire, and from the nearby River Lea, is conveyed into north London for drinking water supply via a 400 years old aqueduct known as the New River. Although much of the channel was re-engineered in Victorian times, this historic watercourse requires regular maintenance and repair. Thames Water is taking a proactive approach to the upkeep of this vital asset. The New River is a 40 miles long aqueduct supplying raw water from the River Lea in the District of Ware in Hertfordshire to North London. The original channel was built between 1609 and 1613, but it was significantly re-engineered in Victorian times by the construction of various tunnels, pipelines and embankments. Despite its age, the New River currently fulfils a vital role, supplying up to 180Mld of raw water to London. This represents 8% of the total daily surface water abstraction for London. In addition, it is a significant local amenity for the communities through which it passes. However, many of the channel's embankment sections require regular maintenance and repairs due to the age of the asset and it is sometimes necessary to carry out significant capital works projects to re-line the aqueduct or repair the embankment.



New River: Construction of new walls - overpumping pipes on embankment

Photo courtesy Thames Water Utilities/Mott MacDonald Ltd. & Barhale Construction plc

Works at Cheshunt

One of these projects was at Cheshunt, where significant leakage became evident in 2005 near a stretch of the New River that had been re-lined in the 1990's following a previous slope failure.

Concern was expressed about the overall stability of the embankment at this site, which is close to housing. Detailed stability analyses were, therefore, carried out, and these concluded that the slope had an unacceptably low factor of safety.

Attempts to effect temporary repairs resulted in only partial success and it was concluded that the leak was serious enough to warrant a permanent re-lining solution. On completion of Thames Water's solution review process, it was decided that the most robust

remedial option was a full concrete re-line of the existing earth channel, effectively extending the previous concrete channel by 65m approximately.

The design team commenced the detailed design in May 2005, under a challenging programme that was set out to allow construction to proceed as soon as possible. The design was required to accommodate a number of uncertainties, such as the nature and condition of the existing wharfing, the nature of the tie-in conditions at either end and the stability of the slopes both above and below the site. A particular technical challenge was presented by the need to maintain stability of the existing embankment which also forms part of the embankment of a statutory reservoir adjacent to the site.



New River

Photo courtesy Thames Water Utilities/Mott MacDonald Ltd. & Barhale Construction plc

Another significant difficulty was the temporary over-pumping of the flow in the New River. This flow - which can be as high as 180Mld - was overpumped using 3no. 450mm diameter pipes which had to be routed under an existing road bridge to avoid interfering with the construction site.

Two temporary dams were inserted to allow de-watering of approximately 100m of the New River channel. Over pumping was achieved via three pumps supported in the upstream channel on a temporary A-frame. This arrangement allowed the new concrete channel to be constructed entirely in dry conditions, and also facilitated an internal inspection of critical parts of the 1990's channel. Permanent shutters were used in the construction of the new walls of the channel (see photo 3).

Construction of the new concrete channel commenced in October 2005. The channel was re-opened in December 2005, only nine months after the project had been initiated. Successful completion in such a short timescale was achieved due to integration of the client, designer and contractor in the project team. In addition, Thames Water's risk management procedures were used to manage the technical challenges described above.

Moving forward

During August 2005, the New River started to leak at another

site, as seriously as the Cheshunt site. Following the success of the concrete re-line solution at Cheshunt, the team decided to implement the same solution to repair the embankment at this new location. The remedial works for this section of the New River channel commenced in April 2006. This sequence of events highlights the need for ongoing intervention along the New River, particularly on the embankment sections.

In order to help safeguard the future of this crucial asset, Thames Water is currently investing in a new, integrated programme of investigations, assessments and repair works together with Framework Consultant *Designer Consultant Mott MacDonald Ltd and Performance Partner, Barhale Construction Ltd*. This programme of work will include a simple but robust assessment tool to help manage the future workload and, where appropriate, new procedures for asset investigation and repair.

To date, some £4 million has been committed for the New River repairs, of which the works at Cheshunt accounted for £0.8m ■

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