

Danesborough Water Quality Zone 21

£11.5m scheme to rehabilitate 30km of water mains in the Bridgwater area

by Steve Bilton and Davin Eversett

Bridgwater was once the leading industrial town in Somerset, a major manufacturing centre for tiles and bricks in the 19th century, although perhaps more famous for cellophane production until 2005. Much of the larger manufacturing has ceased and has been replaced with retail, distribution and support services with good transport links to the rest of the country. In parts of Bridgwater the water supply network dates back to the early 1900s, and was sized to cater for the industry of the day. More than 100 years later, these large diameter unlined cast iron mains that form part of the distribution system, while still in a generally good structural condition, are now a cause for concern, due to the build up of corrosion within the main and the risk of disturbance of settled out deposits. This had created significant constraints on the operation of the network as it became increasingly more difficult to carry out changes to the system without causing discolouration events.



Welding Team on Quantock Road Trunk Main

Courtesy of WECS (Wessex Engineering Construction Services)

This prompted Wessex Water to accelerate major investment for the Bridgwater area. As a result, and as part of *Operation Clean and Clear*, Wessex Water is investing £11.5m in renovating almost 30km of water mains in this supply system. In 2010 an 18 month project was started to reline, replace and clean the existing network to improve the water supply to its 45,000 customers in the area.

Design

Because of the severe constraints imposed on the operation of the network, an extensive planning phase was carried out prior to the rehabilitation works by Wessex Engineering and Construction Services (WECS), the construction subsidiary of Wessex Water. The key drivers for the planning phase were to minimise discolouration risk while at the same time maximising the amount of rehabilitation work that could be done, particularly the lining works, to meet the very tight programme set by the Business. Following an initial appraisal undertaken by the consultants Mouchel, and network model analysis by Wessex Water, all works on the trunk mains were sequenced so that work proceeded from upstream to downstream to minimise the potential risk of contamination of rehabilitated

mains. Some new trunk mains were introduced into the outline design to allow rationalisation of the network, and also enable the temporary decommissioning of sections of the mains for lining.

Following on from modelling studies, structural condition assessments were undertaken by May Gurney to confirm the renovation technique required. In some cases it was found that suspected unlined mains had previously been lined and now only required to be flushed.

Communications strategy

In parallel with the planning works, Wessex Water developed a communications strategy using its in-house team. All customers in the area were supplied with leaflets explaining the need for the work and the improved water quality that customers would receive on completion. Wessex Water also held two public meetings, published several newspaper articles, provided interviews with key staff, and used "advertorials" to raise the public awareness of the scheme and keep them in touch with progress. A dedicated webpage on the Wessex Water website was kept up to date, and

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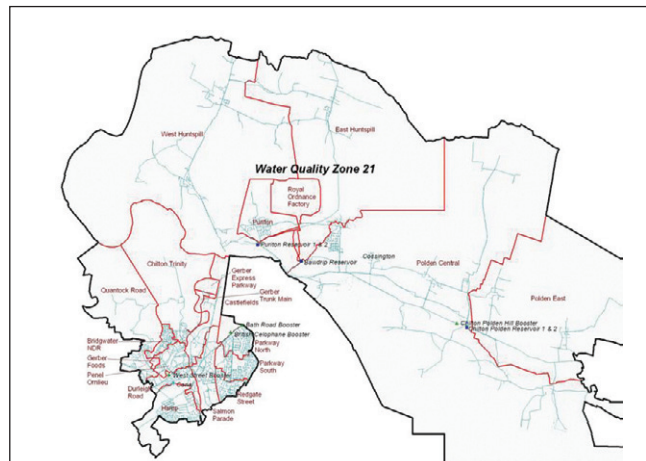
signage was installed on all arterial routes in and around Bridgwater to advise the public of what was happening. Regular meetings were also held with the Town and the County Council. It was noticed that there was an increase in positive customer contacts, with them asking for more information about what was being done.

The detailed design process followed the proposed construction sequencing, with the trunk mains being renovated first, followed by the downstream distribution network. The scheme has used several renovation techniques to enable the work to progress as quickly and efficiently as possible. The model for this DOMS (Distribution Operation Maintenance Strategy) was used to sequence the work to ensure that the customers would see minimal effect during the works.

Construction

Where possible, cleaning of the existing lined trunk mains was undertaken by flushing. One section of work included a 4km section of trunk main, but was complicated due to the location and depth of the main and the volume of water - 220l/s - required to achieve a successful flush. The greatest constraint was the requirement to maintain a reliable water supply to a large processing works, one of Wessex Water’s major consumers, which is supplied off this trunk main system and accounts for about one fifth of the Bridgwater supply demand area.

During the flushing operation, undertaken over a 12-hour overnight period, supplies of 40l/s were maintained to the plant through a major tankering operation. Ten tankers were used, drawing water from three different water supply works around the local distribution system, and supplied it directly into the potable water holding tanks at the processing works via a custom designed manifold and pumping system installed as part of the operation. A contingency facility of an additional feed from a smaller distribution system was also provided to support the tankering operation.



Plan of the DOMS for the Danesborough scheme - Courtesy of Wessex Water

A dedicated washout facility was provided, discharging into the tidal section of the River Parrett via a storm water discharge pump station rated at 700l/s. The night flush was arranged to coincide with dry weather, to avoid overloading the pump station and spring tides to ensure maximum dilution in the river. Continuous monitoring was provided at 6 (No.) key locations along the main being flushed, recording key quality parameters including chlorine and turbidity before, during, and for a period after the flush, to ensure the system had fully stabilised.

Ice-pigging

A 1km section of 400mm concrete lined ductile iron trunk main could not be cleaned by flushing because of the location of the main and the configuration of the network. For this section, cleaning was undertaken by ice-pigging. This process involves the injection of a

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plug of icy sludge into the main that is then pushed through the main in a similar way to a conventional swab. This was the largest diameter main that this cleaning technique had been applied to, and was even more challenging due to the exceptionally high temperatures at that particular time of year. For the initial run, the ice plug was found to have melted before reaching the end of the main; therefore the main was split into four sections and the pigging operations repeated. Camera inspections of the cleaned main showed a good quality result and allowed the main to be brought back into service at a higher flow rate than had been used previously.

The majority of the mains, approx 22km, were relined using Copon 169 (now known as Scotchkote™ 169) supplied by 3M, and Fast-Line supplied by Subterra, this being installed by the standard technique of spray application, which is a good process to use when dealing with the issues found in the zone where the structural integrity of the existing pipes is good.

The open cut sections in general were constructed using standard processes and system in roads and fields. The team had a difficult section where the existing main went under a major railway line, which required them to remove from insitu a 4'6" culvert and 2 (No.) 50m-long, 300mm, PVC mains, and replace with a single 500mm PE main. The work itself had its challenges. The main was approx 5m in depth either side of the railway line, as well as the mains inside the culvert being strapped in position, which requiring confined space entry. They also had to get approval from Network Rail to complete the installation, but again in getting early contact via the design team, agreement was achieved well in advance of the works and the main replaced two weeks ahead of program.

Project team

A single project team was established, which included the secondment of the local Network Inspector, Network Scientist, and also a Somerset Highways inspector who were all located in a team

office within the working area. This raised awareness of programme developments, construction issues and enabled quick reaction to project changes to occur without the need for arranging meetings at a later date.

The client for the project is Wessex Water. Project management and CDM-c role was undertaken by Wessex Engineering and Construction Services (WECS). The civils work was undertaken by WECS and Lewis Civil Engineering. The relining work was undertaken by May Gurney and Daniel Contractors Ltd, with the design work done by WECS, Atkins and May Gurney. Specialist contractor Agbar in conjunction with Bristol University was appointed to undertake ice-pigging. Electrosteel was the main supplier of Ductile Iron pipework, with GPS providing the PE pipe, AVK supplied the valves, and Walton Civil Engineering was the tarmacing and reinstatement contractor for this scheme.

Anticipated completion

Completion is scheduled for August 2011. Achieving this target will be a testament to the good background planning, the early involvement from many parties involved in the design and construction of the work, the early input from the public relations team, and the overall team effort of all those involved in this challenging project.

The legacy of *Operation Clean and Clear* will be the development of an Operation and Maintenance strategy, which will allow Wessex Water Operations to better use the distribution network around Bridgwater, to ensure good water quality is maintained and the prolonged life of the assets.

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