

Monkton Combe Emergency Water Supply

safeguarding city of Bath water supply during future droughts

by
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Long dry spells and variations in rainfall had threatened the water supply to the city of Bath and surrounding area. The purpose of this project was to safeguard against water shortages caused by future droughts. A former abstraction point at Limpley Stoke on the River Avon was rebuilt to supplement the water supply to the Tucking Mill WTW by providing up to 7 Ml/d additional flow. Submersible pumps are used to extract the raw water from the River Avon and it is then transferred to Tucking Mill Lake, located, within the WTW site near Monkton Combe. The mixed lake and spring water is passed through through a Boll filter screen before treatment within a dual stream membrane plant and granulated activated carbon (GAC) contactors. Flows then enter the existing chlorine contact tank before being transferred to one of two existing reservoirs via a new delivery main and thence into supply.

Scheme driver

Previous long dry spells and variations in rainfall had led Wessex Water to identify the need for an emergency water supply to supplement their existing supply during drought conditions. The scheme had been partially developed previously but had been put on hold when conditions improved. Subsequently the need was identified to enhance the supply to the existing West Ashton and English Combe reservoirs, which feed the distribution system for Bath and the surrounding area. The existing water treatment works at Tucking Mill Lake, located 3kms south east of Bath, was selected by Wessex Water as the location for the emergency package treatment plant.

Existing situation

The existing Tucking Mill WTW is fed by spring supplies that only undergo pH correction and chlorination before being pumped to the Hampton Down reservoir to supply the city of Bath. The lake was originally constructed for disabled anglers to fish and also to act as a water supply for an experimental plant that was located at Tucking Mill.

An existing abstraction point existed on the River Avon, but during the summer months when the river is at a low level this existing abstraction pipe is above the water level. The facility has never been used and an existing raw water main from the river intake, which was installed 30 years ago, had never been commissioned. It was hoped that this could be re-used, but investigations showed that the joints on the existing 2.3km DN450 pipeline had degraded and required resealing.

Scheme

The new works included a sheet piled river intake to replace the existing unsatisfactory arrangement. New pumps were installed to lift raw water flows to an existing DN 900 tunnel, which passes under a railway line, to the Limpley Stoke pumping station. The 2.3km pipeline from here to the Tucking Mill site had to be relined due to its poor condition. The relining used 3150D SDR17 HPPE pipe that was butt fusion welded and pushed inside the existing pipeline from various access points along the route.

At Tucking Mill, the raw water enters the existing lake via a diffuser system. At the western end of the lake an existing pumping station was refurbished and used to extract water from the lake to the new emergency package treatment plant. Two centrifugal pumps at the lake pumping station operate in a duty assist configuration. A by pass was installed in the incoming pipeline to supply water to the pump sump direct in the event that the algae content of the lake increases and affects water quality. The lake



Installing GAC vessels

photo Iain Dickie courtesy Hyder Consulting

water is stopped from entering the pump sump by closing a set of penstocks to the inlet screens on the front of the pumping station.

Raw water is transferred through a Boll filter and coagulant dosing point to the emergency package plant supplied by Memcor at a rate of 81 l/s via a HPPE pipe. The plant is located in what was the car park for the Tucking Mill site. To achieve the contact time for the coagulant prior to entering the Memcor plant, the flow passes through a 52m long DN600 DI flocculation loop. The Memcor plant operates using a membrane filtration system and is housed in 2 ISO freight containers with the MCC, air handling equipment and chemical storage in a further 2 ISO freight containers.

The flow is pumped from the Memcor plant to the inter-stage balancing tank where horizontal suction pumps then take the flow via two streams which feed the two stage GAC process. After treatment by the GAC the flow enters the existing contact tank, for chlorination. During the non-drought operation all the borehole style pumps transfer the water to Hampton Down reservoir. When



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in drought conditions, modifications to the existing manifold allow the additional flow of 81 l/s to be diverted along the new rising main. It then joins the West Ashton and English Combe reservoir transfer main while keeping the normal supply from Tucking Mill WTW to Hampton Down reservoir.

The optimum route identified for the new 1.4km treated water main was along the abandoned railway track of the GWR Somerset and Dorset railway, part of which now forms a cycle track. Along the route two major structures were encountered, a long arch bridge that the main passes through, and the Midford Viaduct that the main passes over. Both these structures have significant importance to the local industrial heritage. The viaduct appeared in the opening sequence of the 1952 film "The Titfield Thunderbolt". After the viaduct, the main leaves the old railway track and joins the English Combe to West Ashton transfer main at the Midford pumping station. Here the valve arrangement allows the Tucking Mill flows to be transferred to either English Combe or the West Ashton reservoirs, depending on demand.

Both the *Memcor* package treatment plant process and the GAC backwashing process, produce waste products that need to be treated on site prior to disposal. The *Memcor* waste includes dosing, acid. This is treated on site by a neutralisation plant before being pumped into the dirty backwash tank. The backwash from the GAC is also collected in the dirty backwash tank and is pumped, at a rate of 8l/s, along with the neutralised waste from the Memcor plant via a new rising main at a rate of 8 l/s to an existing sewage pumping station and on to treatment at the local sewerage treatment works.

Project status

The whole scheme was to be commissioned by the 30th June 2006 in preparation for the peak summer demand. To assist in meeting this deadline the project was managed directly by Wessex Water in-house contractor Wessex Engineering and Construction Services Ltd. ■

Note *The author of this article, Richard Terrell, is a Project Engineer with Hyder Consulting Ltd.*
