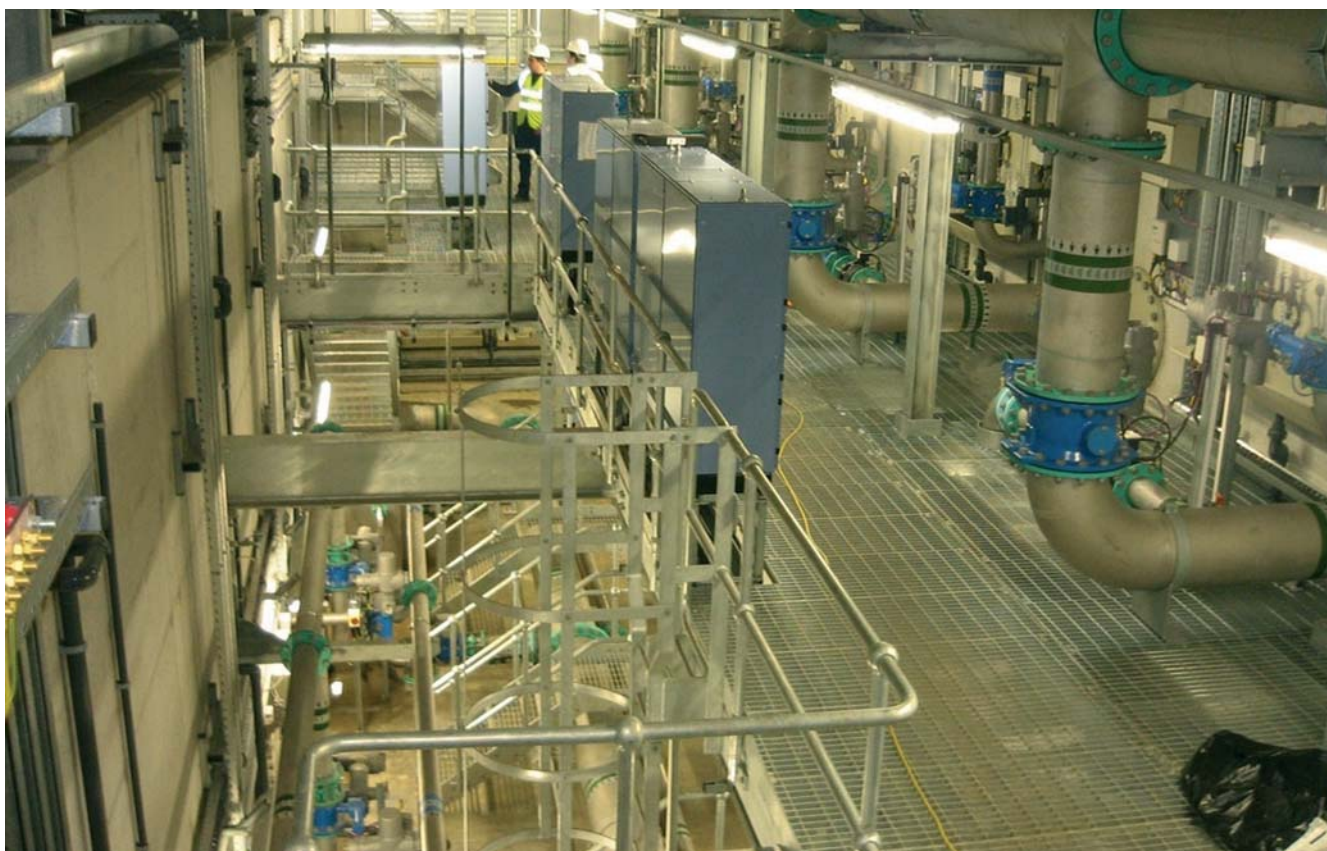


# Ridgaling WTW

by  
David Morgan, Robert Carline & Simon Povey

**B**arley WTW is located five miles north of Burnley, Lancashire, in an area of outstanding natural beauty (AONB), in the shadow of Pendle Hill, a popular tourist area. The existing works was a United Utilities (UU) direct filtration, two stage pressure filtration plant. Twelve of the eighteen first stage Bells vertical pressure filters date from 1912, the remainder from circa 1930. These were supplemented by similar vessels in 1993 for manganese removal. Following several stages of chemical conditioning throughout the plant, final water is transferred to Ridgaling service reservoir (SR) via a 24" cast iron main approximately 3km long. The raw water quality has high colour and turbidity which the works could not treat. Whilst the plant had a hydraulic capacity of 12MI/d, it had to be shut down for 4.5 hours a day for manual backwashing, reducing the average output to 4MI/d. The reliable yield was 6.8MI/d serving a population of up to 54,000.



Barley WTW First (upper) and second (lower) stage filter galleries

courtesy KMI+

A strategic study in 2003 identified that the upland sources must be fully utilised if the demands during a drought were to be met. The purpose of the project was to provide a reliable yield of 12 MI/d, the three quality drivers being cryptosporidium, trihalomethanes and turbidity. To meet this criteria, the consent date, and to allow for major outages elsewhere later in the AMP4 cycle, an *MWH* team was established early in the programme to undertake the outline design.

## New works

The 1912 plant sat in a steep sided, narrow valley in the village of Barley. **Initial expectations were to build a new works nearby, on land owned by UU. The early development of the scheme was by MWH, as Solution Service Provider for UU.**

Having taken the project to a pre-determined level of design, an approved project budget was set in conjunction with main contractor

**KMI+ (a Kier, Murphy Interserve and Mouchel Parkman Joint Venture).** The detail design was then completed by **GHA (Civil) and Interserve (mechanical & electrical).**

As the scheme was developed and cost estimates established it became clear that the logistics of building the new plant in the preferred location would significantly exceed the project budget. **With the clock running and costs increasing, a key strategic decision to relocate the plant was made in September 2004. Thirteen potential sites were identified and quickly assessed, the chosen site being 700 metres downstream of Ridgaling SR.**

Numerous items needed to be addressed urgently; land purchase, surveys, planning permission, construction near land designated as green belt/AONB and, not least, the difficulties associated with getting plant, labour and materials into the site whilst addressing the concerns of local residents.

As part of the strategic procurement of AMP4 contracts, United Utilities has set up an alliance which consists of *KMI+ and MWH*. The staff delivering the programme are sourced from all three parties with the emphasis on working together as a team to resolve issues.

### Overall scope of new works

The overall scope of the new works included pH correction by sulphuric acid or sodium hydroxide, coagulation via aluminium sulphate, followed by polyelectrolyte for floc development. This leads onto a three stream flocculation/lamella clarifier, 5No first stage polishing filters and 4No second stage rapid filters for manganese removal via sodium hypochlorite and sodium hydroxide application. There is a chlorine trim and pH correction for disinfection followed by contact tank and outlet pumping station with orthophosphate dosing for plumbosolvency control and final pH trim. Washwater was collected, dosed with polyelectrolyte and/or aluminium sulphate and forwarded to 2No flocculator/lamella clarifiers. Sludges are blended and forwarded to picket thickeners and onto sludge holding tanks and then tankered off site.

### Concerns of local residents

To aid the planning application, weekend open meetings were held at a local village hall to establish the concerns of local residents. The elevation of the works meant distant views into the site needed careful consideration and the selection of building materials were in sympathy with the locale in order to satisfy the planning authority. 3D visualisations were produced in order to achieve this. Negotiating narrow country lanes with 100T cranes needed detailed thought and the traffic plan developed a one way system, including a temporary road into the site. Attending local parish meetings, ensuring deliveries followed the designated route in, and avoiding school opening/closing times, were some of the measures adopted.

**Commissioning the new plant was particularly challenging.** A key point in the commissioning sequence occurred when the 24" main was declassified to raw water. To allow this, a 3.5Km pipeline to Newchurch SR was laid to maintain supply. All the mains to consumers were cross-connected onto new supplies before the old

works was by-passed. At this point, Ridgaling SR could no longer be supported from Barley, which was the sole source for several villages. To enable this, the network was modelled by UU Networks and re-valved to balance the loss of supply. All the other plants in the region were at full capacity to meet demands. Temporary diesel pumps sent flows back into Ridgaling SR to allow continuity of supply.

A 24 hour, 7 days a week shift pattern was established from mid-December 2006 to the end of February 2007 to ensure the contract completion date could be met. Out of hours shifts were covered jointly by the KMI+ commissioning team and UU Operations. This client input proved to be invaluable, making the prescribed training a formality.

### Principal sub-contractors were:

Boultings (electrical installation); Hydroklear (dosing systems); Paques (lamella plants); Compass (mechanical installation); CARA (stonework and blockwork); AMT (filter systems) and Nemark (steelwork & cladding); Principal plant suppliers were: Blackburn Starling (MCC;s); Forbes (GRP Tanks), Grundfos (dosing pumps) and KSB (Pumps).

At the time of writing, final tidying up on site is nearly complete, the project will be under the £19.5M approved spend, is ahead of programme and to date has recorded an outstanding 285,000 man hours without any accidents.

Teamwork, capability and commitment of all those involved has delivered an outstanding plant of which they can all be proud. ■

**Note: This scheme was originally Barley WTW but has been renamed as the location of the works has changed as discussed in the article.**

**Note: The Editor & Publishers wish to thank the authors David Morgan, a Principal Civil Engineer, MWH; Robert Carline, a Lead Commissioning Engineer at KMI+ and Simon Povey, a Project Coordinator at United Utilities for producing the above article.**



3D visualisation to aid the planning application

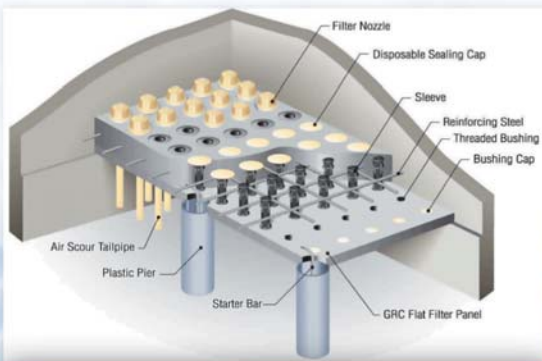
courtesy MWH



Clean backwash pumps flanked by second stage filters and chemical building with admin building in the distance.



Construction continues apace in July 2006



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