

Franklaw WTW — water quality improvements

framework alliance provides value engineering solutions

by

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As part of its current 5 year Asset Management Plan (AMP3) and in order to ensure compliance with impending regulatory requirements with respect to drinking water quality and wastewater discharges, United Utilities (UU) is pursuing a multi-million pound investment in Water & Wastewater infrastructure in North-west England. Three Framework/Partnering Agreements covering an area stretching from Carlisle to Chester have been procured. One of the largest water projects is being undertaken at Franklaw WTW near Garstang, Preston in Lancashire.



Franklaw WTW - Pumps in treated water house

Alliance

HMB Alliance (Harbour General/Morgan Est/Barhale Joint Venture in Alliance with a Carl Bro/Mott MacDonald JV team as Design Consultants) successfully secured the Northern Area Framework Partnership for the entire £400M+ Northern Framework Programme. Working closely with contractors and client, *Carl Bro/Mott MacDonald* design teams are involved in the Value Engineering and Detailed Design of Water and Wastewater projects ranging in value from £500k to £25m

Franklaw WTW

The existing Franklaw WTW was constructed in the 1970s after a severe drought which left many parts of Lancashire without water. The plant currently treats up to 280 ML/d of water abstracted from the nearby River Wyre and comprises coagulation, clarification, single stage Rapid Gravity Filters (RGF) and disinfection. As part of the scheme it is normal to augment the River Wyre with River Lune water.

There is also an ion exchange plant which receives up to 92 ML/d of borehole water. The River Wyre water is pumped to the works for treatment via three *Degremont* Superpulsators, twelve *Aquazur* 'V' duplex sand filters and a single disinfection contact tank before being pumped into supply. As present, Franklaw is the recognised contingency or 'hot standby' for several other stations and as a result the duration of its operation can vary considerably.

Water quality improvements

Drinking Water Inspectorate (DWI) requirements for AMP3 water quality requires four WTW supplies in the area to be improved in respect of Cryptosporidium and three of these in respect of

manganese. UU identified the need to provide a new treatment process to the water supply serving the Preston area which currently relies on coarse screening and disinfection to ensure water quality.

The solution being implemented by UU is to provide a 'super plant' at Franklaw to supply compliant water to the four supply zones by extending the existing treatment process to provide manganese and cryptosporidium treatment. The works will operate as a base load plant with a throughput made up of blends of raw water sources with an average flow into the works from other zones of 120ML/d via the new 900mm diameter Barnacre/Thirlmere Aqueduct (TA) main. Franklaw will provide up to 220 ML/d of drinking water for the surrounding urban areas.

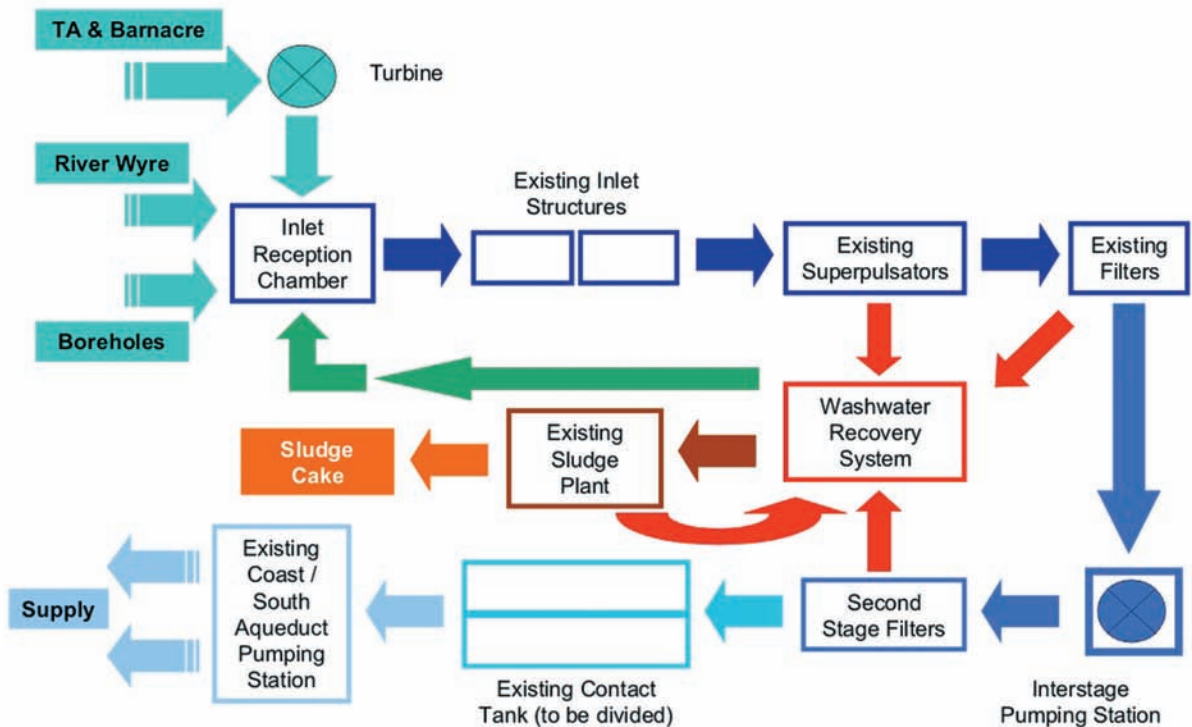
Cryptosporidium

Cryptosporidium is a tiny micro-organism which can sometimes cause a form of sickness and diarrhoea called cryptosporidiosis. The cryptosporidium bug lives in the stomachs of animals and is released with their excreta and is resistant to chlorine treatment. UU are particularly concerned about the possible effects of cryptosporidium from animals grazing on the catchment of Thirlmere in the Lake District. However, there are other sources of cryptosporidium that are not connected with the water supply. Cryptosporidium can particularly affect people in poor health. The new filtration system at Franklaw should remove cryptosporidium from the final water. Due to the scale of civil engineering involved, the project is unlikely to be completed until 2004.

Process requirements

Purpose of the project is to meet regulatory requirements for

Franklaw WTW Schematic



Franklaw WTW - Schematic diagram of plant

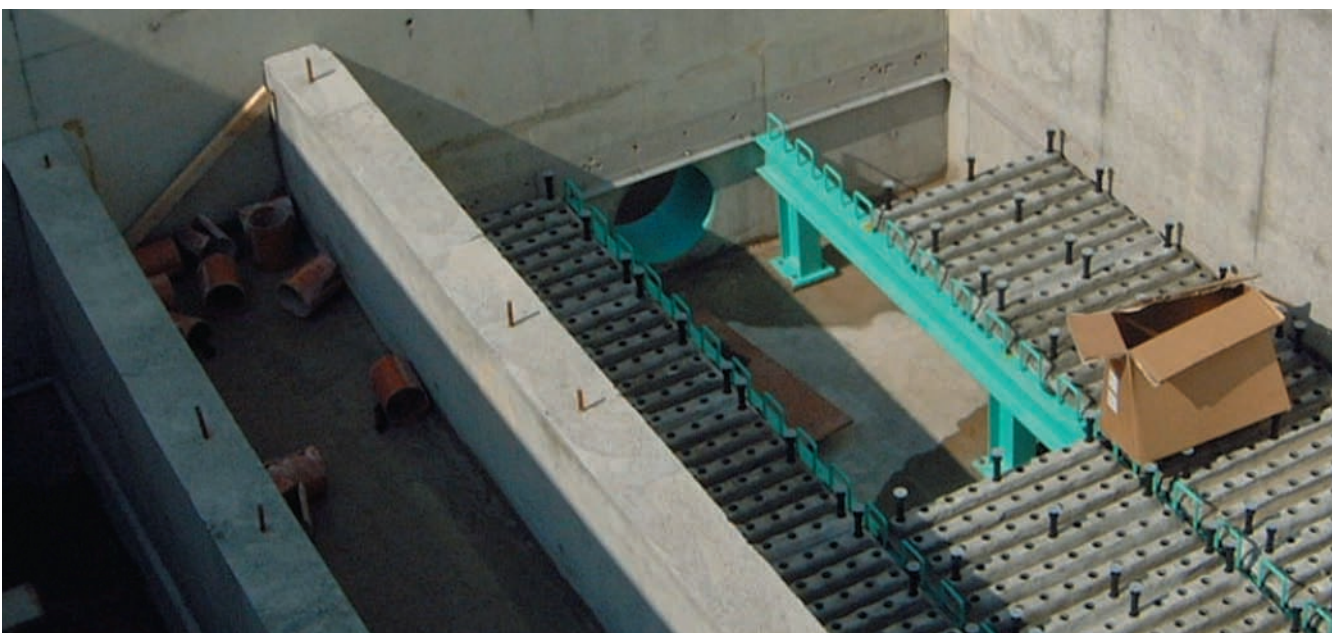
the reduction of manganese and cryptosporidium in supply. This is to be achieved by improving and extending the existing treatment works at Franklaw, without adversely impacting on the performance of the WTW in respect of other water quality parameters. UU's representative, MWH carried out feasibility and initial design work on the project and specified the additional treatment processes required to meet the regulations.

This information was passed on to the *HMB Alliance* as the basis of Detailed Design and Construction in the form of a Design Statement.

Key changes

- * **New Inlet Reception chamber**
 - provide new blending facility;
 - generate electricity used to run the plant;
- * **New Interstage Pumping Station**

- dual function included storage capacity & pumping systems;
- innovative design utilising temporary support ring beams in final solution;
- * **Enhanced/Efficient Chemical Dosing/Mixing**
 - flexible design to allow for all operational requirements;
- * **Existing First Stage Filtration**
 - repair & refurbish fittings, valves, access walkways, and openings to bring works into line with upgraded 'base load' plant status;
- * **New Second Stage Filtration**
 - five filters incorporating CADAR floor beds with nozzle density of 55/m²;
 - steel flooring support system achieves time & cost savings;
- * **Contact tank modifications**
 - optimised design to ensure adequate contact time for final chlorine dosing;



* New Washwater Recovery System

- the VE exercise identified an alternative system comprising of six VEXAMUS fabricated steel units which could be used to deal with the washwater from both existing and new phases resulting in significant time and cost savings to the client.

* Miscellaneous Plant Repairs & Refurbishments include;

- treated water pumping station and sludge treatment plant improvements, new SCADA/HV switchboard equipment & replacement of emergency generation equipment;

Success for value engineering

The initial task for the HMB Alliance was to challenge the preliminary design for the scheme to identify savings to the project through innovative design and value engineering (VE) exercises. The VE team, which consisted of UU, MWH, HMB Alliance and the appointed process engineers Biwater Treatment, were able to add value to the project by identifying considerable savings to the preliminary design. The three main areas that were identified were interstage pumping, washwater recovery (Lamella) and rationalisation of plant layout and pipework.

Target Cost was first valued at just over £27 million in June 2002 and three months later after some very successful VE the contract value was engineered down to just over £20 million. A massive saving of £7 million on the Franklaw scheme, which in turn provides added value to the wider framework through continuous improvement and intelligent design solutions.

HMB Alliance made significant input into the way savings were achieved. HMB Project Team used their combined experience to develop alternative approaches to design and construction processes, with the result that whole structures were deleted with those

remaining being made simpler and quicker to build.

The whole VE exercise must be considered a success for the whole of the Framework Team. With the knowledge and input from all sides, the timescale for the project was adjusted so that the VE proposals could be engineered and incorporated without compromising the project and date for compliance with regulatory obligations.

As the project has progressed the Alliance partners have learned more about each other and the roles and responsibilities of teams and individuals have grown to suit the needs of the project. This approach embraces the essential principles of a partnering environment by co-ordinating and managing a range of disciplines and activities in order to improve quality and efficiency in the delivery of intelligent, innovative and robust solutions to meet time and cost parameters.

Who's Who on the project

Client: United Utilities; Client's Representative: Montgomery Watson Harza; Framework Partner: HMB Alliance (Harbour & General/Morgan Est/Barhale JV and Carl Bro/Mott MacDonald Design JV) Framework Design Consultant: Carl Bro Group; Process Consultant: Biwater Treatment.

The Franklaw project is on course for completion to meet the compliance date in May 2004. ■

Note: In preparing this article, the author John Henderson, a design engineer with Carl Bro Group was assisted by:- David Dewar, United Utilities Implementation Manager, (Asset Delivery); Roger Woodcock, MWH Project Manager; Graham Wallbank, HMB Project Manager & Scott Henderson, Carl Bro Project Design Manager.

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