Harlow Hill Water Treatment Works

trihalomethane reduction scheme

by
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Harlow Hill Water Treatment Works supplies treated water to the areas of Harrogate, Knaresborough, Boroughbridge, Paisley Bridge, Ripon and Studforth. The works is designed for an output of 42Ml/day. Raw water feeding the treatment works is secured from a variety of upland moorland sources namely, Scargill, Leighton and Roundhill Reservoirs. In addition, an amount of treated water back-up is supplied from Eccup Water Treatment Works, some 20 kilometres distant, that feeds directly to the treated water storage facility on the Harlow site.

Harlow Hill WTW; Construction of clarification unit under the regime of continually operating live treatment process *courtesy Yorkshire Water Services*

Initially, Harlow Hill was a two stage treatment works that utilised upward flow clarification and rapid gravity filtration as the main treatment processes. Blending of all the different sources is still accommodated at a newly reconfigured inlet works and then split into two treatment streams when hydraulic mixing for coagulation with aluminium sulphate and pH correction with lime is effected. Flocculation by polyelectrolyte is followed by clarification through 4No. upward flow clarifiers and then rapid gravity filtration via 9 No. filters of mixed media comprising gravel, sand and anthracite.

The treated water enters supply via 10 megalitre and 20 megalitre storage structures to both pumped and gravity fed supply systems.

The drivers of the new project involve both quality and timescale goals.

The output from Harlow Hill Water Treatment Works exceeded the relevant Prescribed Consent Value's for Trihalomethanes (THM's). This had resulted in regulatory failures in the area of supply. The increased raw water colour levels meant that the treatment works was unable to remove sufficient organic matter before chlorination to keep the THM's in distribution within the standard of 100µg/l.

The DWI imposed the statutory obligation for full compliance of the Plant with regard to this Water Quality driver by 31 December, 2006. In addition, a number of base maintenance issues had also been identified and required to be addressed in parallel with the delivery of the Quality aspects.

Methods

The methods employed to examine the ways and means of achieving both, have included a two-stage feasibility process, a number of value management studies, review and challenge events involving the resources of the newly appointed AMP4 Technical, Commercial and Behavioural Framework Consultants, namely Arup Turner & Townsend and Castleton respectively and contributions from one of the newly appointed Contract Partners for the AMP4 Large Schemes programme, Mott MacDonald Bentley.

Erection of steelwork frame to newly constructed rapid gravity filter substructure *courtesy Yorkshire Water Services*

Tendering process

The tendering process was based on the provision of the initial preferred solution incorporating a third stage of manganese removal, the effect of which could have been to add a new stage of manganese contactors and involve existing filter upgrades with a complex revised chemical dosing regime that incorporates relocation of dosing points as regards chlorine, MSP and lime as well as a storage conversion exercise from alum to ferric.

Following contract award and during design development phase, an innovative, alternative approach towards providing the above new processes was adopted that maximised the use of existing assets as opposed to merely bolting on additional treatment units. This stage was particularly influential in securing cost reductions to the project from the collaborative contributions made from both successful and unsuccessful tenderers. I**t negated the need for extensions to the existing banks of gravity filters and presented the advantage of minimising site impact in terms of land take.**

New filtration stage

By the construction of a wholly new filtration stage comprising 8 No. rapid gravity filters and conversion of the existing filters to manganese contactors, realised a more robust treatment process, optimised the chemical dosing regime, provided seamless integration of the base maintenance aspects and allowed uninterrupted supply of water to customers during the construction activity.

The summary scope of the preferred solution then comprises:

* 8 No. new rapid gravity filters;
* clean backwash system including storage tank;
* recycling facility
* interstage pumping;
* dirty washwater handling;
* modifications to chemical dosing regime, including coagulant conversion from alum to ferric;
* upgrading of power supply;
* upgrade to control systems;
* construction of additional clarifier;
* covering of existing filters.

The programme for delivering the project by the Compliance date was extremely tight and required close and continued collaboration between all parties involved throughout each and every step of the programme. In order to make as early a start as possible on project delivery, decisions on procurement of certain items such as the type of flooring to be adopted for the new filters, were made very early in the initial design stage where the incorporation of three dimensional software in the design process provided a virtual 'walkthrough' and there from a clear insight into potential operational 'pinch-points'. This allowed detailed design to be completed and 'frozen' earlier in the process.

Construction Lean Improvement Programme tools were employed to identify critical areas of the programme that offered the potential to condense durations of the various construction activities. Most of the new build involved working with or alongside 'live' processes where small working areas with various restrictions were a feature across the whole site. **The main construction of the new rapid gravity filter block itself utilised the only available footprint which consequently determined the dimensional constraints within which to design and work safely.**

Progress has been exceptional in achieving Compliance date of 31 December 2006, the momentum of which will be carried forward in attaining the project completion date of June 2007. ■

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