

# Langsett Water Treatment Works

## Trihalomethane Compliance

by Alan Bennett

**L**angsett Water Treatment Works is an exposed site located to the north of Sheffield adjacent to the Peak District National Park. The works was constructed in 1985 with a maximum design capacity of 60 MI/d to supply a population of 200,000 in the Sheffield and Barnsley areas of South Yorkshire. In common with most other reservoirs in the Pennine catchments, raw water quality has deteriorated significantly since the works was commissioned, with increasing levels of colour and periodic high turbidity. Added to these problems, raw water sources contain high levels of Trihalomethane (THM) precursors which require to be removed efficiently to meet the PCV regulatory standard of 100 micro grams per litre as a single sample within the distribution system.



Langsett WTW: Preferred location of new process units

*courtesy Yorkshire Water*

**The current £6.2m project to resolve the THM problem is to extend the existing WTW by-**

**Construction** of a third stage of treatment in the form of manganese removal contactors plus backwash facilities.

**Decommissioning** the existing contact tank before the existing Rapid Gravity Filters (RGF's).

**Construction** of an enlarged capacity contact tank after the new contactors.

**Relocation** of the chlorine dosing point.

By constructing a new manganese stage downstream of the existing RGFs it will be possible to enhance solids and colour removal by the clarifiers and the RGF's. The RGF's will then be dedicated to residual solids removal, and the new manganese contactors will be pre-dosed with chlorine, and pH adjusted to a point where manganese and iron will be precipitated and removed by the contactors. By moving the chlorination point to after the RGF's, the THM precursors will be removed by the RGF's before the chlorine is dosed.

Location of the new treatment process is discrete from the existing works, but is located on the existing site in a disused quarry. It, therefore has the minimum impact both from a planning and operational perspective.

The project will be completed by 31 December, 2006 in order to meet the DWI regulatory compliance date.

### **Existing treatment process**

The existing treatment process consists of pH correction within the inlet flash mixer, flocculation with the aid of ferric sulphate, clarification in 2 superpulsator streams. and suspended solid manganese and iron removal via the RGF's. Associated with this are chemical dosing facilities for coagulation, flocculation, pH correction, disinfection and plumbosolvency control.

Polyelectrolyte is used to thicken sludge in two sludge thickeners. Dewatering is by 3 no. plate presses. Cake is transported to a sludge drying area before being taken off site to landfill.

## Project execution

The drivers of the project involve both quality and timescale goals. The methods employed to examine ways and means of achieving both, have included a two stage feasibility process, a number of Value Management studies, Review and Challenge events and Workshops. These exercises have involved the resources of Technical and Commercial Framework Consultants and Contractors. Such collaborative involvement continued throughout feasibility in accordance with the company contract strategy.

The first stage of Feasibility Study involved the technical evaluation of the possible options available to resolve the issues associated with the scheme drivers. The resulting output directed a second phase of examination on a more detailed study incorporating outline design and costings.

## Contract strategy

At an early stage of feasibility it was recognised by all involved with the scheme, including the tendering contractors, that programme constraints were a major factor in ensuring successful delivery of the project in accordance with the DWI compliance date. In order to mitigate these constraints, an alternative procurement strategy was developed. This strategy involved a short quality submission and interview to appoint a single contractor, who would then develop the design, and negotiate a contractual target cost. This approach gained 8 weeks on the programme and allowed an early start on site to commence the critical path activities of ground excavation, formwork and concreting, thus reducing the risk of delays during the worst of the winter weather.

The subsequent contract awarded to *Earth Tech Morrison (ETM)* included the design, construction and commissioning of the process necessary to achieve the water quality standards required by the specified compliance date.

## Programme - Key dates

Start on site (excavation works)	September 2005.
Start of Main M & E installation	April 2006
Commence Commissioning	July 2006
Completion	September 2006.

A site start was made in September 2005. The civil construction activities are now well advanced with the main plant concrete substructure and contact tank to be completed early March. The mechanical installation is due to start at the beginning of April 2006.

One of the unique aspects of this project is that the concept of 'Critical Chain Project Management' is being used to programme the work. This is a management tool to assist complete the project by the Contract Completion date. It is based around a revised way of thinking with regard to estimating task durations and allocating the appropriate risk associated with the task/project. Time allowance included in an activity to cover task risk is removed and put into a 'project buffer'. The programme is then updated and the 'project buffer' monitored and appropriate action taken to ensure a suitable level of buffer is maintained to the end of the project.

Current target completion date for the water treatment works, using this concept, is September 2006, which is three months ahead of the Compliance Date.

A key factor in project delivery has been the close working relationship of the project core team consisting of YWS as client, ETM and Arup as Framework Contractors and Consultants. All parties have worked collaboratively throughout feasibility, design and construction, to ensure the delivery of a value for money project at a minimal risk. Full co-operation of YWS operational staff has also been necessary to ensure that water supply from the existing works has been maintained throughout the construction period.

## Key Project Participants

Yorkshire Water Services - Client  
Earth Tech Morrison (ETM) - Principal Contractor/Designers  
Arup - Technical Consultant  
Turner & Townsend - Commercial Consultants. ■

**Note:** *The author of this article, Alan Bennett, is Capital Solutions Manager, with Yorkshire Water Services.*



Construction of contact tank + manganese contactors

courtesy: Yorkshire Water