Washpool WTW near Bath

cryptosporidium protection scheme

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The springs in St Catherines Valley, to the north east of Bath, are strategically important sources supplying up to 30% of the water required by Bath and neighbouring areas. Following a risk assessment in 1999, the spring sources were identified as 'at risk' from *cryptosporidium.* Wessex Water agreed with the Drinking Water Inspectorate to provide *cryptosporidium* protection during the AMP3 period in order to comply with the Water Supply (Water Quality) (Amendment) Regulations 1999.

Washpool Treatment Building

The existing works at Washpool is located approximately 1km north of Batheaston. The site also serves as the pumping station for water transferred from the east of Wessex's region into the Bath system. The rated output of the Washpool plant is 11 Ml/d. The existing works comprises:

* screening;
* chlorination;
* pumping to Hollies Lane reservoir;
* contact main;
* dechlorination with sulphur dioxide at Holllies Lane reservoir.

The sources suffer frequent turbidity spikes during periods of heavy rain and it was concluded that the existing treatment process did not provide adequate protection against *cryptosporidium.*

Membranes were identified as the most appropriate treatment technology.

Process design

The new works will use the *Memcor* continuous microfiltration (CMF) membrane system to provide protection against *cryptosporidium.* Two *Memcor* E108M10C units provide the primary membrane system.

Raw water will be supplied from the four existing spring sources. There is sufficient gravity head available to supply the membranes directly from these sources. Due to the different elevations of each spring source, a series of pressure reducing valves will be used to control the flows and pressures from each source before they combine to feed the membranes. A final pressure-regulating valve will be used to control feed pressure to the membranes. Two strainers rated at 500 microns and operating as duty standby units will provide protection for the primary membranes. Each primary membrane unit operates at a fixed flow of 240m³/h. The filtrate is directed to a new filtered water balance tank, the level in this tank being used to control the number of membranes in operation. The filtered water is disinfected using the existing chlorination equipment before being transferred by re-lift pumps to the supply reservoir.

The membranes perform regular automatic backwashes using the patented Memcor gas backwash. Compressed air is introduced into the fibre lumens whilst raw water flows across the exterior surface of the membrane. This produces a very effective backwashing mechanism, improving the ability of the system to operate at high turbidities when compared to its competitors. The interval between successive backwashes is controlled by the feed water quality.

There is not enough capacity available in the existing sewer infrastructure to enable all the wastewater generated by the membrane system to be discharged. Dirty backwash water from the primary membranes is concentrated using secondary membranes. These are two *Memcor* 12m10C CMF units. The primary dirty backwash water will be directed to a balance tank before being pumped to the secondary membranes. Filtered water from the secondary membranes will be returned to the clean backwash water holding tank for backwashing of both primary and secondary membranes. A raw water top up is also supplied to this tank. The dirty backwash water from the secondary membrane will be discharged to sewer.

In addition to the automatic backwashing, both sets of membranes will require periodic cleaning using caustic and acid solutions. Concentrated sodium hydroxide and sulphuric acid will be diluted using a single clean-in-place (CIP) tank. This is a departure from

the standard *Memcor* design, however, it reduced significantly the footprint of the membrane system. This was an important consideration at this site due to the limited building area available. The operation of this tank needed to be carefully considered during the design phase so as not to compromise the membranes. Caustic CIPs will predominate and the caustic solution will be re-used until an acid clean is required. The CIP tank will then be flushed and filled with acid. After each acid CIP the tank will be flushed again and filled with caustic to enable a caustic CIP to take place. To reduce membrane down time during a combined acid and caustic CIP, the membrane skid will return to operation if required. Chemical rinse water and the CIP solutions will be neutralised and discharged to sewer.

Site selection & architectural concept

The Washpool site is in a sensitive location within the Cotswold AONB and close to St Catherines Brook. It is also close to a number of residential properties and access is restricted to narrow country lanes.

A detailed site selection and environmental assessment exercise was required to support the planning application and extensive consultation with the planning authority, two parish councils and with the highways authority was essential. The final scheme, following several revisions, comprises:

* a high quality building in the form of a traditional barn in keeping with local building styles. It will use natural rubble stone walls and an artificial Cotswold stone tile roof;
* concrete tanks required as part of the engineering solution will be buried at the rear of the building;
* the site footprint is kept to the minimum required and the buildings are arranged to form an enclosed courtyard;
* extensive landscaping to the rear of the building and to boundaries of the existing site will be included;
* the existing strainer house will be demolished. Existing and proposed equipment in the building will be accommodated in the new development.
* layout of the courtyard and gates is arranged so that the planting screen to the road can be reinforced.

Design & construction

A design and construct contract for the complete works including membrane equipment, mechanical, electrical and civil and building works was awarded in August 2001, following a competitive tender and further development of the technical solution and planning requirements. Planning permission was finally obtained in October 2001. Civil construction, including a bored pile retaining wall with ground anchors is underway during March – April 2002. Commissioning is scheduled for the autumn of 2002.

The total scheme value is approximately £3.4 million.

Project team

Key members of the project team are:
Project Manager: *MWH Wessex[1] Ltd* (formerly Wessex Water Engineering Services); Architect: *Race Cottam Associates;* Consultant: *Binnie Black & Veatch;* Main Contractor: *Earth Tech Engineering Ltd;* Membrane Supplier: *USF Memcor;* Civil sub contractor: *Dean & Dyball.* ■

Note: [1] MWH Wessex Ltd is a joint venture between MWH UK Ltd and Wessex Water Ltd.. MWH Wessex is responsible for managing the AMP3 capital programme for Wessex Water Services *Ltd.*

Note on the authors: *Lisa Staples is Process Engineer and Julian Welbank, Technical Manager, MWH Wessex Ltd.*