

Friar Waddon Water Treatment Works, Dorset cryptosporidium protection for strategic water supply

by Martin J Kevill & Lisa Staples

The water treatment plant at Friar Waddon is strategically important to the supply of water required by the coastal town of Weymouth and neighbouring areas in Dorset. Following a risk assessment in 1999, the borehole sources at Friar Waddon were identified as being at risk from *Cryptosporidium*. Wessex Water subsequently agreed with the Drinking Water Inspectorate (DWI) to provide cryptosporidium protection during the AMP3 period to comply with the Water Supply (Water Quality) (Amendment) Regulations 1999.



Friar Waddon:WTW: Filter gallery, primary & secondary membranes (Courtesy Earth Tech Engineering Ltd).

The existing works at Friar Waddon is located approximately 5 miles north of Weymouth near the village of Upwey. Rated output of the plant is 10Ml/d.

The existing works comprise:

- * borehole raw water abstraction;
- * chlorination;
- * chlorine contact tank and integral balance tank;
- * dechlorination with sulphur dioxide;
- * high lift pumping to Goulds Hill 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*.

Process design

The new treatment works utilises the *Memcor* continuous microfiltration (CMF) membrane system to provide protection against *Cryptosporidium*. Three *Memcor* E66M10C units provide the primary membrane microfiltration system.

Raw water is supplied to the new membrane plant from two existing borehole sources, these pumps are variable speed and are used to direct feed the membrane plant and provide a constant feed pressure for the new primary filtration membrane units. Two strainers rated At 500 microns provide protection to the membrane units. Each primary membrane unit operates at a fixed flow of 146m³/hr. The number of primary membranes required to operate is controlled by the demand from the existing chlorine contact tank. The filtered

water is then disinfected using the existing chlorine and dechlorination equipment before being transferred by the existing relift pumps to the existing service reservoir.

The microfiltration membranes perform regular automatic backwashes using the *Memcor* standard backwash system. Compressed air is introduced into the fibre lumens whilst raw and/or filtered water flows across the exterior surface of the membrane, thus providing a very effective backwashing system. The interval between successive backwashes is controlled by the feed water quality.

In order to reduce the impact of wastewater being discharged into the existing sewer infrastructure, dirty backwash from the primary units is concentrated using secondary membranes. The units comprise two *Memcor* 12M10C CMF units,

Primary dirty backwash water is directed to a balance tank before being pumped to the secondary membranes. Filtered water from the secondary membranes is returned to the clean backwash holding tank for backwashing of both primary and secondary membranes. Dirty backwash water from the secondary membranes is then discharged to sewer.

In addition to the automatic backwashing, both sets of membranes require periodic cleaning using caustic and acid solutions. Each clean in place (CIP) solution is prepared and maintained at the correct concentration and temperature until required for cleaning. Caustic CIP washes are performed most frequently with a combination of an acid CIP followed by a caustic CIP. This is performed after a user defined number of caustic CIPs. The caustic solution is used a number of times, whilst the acid CIP is only used once. Spent solutions from both the caustic and the acid CIPs are both neutralised prior to discharge to sewer.

Design & Construction

A design and construct contract for the complete works, including membrane equipment, electrical, software, civil and building works was awarded to *Earth Tech Engineering Ltd* following an invitation to competitive tender. Friar Waddon is one of three cryptosporidium protection schemes undertaken by *Earth Tech* for *Wessex Water Services Ltd*, utilising the *Memcor* CMF membrane technology.

Planning permission for the building was obtained in parallel with the design and procurement phase. Civil works commenced in January 2002 with extensive excavation and landscaping works required to partly bury the new building. This was required as a result of planning permission to ensure that the new building minimised the visual impact of the building profile from surrounding area and adjacent residential properties.

Principal contractor for the project was *Earth Tech Engineering Ltd*. Planning Supervisor was *Wessex Water Services*. Other key members of the project team were: *Binnie Black & Veatch, Consultant; Memcor Ltd, Membrane supplier; Dean & Dyball Ltd (Ringwood), Civil Contractor; Mechanical subcontractor, Alpha Plus; Electrical Subcontractor, Lloyd Morris Electrical Ltd; Architect: Race Cottam Associates.*

Civil construction, installation of mechanical and electrical equipment and commissioning was substantially complete by December 2002, achieving the DWI regulatory date for the installation of cryptosporidium barrier on the supply water. The plant is currently supplying cryptosporidium screened potable water to Weymouth and neighbouring areas.

Total scheme value for Friar Waddon was £2.3 million.■

Note on the authors: *Martin J Kevill is with Earth Tech Engineering; Lisa Staples is with Wessex Water Services Ltd.*



Architects TO THE WATER INDUSTRY

- Concept Design Solutions
- Building Design
- Planning Applications
- Sensitive Site Issues
- Visual Appraisals
- Detail Design & Co-ordination
- Contract Administration
- Building Site Inspection

Race Cottam Associates
Tel...0114 2737050 Fax...0114 2737881