Groombridge WTW – Increased Capacity

conventional & biological treatment working together

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Groombridge WTW, owned and operated by South East Water, treats raw water containing iron, ammonium and manganese, abstracted from boreholes in the greensand aquifer. A 5Ml/day conventional treatment plant consisting of aeration, clarification and rapid gravity sand filtration has been successfully extended with a 3Ml/day biological treatment plant using pressure sand filters.

Biological Filtration extension to conventional plant *(courtesy South East Water).*

Based on experience and expertise in the treatment of iron, ammonium and manganese, *Dynamco* was contracted in 1998 to appraise, design and build an extension to the WTW to increase its capacity from 5Ml/day to 8Ml/day. Given the cost advantages offered by bio-filtration, it was proposed to combine conventional and biological treatment.

Design

The old and new plants run in parallel, both feeding from an initial aerator. The biological stream is flow controlled to enable both treatment processes to be operated at suitable capacity without interfering with each other. Whilst the existing conventional plant is gravity fed, the biological plant required the water to be pumped from a re-lift tank into the pressure filters, as illustrated below

Treatment processes

The conventional plant removes iron by precipitation after aeration and caustic dosing. The ammonium and manganese are then oxidised by chlorine and manganese oxides are retained on sand filters. This is a common process used in the treatment of greensand waters. However, for the plant upgrade, biological treatment now offers a more cost effective alternative to conventional chemical oxidation of iron, ammonium and manganese.

Biological treatment adapts natural bacteriological mechanisms for water treatment purposes. Under particular conditions, filtering water through sand will allow a biomass to colonise the media. Specific bacteria will oxidise and retain iron, ammonium and manganese, resulting in a high quality drinking water.

Control of the physico-chemical properties of water pH and redox potential is critical for biological treatment to be effective. Biological oxidation of iron, (and to a certain extent ammonium) occurs in lower pH conditions than for manganese. Consequently, iron, ammonium and manganese removal cannot take place in a single stage filtration. At Groombridge, two filtration stages are necessary, with caustic dosing prior to the second set of filters to facilitate manganese removal.

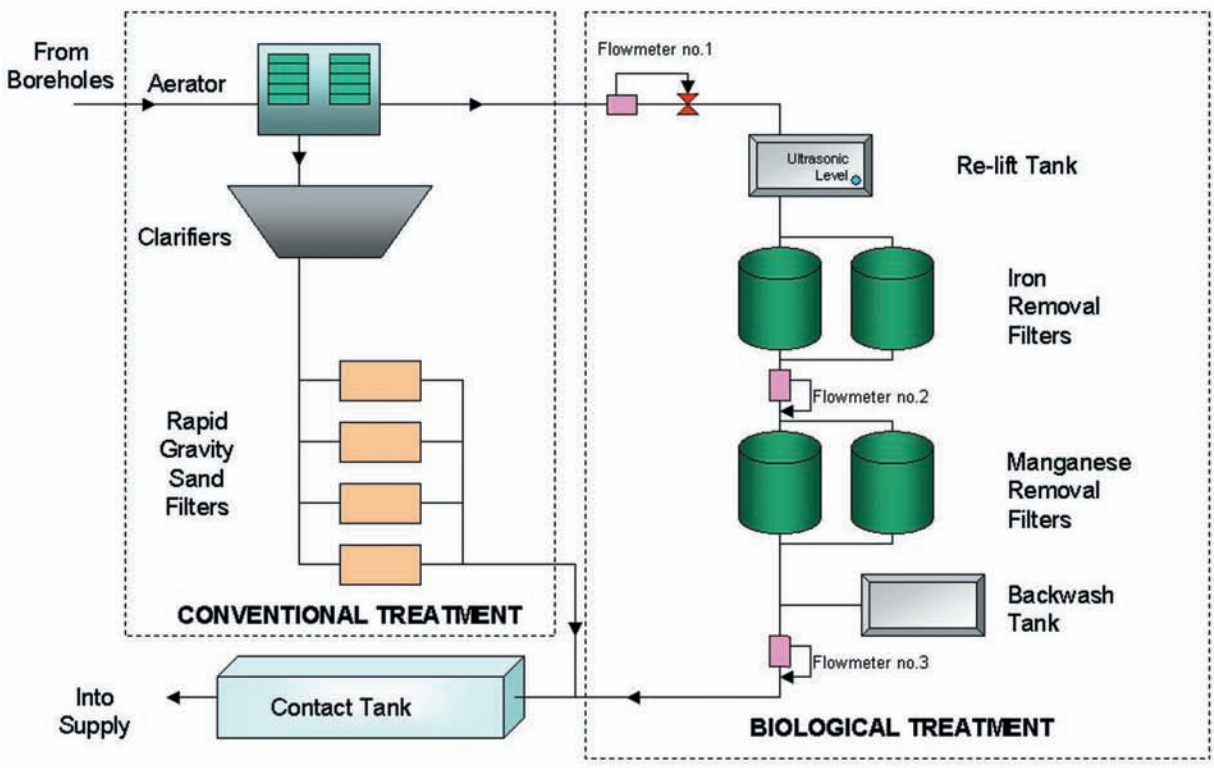
Construction

Construction phase for the biological plant started in September 2001 and ended in June 2002. It comprised three contracts: Civil, Mainlaying and Mechanical Works.

C.J. Thorne was awarded the civil and mainlaying works, *T.J.Brent* completed the mechanical contract. *Dynamco* ensured smooth co-ordination and supervision of the works. With Groombridge WTW being a key water source for Tunbridge Wells and surrounding area, construction had to be planned to minimise the impact on existing plant, ensuring little disruption to water production from the works.

Interface with existing system

One of the key issues of this project was operation and control. *Carlton Controls* created a programme tailored to plant operational



Groombridge WTW showing conventional & biological treatment flow *(courtesy South East Water).*

needs that responds to both conventional and biological treatment requirements. In particular, workable connections with existing plant elements were required in order to regulate shutdown and filter wash sequences.

The biological plant is controlled by three flowmeters as illustrated in the plant diagram. **Flowmeter No.1** regulates the input flow, which is limited by design capacity and programmed to decrease by half during a filter backwash to protect the other operational filter. Also to prevent a sudden shift of flow to the conventional plant, the system will check that the total flow is not above the maximum capacity of the conventional plant plus half the biological capacity. Therefore, when a backwash is expected, the system is setup to decrease the speed of one of the borehole pumps to reduce the overall flow to match reduced plant capacity.

Flowmeters No.2 and No 3. regulate dosing of Caustic and Chlorine respectively. In the event of an anomaly in pH, turbidity or chlorine residual in the biological system only the feed to the biological plant will close and the conventional works will continue to operate. The biological plant is, therefore, an integrated yet independent part of the works.

Commissioning

Commissioning of the biological filtration plant took some six weeks in total. After the second day of operation the iron filters were already effective, though it took another five weeks to seed the manganese filters. During filter seeding, temporary pipework was installed to recycle the 'bio-filtered' water to the head of the conventional works, so as to minimise discharge to water courses. Hence, water was running through the biological plant as in normal operation but redirected to the aerator instead of feeding into the contact tank.

Environmental benefits

The project also reflects the sustainable and environmental values of South East Water. As well as opting for biological treatment, special attention was given to landscaping. *South East Water Conservation Department* was utilised by *Dynamco* to recommend plants, bushes and trees that would suit operational and planning requirements as well as match the environment flora diversity and encourage wildlife habitat development.

Project management

The project benefited from a strong partnership between South East Water and *Dynamco.* This was necessary to facilitate running the two plants alongside and understand impacts caused by one on the other. A close working relationship developed with main contractors helped to smooth contractual interfaces and the involvement of South East Water operational staff throughout the project benefited the commissioning phase. The handover was carried out smoothly as the commissioning finished and the new plant became fully operational. ■

Note on the authors: *Lucile Dumas is an engineer and Gaël F. D. Lehimas, Process Engineer, both with Dynamco Ltd.*