High Wycombe STW Transfer

£42m scheme improves environment & eases housing shortage

by

Stuart Shurlock CEng, MICE, MCIWEM

Thames Water's £42m High Wycombe STW transfer project is creating a dramatic improvement in the environment of the southern Chiltern Hills, while at the same time releasing a valuable brownfield site which will contribute to the alleviation of southeast England's housing shortage.

Little Marlow STW Reconstruction courtesy: Thames Water

High Wycombe & Little Marlow STWs

The town of High Wycombe sits in a steep sided valley in the Buckinghamshire Chilterns. Through the town flows the River Wye, a typical attractive groundwater fed stream. Thames Water's High Wycombe STW, which treats a pe of 90,000 and discharges to the Wye, fills the valley floor in an urban area 2km from the town centre. Currently treatment is based on primary settlement and the activated sludge process. The works is in poor condition and has been at risk of failing its discharge consent.

Five kilometres away at the village of Little Marlow, there is another STW, also treating a pe of 90,000 from Marlow and the urban area of the lower Wye valley. Little Marlow's STW treatment process is based on primary settlement and biological filters. Treated effluent is discharged directly to the River Thames. There is a sludge composting plant which produces high quality compost for the domestic retail market. Little Marlow STW is the subject of an AMP3 agreement with the Environment Agency (EA) to replace the existing process with a Biological Nutrient Removal (BNR) plant.

Closure and redevelopment of High Wycombe site

The large High Wycombe site is surrounded by houses, a school and retail outlets. Closure and redevelopment for housing would significantly improve the local environment and provide funds to provide treatment elsewhere.

The agreed solution is to transfer all sewage flows via a tunnel to Little Marlow. However, there were problems to be overcome first. Firstly, the EA wished to maintain flows in the lower River Wye. Secondly, the Little Marlow site is situated in a very attractive landscape near to the River Thames.

The EA was satisfied by including a return flow of treated effluent. The problem at Little Marlow was overcome because the new plant's footprint would only be one half that of the original plant, with the released area being converted back to meadow. A planning application, including an EIA for the whole scheme was submitted to Buckinghamshire County Council, with final approval being received in March 2003.

Contracts were awarded to *Miller Construction (now Morgan Est)* and *Gleeson* to develop the feasibility of the transfer and treatment respectively. These demonstrated the viability of the proposal and main design and build contracts were awarded in August 2002 to

Little Marlow STW under construction courtesy: Thames Water

Amec for the transfer tunnel and pipeline and to *Interserve Project Services* for the treatment plant. Their design partners are *Halcrow and Earth Tech Environmental for Interserve and Babtie for Amec.*

Transfer tunnel & pipelines contract

The transfer contract is based on the IChem E 'Green Book' and is cost reimbursable with a target cost. Identified risks are divided between those which are shared and those wholly taken by Thames Water, but they are all on one register and are managed jointly.

The adopted design is for gravity flow through a 2.9m diameter tunnel 3.3km long with no intermediate shafts. The sewage is to be contained in a 1000mm dia GRP pipeline and the return flow in a similar 600mm pipeline. Both are to be bolted to the tunnel walls, allowing man access for inspections and repairs. Double containment of the sewage protects the surrounding chalk aquifer which is exploited for potable water supply by Thames Water's nearby Bourne End source.

Tunnel

For the tunnelling, Amec used a refurbished Lovatt EPBM. Precast bolted segments manufactured by *CV Buchan* were used to ensure watertightness. The TBM, named Betty after a local councillor, was launched in May 2003 from a 10.7m dia bolted segment shaft at the High Wycombe end and which had been sunk through the overlying water bearing gravels to the chalk strata. The TBM then drove through the New Pitt Chalk beneath the water table, to reach a Chalk Rock Band at 2000m. Once it was above the wet strata, it was possible to inspect the cutting head. It was discovered then that the TBM nose cone had been seriously damaged. After repairs, progress through the flinty Lewes chalk continued, until performance suddenly deteriorated. Another inspection revealed that almost all cutting teeth had been ripped off or damaged. Finally, the repaired TBM raced ahead to reach the reception shaft in early January 2004.

For 1400m from the reception shaft to the boundary of the STW, *Amec's* subcontractor *Dragtone Ltd* has laid a twin pressure main, consisting of 800mm and 600mm GRP pipes, supplied by *Johnston Pipes Ltd.* These mains were completed in the Autumn of 2003, after negotiating the A4155 Marlow Road and water bearing gravels close to the site.

After the tunnel breakthrough, cleaning and fitting out commenced. Pipe installation was due to start in March 2004, followed by completion of the shafts and the inlet works at High Wycombe, which will contain flow measurement and control, rotating bar interceptors, odour control and the discharge pipe for compensation water. The contract is well on target to complete in July, ready for the first transfer of flow in August 2004.

Little Marlow BNR plant.

The interserve contract for Little Marlow BNR plant again uses the IChem E 'Green Book' form but is set up as a Single Site Alliance. An integrated team of *Interserve, Thames Water, Halcrow and Earth Tech* staff worked on the design in a vacant Thames Water office, relocating to site once construction started. This team produced the planning application as well as a main design. Earth Tech's 'West Coast' variation on the BNR process was adopted for its capability of dealing with diluted flows.

Other challenge

The other main challenge was enabling the existing plant to function while being totally rebuilt. This was achieved by enhancing performance by increased recirculation, allowing the demolition of three filters and two humus tanks. The space created is enough for the much smaller footprint of the new plant. This has a new inlet works with screening and grit removal, three 37m dia primary settlement tanks, a 20,000 cu.m BNR plant, three 37m dia. flat bottom final settlement tanks with sludge removal by suction, and a tertiary treatment plant and pumping station for the flows returned to High Wycombe. The existing sludge treatment process is being extended, including extra bays within the composting building. The new sludge process incorporates fermentation of primary sludge for the production of Volatile Fatty Acids (VFAs) to provide nutrients for the BNR process.

Work started on site in April 2003. The excavation required for all of the tanks was facilitated by extensive well-point dewatering with groundwater discharged to a nearby lake. By March 2004, all tanks and structures were complete and mechanical plant installation was well under way. Process commissioning was due to start in June, taking flows away from the existing works. Once the full transfer at Little Marlow has been completed, flows will be diverted from High Wycombe in three phases, with return treated effluent flows being ramped up accordingly. The start of decommissioning, demolition and landscaping of the redundant Little Marlow plant was planned for July, while phased recommissioning of the High Wycombe plant will follow each transfer phase. This should allow access for developers to be available by the end of 2004, well ahead of the March 2005 regulatory deadline..

Effect on the environment and local communities

A major scheme such as High Wycombe Transfer is certain to have a significant environmental impact. In this case, the scheme itself delivers many benefits. It removes a potential 'bad neighbour' from the heavily built up Wye valley. The pollution load on the Wye itself will be reduced, while flows are maintained. The ageing plant at Little Marlow will be replaced by a modern compact plant with new odour control, the nutrient loads discharged to the Thames and Wye will be reduced and the quantity of sludge being recycled as compost will be doubled. During the project, strict controls have been placed on noise and traffic at both sites. Particular attention has been given at High Wycombe to prevention of pollution of the Back Stream, tributary of the Wye and at Little Marlow constant attention has been given to maintain flows and levels in local ground water fed streams, ponds and lakes.

The local population has been involved with the project throughout. Regular meetings are held with communities neighbouring Little Marlow to brief them on progress and get feedback on environmental performance. At High Wycombe, the local community, including the adjacent primary school, has been involved in the tunnel launch and breakthrough, and in diversion of the River Wye for the redevelopment scheme. For such a large project in a relatively small and sensitive area, adverse reactions have been minimal and good relations have been maintained throughout. ■

Note: *The author of this article, Stuart Shurlock, is Senior Project Manager, Thames Water.*