

# Shaftesbury STW Expansion

## major upgrade & new ASP meets increasing demand

by  
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**S**haftesbury is a popular residential area served by Wessex Water and is expected to grow in coming years. New home developments will increase the population from 9,000 to 13,000 by 2022 and there is also a significant trade load from local businesses including a new oil/water separation business and a laundry. These trades predict steady growth within the next ten years thus increasing the flows and loads to the Sewage Treatment Works, which enjoys a rural location within farmland in a valley on the south side of the town.



Shaftesbury STW: General view of construction works

*courtesy: Wessex Water*

### Existing works

The original treatment process, constructed in the 1970s consisted of an activated sludge plant with a liquid stream incorporating preliminary treatment, biological treatment in an oxidation ditch and final settlement prior to discharge to Stirchell Brook. A primary settlement tank was added in 1992. Tertiary lagoons were later added to improve the suspended solids quality in the final effluent. Sludge was originally dried in open sludge drying beds prior to disposal off-site, but new sludge storage tanks were constructed in 1998.

Storm flows in excess of FFT overflow from the inlet works to a storm tank. The storm tank overflow discharges to adjacent storm plots.

### Purpose of scheme

Shaftesbury STW was operating close to its capacity and predicted growth in the area placed the existing Environment Agency, EA, discharge consent at risk. The capacity of the existing plant needed to be increased to accommodate the increased flows and loads to the works. The increased plant capacity resulted in a corresponding tightening of the existing EA discharge consent to ensure that the increased discharge from the STW did not impact upon the receiving watercourse. Future flows and loads were calculated based upon a design horizon of 2012 and a new discharge consent of 12:25:3 mg/l BOD:SS:AmnN has been approved by the EA and will come into effect on 31st December 2005.

### Project delivery

#### Wessex Water proposed a two stage approach to address the capacity issues at Shaftesbury STW:

- \* implementation of advancement works to ensure that the existing works remained compliant pending completion of the major expansion works:
- \* construction of a parallel activated sludge plant to ensure compliance with the new EA discharge consent by December 2005.

### Advancement works

#### Two key areas were targeted to temporarily improve the performance of the existing works pending completion of the major plant upgrade:

- \* addition of an anoxic zone and replacement of the existing surface aerators to improve the biological performance of the existing oxidation ditch;
- \* provision of additional temporary aeration capacity to supplement the existing oxidation ditch volume.

The anoxic zone was designed and constructed by the *Costain/Carl Bro Alliancc* in collaboration with *Wessex Engineering Services*. The anoxic zone consists of a concrete tank located after the discharge from the existing PST and prior to the inlet of the oxidation ditch. The anoxic zone improves sludge settlement and the operational performance of the oxidation ditch. The tank was placed in service in 2003. The existing surface aerators were also replaced as part of this contract.

### Options

Several options were investigated to provide additional temporary aeration capacity. However, a new storm tank was required to supplement the existing storm tank volume in order to meet the new consent. The most cost effective way to provide additional temporary aeration capacity for the short term was to accelerate the construction of the new storm tank and to design the tank so it could be used as a temporary aeration tank in the interim period until the new storm volume was required in December 2005.

*Naston Ltd* completed the design of the dual purpose tank in collaboration with *Wessex Engineering Services* and it was completed by *Naston (M &E)* and the *Damar Group (Civil)* in August 2004. Since then, the tank has been operating as an aeration tank supplementing the existing oxidation ditch volume. The operation mode will be converted to storm tank operation once the new ASP is on line.

Upgrade of the existing site power distribution system was required to accommodate the new works. This was performed by *Naston Ltd* under the advancement works contract.

Implementation of the advancement works and intense monitoring programme have ensured that the existing plant stays in compliance in the interim period until the new ASP plant is constructed.

### Parallel Activated Sludge Plant

After an optioneering exercise, *Wessex Engineering Services* decided that the most cost effective way to improve the capacity of the existing works in the long term was to construct a parallel activated sludge plant to supplement the existing oxidation ditch. Under the final configuration, the new ASP will treat 60% of design flows and the oxidation ditch will treat the remaining 40%.

The *Costain/Carl Bro Alliance* was retained by *Wessex Engineering Services* to complete the outline design of the ASP plant.

The original intent was to locate the new plant in an adjacent field north of the existing works. However, the field sloped significantly and the presence of repeated hummocks was a classic sign of land slip. A site investigation programme confirmed that the Shaftesbury escarpment is located on an ancient slip plain and the development of this site would require significant remedial measures to ensure the structural stability of the proposed works.

### New site

A new site needed to be found outside the influence of the slip plain. The field immediately south of the existing works was investigated and found to be suitable. Consideration was given to the visual impact of the new works, specifically from the vantage points of the Shaftesbury town centre which occupies an elevated position to the north of the site. Additional landscaping measures were incorporated into the design to provide screening.

The outline design was completed early in 2004. Competitive tender documents based on the outline design were released to five contractors for the detailed design and build of the ASP. Successful tender was submitted by *Lawrence* and the contract was awarded in June 2004. *Earth Tech*, *Lawrence's* nominated designer commenced immediately with the detailed design of the works.

### Inlet works

Several options were considered for the new inlet works including a package type arrangement. It was decided that the most cost effective option was to divert storm overflows upstream of the grit removal and screening equipment to minimise the size of this equipment so it could be retrofitted within the existing inlet works structure.

The incoming sewer is diverted into a new fats, oil and grease, FOG removal tank incorporating coarse bubble diffusers and a beach scraper system. Flow then passes through a new storm overflow screen chamber where the pass forward flow is limited to FFT, 88 l/s by a modulating penstock. Flow is then diverted through the existing inlet works structure retrofitted with a new *Jones and Attwood* grit removal system and new *Longwood* screens, with an associated *Haigh* screenings handling plant before flowing to the existing PST.

### ASP

Flow exiting the PST is split between the existing oxidation ditch 40%, and the new ASP 60%. Flow enters the new ASP via a distribution channel upstream of three aeration lanes with an operating depth of 5 metres. The aeration lane structure is supported on precast driven piles. The civil structure is now complete. The lanes will be fitted with a *Sanitaire* fine bubble diffused air system with associated blowers. Flow exiting the aeration lanes is split between two new 16m dia. final settlement tanks with 3m side wall depth. The FSTs are also supported by precast driven piles. Civil work for the FSTs has been completed by *Galglass* and the tanks will be fitted with a scraper mechanism supplied by *CEES*.

Associated works include new inlet works and ASP MCCs, a new standby generator supporting the new and existing works and an upgrade of the telemetry/SCADA system.

The inlet works will be commissioned in March 2005 and the ASP is on programme for completion in July 2005. ■

**Note on the authors:** *Steve Rowe is Project Manager; Drummond Modley, Wastewater Engineering Manager, both with Wessex Water.*