# Taw Torridge Sewage Treatment Project

## £25.9m scheme delivered target capital & operating costs

by

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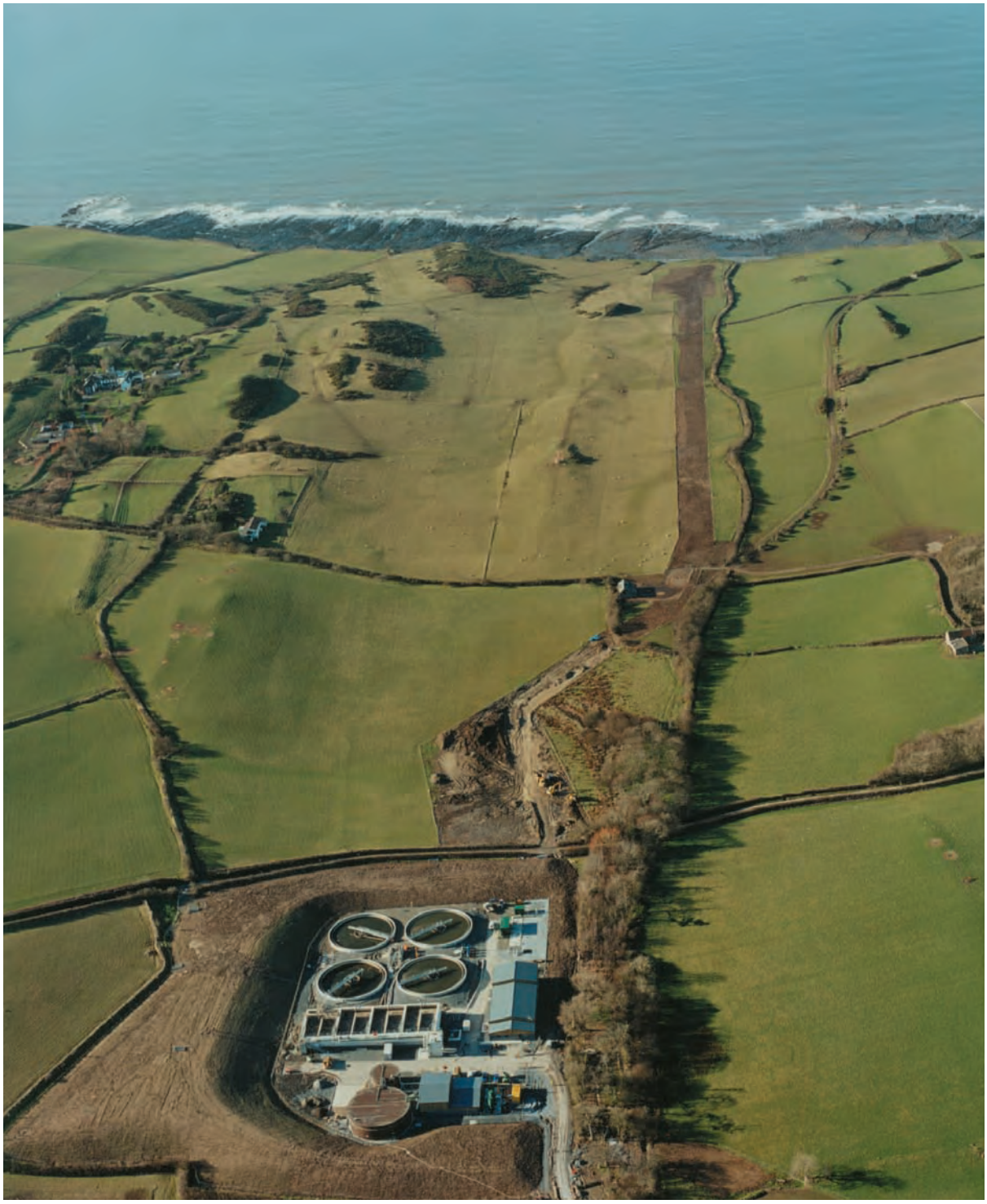
**South West Water's Taw Torridge Sewage Treatment Project will enable the bathing water at Instow, on the Taw Torridge Estuary meet requirements of the Bathing Water Directive. It is also designed to meet requirements of the Urban Waste Water Treatment Directive. The project which included a new sewage treatment works built on a greenfield site was successfully delivered on time, at a capital cost which was £3.5m below target of £25.904 million, and at an operating cost £57k below target.**



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Cornborough *(Copyright: Still Imaging, Chudleigh, Devon; courtesy SW Water).*

In the late 1980s, fine screening plants were built at Northam and Bideford, discharging screened effluent. The project converted these to pumping stations. Two works at Yelland and Westleigh, which discharged primary treated effluent to the estuary, were also converted to pumping stations. Over 15km of pipelines were laid to transfer the effluent from the pumping stations to the new works.

**Background**

The chosen site for the new treatment works was the subject of a Compulsory Purchase Order (CPO), which led to delays and so the need for a short construction time. With any scheme that comes off the back of a CPO, there are a number of significant issues that require sensitive resolution. In the case of Taw Torridge Sewage Treatment scheme, which has been under development since the 1960s there were a number of major constraints that dictated the course of the design.

These included

* an approved planning layout for a new sewage treatment works at Cornborough, Bideford, based around a lamella/BAFF process;
* an agreed discharge consent for the new works, including the discharge point for the final effluent outfall;
* land procurement issues in connection with the CPO;
* significant interest from a number of environmental organisations and public forums.

Notwithstanding the above, and the highly charged political start to the scheme, the foot and mouth outbreak brought additional challenges to the team. South West Water had identified initial objectives for the scheme as follows:

* an initial budget of £27.24m
* full consent compliance by December 31, 2002.

**Preferred option selection**

In March 2001, *Morgan Water (civil contractor), Black & Veatch (process contractor - formerly Paterson Candy), Pell Frischmann (civil/structural designer)* were invited by SWW to develop and deliver a new sewage transfer and treatment scheme for the Bideford Bay area in North Devon.

Whilst significant design development had taken place historically, there were process concerns relating to use of a lamella/BAFF process at the treatment works. The team re-evaluated transfer and process options which resulted in an activated sludge process at the works. During this period, optioneering of treatment versus transfer efficiencies at secondary sites in the catchment also took place. The team was mindful of the need to minimise changes to the approval planning layout already issued.

By re-evaluating the historic proposals, the team quickly gained ownership for the scope of the project.

**Project scope**

Following selection of the activated sludge treatment option, the project scope can be summarised as follows.

* conversion of Yelland, Westleigh, Bideford and Northam treatment works into transfer pumping stations;

Directional drilling equipment *(Copyright: Still Imaging, Chudleigh, Devon; courtesy SW Water).*

* installation of approximately 13 km of sewage transfer mains up to a maximum diameter of 600mm, including a directional drill crossing underneath the River Torridge;
* a new Sewage Treatment Works (STW) at Cornborough, near Bideford, comprising aeration tanks, final settlement tanks, UV disinfection, sludge storage and balancing tanks, main control building, sludge thickening building and site infrastructure;
* a new final effluent outfall pipe discharging through a 600m length directionally drilled 800mm diameter sea outfall with 10 diffuser ports.

In parallel with scoping the works, a series of initial target costs were produced, culminating in an agreed target cost of £25.904m, at which stage the project Partnering Agreement and Risk Share Deed were signed in November 2001. The construction contracts were IChemE (green book) Target Cost with a pain/gain mechanism measured against the total target cost for all partners including SWW. The target increase in annual operating cost was set at £0.774m p.a. The programme to Take-over was set for the end of December 2002, leaving just 13 months to carry out the works. In addition, an agreed key performance indicator schedule was established, against which the team would be measured.

**Challenge**

It was recognised at an early stage that out of quality, cost and programme issues, the latter would present the team with the greatest challenge and would require a novel approach to the various interfaces within the project team. Previously, site structures had concentrated on resolving 'harder' issues at the expense of 'softer' and it was in correcting this imbalance that the team considered most gains could be achieved.

**Approach**

Softer issues are people related and hence improvements in environment and relationships were instrumental in facilitating the various interfaces. A co-located working environment, in itself, is not sufficient. It was important to the core team that openness and trust were woven into everyday working practices and the right balance between formal and informal communications was achieved to encourage greater participation across the whole project team.

**Teamworking**

As well as experience of individuals, team selection was also based on personality and individual strengths. One important aspect of this was that no one individual dominated throughout the project. Different individuals 'led' the project at different stages according to requirements at the time. This largely arose from the fact that nearly all of the project team had experience of previous partnering contracts.

**Communications**

Having created the right conditions for informal teamworking, it was important to support these methods with a more formal process. As an example, the natural exchange of ideas on site was supplemented by appropriate level meetings that served to capture, record and agree issues without stifling natural dialogue.

**Outcome**

The project was successfully taken over on 30/12/2002 with the following performance aspects achieved:

* capital cost delivered for £3.5 million below target
* operating cost estimated at £57k below target;
* takeover achieved on 30/12/02 on programme;

* a high score on KPI objectives (independently assessed by SWW;

**One exception**

There was, however, one exception to this general concept which was programme management. It was essential to maintain ownership for individual contributors but offer a facility to co-ordinate and resolve discrepancies. The core team appointed an experienced planner to bridge across individual company boundaries. The effectiveness of this role was such that at times people were not aware which company they were employed by.

* operations and maintenance were happy to accept plant for takeover;
* process at the main STW is working well and in compliance with prescribed consent conditions;
* all 3rd party environmental/regulatory consents have been complied with;
* positive feedback has been given by the public and interested parties both during construction and following completion.

**Conclusion**

It may not be unusual for a project to deliver on one (or even two) out of three aspects with regard to quality, time and programme. To achieve all three, with K.P.I's indicating a very high performance team, individual enjoyment and end user satisfaction, resulting from a two month takeover period is credit indeed. ■

**Note on the authors:** *Nick Gough is Programme Leader, South West Water; Simon Hancox is Project Manager, Morgan Water; Ian Aldridge is Project Manager, Black & Veatch.*

## Technical Details

Treatment Standard - UWWTD - 25BOD/35 S/S;
Treatment Plant - designed to accommodate saline of levels up to 9000 mg/l;
Hydraulic Capacity - 620 l/s including 20 l/s liquor returns (approx. 6DWF);
Max flows from Bideford 450 l/s & Northam 150 l/s.
Activated sludge process - 4 x 8m deep aeration lanes;
4 x 4m deep final settlement tanks;
2 x RAS pumping stations & 1 SAS pumping station;
UV disinfection;
2 x Drum Thickeners;
3 days surplus activated sludge storage & 3 days thickened sludge storage;
Standby generator (1000 kVa);
Odour control - 2 stage Catalytic Iron Filters with Carbon polishing. Odours are ducted from inlet to the works, sludge tanks, thickeners, thickener building and filtrate sump;
SCADA and telemetry for the works and dedicated telemetry for UV plant;
Screening and grit removal located at the terminal pumping stations prior to transfer.

**Pumping Stations**
**Bideford** - max 450 l/s flow to treatment works. Receives local Bideford catchment flows and up to 150 l/s from Yelland and Westleigh;
Grit & screenings removal refurbished;
New standby generator (1200 kVa);
Chemical conditioning facility for septicity control;

**Northam** - max 150 l/s flow to treatment works;
Grit & screenings removal refurbished. New Washpactor and grit classifier.
New standby generator
Chemical conditioning facility for septicity control.

**Yelland** - max 150 l/s transfer to Bideford PS;
Existing screening plant removed;
New standby generator;
Chemical conditioning facility for septicity control;

**Westleigh** - max 14 l/s transfer to Bideford PS via Yelland transfer main.
**All pumping stations equipped with telemetry outstations.**