

# North Queensferry WwTW

## £1.95m project to replace dilapidated works

by  
Andy McLaren

**N**orth Queensferry, a seaside village in Fife, sits between the Forth Bridge and the Forth Road Bridge, approximately 10 miles from Edinburgh. The existing waste water treatment works, situated on the banks of the Forth Estuary and serving a population of around 1,600, was nearing the end of its useful life and needed to be replaced. The project required the upgrading and refurbishment of the existing works and the building of a temporary treatment facility to maintain the current sewage treatment process throughout the construction period.



*The North Queensferry WwTW site sits on the edge of the Forth Estuary and in the shadow of the Forth road and rail bridges*

*Courtesy of Scottish Water Solutions*

### Existing works

The existing North Queensferry WwTW, built between 1981 and 1983, was an underground inlet works and primary tank situated next to the Forth estuary. It provided only primary treatment through inlet screw pumping station (duty / standby pumps); storm overflow (with bar screen); grit channels and comminutor and associated manually raked bypass screen; two rectangular RC primary settlement tanks and two associated floating arm draw-offs; sludge chambers and one associated sludge liquor / draw-off pump.

After discharging to the outlet channel of each tank, the effluent combined in a sampling chamber before gravitating by a long sea outfall into the Firth of Forth estuary.

The WwTW was meeting its discharge consent and had a good compliance record going back a number of years. However it was

showing signs of age and has been particularly badly affected by saline intrusion. The ingress of saltwater into the works may have also contributed to the odour problems experienced at the site which have led to a number of complaints.

Previous studies concluded replacement of the asset with septic tanks was most the feasible and cost effective intervention to address the following issues:

- Severe corrosion of underground concrete structure and joints including screw pump trough and cover support (tank not permanently fenced off and public access on to structure). Temporary Heras fencing erected in the interest of H&S.
- Saline intrusion.
- Mechanical equipment (screw pumps, macerator, screens, valves and pipework) in very poor grade 4/5 condition.



The North Queensferry WwTW site sits on the edge of the Forth Estuary and in the shadow of the Forth road and rail bridges

Courtesy of Scottish Water Solutions



The North Queensferry WwTW site sits on the edge of the Forth Estuary and in the shadow of the Forth road and rail bridges

Courtesy of Scottish Water Solutions

- Extensive corrosion and asset failure.
- Significant odour due to saline intrusion and during the removal of primary sludges.

## Scope

The agreed project scope was to install four 100,000-litre GRP septic tanks and a new screw pumping station, together with ancillary pipework, manholes and overflow chambers. As well providing improved screening of waste water and refurbishment of mechanical equipment, the project has addressed and prevented future problems caused by corrosion and helped reduce odours around the facility.

Scottish Water Solutions managed the project and the work was carried out by contractors Balfour Beatty. Work commenced in July 2008 and was due for completion in Autumn 2009.

## Construction / Delivery Issues

The location and nature of the site, on the boundary of the North Queensferry Outstanding Conservation Area, presented a number of challenges to the project team. Due to land restraints, a private garden area had to be leased in order to site the temporary treatment works. Overall land restriction on the site gave rise to construction sequencing problems and required careful logistical planning as there was very little opportunity to work on activities in parallel. There are also a number of residential properties in the vicinity, the nearest of which were less than 10m away.

Significant communication and liaison had to be carried out with the local community before work began, particularly over demolition of the old concrete structure and transportation of large loads to and from the site along narrow streets. Conditional surveys, both internal and external, were carried out of neighbouring properties and public areas.

The tidal impact of the River Forth also required careful planning of excavation works. GGBFS (ground granulated blast furnace slag) was used as a 60-80% cement replacement in the concrete due to the aggressive nature of the marine environment. Although a good solution to corrosion issues, the use of GGBFS presented a number of challenges to the project team, particularly as its early strength gain takes significantly longer to achieve in comparison with traditional concretes. This impacted on programme timescales.



Four 100,000-litre GRP septic tanks were installed as part of the project

Courtesy of Scottish Water Solutions

## Temporary Works

The temporary works was in operation throughout construction of the replacement plant. A purpose built temporary pumping well was constructed to bring together the flows from the incoming sewers and two temporary duty /standby pumps were installed which transferred incoming sewage to a flow splitter immediately upstream of two 100m<sup>3</sup> septic tanks installed as the temporary treatment plant. Each septic tank was fitted with a bottom sludge draw off, together with connections to allow top water to be decanted prior to sludge removal by tanker.

## Final Works

Flows entering the pump chamber are pumped into plant by means of a duty/standby set of Spaans Babcock Archimedes screw pumps (rated at 33 l/sec) to a CSO chamber. The flow entering this chamber is screened through a 100mm bar screen. Flows in excess of 23 l/sec overflow via a 50mm bar screen to a short sea outfall. The coarse screened sewage then passes through a 2 way flow splitter to a further two 2-way splitters. This is to ensure that each of the four septic tanks receive the same flow. Each septic tank is fitted with an inlet isolating valve and three sludge removal valves, which allow individual compartments to be emptied. All valves are operated manually.

The pumping station Archimedes screw pumps operate on a duty/standby basis. One pump will be in operation at all times. If the duty pump fails, the standby pump will run and a telemetry alarm will be generated.

**Note: The editor & Publishers thank Andy McLaren, Project Manager with Scottish Water Solutions, for providing the above article. ■**



## Spaans Babcock Ltd.

We are pleased to be associated with Scottish Water and Balfour Beatty, supplying the Screw Pumps to the North Queensferry WwTW.

*Other contracts we have been associated with, also featured in this publication include:  
Kirkcaldy WwTW.*

Please contact us for all your Screw Pump, Screw Generator, Aeration, Screening and Penstock requirements

**305 Phoenix Close, Heywood  
Lancashire, OL10 2JG**

**Tel: 01706 627770 Fax: 01706 627771  
E-mail: sales@spaans.co.uk  
Website: www.spaansbabcock.com**