

Bridlington revised Bathing Water Directive Scheme

Yorkshire Water's £40m investment to achieve 'excellent' bathing water standards in Bridlington

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With two wide sandy beaches and a busy harbour, Bridlington on Yorkshire's east coast is enjoyed by residents and holidaymakers alike. Both the North and South Beaches are officially designated as bathing beaches and have had Blue Flags in the past. However the revised Bathing Water Directive (rBWD) which comes into force in 2015 will introduce more stringent water quality standards for designated bathing waters. Yorkshire Water Services (YWS), in partnership with the Environment Agency, Scarborough Borough Council, East Riding of Yorkshire Council, North Yorkshire County Council, the National Farmers' Union and Defra, have committed to achieving the new 'Excellent' standard for eight beaches in the Yorkshire region, including the beaches at Bridlington. The Bridlington rBWD scheme involves an investment of around £40m and is designed to ensure that any YWS assets, which could influence bathing water quality, do not adversely affect achieving the desired standard.



Aerial view of Bridlington with the harbour separating the designated North and South Beaches - Courtesy of Peter Smith Photography

Pre-construction

Construction work commenced in October 2012 but feasibility work and planning applications commenced about two years earlier. The scheme has been developed using a marine impact model (MIM) to assess the consequence of storm discharges into the coastal waters. Water quality is known to be affected by the effects of the tide and the wind, so these are included in the analysis. The storm runoff has been generated by a detailed InfoWorks model of the sewer network produced by MHW and the MIM has been undertaken by Intertek-Metoc.

Unusually, at Bridlington the MIM was initially unable to replicate the existing situation. The modelling identified an unknown source of bacterial pollution which required significant further investigations and research. The source turned out to be the

harbour sediments which were found to contain a significant store of compliance relevant faecal indicator organisms.

It appears that the tidal action plus vessel movements disturb the sediments in the bottom of the harbour resulting in the organisms being re-mobilised and impacting on the adjacent bathing waters. The source of these organisms appears to be combined sewer overflows (CSOs) from the sewerage system. The solution developed involves removing almost all the discharges from the CSOs which eventually reach the harbour.

As well as dealing with storm water flows the rBWD scheme needed to increase flows receiving full treatment. Thus the pumping stations to and from the treatment works and the works itself also needed upgrading.

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The final scheme involves the following works:

- New CSO with fine screening at Springfield Avenue.
- An underground tunnel to transfer storm water from Springfield Avenue CSO to the promenade.
- A new storm water pumping station on the Spa Promenade (Belgrave Road Pumping Station).
- A new long sea outfall.
- An extension to the existing Headworks Pumping Station.
- Provision of additional treatment capacity at Bridlington WwTW.

Due to the sensitive location of the two proposed pumping stations on the sea front promenade, extensive public consultation was undertaken in developing the design for planning approval. Both structures have been dealt with in a different and innovative way.

Architecturally Belgrave Road Pumping Station makes reference to existing structures on the promenade and the scale and layout of the building has been carefully considered to minimise its impact and facilitate the creation of new enhanced landscape within this site. This includes new level-access public terraces, a range of seating areas, carefully chosen viewing points and a new stair connection to the north of the building.

At the Headworks the Arup design concept was to extend the pumping station using pre-cast concrete panels that are sensitive to the existing facade. A local artist, Rachel Welford, has been selected to create artwork on the new facade. The local school and community have been involved in developing the design for this public artwork.

In addition five new beach chalets are to be provided in front of the exiting building. The chalets are deliberately higher and wider than usual - approximately 4m high to the apex - in response to

the scale of building behind - the larger chalets will help to reduce the perceived scale of the building and provide larger more flexible 'family' units, which also have space for wheelchairs. The local council and YWS are jointly funding five additional units to the north of the new building.

Construction works

The scheme has divided into three construction contracts.

- Bridlington WwTW capacity enhancement: Contractor: MGJV (medium treatment).
- Bridlington Onshore Works: Contractor MGJV (large schemes).
- Bridlington Offshore Works (sea outfall): ABCO Marine.

Bridlington WwTW

The Bridlington WwTW is located to the south of the town and has been upgraded within the footprint of the existing site. The flow to full treatment capacity has increased from 288l/s to 349l/s.

Upgrading has involved the construction of new primary settlement and final settlement tanks along with associated sludge treatment facilities.

Bridlington onshore works

This is the largest, both financially and geographically, of the three contracts and consists of four principal elements.

Headworks Pumping Station: An extension to the Headworks Pumping Station is required to pump sewage flows to the WwTW. The extension allows larger pumps to be installed and provides facilities for the removal and maintenance of these pumps. A new public terrace is being provided on top of the pumping station building. As noted above an artist has been commissioned to develop new works for the facade and also for the glass balustrades

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in front of five of the ten new beach chalets which are to be provided as part of the scheme.

Springfield Avenue CSO: A physical hydraulic model was constructed to develop the design of this new storm overflow structure and connecting pipework. It is a congested site located between a public road, highway bridge, housing and an existing storm detention tank.

All sewer flows will be diverted from the trunk sewer into the CSO chamber. During times of storm, excess flows will overflow through a 6mm two dimensional fine screen and into a tunnel to be discharged out to sea.

Stormwater Transfer Tunnel: The new tunnel has been constructed to transfer flows from Springfield Avenue CSO out to the beach promenade. The tunnel is 800m long and 2.1m internal diameter and is of segmental concrete construction. Along the route flows from two other CSOs, on Hilderthorpe Road and Bessingby Way, are also picked up.

The tunnel was constructed using a Tunnel Boring Machine (TBM) which was named 'Crystal' by local school children. Palace Car Park, adjacent to Springfield Avenue, was used throughout the tunnelling works for access and to enable excavated material to be removed. This significantly reduced the activities required at the other shafts.

Belgrave Road Pumping Station: This new stormwater pumping station is located on the Spa Promenade and will pump stormwater from the transfer tunnel into the long sea outfall pipeline. 4 (No.) vertical bowl pumps (3 (No.) duty pumps) from Bedford Pumps Limited will be capable of pumping 2,500l/s each.

The new pumping station is connected to the transfer tunnel and the long sea outfall. Normally storm flows will gravitate through the long sea outfall and be discharged into the sea. This is not possible when high tides coincide with heavy rainfall and then pumping of the storm water will be required.

The station is being built on the site of some public conveniences which are being rebuilt alongside the pumping station. The area around the pumping station will be landscaped. A new terrace will also be created on the roof providing a fantastic viewing platform over the south beach.

Secant piles have been driven 18m down to the chalk bedrock to create a wall within which the pumping well below the structure has been built. Above ground the buildings associated with the pumping station and the replacement toilet block have been constructed in sandblasted reinforced concrete to give a sand castle effect. The complete top of the combined structure will be a public open space.

Internally rooms accommodate the new power supply transformer, switch gear and control panels. Ventilation and activated carbon odour control is also incorporated and is being provided by Project 77 (Environmental) Ltd.

Long sea outfall

The long sea outfall will be over 1.2km long. This is part of the new stormwater management system which allows dilute wastewater to be transferred into the sea during heavy rainfall. Specialist contractors ABCO Marine are undertaking this work.

The 2.0m external diameter HDPE pipeline itself was produced in Norway by Pipelife Norway and was towed across the North Sea to Teesside in July 2013. On the River Tees, concrete weight collars have been added to the pipes and the sections of pipe have been joined together into a single 1,250m length.



New final settlement tank being constructed within the existing Bridlington WwTW - Courtesy of Peter Smith Photography



Congested site for Springfield Ave CSO with an existing storm detention tank to the left and a highway bridge on the right - Courtesy of Arup



TBM "Crystal" being lowered into the drive shaft following naming by local school children - Courtesy of Arup



New Bedford pump being craned into the partially completed Belgrave Road Pumping Station - Courtesy of Arup



Long sea outfall pipeline being towed into the River Tees at the end of its journey from Norway - Courtesy of Peter Smith Photography



Beach and offshore trench excavation at Bridlington in preparation for pipe arrival - Courtesy of Arup

On the beach down to the low water mark a temporary cofferdam has been constructed using two rows of steel sheet piles and the pipe trench has been excavated between them. Two jack-up barges with large excavators on board were used to excavate the remaining marine trench out to the discharge point.

Unfortunately due to weather and other delays installation of the pipe in the marine trench could not be achieved prior to the onset of winter weather. Consequently the equipment was stood down over the winter period

Scheme progress

At the time of writing, May 2014, the scheme is approaching completion. The increased flows have been transferred to the treatment works from the Headworks. The artwork and beach chalets have yet to be installed.

Belgrave Road Pumping Station substructure is complete and the superstructure is almost complete. Pumps are installed and the new power supply will be made live shortly.

The tunnel is complete and storm flows from the CSOs are overflowing into it and it is in beneficial use as off line storm storage pending completion of the long sea outfall. The sea outfall contractor has remobilised in preparation for the pipe to be towed from Teesside to Bridlington and sunk in the trench. Following this the trench will be backfilled and the piling removed to return the beach to its original condition.

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