

# Torbay Sewer Rehabilitation Scheme

## delivering £1.9m of extensive sewer rehabilitation works in the midst of the South West's flagship holiday destination

by Geoff Willcocks BEng (Hons)

The English Riviera, primarily comprising of Torquay and Paignton has a resident population of 123,000 which expands to 180,000 during the summer months. Major sewerage works completed in 2002 as part of South West Water's 'Clean Sweep' enhanced sea water quality and provided the resort with high quality sewage treatment. In order to maintain these high standards, in 2012, SWW employed H5O to deliver a £1.9m package of works to rehabilitate over 7.7km of sewers within the catchment. The aging network had been surveyed in the previous year and a number of areas with structural concerns and evidence of infiltration had been identified. The project required the site team to consider new methods and enhanced technology, to efficiently deliver works within a topographically challenging area with sensitive residential and business considerations. Public awareness and communication, statutory authority consultation and optimum construction solutions would be key to the successful delivery of the project. This article examines two aspects of the work which significantly contributed to the successful delivery of a potentially disruptive project.



Photographs illustrating the pre-condition pipeline and post-lining improvement following installation of the Brawoliner 3D - Courtesy of BBUSL & Exjet



(Left) Rehabilitation works outside the Princes Theatre, Torquay maintaining traffic flows - Courtesy of BBUSL  
(Right) Aerial shot of Torbay - Courtesy of South West Water

### The problem

SWW commissioned consultant AECOM to carry out Sewerage Economic Assessment Model (SEAM) analysis to produce a summary of targeted sewers for rehabilitation within the Torbay catchment. The process produced a schedule of repairs throughout the area identifying over 270 sewers requiring remedial work, with diameters ranging from 100mm through to 600mm, in highways, private gardens and business premises. AECOM provided recommendations regarding method of sewer repair, but the H5O Alliance, through the delivery partners, were charged with reviewing each case on its merits to achieve the optimum solution using a toolbox of rehabilitation techniques.

### Stakeholder engagement

The English Riviera is a natural amphitheatre with the coastline beaches at Torquay and Paignton forming the stage. A series of pump stations, rising mains and gravity sewers direct all flows to Brockenbury Treatment Works, with final effluent flows returned to the sea via Churston Tunnel.

The required remedial work impacted on all regions within the catchment. Although having a relatively dormant road network

during the close season months, the seasonal road embargo results in each Utility company competing for road-space to carry out their planned maintenance works.

**Collaborative working:** Traffic management, pedestrian restrictions and maintenance of premise accesses required particularly careful consideration with narrow streets and an extensive one-way road network. The winter work schedule, generally in the central commercial locations required close coordination with other utility providers, sharing road-space where possible, and ensuring diversion routes would not impact on each other.

Justin Bound and Tom King of H5O were responsible for the management of the programme in close partnership with Rob Ketch of Torbay Highways. Frequent liaison and flexibility in scheduling and working methods enabled decisions to be reached quickly with all stakeholders and requisite needs accommodated.

The close working relationship with local utility providers proved invaluable when unplanned events occurred such as service clashes. The site team worked particularly well with Wales & West Utilities when finding existing sewer mains with moled gas services



passing through them. These were swiftly removed safely and without incident, minimising risk and disruption to the customers.

**Community Liaison:** The dedicated H<sub>2</sub>O Customer Liaison Officer, Andrew Clarke, in conjunction with the SWW communications team ensured the scheme received full media coverage across the catchment. Early regional press releases explained the overall proposed works, followed by targeted local liaison providing the public with full details of site locations, programme and explanations of the reason for, and nature of, the remedial work.

In one particular area of the project, the site management was advised of a specific issue of residents with special needs. Subsequently, the team worked closely with the Torbay Alzheimer's Society to cater for a number of sufferers living close to the works area. Taking guidance from the Society, a safety advice note was compiled in order to provide the site personnel with an understanding of some of the common symptoms and to raise their own personal awareness and how to treat customers on daily basis.

A further example of addressing specific community concerns occurred in Tor Vale whereby following consultation and door-to-door liaison with local residents, the use of an epoxy lining to eliminate styrene odours was specifically chosen due to concerns regarding a child with a respiratory illness in an adjacent property.

#### Product choice & innovation

In Melville Place, Torquay, AECOM had originally scoped a rehabilitation repair with traditional open-cut techniques. Site visits soon established that this methodology would present severe access issues, installation difficulties and potentially compromise the structural integrity of adjacent structures.

The entire 42m pipeline length followed a stepped pedestrian thoroughfare with a maximum width of 2m. The depth of

excavation averaged 2.5m with a three-storey structure to the north and a retaining wall to the south with a drop of 5m to ground level. The path gradient of 1:3 combined with highways restrictions at either end presented the site team with a number of dilemmas. Seasonal traffic restrictions permitted a limited window to carry out the works with a road closure only being granted at one end of the pipeline.

The sensitive location of the scheme, at the centre of the 'English Riviera', required a solution with minimum impact on the residents, holidaymakers and businesses. Excavation activities in the confines of the steps would unavoidably impact on the highways at either end and presented major logistical issues with plant, trench support and material placement.

The duration of the footpath closure between two strategic roads would have caused considerable negative public feedback and consequently threaten the excellent Service Incentive Mechanism (SIM) record achieved on the framework to date.

#### New technologies

H<sub>2</sub>O consulted with Exjet to formulate an innovative trenchless solution to minimise risk to properties and workforce. To further complicate a lining option, the pipe diameter varied between 150mm and 225mm along its length and deviated with a number of bends and six lateral connections. In developing the no-dig option Exjet promoted a new variant on the previously used Brawoliner®.

The Brawoliner 3D® liner system was developed to meet the challenges of pipelines where there are several changes in diameter within specified ranges. The seamless textile liner can adjust itself to the host pipe within the stated diameters without creases or wrinkles including 90° bends. In this instance, the 150mm to 225mm diameter range could be accommodated along with deviations with a single liner.



## Installation

The objective to complete the operation in two working days provided H5O and Exjet Limited with a challenging timeframe. Following a pre-commencement CCTV survey, root cutting using a high pressure rotary jetting system cleared the host pipe of obstructions. Liner installation commenced with careful inversion of the liner using the minimum amount of water due to the gradients involved. Once fully inverted, the liner was allowed to deflate prior to being re-inflated using compressed air and a calibration hose. The Brawoliner 3D® has a relatively low burst strength in lieu of increased flexibility, so adherence to the 0.3 bar recommended installation pressure was critical. To this effect, the re-inflation of the liner was controlled to just hold against the host pipe inner wall.

In order to cure the liner, hot water was introduced at the upstream end of the liner via the inversion drum in small increments rather than heating a full pipe bore of water to avoid excessive stretching. By trickling hot water through the liner calibration hose combination the internal air temperature enabled curing of the impregnated liner. In order to guarantee a full cure in a challenging application, this temperature was maintained beyond the manufacturers recommended curing time. The full process from installation to curing was completed on the first day.

The second day involved re-opening of the six lateral connections using primarily an IMS cutter and a Springbok cutter for the smaller 150mm section and demobilisation of the site.

## Success

The achievement of using the Brawoliner 3D® to mitigate the difficulties of lining a failing pipeline with numerous challenges of size variation, connections, gradient and access restrictions was an excellent example of innovative thinking and skilled delivery to provide the required scheme output. The chosen method reduced costs, time durations and customer impact with no complaints

received throughout the installation. The innovation reduced plant and water usage, improved the environmental performance compared with the original excavation construction method, and resulted in a substantial reduction in hazardous operations and risk to structures.

## Team recognition

The consideration taken and effectiveness of the works carried out by the delivery team was recognised in October 2013, with the receipt of a PURE Service Award from SWW presented by Director of Engineering, Graham Murphy upon completion of the scheme. In addition the project was shortlisted for the NJUG awards

## Conclusion

The project is an excellent example of collaborative working with all stakeholders in the high profile catchment in the South West. The substantial SWW investment on coastal infrastructure will continue to improve bathing water quality and provide a robust sewerage network for future generations.

The Torbay Sewer Rehab Project demonstrated that with effective planning, clear communication, and innovative methodology, major rehabilitation works can be delivered effectively and efficiently in the most sensitive locations.

The Torbay Sewer Rehabilitation Project completed in September 2013, coming under the client target cost budget of £1.9m with 7,709m of reportable sewer repair. Despite the potential high risk of the schemes and the large amount of streetworks involved in highly populated areas (working on over 130 streetworks notices) the H5O team achieved their target of zero harm.

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