

# Peregrine Close (Swindon) Flood Alleviation Scheme

part of the Thames Water's £400m programme to significantly reduce the number of properties at risk from sewer flooding

by  
Peter M Taylor, BSc, MIMechE

**P**eregrine Close is a small, low-lying residential estate road adjacent to the River Cole in the Covingham district of North Swindon, Wiltshire. Twelve homes in the close have suffered from frequent flooding due to hydraulic incapacity of the local foul network. Fluvial flooding from the River Cole also causes surface water flooding locally, but this is the responsibility of the Environment Agency (EA). Thames Water understands the distress caused to customers by sewer flooding and the solution in Peregrine Close forms part of the company's £400million programme between 2005 and 2010 to significantly reduce the number properties at risk from sewer flooding. It was essential to provide relief to these homes as quickly as possible to avoid the risk of further flooding during the winter.



New Pumping Station

Courtesy of Thames Water

## Design approach

The foul sewerage catchment is responsive to rainfall because of surface water misconnections and infiltration. Peregrine Close is one of the lowest points in the catchment and so acts as a 'relief valve' when the catchment becomes surcharged during storm events. A verified hydraulic model using InfoWorks software was developed to get a better understanding of the foul sewer network behaviour during wet weather and also to assist in solution development. The hydraulic model predicted flooding at Peregrine Close for the known historical rainfall events and was therefore considered acceptable to develop solutions.

Solutions considered included:

- increasing the sewer network storage capacity
- increasing flow conveyance away from the close
- introduction of a CSO (Combined Sewer Overflow)
- isolation of this close from the public sewer.

Increasing flow conveyance proved impossible due to capacity restrictions in the downstream network; the option of a CSO was discounted due to the time required and uncertainty of obtaining the necessary EA consent. The adopted solution involved a combination

of isolating the close from the public sewer and an increase of storage capacity in sewer network.

The strength of this solution is that the properties will always be protected from sewage backflow in wet or dry weather, although fluvial flooding remains a risk to be resolved by others. This solution provided protection to properties in Peregrine Close for in excess of a 1 in 30 year rainfall return period. The tank sewer has improved flood risk to all properties in the catchment.

Thames Water Capital Delivery design department and Halcrow Group Ltd undertook the design jointly.

## Solution

### *Isolating the close from the foul catchment*

The local sewers in the close were reconfigured to flow to a new, 11l/s pumping station with two submersible, centrifugal pumps operating as duty/standby in a 2.1m diameter, 4m deep wet well. Significant consideration was given to the aesthetics of the pumping station addressing the conflicting requirements of operational access, security, visibility (to discourage anti-social behaviour) and the understandable concerns of the neighbouring property owners about odour and noise.



Weholite Pipe 1st delivery

Courtesy of Thames Water



Weholite Pipe excavation

Courtesy of Thames Water

The pumping station was connected to the public sewer by 52m of 125mm OD SDR11 PE100 rising main with the existing gravity link to the public sewer disconnected and grouted. Foul manholes in the close were sealed to prevent ingress from river flood water.

**Storage tank**

A large (750m<sup>3</sup>), offline, gravity attenuation tank situated in a narrow strip of public open space adjacent to the River Cole in Covingham Drive was linked to the network by transfer sewers. The tank was constructed using triple 2.2m diameter pipe sewers, 65.5m long.

During a review of the design solution, the health and safety implications of manipulating 2.8m lengths of concrete box culvert weighing 38 tonnes off delivery vehicles in a residential area, led to the decision to use high density polyethylene (HDPE) pipe instead. Weholite HDPE pipe, from Asset International Ltd was chosen, with an equivalent weight of 0.75 tonnes. The design incorporated dry weather flow channels and proprietary HDPE end chambers. Two further advantages of using Weholite rather than concrete culvert were a reduction in programme and cost due to the relative speed and ease of construction.

**Construction**

The contract for construction was let to J Murphy & Sons in August 2008 and flood protection was provided to customers in January 2009, two months ahead of the regulatory target of March 2009. Residents of Peregrine Close were relieved from the worry of foul flooding in the coming winter months. The prompt start to the scheme owed much to

close attention to the relevant planning authorities, to the EA for consent to work in the flood plain and to land owners issues.

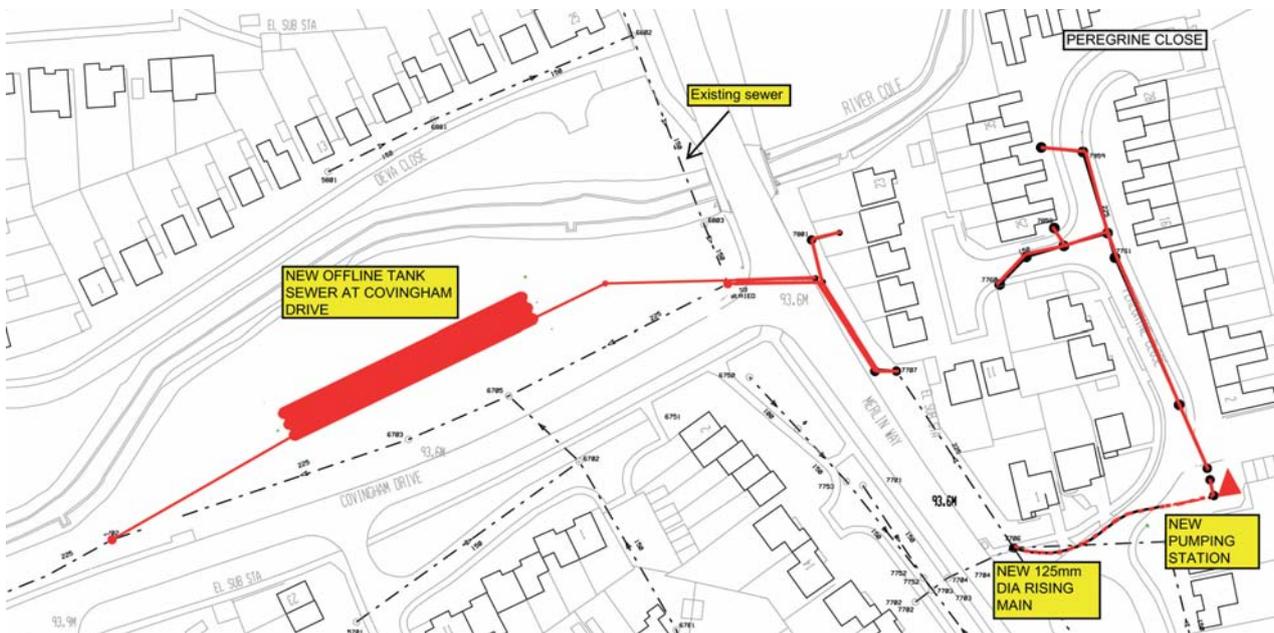
On the network, foam concrete rather than compacted granular material was used as backfill in open trench work in residential roads to reduce noise and vibration during construction. To speed up the production rate and reduce traffic congestion caused by traffic lights along the busy Merlin Way, dual trench construction was adopted, with sewers offset horizontally and vertically.

Completion of the tank by December 2008 considerably reduced the risk of inundation of the large excavation from winter rains and flooding from the adjacent River Cole. Construction of the tank required the removal of some 7000m<sup>3</sup> of clay, which was used as capping material on a local landfill site, rather than disposal as classified waste - considerably reducing costs. A haul road was constructed to enable pipe deliveries and materials to be delivered and spoil to be removed, safely and without disruption to traffic flows.

**Summary**

Focus on construction safety and customer needs have resulted in innovation in design and construction. The regulatory sewer flooding outputs were delivered ahead of time and within the £1.million budget approved.

**Note: The Editor & Publisher thank Peter M Taylor, Senior Project Manager with Thames Water - Capital Delivery, for providing the above article. ■**



Network Solution Plan

Courtesy of Thames Water