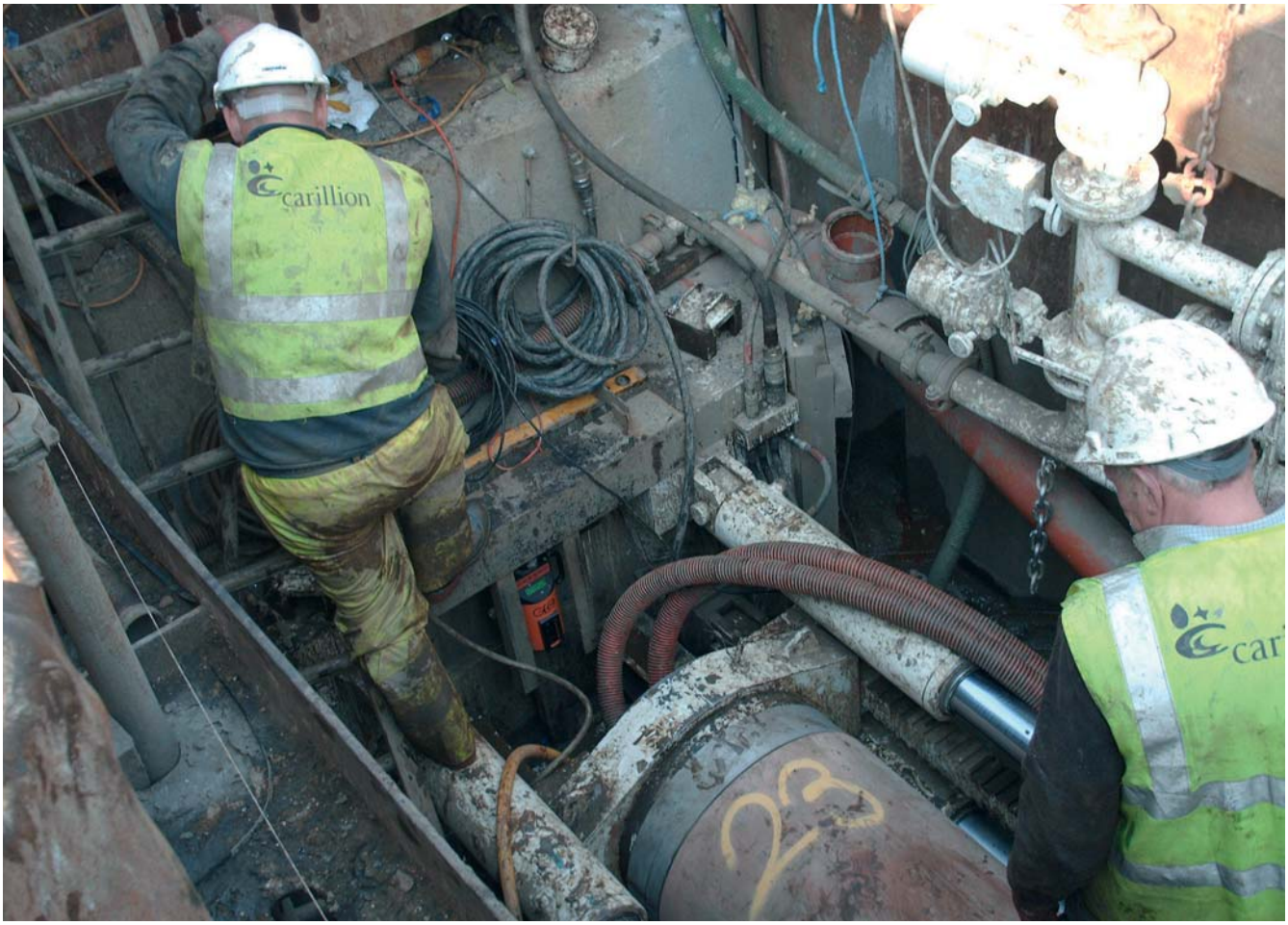
Acomb Crescent Flood Alleviation

CSO & overflow pipework removes properties off flood register

by Richard Woodhouse

The Red House Farm area of Newcastle is a 1960s housing estate that was constructed close to the Ouseburn watercourse in North Gosforth and is bordered to the east by the A1 dual carriageway and to the west by the City of Newcastle Golf Club. The estate is served by a partially separate system with highway drainage and roof drainage from the front of properties discharging directly to the Ouseburn. Foul flows and roof drainage from the rear of properties are served by a combined sewer that discharges to the Ouseburn Trunk Sewer. A sewer that serves the Kenton and Fawdon area (known as the Kenton/Fawdon Sewer) passes through the area before entering the Ouseburn Trunk Sewer. The Ouseburn Trunk Sewer takes flows from Newcastle Airport and the village of Woolsingham to the north west of Newcastle and follows the Ouseburn through the north and centre of Newcastle before connecting to the "C Leg" of the Tyneside Interceptor Sewer and flows are ultimately treated at Howdon Sewage Treatment Works.



Pipe jacking in poor ground *courtesy of Entec UK*

In June 2005, a major localised rainstorm event occurred in the Red House Farm area of Newcastle and resulted in a large number of properties reporting flooding to Northumbrian Water's Customer Contact Centre. Although the rainstorm event is believed to be classed as "extreme" (in excess of 1 in 40 year intensity), investigations including hydraulic analysis have shown that the risk of flooding occurring to the properties affected was more frequently than once every ten years with some properties being more frequent than once in five years.

All water companies in England and Wales are required to report annually those properties that are at risk of flooding, either internally or externally, more frequently than once in every 20 years. In line with Ofwat reporting requirements, 57 properties were placed on the DG5 internal sewer flooding register and 13 placed on the DG 5 external register..

Northumbrian Water wrote to those customer affected informing them of which register their property had been placed. All properties were analysed to determine the effectiveness of installing temporary mitigation measures to reduce the impact of any additional flooding that may occur until the construction stage of the project was completed. Flood boards were installed to a number of properties after surveys had shown that their installation would not have a negative effect on other customers.

External Stakeholders

Due to the number of customers affected by the flooding, the local

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MAKING TOMORROW A BETTER PLACE

Fluming existing flows through new CSO chamber during construction *photo courtesy of Entec UK*

residents set up an action group and involved their local MP, Mr Doug Henderson as well as Newcastle City Council. Northumbrian Water met the residents, Mr Henderson and representatives from the local authority at an early stage in the process and ensured that they were regularly updated with progress and decisions that had been made.

Project

Northumbrian Water Sewer Flooding Group prioritised this problem for investment and Entec UK Limited was appointed from the company's Civil Engineering Consultant Framework. Their brief was to establish the true extent of the hydraulic problem that had caused the flooding and to identify a number of options to alleviate it.

Feasibility

To establish the true extent of the problem a hydraulic model of the local surface water and partially combined sewer as well as the main Kenton/Fawdon trunk sewer was constructed. The hydraulic model was verified following a detailed flow monitoring exercise carried out by Total Flow Surveys, an in-house Northumbrian Water company.

The hydraulic model was used to confirm the various flooding mechanisms that affected the sewerage system serving the 70 properties that had experienced flooding in 2005.

During the feasibility stage, Entec UK carried out overland flow routing to determine the path of the escaped sewage once it had left the sewerage network. This technique helped to identify a number of options that would reduce the risk of flooding to the affected properties to the Northumbrian Water design standard of 1 in 40 years return period storms.

A stakeholder meeting was held with the extended project team to discuss all available options and it was agreed that the preferred option outlined in the report should progress to design. This decision was ratified internally by the Wastewater Network Asset Policy Group and the Northumbrian Water Asset Policy Steering Group. These groups meet to discuss amongst other things, individual investment projects to ensure that best value is being achieved and that any project meets with the Northumbrian Water Capital Plan for that year.

Design

A brief was prepared for the design stage of the project and Entec UK was asked to provide a fee bid. After the project manager scrutinised the bid it was accepted and Entec UK was appointed as Designer and Planning Supervisor for the project.

The option to be developed required the construction of a new Combined Sewer Overflow (CSO) on the Kenton/Fawdon Trunk Sewer together with over 1km of overflow pipework that would discharge into the Ouseburn at the side of the 18th hole at the City of Newcastle Golf Club. There was an existing CSO located on the Kenton/Fawdon sewer at Acomb Crescent and the installation of the new CSO did not increase the number of spills or quantity of discharge from the network during storm events.

The option also identified a requirement for significant upsizing to the local surface and combined sewers that serve the Red House Farm area. During this stage, detailed discussions were undertaken with the Environment Agency, Newcastle City Council and the City of Newcastle Golf Club.

Site Investigation

A detailed site investigation was undertaken and results showed that the ground in the area of construction consisted of running sand at a depth in excess of 3m below ground level. This required that an alternative trenchless techniques were required for the upsizing of the combined sewer in Red House Farm. It was not possible to carry out detailed site investigations in the golf club, as this would have coincided with planned tournaments. However, a desktop study indicated that the ground in this area was similar to that immediately outside of the golf course which investigations had shown to be made up of clays and gravels.

Construction

Prior to construction, a two day customer event was held by Northumbrian Water with over 2,500 letters of invitation posted to all those affected by either the flooding or the proposed works.

Carillion Civil Engineering (at the time Mowlem Johnston Construction) was appointed to carry out the construction of the works. This project was not tendered but negotiated using Option C of the NEC ECC suite of contracts. This allowed Carillion to become involved at the design stage of the project to bring benefits from a team approach. This ensured that their experience in construction works of this type in poor ground was inputted at an early stage in the project.

Construction commenced in October 2006 and an immediate site investigation was undertaken in the golf club to determine ground conditions. The site investigation showed that the ground was significantly worse than expected and that extensive dewatering was required to construct the 1050mm diameter overflow pipework. This dewatering added significant time delays and cost to the project.

The project was completed in June 2007 with the CSO and overflow pipework being completed by March 2007.

Ongoing discussions with the local residents were continued during the construction and Mr Doug Henderson MP visited the site to ascertain the extent of the works required to alleviate the flooding problem.

Construction went according to the programme after it was revised to show the poor ground conditions in the golf course. A number of complaints were received from local residents but this is to be expected whilst carrying out work in narrow streets outside customer's houses.

These complaints were dealt with in a timely manner by the project team.

On completion of the project a detailed post project review was undertaken and lessons learned, both positive and negative, were highlighted and circulated to all Northumbrian Water Project Managers.

All properties that experiences sewer flooding in 2005 have now been removed from the DG5 registers and letters have been sent to customers stating that the risk of flooding to their properties has been reduced.

Note: ***The Editor & Publishers wish to thank Richard Woodhouse, Investment Delivery Team Leader with Northumbrian Water Ltd., for producing the above article for publication.***■