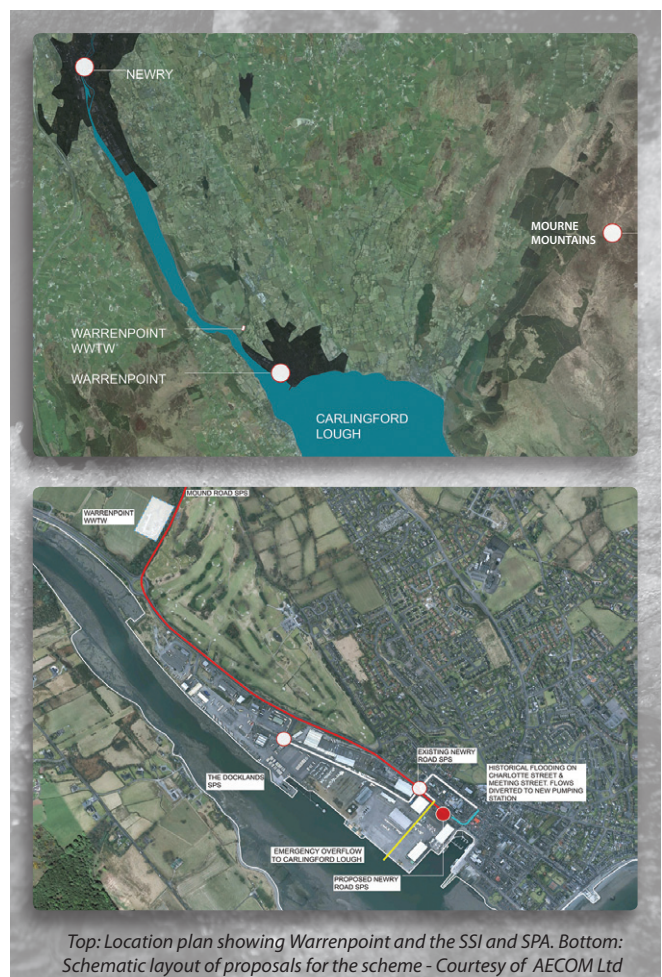


# Newry Road Wastewater Pumping Station

## reducing spills to Carlingford Lough and protecting low lying areas of the local catchment from flooding

by Sam McManus BEng CEng MICE & Alan Lavery BEng CEng MICE

Warrenpoint is located at the southern approach to the Mourne Mountains and is adjacent to the northern shore of Carlingford Lough. Designated an Area of Special Scientific Interest and Special Protection Area, Carlingford Lough is an important shellfish water and provides links to the nearby city of Newry via the Newry River and Newry Canal. A combination of recent local development, together with increasingly high tides has put pressure on the ageing infrastructure. This has resulted in frequent combined sewer overflow (CSO) discharges to the environmentally sensitive Carlingford Lough and flooding of low lying properties in Warrenpoint. NI Water has invested £3.4m to upgrade the Warrenpoint sewerage network, future-proofing the network for population growth.



### Background

In 2008, NI Water appointed AECOM to develop a hydraulic model of the sewerage network to recommend solutions for system deficiencies as part of a Drainage Area Plan (DAP) for Warrenpoint. This analysis demonstrated that the ageing sewerage system in Warrenpoint had insufficient capacity and was in poor condition in some locations, resulting in surcharging, flooding and frequent CSO spills. The DAP recommended a number of capital works schemes within the Warrenpoint catchment, with replacement of the Newry Road Wastewater Pumping Station (WwPS) being key to resolving the flooding problems.

The existing Newry Road WwPS receives flow from Newry Road and Charlotte Street and forwards flow at a rate of 155l/s (equivalent

to Formula 'A') to the Warrenpoint WwTW. Once it had been determined through model analysis that the WwPS was inadequate, model simulations were undertaken based on new pumping station design criteria in order to identify the requirements for a new pumping station. A number of potential options were identified and simulated.

The optimum solution involved the construction of a new 780m<sup>3</sup> storage WwPS and localised sewerage network upgrades. Model simulations incorporating these new design proposals illustrated significant network improvements including the elimination of flooding at five properties currently listed on the DG5 internal flooding register and compliance with the spill frequency and volume requirements of the EU Shellfish Directive.

# NEWRY ROAD WASTEWATER PUMPING STATION delivered by DAWSON WAM



### Drivers for the scheme

Property flooding	The Newry Road WwPS had insufficient capacity within the foul and stormwater wet wells causing significant surcharging and out of sewer flooding to properties.
EU Shellfish Directive	Time-series network analysis indicated that the pumping station had an annual spill frequency greater than 50, with a total spill volume of approximately 36,000m <sup>3</sup> which did not meet the requirements in the EU Shellfish Directive.
Tidal ingress	The stormwater overflow was in poor condition and did not prevent tidal ingress flow, thus exacerbating flooding problems.
Pollution	Inadequate overflow screening facilities at the existing WwPS did not meet Northern Ireland Environment Agency (NIEA) discharge consent requirements and therefore classed as Unsatisfactory Intermittent Discharges.

### Scheme description

The Newry Road scheme involved the completion of two work packages in order to protect low lying properties from flooding and reduce spills to Carlingford Lough.

- Replacement of the existing pumping station with a new wastewater pumping station incorporating 780m<sup>3</sup> storage.
- Upgrade of strategic pipelines within the sewerage network.

### Newry Road WwPS

This element of the contract involved the construction of a new wastewater pumping station with separate foul and stormwater storage chambers.

As a result of a comprehensive review process with project stakeholders, including retailers, local councillors, planning authorities and government officials, it was agreed that the new pumping station should be constructed within the site of an existing public car park adjacent to the main Newry to Warrenpoint Road (approximately 100m east of the existing pumping station).

Limiting the construction footprint to part of this car park would reduce disruption to the local community and the adjacent main Warrenpoint to Newry feeder road.

In order to minimise the land-take of the design, whilst protecting the structural integrity of adjacent storage warehouses, the design team proposed the construction of 2 (No.) 10.7m diameter, 12m deep circular shafts. This arrangement would enable the provision of 780m<sup>3</sup> of online storage below the invert level of the main incoming pipeline.

This results in maximum flood protection to the upstream catchment whilst meeting the spill frequency and volume discharge consent requirements of the EU Shellfish Directive for Carlingford Lough.

The new pumping station has been designed so that incoming flow discharges into the foul wet well. In dry weather conditions the sewage is retained in the foul well before transfer through a new 450mm diameter rising main to the WwTW (via duty/assist/standby variable-speed pumps, with a maximum discharge capacity of 250l/s i.e. future formula 'A').

During wet weather the storage capacity in the foul well will be completely utilised prior to spill into the adjacent stormwater wet well via a 6mm bi-directional mechanical screening unit. The stormwater wet-well will drain back into the foul well when the storm abates. When all of the storage in both wells is fully-utilised the storm sewage pumps will transfer stormwater to Carlingford Lough at a rate of 1,360l/s via a new 800mm diameter main.

### Catchment upgrades

DAP recommendations included the upgrade and replacement of a number of pipelines within the network to increase capacity and reduce sewer flooding. Existing pipelines within the catchment found to be in a suitable structural condition were inspected and cleaned whilst other new pipelines including a new 1,050mm diameter trunk sewer were installed to optimise the catchments ability to transfer flow to the new station.

This strategy provided full optimisation of the existing infrastructure and provided a phased mechanism for transfer of foul flows during commissioning.

Stormwater flows from a significant area of the catchment, which previously entered the existing station's stormwater wet well, were redirected from the existing station and reconnected to the existing outfall pipeline, located within Warrenpoint Harbour Authority land, leading to Carlingford Lough.



Overlooking the foul and stormwater wet wells, illustrating the complexity of the caisson construction - Courtesy of AECOM Ltd



Jacking positions around the perimeter of shaft, used to drive the segmental rings into the ground a section at a time - Courtesy of AECOM



Construction of trench boxes to facilitate pipeline installation in difficult ground conditions - Courtesy of AECOM Ltd

Re-routing these flows through a complex network of services and existing infrastructure allows stormwater flows to discharge to the Lough during normal flow conditions but provides protection to the low lying catchment during high tide by diverting flow to the stormwater wet well through a high level relief network which utilises the storm pumps in the new station.

#### Construction methodology

Difficult ground conditions, including made ground, gravels and a high water table impacted on the design and construction of both the pumping station shafts and the various pipelines within the catchment. Construction risks were reduced through the use of caissons for the pumping station structures, which were formed using segmental shafts.

The shafts were initially sunk to a depth of 10m below ground level where rock was encountered. The remaining two meters required significant time and effort to excavate as prolonged rock breaking and groundwater control was required.

At formation level the groundwater, now with a hydraulic head of 9.0m above the base level, was increasingly more difficult to control especially during the installation of the two interconnecting 450mm pipelines which were drilled through rock between the shafts.

All other excavations below 3.0m required significant dewatering and stabilisation, with pipeline excavations requiring support with trench boxes or sheet piles (which were necessary for the deeper sections).

#### Stakeholder management

Implementation of the various network upgrade recommendations required the development of detailed traffic management plans which included the provision of one way traffic flow systems and road closures.

The overall project stakeholder plan including public open days and follow-up meetings with local businesses, residents, statutory authorities and councillors played a large part in communicating upcoming work programmes and ultimately the successful completion of the project.

#### Contract details

AECOM has provided concept civil design for the wastewater pumping station, pipeline design, NEC project management, site supervision and stakeholder engagement services for the project.

The contract was procured as Design and Build, utilising the NEC3 - Engineering and Construction Contract (ECC) - Option A, Priced Contract with Activity Schedule. The project was tendered amongst a select list of contractors appointed under NI Water's Integrated Wastewater Framework.

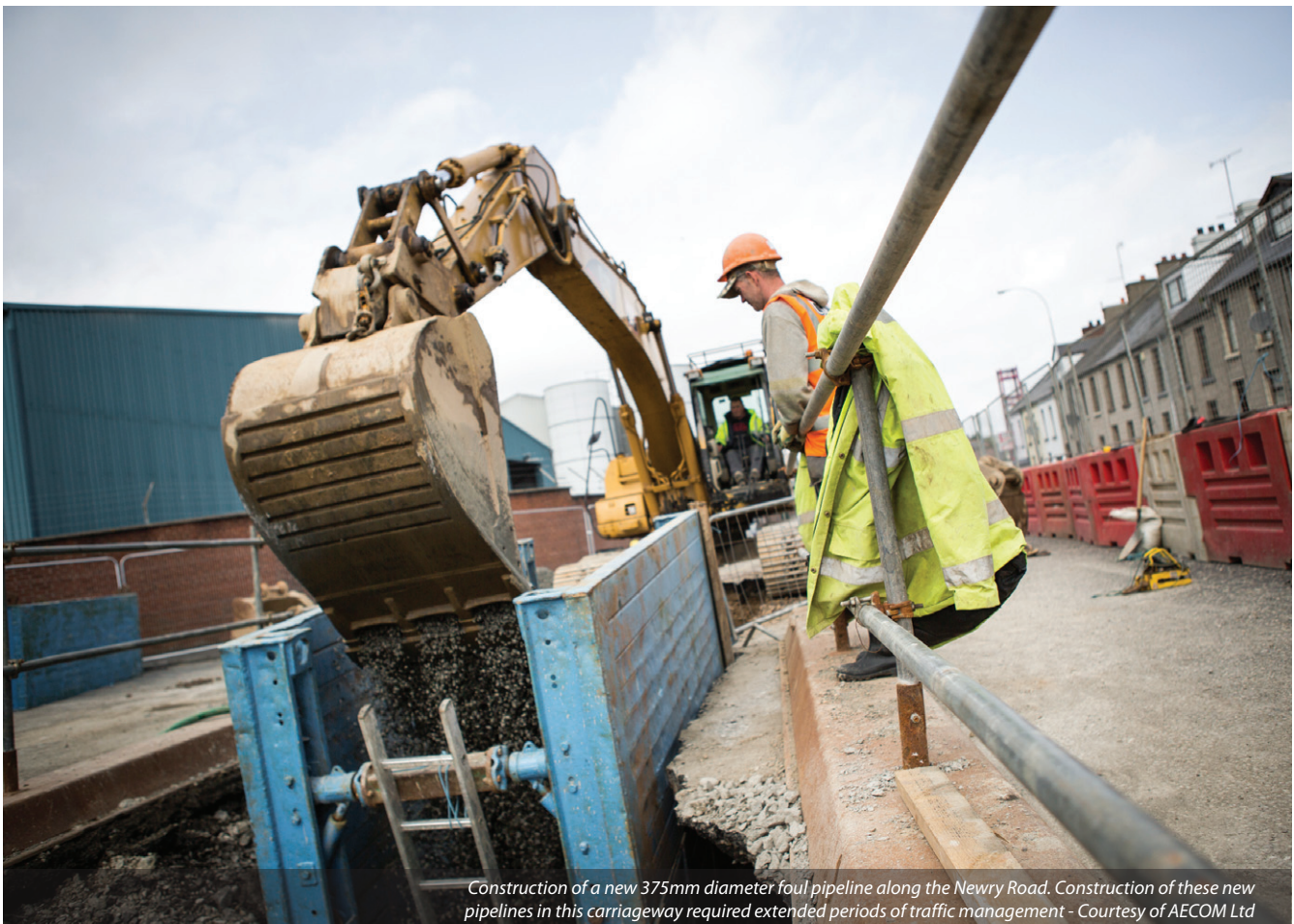
The contract was awarded to Consent Solutions in November 2012 and work commenced on site in February 2013.

#### Current status

The project was completed in Summer 2014. Following flow transfer to the new station in May 2014 and completion of the required testing and commissioning, the old pumping station is to be demolished and the existing car park, under which the new station is constructed, reinstated and opened to the public.

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*Thanks also to Alan Lavery for the photography used in this article [www.alanlaveryphotography.com](http://www.alanlaveryphotography.com).*



*Construction of a new 375mm diameter foul pipeline along the Newry Road. Construction of these new pipelines in this carriageway required extended periods of traffic management - Courtesy of AECOM Ltd*