



Antrim Wastewater Project

An insight into the extensive £23m wastewater treatment and drainage improvements undertaken across the wider Antrim area



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Background



Antrim Wastewater Treatment Works (WwTW) was constructed at Milltown in the early 1970s to serve a population equivalent of 30,000 from Antrim town. The rationalisation of outlying catchments in the mid '90s led to the works receiving additional flow from several neighbouring settlements, including Templepatrick, Crumlin, Dunadry, Killead, Aldergrove and Belfast International Airport.

Due to the limited financial investment available, restricted improvements over the years had resulted in a significantly large number of pumping stations (PS) and combined sewer overflows (CSOs). Having identified a need for capital investment, Northern Ireland Water (NI Water) undertook an appraisal study to identify and evaluate appropriate options to deliver effective wastewater treatment and outfall arrangements for the Antrim catchment up to a 2035 project horizon.

permitted substantial loss of flow and loading (sewage) at a large number of pumping stations (PS) and combined sewer overflows (CSOs).

The appraisal included for the completion of a Flow and Composition Study (FACS) at the WwTW and a comprehensive catchment-wide Drainage Area Study (DAS) to investigate the scale of the network problems. The output of these studies was to provide NI Water with an integrated wastewater treatment and network solution for the complete catchment – an area of approximately 14km².

What the project involved

At the centre of the Antrim Wastewater Project was the construction of a state-of-the-art wastewater treatment works to replace the existing outdated and overloaded works on the same site at Milltown Road on the outskirts of Antrim.

The modern new treatment works, which is designed to serve a combined residential and industrial population equivalent of 87,000, incorporates a sludge handling and dewatering facility for the region. The wastewater treatment process consists of an inlet screw pumping station, preliminary treatment (screening, grit removal, storm separation and storm storage), primary treatment utilising refurbished existing tanks and a new secondary treatment stage in the form of an activated sludge plant with final settlement.

This provides carbonaceous removal together with nitrification/de-nitrification and chemically-assisted co-precipitation to aid nutrient removal, and ultimately provides a high quality effluent to meet the consent requirements for discharge to nearby Lough Neagh.

The new sludge treatment facility not only deals with site-generated sludge, but also caters for imported sludge from neighbouring treatment facilities and septic tanks from the surrounding rural areas. The facility comprises separate sludge

thickening and dewatering stages to produce a minimum of 27% dry solids content sludge for transport off site to an incinerator in Belfast.

At Massereene, in Antrim town centre, a new pumping station, incorporating 650m³ of storage capacity and screening was constructed within the grounds of the Antrim Forum, on the site of an old war memorial. Built completely underground, this huge piece of infrastructure (12m dia x 10m deep) replaces the existing ineffective station, located within the historic Antrim Castle Gardens area and provides protection to the sensitive Sixmilewater River which runs adjacent to the site. Relocating this facility to the other side of the river greatly enhanced the Council's plans to carry out extensive restoration work within Antrim Castle Gardens which date back to the 17th century.

Upsizing of the existing sewerage network within the town centre (upstream of the new pumping station) was also undertaken to alleviate the area's historical flooding problem. Given the element of disruption that existed, the opportunity was taken to replace existing watermains in conjunction with the sewer upgrades, ahead of a planned environmental improvement scheme for the town centre and conservation area due to be carried out by the Council.

Massereene Pumping Station is a strategically important cog in the operation of the Antrim sewerage network, being responsible for passing forward approximately 40,000 population equivalent flow to the treatment works. Upsizing of the existing sewerage network upstream of the new pumping station was also carried out which allowed NI Water to close two troublesome CSOs and provide storm alleviation in an area predicted to flood within the project horizon.

Catchment schematic



Aerial photographs showing:

- 1 The new Antrim Wastewater Treatment Works at Milltown Road, Antrim
- 2 Massereene PS and Antrim Town Centre
- 3 Randalstown PS and Randalstown Town Centre



Facts and figures

During the complex and challenging Antrim Wastewater Project...

Around **12,000m³ of concrete**
was poured

More than **115,000 man hours**
were worked

1,476 nozzles
were fitted in the aeration lanes

More than **16,000m² of hard landscaping**
was put down

Around **48km of electrical cabling** and
7km of ducting were installed

Over **15km of new sewers**
were laid

8 tonnes of copper
were used within the electrical control panels

More than **60,000m³ of spoil**
was excavated and reused

Approximately **18,250m² of formwork**
was erected



IT WAS GREAT TO HAVE BEEN INVOLVED IN THE ANTRIM PROJECT WHERE PLANNING, COMMUNICATION, INNOVATION AND VALUE FOR MONEY WERE ENGENDERED BY ALL STAKEHOLDERS IN A TRUE PARTNERING ETHOS.

MARK CASSIDY

PROJECT MANAGER, BSG CIVIL ENGINEERING

Challenges

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THE SCALE AND COMPLEXITY OF THE ANTRIM PROJECT SHOULD NOT BE UNDERESTIMATED. THE SUCCESS OF THIS EXTENSIVE SCHEME LIES IN THE COMMITMENT SHOWN BY ALL PARTIES TO WORK TOGETHER TO DELIVER A MODERN WASTEWATER TREATMENT SYSTEM ON TIME AND WITHIN BUDGET.
NEVILLE SNODDY
SENIOR PROJECT MANAGER, WIS
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One of NI Water's most complex wastewater treatment and infrastructure upgrade contracts, the Antrim Wastewater Project presented a number of challenges to the team. These included:

- Laying new sewers through busy town centres ahead of planned streetscape works.
- Working within historic areas rich in archaeology such as Antrim Castle Gardens and Shane's Castle Demesne.
- Carrying out extensive construction works alongside the Sixmilewater River and River Maine.
- Removal of sensitive war memorial.
- Pipelaying under major river courses.
- Programming construction activities to suit important events such as the Ulster Rally, Remembrance Day and Antrim Market.

Perhaps overall, one of the biggest challenges was the delivery of the project within the timeframe for compliance imposed by the NI Environment Agency, and the need to programme the network improvements to be complete prior to full process commissioning and proving of the new treatment works. This was made even more difficult by the necessity for significant design development of the network solutions post contract award, which when fully developed, required third party approval from landowners, public bodies and other interested groups before construction could be commenced.

Sympathetic construction

Consistent and effective communications took place with a number of third party stakeholders to ensure that each part of this major project was undertaken in a manner that satisfied all involved.

To minimise disruption the team carried out pipelaying in busy areas during the night with roads reopened for early morning commuters. Trenchless methods of pipelaying were employed to cross rivers and indigenous landscaping plans drawn up for amenity areas affected by construction works.

The project team maintained close liaison throughout with Antrim Borough Council, Roads Service and Translink to ensure all work was carried out with minimal inconvenience to road users and pedestrians and to provide effective notice so that buses could be rerouted where necessary.

An environmentally-friendly approach to construction was undertaken throughout the contract, no more so than on the construction of the shaft at Massereene Pumping Station, where the innovative 'Caisson' design was employed. This 'top-down' method of construction means there is no need for expensive, high risk temporary piling or shuttering work, as the shaft walls become the final tank walls. Furthermore this approach drastically reduces the amount of spoil being excavated and removed from site.

At particularly sensitive locations i.e. Antrim Castle Gardens and Shane's Castle Demesne, designated historic parklands, detailed landscape and visual impact assessments were carried out and careful consideration was exercised when finalising pipeline routes. Sympathetic pipeline construction techniques were employed with directional drilling and tunnelling methods being implemented and a qualified archaeologist was present during the stripping of all topsoil to ensure any significant finds were recorded and preserved if necessary.

Artefacts uncovered during the project included ceramics, glass and animal bones ranging from the 17th to early 20th centuries and a number of underground timber structures and dry stone drainage dating back to the 1600s.

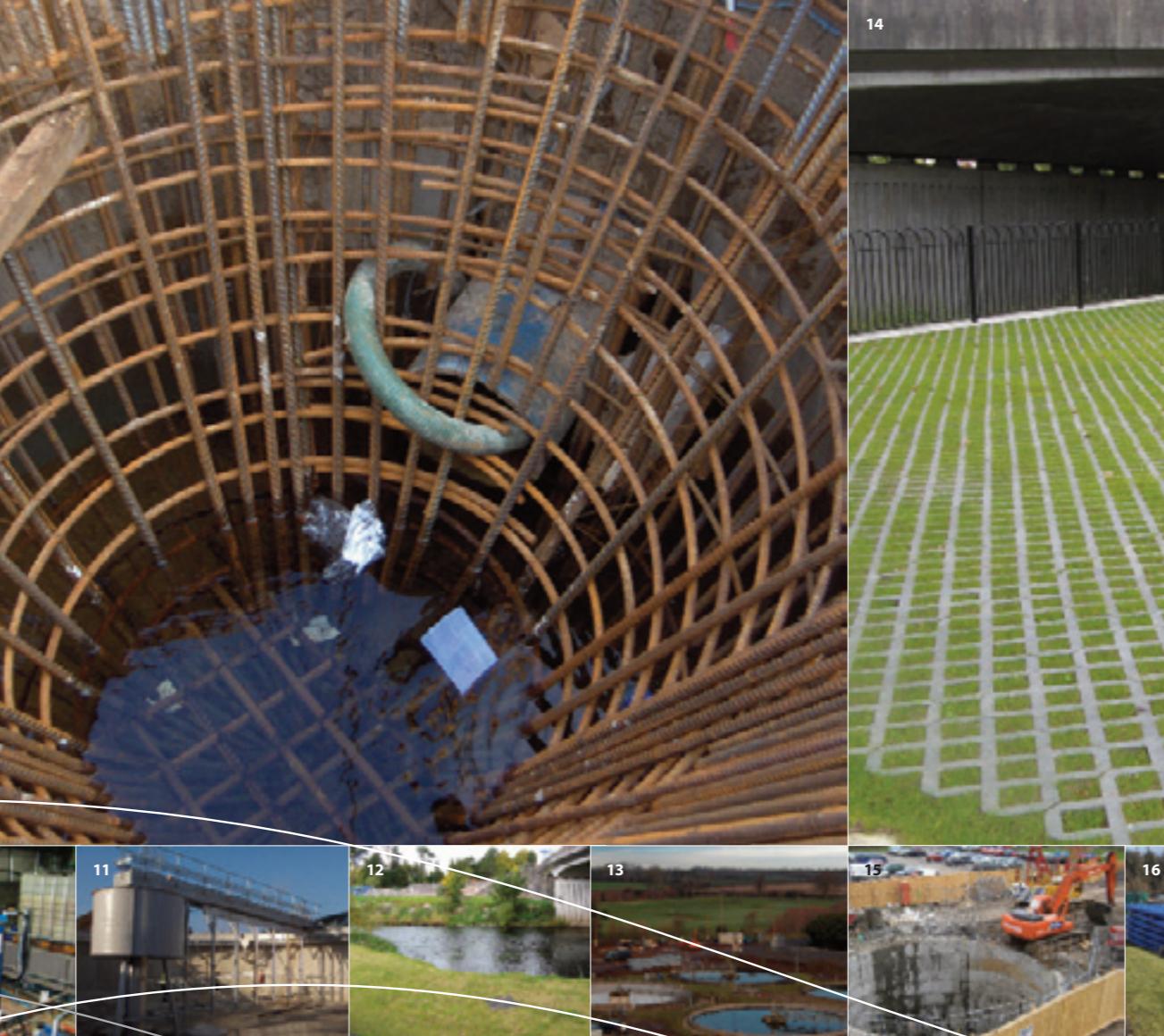
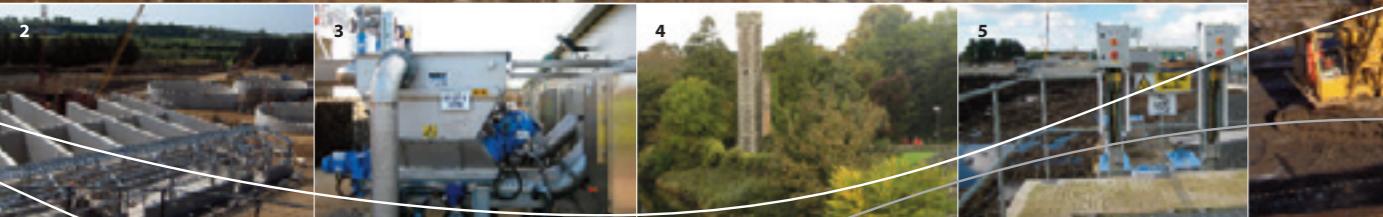


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STAKEHOLDER ENGAGEMENT WAS CENTRAL TO THE SUCCESS OF THE ANTRIM PROJECT. THE TEAM IS GRATEFUL TO ALL THE EXTERNAL STAKEHOLDERS WHO FACILITATED AND SUPPORTED US IN DELIVERING THIS VITAL UPGRADE SCHEME.

SAM DUNN PROJECT SUPPORT,
MCADAM DESIGN

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Innovations

Driving forward innovation and using best practice experience gained from previous NI Water schemes were fundamental to the success of the Antrim Wastewater Project.

The sludge reception facilities at Antrim are state of the art and incorporate a number of best practice ideas from other WwTW sites. Improvements include siting all sludge handling holding and thickening equipment in close proximity to each other to minimise pipe runs and prevent pipe blockages; reorientation of sludge dewaterers to minimise the number of sludge augers required to transport sludge cake; construction of a unique imported septic sludge reception facility designed to prevent blockages to screens and assist removal of grit and stones; siting the entire sludge facility in an area that minimises odour impact on receptors and which enables NI Water Operations to better control tanker movements.

Reuse of existing structures was one element that was continually assessed by the NI Water delivery team at Antrim. Existing primary tanks were refurbished for reuse and optimisation of existing problematic primary desludging was carried out, with a sludge air-lift system incorporated. This innovative system has prevented the need to remove the existing sludge draw-off system in its entirety at great expense.



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THE HI-TECH
INSTRUMENTATION
INSTALLED AT THE
NEW WWTW IS
ALLOWING
OPERATIONS TO
MANAGE THE SITE
IN A MUCH MORE
PLANNED AND
ECONOMICAL WAY.

DAVY MCCULLOUGH
OPERATIONS MANAGER,
NI WATER

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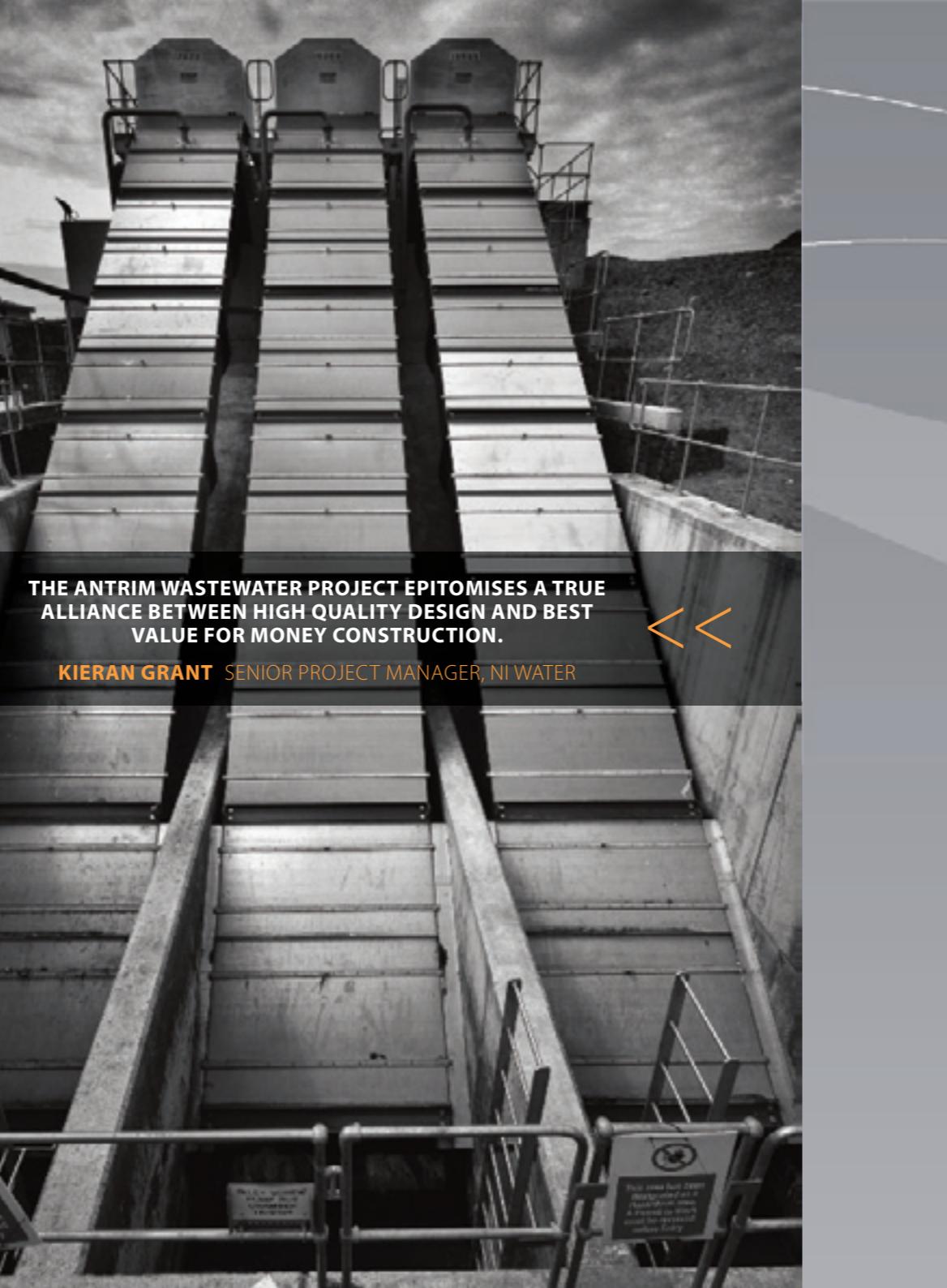
Benefits

The £23m Antrim Wastewater Project represents a major investment by Northern Ireland Water into delivering a modern sewage collection and treatment system for the wider Antrim area.

The construction of the new state-of-the-art wastewater treatment works at Milltown Road, coupled with the extensive refurbishments of associated pumping stations, the laying of new sewers and the closure of troublesome CSOs in the network, is having a hugely positive impact in the quality of the water in Lough Neagh and is helping to combat local out-of-sewer flooding incidents.

With a design life of 25 years, the new Antrim Wastewater Treatment Works will cope easily with future residential or industrial growth, and with its robust treatment processes will ensure a high quality of treated effluent is discharged to Lough Neagh for many years to come.

The combination of innovation, best practice methodology and forward planning in construction has delivered this project on time, within budget and to the level of excellence required to meet ever increasing quality standards.



>> THE ANTRIM WASTEWATER PROJECT EPITOMISES A TRUE
ALLIANCE BETWEEN HIGH QUALITY DESIGN AND BEST
VALUE FOR MONEY CONSTRUCTION. <<

KIERAN GRANT SENIOR PROJECT MANAGER, NI WATER