

Toome/Creagh Wastewater Upgrade Project

effective combined treatment solution delivered by NI Water

by Kieran Grant

The villages of Toome and Creagh are situated approximately two miles apart, to the north-west of Lough Neagh, in two different council areas. Until recently the areas were served by two separate wastewater treatment works (WwTW): Toome WwTW and Creagh WwTW. Northern Ireland Water, as part of its extensive investment programme to upgrade the wastewater systems across Northern Ireland, has just completed a major £5m package of improvement works in the Toome and Creagh areas. Forward thinking and rationalisation in design saw NI Water and its project team develop an optimum combined solution to deliver a modern treatment system for the two areas, which would bring about significant environmental benefits for the wider Toome/Creagh catchment.



Compact aeration system at the new Creagh WwTW

Courtesy of Northern Ireland Water

Need for improvement – previous situation

Toome WwTW was constructed in the 1960s, and subsequently extended in the 1970s to provide treatment for a design population of 1,011. In 2009, the loading at the works was 1,900 PE. The treatment process comprised preliminary treatment, primary settlement and humus tanks, with discharge to the River Bann. Prior to the recent upgrade, the WwTW was at risk of failing the Northern Ireland Environment Agency's (NIEA) Registered Discharge Standard (RDS).

Creagh WwTW was also constructed in the 1960s, but for the lesser design population of 188. In 2009 its loading was 600 PE. The WwTW consists of a primary settlement tank and a percolating biological filter, with discharge to the Moyola River. A temporary package plant consisting of a Submerged Aerated Filter was included in the treatment process in 2004, but the WwTW continued to struggle to comply with the then RDS.

Project background and appraisal

In 2008, the combined Toome and Creagh population was calculated at 2,500 PE. Potential residential and industrial growth was considered likely to increase this figure to around 4,400 PE by 2025.

Following extensive appraisals to analyse the optimum solution, which looked at both separate upgrades and an amalgamated design, a business case was put forward for a new WwTW sized at 4,400 PE to accommodate substantial growth, without capital over-investment, to meet the current RDS.

With land not readily available in Toome, Northern Ireland Water concluded that a new WwTW at the existing Creagh WwTW site to treat the combined populations of Toome and Creagh, to comply with a RDS of 30:50:15 and discharging to the Moyola River, was the preferred solution.



OVIVO
Bringing water to life

Creating Value in Water

through innovation, creativity and expertise

Focus

World leading expertise dedicated solely to water

70%

New advanced water reuse design helps water-restricted business expand by 70%

44%

MBR reduced energy cost by 44% over the previous WWT systems

\$200k

Water industry expertise prevents complete factory refurb, saving \$200k

£90,000pa

Net savings achieved through water reuse

Experts in water - Ovivo is a single, global platform bringing together the world's best expertise in water including: Brackett Green® Copa®, Eimco Water Technologies® and Jones+Attwood.

info.uk@ovivowater.com

ovivowater.com



Toome Terminal prior to demolition

Courtesy of NI Water



The old Creagh WwTW

Courtesy of NI Water



The new compact aeration system

Courtesy of NI Water



View towards the new inlet works

Courtesy of NI Water

Within the Creagh WwTW site, there was ample land space available for both this solution and a future third stream. This availability offered the opportunity for phasing, up to 2025 and beyond, to accommodate growth - especially local government aspirations for industrial expansion in the catchment.

All of the solutions considered for wastewater treatment in the Toome/Creagh catchment would require modifications and upgrade of the existing sewerage network. Flows would have to be re-directed; new or upgraded pumping stations would have to be undertaken and pumping mains and gravity sewers provided.

It was decided that the project would be carried out as two separate contracts; (i) the construction of the new Creagh WwTW and (ii) the upgrade of the Toome/Creagh sewerage network.

Contract award

Creagh WwTW: Northern Ireland Water awarded the Contract for the new Creagh WwTW to joint venture (JV) contractors GEDA Construction and Ovivo. At the time, this experienced JV was undertaking a similar wastewater treatment project for the combined Bushmills/Portballintrae catchments.

NI Water had made provision in the Bushmills WwTW project procurement process for an additional contract of similar nature, and up to EU Threshold value, to be negotiated under the competitive rates tendered within that Restricted List Procurement Process. As such, Northern Ireland Water appointed GEDA-Ovivo JV as the preferred bidder for the Toome/Creagh WwTW Contract via the Bushmills WwTW Contract.

NI Water briefed GEDA-Ovivo JV to develop proposals with Activity Schedule and Prices for Creagh WwTW under a Professional Services Contract based on the Contract utilising the NEC 3 Option A (Priced Contract with Activity Schedule).

Having the same project management and design team on board for both projects delivered economies of scale, and allowed the team to hit the ground running with the new Creagh WwTW in November 2009.

Toome/Creagh Sewerage: For the Toome/Creagh sewerage network upgrade, the four IWWF (Integrated Wastewater Framework) Consortia were invited to tender. The GEDA-Ovivo JV was also successful in this tender, which was awarded by Northern Ireland Water in January 2010.

Project drivers

The following formed the principal project drivers for the entire Toome/Creagh scheme:

Quality: Toome WwTW was at risk of failure, and Creagh WwTW was already failing its RDS.

Growth: 60% population & industrial growth anticipated to 2017.

Compliance date: NI Environment Agency advised that Toome & Creagh WwTWs should comply with the RDS by April 2012.

What the combined project entailed

The new combined solution called for reconfiguration of the existing network so that all flows from the old Toome WwTW could be conveyed to the new wastewater treatment works in Creagh, before final discharge to the Moyola River.

In a complete overhaul of the existing systems, wastewater would no longer be treated at the old Toome works, but would be transferred along a new sewer network to the new treatment facility at Creagh. The old WwTW at Toome was to be decommissioned and refurbished as a terminal pumping station with additional underground storm water storage provided at this site.

The new treatment works at Creagh is designed as a conventional Activated Sludge Plant (ASP) located on the site of the existing works. With built-in flexibility, the new works has been designed to the year 2025, to treat the increasing flows and loads. It currently treats a population of approximately 2,500 PE but is capable of treating a future population of 4,400 PE.

In addition to the modern new wastewater treatment works at Creagh, the multi-million pound project involved the following:

- Construction of the Toome Terminal Sewage Pumping Station (SPS) and storm storage facility (previously the site of the old Toome WwTW).
- Toome Terminal SPS included foul and storm pumps, screening and standby generator.
- Gravity overflow from Toome Terminal SPS to River Bann.
- New 600mm dia tunnelled gravity sewer from Main Street SPS, Toome, to Toome Terminal SPS.
- Small diameter gravity sewer rationalisation along Main Street in Toome village.
- Demolition of existing Toome WwTW.
- 180mm dia Toome pumping main onward to Creagh WwTW.
- Refurbishment/upgrade of Derrygarve SPS, and diversion of Derrygarve pumping main directly to Creagh WwTW.
- Refurbishment/upgrade of Blackpark SPS and a new 90mm dia pumping main from Blackpark SPS to Creagh WwTW.
- Refurbishment/upgrade of Hillhead SPS and 110mm dia pumping main to Creagh Industrial Park SPS for onward pumping to Creagh WwTW.
- Refurbishment/upgrade of Creagh Industrial Park SPS and new 180mm dia pumping main to Creagh WwTW.

Process description at Creagh WwTW

At the new Creagh WwTW, all sewage flows, which have been pumped from the new Toome Terminal SPS, Derrygarve SPS, Blackpark SPS and Creagh Industrial Park SPS enter a new inlet attenuation chamber complete with stone trap. The works has been designed to accommodate a Formula 'A' flow of 23.26l/sec.

As the Formula 'A' flows and FFT flows are similar i.e. 23.26l/sec and 22.04l/sec respectively, there is no requirement for storm tanks. The formula 'A' flow passes forward to secondary treatment. The new preliminary treatment plant comprises duty/standby 6mm bi-directional screens, each with screening conditioning facilities and a grit and grease removal unit capable of handling flows up to Formula 'A' flow (23.26l/s).

New anoxic selectors have been incorporated into the design, which have four individual sectors complete with mixers and bypass facilities, providing a combined volume of 200m³ capacity. The settled sewage combines with the Return Activated Sludge from the activated sludge process; the influent flows into a new conventional activated sludge plant, comprising of twin circular outer lanes and inner final settlement tanks.

The aeration lanes, in conjunction with the FSTs, are capable of operating at elevated mixed liquor concentrations due to varying volume facilities - such that when one lane is out of service for extended periods, it does not compromise the effluent consent standard. Adjustable bell mouths in the ASP can be used to vary volume in the tanks to optimise loading requirements at the works.

Mixed liquor from the aeration tanks (each 17.3m dia with 4.5m high walls) flows to the new inner final settlement tanks (each 8.5m dia with 3.0m high walls) by means of weirs. Sludge blanket detectors are provided for each final settlement tank for alarm purposes.

Sympathetic design & construction

NI Water and its contract team worked closely with planners, architects, engineers and landscape experts to develop visually-pleasing low-impact designs that blend with the natural character of the landscape. The new wastewater treatment facility was constructed entirely within the confines of the existing site perimeter and the buildings are in kiosk-type form to comply with current planning regulations.

Both the Creagh and Toome sites have been landscaped with a belt of native trees and shrubs, mainly deciduous species suited to the



Inlet works, screening and grit & grease removal

Courtesy of Northern Ireland Water

waterside locations. The planting mix has been designed to require minimum management with oak and pine as the “climax” species, and a dense understory of native shrub species.

To promote sustainability, trenchless methods of pipe laying were utilised where possible, and all spoil excavated on the Toome and Creagh sites was reused in landscaping the areas around the new WwTW and new Terminal SPS. Final effluent from the WwTW plant is reused as washwater during the treatment process, for screen washing and sludge thickening.

Challenges

Apart from the need to design and construct a wastewater treatment works that would be accepted in a lowland area on the shores of Lough Neagh, the biggest challenge for the team has been to construct a modern new works whilst maintaining operations at the existing plant on the same site.

All construction work on Creagh WwTW site, and at the various sewage pumping stations, had to be completed in their entirety and commissioned simultaneously so as to permit a single commissioning start up. This was achieved through agreed phasing and proactive programming. During construction, no relaxation in discharge consent standards was permitted, and therefore it was imperative to maintain high quality standards to the Moyola River for final effluent and construction groundwater.

NI Water and the GEDA-Ovivo JV, developed a robust Environmental Management Plan to meet NIEA requirements for the contract, which meant that all possible measures were undertaken to ensure that the construction work did not adversely impact on the adjacent Moyola River, the River Bann and/or other watercourses.

Community liaison

Considerable time and effort was afforded to public relations associated with the project. Council presentations and information days were convened to inform local residents, businesses and elected representatives as to the scope of the project, its importance, and, most importantly, how any likely impact would be managed.

Written updates were distributed regularly to local businesses in Toome to keep them up to date with progress on pipe laying work in the village, and letter drops were carried out to residents in both the Toome and Creagh areas to keep them abreast of progress.

Ahead of any school holidays, updates included key safety information to advise parents not to let their children play near, or on, any construction sites, and all key milestones were covered by all local media through a steady stream of project press releases.

Throughout the scheme the project management team also worked closely with council representatives in both Antrim and Magherafelt Councils, local community groups and DRD Roads Service in the programming of works, and all possible measures were undertaken to facilitate road users and the local community. For example, in a bid to ease congestion during pipe laying in Toome village, a tunnelling machine was employed to lay the new 600mm dia gravity sewer from Toome Main Street SPS (which was later decommissioned) to the new Toome Terminal SPS.

To complete the project as quickly as possible, the team worked throughout the July holidays (a 2-week period which forms the main builders’ holidays in Northern Ireland). A fantastic rapport was built up between the project management team and local businesses, which ultimately helped to ensure a smooth 4-month construction period for tunnelling in the village. The team supported local businesses at every opportunity through the purchase of general commodities and sourcing local labour and supplies.

Conclusion

Now complete, the new and refurbished infrastructure in Toome and Creagh is delivering an improved level of service to the people in the locality; the standard of discharge has been enhanced to meet the latest European wastewater directives and industrial and domestic growth in the area will be accommodated by the new system until at least 2025.

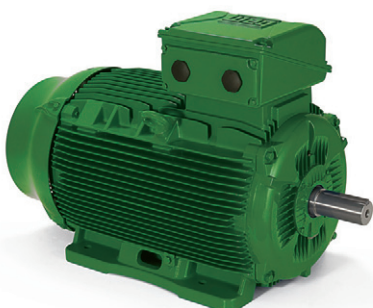
The Editor & Publishers thank Kieran Grant, Senior Project Manager with NI Water, for preparing the above article for publication.



View from grit & grease removal plant showing activated sludge process and main control centre

Courtesy of Northern Ireland Water

We can't predict the future
but we can see it coming.



Meeting the IE2 standard for motors is mandatory from June 2011, WEG motors already exceed it. The IE3 standard won't be enforced until 2015 but WEG already produces Premium Efficiency IE3 Motors. No date has been confirmed for the IE4 rating but you can already choose a super efficient IE4 motor from WEG. Being ahead of the game is what we call WEGnology...

If you want to get ahead, visit www.weg.net

