Whitehead, Ballycarry & Ballystrudder Rationalisation

NI Water's £7m investment for the Islandmagee Peninsula

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An innovative new rationalisation scheme has been delivered to improve wastewater treatment on the Islandmagee Peninsula north of Carrickfergus, Northern Ireland. Formerly two aged works at Ballycarry and Ballystrudder discharged effluent into the environmentally sensitive shellfish waters of Larne Lough. This sea lough south of Larne annually harbours important numbers of brent geese and roseate and common tern. A further pumping station at Whitehead, which was run down and past its useful life, discharged macerated flows into the Irish Sea, in an area which is an important summer breeding ground for puffins. Several options were considered before a solution was reached to treat flows from all three catchments and discharge through a new purpose-built long sea outfall. Abandonment of the three short sea outfalls discharging to Low Water Mark was achieved and an unsightly concrete pumping station structure in a highly visible public amenity area replaced with an aesthetically-pleasing building in tune with its natural surroundings.

Whitehead town - Courtesy of NI Water Ltd

Background

The wastewater treatment works (WwTW) at Ballystrudder and Ballycarry were constructed in the 1970s and discharged into the marine shellfish waters of Larne Lough. Growing local populations and tighter environmental standards led to the Northern Ireland Environmental Agency (NIEA) imposing discharge standards which were unattainable without expensive tertiary treatment. The pumping station (WwPS) at Whitehead discharged at Low Water Mark into the Irish Sea, one kilometre north of the picturesque seaside town of Whitehead and just beneath the lighthouse at Blackhead headland, a popular coastal walk.

Objectives/need

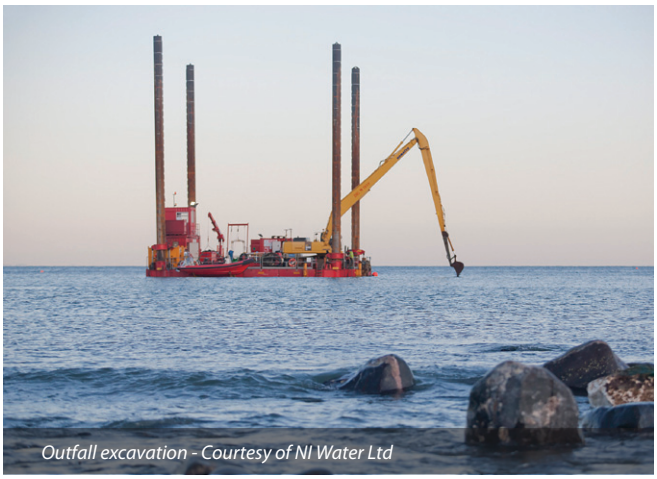
The old facilities at Ballycarry and Ballystrudder were in need of modernisation and required extensive upgrading to provide wastewater treatment to comply with European Union legislation. The existing plants were undersized for the current and future populations, and unable to meet the more stringent discharge consent standards imposed by NIEA.

Maceration of raw sewage followed by a pumped marine discharge to Low Water at Whitehead was deemed unsatisfactory under the Urban Wastewater Treatment Directive (UWWTD). In order to meet bathing water standards, a marine discharge was required to provide 100:1 initial dilution. In the assessment of the project it was determined that the pumping stations at Larne Lough had to be provided with sufficient emergency storage to safeguard against a maximum of 12 spills per year.


Whitehead New Pumping Station (from viewing platform facing north) Courtesy of NI Water Ltd


Whitehead New Pumping Station - Courtesy of NI Water Ltd


Marine borehole - Courtesy of NI Water Ltd


Outfall excavation - Courtesy of NI Water Ltd

Solution

The £7m Whitehead, Ballystrudder and Ballycarry Rationalisation Scheme was developed to meet environmental standards in the most cost effective way practicable for NI Water.

- ***Whitehead:*** Whitehead Pumping Station was replaced with a state of the art underground pumping station and an above ground aesthetically-pleasing pumphouse incorporating coarse screening and odour control. Acceptability of the scheme was enhanced by facing the reinforced concrete building in natural stone and providing a public viewing area on the roof. This was designed to complement a public area of high amenity value commanding views of the town of Whitehead to the south and Blackhead lighthouse to the north. A 2.2km pumping main was laid to convey preliminary-treated effluent flows to Ballystrudder WwTW.

- ***Ballycarry:*** Secondary treatment was retained at Ballycarry WwTW and a new inlet works and effluent pumping station constructed to transfer secondary-treated flows through a 1.2km pumping main to Ballystrudder WwTW.

- ***Ballystrudder:*** A new inlet works at Ballystrudder WwTW was provided to give preliminary treatment and blending of flows from Whitehead, Ballystrudder and Ballycarry. A new final effluent pumping station conveys the treated flows through a 1.7km pumping main to a new 850m long 355mm diameter sea outfall discharging into the Irish Sea at Cloughfin Bay. The scheme has been designed to a 2035 design horizon, which will accommodate a population equivalent of 8,475.

- ***Long sea outfall:*** In an attempt to shorten the marine construction programme and to reduce as far as possible the impact of construction on the sensitive marine habitat around Cloughfin Bay, investigations were made into the use of horizontal directional drilling (HDD) using a land-based drilling-rig to drill the outfall over the first 650m of the outfall prior to a final 200m section of conventional excavation and diffuser construction.

  Land-based and marine site investigations, and 5 (No.) marine boreholes suggested the rock type being a uniform Mercia Mudstone layer was amenable to this method. The new marine licence, replacing the former FEPA licence, was granted on this basis and drilling began in August 2011. While still drilling beneath the land, the drilling-rig encountered an unforeseen fault within the underlying strata, this prompted additional site investigation boreholes that identified an area of unpredictable ground conditions.

  The HDD method had to be abandoned and the barge already on site to undertake the conventional excavation of the final 200m stretch was used as a platform to complete the excavation of the trench using conventional methods. The pipeline was fitted with concrete collars and pulled inshore, laid in the trench and then overlain with concrete mattresses. A four-port diffuser was installed at 12m depth of water and protected with rock armouring.

  Effluent flows from all three catchments have been discharging through this outfall since March 2012.

  Extensive emergency storage at Whitehead, Ballystrudder and Ballycarry mitigates against non-compliant discharges to the combined screen outfall at Whitehead and modelling predicts no more than 12 agglomorated spills per year into Larne Lough.

Contract delivery

The land-based ECC NEC2 Option A Design and Build contract was constructed by a Joint Venture between BSG Civil Engineering and Williams Industrial Services with Doran Consulting Engineers providing the design.

The marine-based ECC NEC3 Option A Design and Build contract was undertaken by Van Oord Ltd, ABCO Marine Ltd and Halcrow, along with specialist sub-contractors Terra Solutions Ltd and AMS No-Dig Ltd. WYG undertook project management and administration of the contracts with RPS undertaking technical review.

Value & innovation

The scheme has sought to bring value and innovation to NI Water without compromising water quality standards in meeting the latest NIEA and Urban Wastewater Treatment Directive (UWWTD) discharge consent standards.

In its ongoing drive for efficiencies in the delivery of treatment solutions, NI Water had to resist local political pressure calling for full secondary treatment at Ballystrudder WwTW. NI Water presented the argument by proving through marine modelling and environmental studies that bathing water quality was achieved to the statutory and UWWTD standard required for coastal populations of less than 10,000pe.

Political lobbying and pressures brought to bear on the Planning Service delayed granting of planning approval and the commencement of work on site, but failed to dislodge NI Water from delivering to the legislative standard as it now stands. Approximately £2m was saved through this innovative approach. Should legislation change or the local population equivalent exceed 10,000, NI Water has made provision to facilitate the addition of secondary treatment at Ballystrudder in the future.

Stakeholder involvement

The scheme drew particular attention from NIEA, local councils, landowners and local fishing interests. Quite apart from commissioning the various reports required to meet planning approval and the marine licence, NI Water became proactive in generating media coverage highlighting the positive aspects of the proposals and meeting all elected representatives and environmental interest groups.

A badger sett was successfully avoided during construction, access and off-road parking was provided for birdwatchers at Larne Lough, a public viewing area was provided at Whitehead to maximise views of Whitehead and Blackhead lighthouse. The fishermen themselves were engaged prior to construction, in assisting in the removal of fishing gear from the seabed and marked the outfall excavation to safeguard the construction area.

As with work on any peninsula, careful traffic management was required, to this end road closures were staggered to minimise disruption while 6.4km of pumping main, and gravity sewer were laid. The pipe laying works were undertaken through a combination of open-cut and directional drilling techniques.

Conclusion

The scheme has improved the water quality in Larne Lough and the Irish Sea and provides a robust treatment solution for the next 25 years.

NI Water is committed to investing in projects that will deliver the best innovative solutions and benefit the local community, economy and the environment.

The editor & publishers would like to thank Jonathan Rowe, Senior Project Manager with NI Water, for providing the above article for publication.

Ballycarry WwTW - Courtesy of NI Water Ltd

Ballystrudder WwTW - Courtesy of NI Water Ltd

Whitehead New Pumping Station (from viewing platform facing south) Courtesy of NI Water Ltd - Courtesy of NI Water Ltd

Blackhead Lighthouse - Courtesy of NI Water Ltd