

North Kessock WwTW Transfer Scheme

£4m solution for environmentally sensitive area

by
Rob Atkinson

Carrying out a 900m marine crossing in one of Scotland's most environmentally sensitive habitats was a major feature of a project in the Scottish Highlands. With bottle-nosed dolphins - the most northerly group of the aquatic animals in the world - resident in the nearby Moray Firth significant liaison with third party stakeholders was required before and throughout the North Kessock project. Investment was required after the Scottish Environment Protection Agency (SEPA) identified a need for sewerage provision in the area to comply with the Urban Wastewater Treatment Directive and the Habitats Directive. The existing works had comprised only of maceration before direct discharge to the sea and the macerators were often out of service and required substantial renovation.



The pipelaying barge next to the Kessock Bridge

courtesy Scottish Water Solutions

Existing works

The existing wastewater catchment at North Kessock includes 391 properties with the majority of flows being pumped by the Bellfield pumping station and the remainder by gravity. Flows were joined together upstream of the macerator at Craighton.

Treatment comprised of maceration and direct discharge to the sea via the existing asbestos-cement outfall. When the macerator pumps were out of service, raw wastewater bypassed the macerators via a static bypass screen.

The existing storm tank at Bellfield pumping station comprised an old septic tank converted to a storm tank in the 1980s. Storm overflow to the storm tank was via a dedicated chamber when the Bellfield pumping station pumps were "beaten". Settled storm flows were discharged to the bay via a dedicated outfall fitted with a flap valve. Parts of the catchment was located below sea level flow and load surveys indicated high levels of infiltration during high tides.

Options

Several different options had been considered over a number of years

to improve wastewater treatment. These included a wastewater treatment works uphill from the village, ruled out because of the cost and potential planning issues. Another option looked at was a pipeline across the Kessock Bridge, but major alterations to the bridge would have been required.

After discussions with stakeholders the marine transfer option provided the most acceptable solution.

The proposed solution carried significant construction risks and opportunities but with little process requirement lent itself to a design and build arrangement. Scottish Water Solutions worked with contractors Morrison Enpure JV to develop the optimum design for the solution and deliver significant environmental benefits and allow for growth in the area.

New pumping stations at Bellfield and Craighton end of North Kessock would be required along with suitably sized storm water holding tanks at each site. Waste water would eventually be pumped across the firth via a pipe buried two metre under the seabed and connected with the Inverness sewer system at the Carnac pumping

station. Flows would be treated at the Allanfean treatment works which already handles waste water from across Inverness.

New works

- * At Bellfield pumping station the existing pumps have been replaced with two duty/standby pumps rated at 3DWF - 9 l/s each
- * A new storm overflow has been constructed with a 6mm 2D mechanically raked screen rated at 226 l/s. A new storm tank at Bellfield, requiring a 5m excavation adjacent to the foreshore, was also installed along with a new flowmeter to control the speed of the pumps.
- * A new pumping station at Craigton is equipped with two duty/standby transfer pumps to pump the combined Bellfield and Craigton sub-catchments 3DWF (10 l/s) to the Carnac Pumping Station.
- * As the existing sewer pumping main transfer pipe between Bellfield pumping station and Craigton pumping station was oversized for the new flows being transferred, a new transfer pipe of reduced diameter was also required to improve scour and self cleaning.

Marine crossing

Significant liaison took place with stakeholders over the 900m marine crossing required across Beaully Firth. In addition to SEPA and Scottish National Heritage, Ness & Beaully Fisheries, the Inverness Whale and Dolphin Conservation Society and Inverness Harbour Trust were consulted.

Detailed acoustic studies were carried out prior to work starting to approve the proposed pipelaying method and ensure potential disturbance was kept to a minimum.

The original plan put forward by the contractor (Commercial Marine Piling) was to lay the pipe across the sea bed using a 'spud leg' barge and water jetting units to clear a path for the pipe. supplied by Wavin, before laying the pipe in the trench.

Unexpected performance of the seabed material led the contractors to quickly decide to revert to a conventional trenching method using an excavator on a barge. During the pipelaying operation a marine mammal observer was required to carry out continuous monitoring of the area to watch for dolphins and ensure they didn't cross agreed thresholds around the working area.

On the direction of the Inverness Harbour Trust, the pipe had to be buried two metres deep to avoid the risk of being damaged by vessels dragging anchors. The seabed pipeline, like the Kessock Bridge, straddles the Great Glen fault line and has been designed with a degree of flexibility to withstand tremors.

The project has brought significant environmental improvements to the Beaully Firth and provided a holistic solution. As well as treating effluent from North Kessock to a high standard the solution has removed the need for a new works at North Kessock for Scottish Water to operate and maintain.

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Commercial Marine & Piling installing, trenching and backfilling sewage pumping main across the Beaully Firth in water currents up to 7 knots. 2007

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