North Down/Ards WwTW

first time WwTW for north of Ards Peninsula

by
Aled Rees BSc, CEng, MICE

The scenic coastal area east of Belfast in the north of the Ards Peninsula, which includes Bangor and the smaller towns of Donaghadee and Millisle, is a popular residential and holiday area. Until now, sewage from this area has been discharged directly into the sea with only rudimentary treatment. However, the new North Down/Ards WwTW will provide full treatment (including disinfection during the bathing season) when it commences service in 2008.

North Down/Ards WwTW Under construction *courtesy Glen Water*

Project Omega is a Public Private Partnership project between Northern Ireland Water and Glen Water (a joint venture company incorporating Thames Water and Laing O'Rourke) for capital works and the operation of seven wastewater treatment facilities in Northern Ireland.

Most of the project's capital works consist of improvements to existing facilities. **The exception is the North Down/Ards Peninsula in County Down, where a new treatment works and associated feeder pumping stations are needed to provide first time treatment for sewage from Bangor, Donaghadee and Millisle**

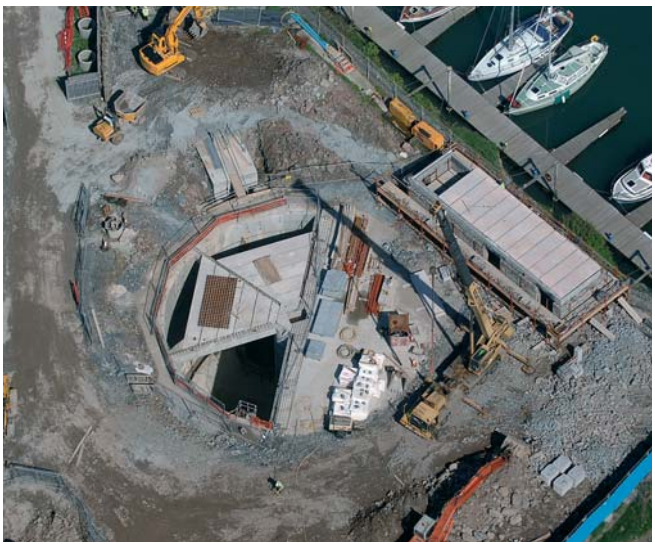
These works are needed by January 2008 and because of the tight programme, an advance works contract for the design and construction of the North Down/Ards Wastewater Treatment Works (WwTW) and the off-site PS's was awarded early in 2006. prior to the finalisation of the PPP contract. All of the building sites within the project are adhering to strictly enforced recycling and waste reduction initiatives as part of Glen Water's overall environmental management system.

Upon completion, the new WwTW facility will help Northern Ireland meet stringent EU directives on water quality, by improving the local marine environment and creating cleaner bathing waters along the North Down/Ards coastline.

Up until now, there has been only rudimentary treatment provided before sewage has been discharged to the sea, just below low water mark, at three separate locations in Briggs Rock (near Bangor), Donaghadee and Millisle. Wastewater from the three existing outfalls will now be intercepted, diverted into new pumping stations and then pumped to the new treatment works.

Storm water separation will also be carried out at each of the pumping stations, which will each be equipped with storm tanks and associated pumps, cleaning equipment and a storm return plant. Overflows from the storm tanks will be screened (by 6mm bi-directional screens) and passed to the existing sea outfall for discharge.

The new WwTW will possess sophisticated odour control technology and has been designed in sympathy with the surrounding landscape.



Progress at Donaghadee Pumping Station May 2007, shows the closeness to the coast

Artists Impression of the completed Wastewater Treatment Works at Donaghadee

All rock excavated during the construction process is being recycled into engineering fill material to help blend the facility into the countryside to reduce visual impact.

Before construction of the facility began, Northern Ireland Water secured planning permission by careful site selection and specifying that a completely covered plant be constructed, with stringent limits on odour and noise. Both criteria have been met and the new facility is meeting all of its construction targets.

The works
Situated near Donaghadee in County Down, the new WwTW has been designed to the following parameters:

* **future population equivalent 110,000;**
* **maximum flow to full treatment.. .. 810 litres/sec;**
* **effluent standard (95%ile) .. .. 35mg/l SS: 20mg/l BOD.**

The works will be completely enclosed, and consist of three buildings, two housing all the process units, one of which will be partially buried and landscaped, and the third smaller building housing the reception area, administration, welfare facilities and the control centre. This building will also be buried and landscaped reflecting the design of the treatment building.

Preliminary treatment
The preliminary treatment will consist of 6mm bi-directional screens, screening conditioning and grit removal - housed inside the Inlet and Sludge Treatment Building. The screened sewage will then be pumped to the Main Treatment Building.This will contain a crude sewage sequential batch reactor (SBR) plant, treated effluent balancing tank, and an effluent pumping station. The main treatment building will also house tertiary treatment units and ultraviolet disinfection, to meet the microbiological standard for the effluent, during the bathing season. All treated effluent will then be pumped to a long sea outfall in the Irish Sea.

SBR plant
The SBR plant will be a 'Fluidyne' system, consisting of a selector zone to improve the settling characteristics of the sludge and six SBR basins. The sequential phases of the 'Fluidyne' SBR system starts with the fill phase. During this phase, sewage feed enters the basin and the mixed liquor is subjected to static fill, anoxic fill and aerobic fill conditions. The react and settle phases follow. Finally decanting occurs.

Unlike most SBR systems, which use timed or combined timed/flow operation this SBR will completely fill each basin in every cycle, to optimise the treatment potential of each basin. During low flows an idle phase will be introduced before the fill phase, to allow the other tanks to fill. When in react and idle modes blowers supplying the process air will operate under the control of dissolved oxygen probes, for maximum efficiency. After the settlement phase, clarified effluent will be decanted, giving further treatment comprising filtration and disinfection during the bathing season, and then pumped to the outfall.

During the decant phase, surplus activated sludge will be extracted from the sludge blanket by submersible pumps. Sludge produced by the SBR process will be mechanically thickened using gravity belt thickeners to between 6% and 8% dry solids content, then taken by tanker to the nearby regional sludge treatment centre for further treatment. To meet the stringent odour limits set on the treatment works, air from the inlet works and sludge treatment area will be vented through an odour treatment unit and high- level stack in the inlet and sludge treatment building.

Design Challenges
The project has presented many design challenges: the main priority has been to meet the programme deadline, but there have also been constraints on project costs, the difficulty in designing and constructing all plant facilities to be inside buildings, and the need for the construction team to minimise any potential disruption within the local communities. These challenges are being met through a combination of close collaboration between the design, construction and buying teams, the plant suppliers; and an operations team, as well as the application of the right skills and expertise at every stage of the project.

Main parties involved in the project are:

Northern Ireland Water.. .. .. Client & PPP Partner;
Glen Water Ltd ... . PPP Partner;
Laing O'Rourke.. .. .. Construction
Thames Water .. .. Process design & operation;
Hyder Consulting.. .. .. Design;
Williams Industrial Services.. .SBR design & plant supply.

At the time of writing (May/07), construction work is nearing completion and installation of mechanical and electrical plant has commenced. Work on the project is currently on programme to complete by the due date of January 2008. ■

Note: *The Editor & Publishers wish to thank the author Aled Rees, a Principal Engineer with Hyder Consulting and the design team leader, for producing the above article*