

The Cardigan Catchment Solution

part of Welsh Water's £1.2 billion investment programme

by
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Cardigan town, on the east coast of West Wales, in the county of Ceredigion is an area of natural beauty favoured by tourists and a haven for wildlife. Cardigan bay is home to resident groups of bottlenose dolphins in the UK. Ceredigion County Council indicate significant growth is anticipated for Cardigan. Dwr Cymru Welsh Water environmental benefits to the Teifi Estuary and other water courses in the Cardigan



Cardigan Bay

courtesy: Dwr Cymru/Welsh Water

In order to meet the Bathing Water Directive of no more than 3 spills per bathing season there were a number of unsatisfactory Combined Sewerage Overflow (CSO) discharges in the catchment that needed to be addressed. However, the funded outputs meant that the complete solution would only be partially completed in AMP3. In particular there were no AMP3 drivers on the storm discharges from the Cardigan Waste Water Treatment Works (WwTW) although it contributed more than 50% of the total projected catchment spill volume.

Welsh Water Capital Alliance partners *Meica Process* and *Morrison Construction*, supported by cost consultants *ChandlerKBS* and *EC Harris*, worked closely together to arrive at an optimum solution for the whole catchment. Around 60 per cent of Welsh Water's £1.2 billion investment programme is being delivered by the Welsh Water Capital Alliance, a strategic partnering team, made up mainly of specialist engineering and construction companies.

The Integrated Catchment Solution (ICS) identified that in order to meet the AMP3 intermittent discharges improvements in Cardigan, work would be required both in the catchment and at the WwTW. The ICS involved the reduction of infiltration, CSO

and pumping station upgrades, the provision of storm water storage, and the increase of Flow to Full Treatment (FFT) at the WwTW.

The existing Cardigan WwTW was upgraded in 1998 from a trickling filter based system to a four tank Sequenced Batch Reactor (SBR) plant. The plant existing consent was 35BOD 25SS with a FFT of 55 l/s. The work identified was to increase the FFT at the Cardigan works to 100 l/sec together with the provision of 750m³ of additional storm water storage. This under the no EA detriment criteria for the consent meant the indicative new consent was 17BOD 10SS that could not be met by the existing SBR process. The preferred process solution was to change the works treatment process from (SBR) to Immersed Membrane Bioreactors (IMBR). The membrane modules would be accommodated within the existing SBR structures, and the reduced activated sludge process volume and footprint required would release a number of the SBR tanks for use as storm water tanks.

Selection of the IMBR process, which it was anticipated would meet a consent of 5BOD: 5SS: 5NH₃ allowed further increase in load of 20% above the requirements of AMP3, affording greater development potential for the Ceredigion County Council. The removal of the major contributor of storm discharges in the

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catchment of the WwTW and the process easily achieving the new tighter discharge consent, gave much greater environmental benefits than that funded for under AMP3.

The IMBR process utilises a physical barrier (the membrane) to separate mixed liquor suspended solids (MLSS) and liquid (final effluent) from the activated sludge process. The membrane pore size (0.1-0.4 microns) and biological plant performance ensures that high quality effluent is consistently produced. The membranes purchased were the *Kubota* submerged flat plate membranes along with process support were supplied by *COPA* MBRTech. All ancillary plant was designed and commissioned by *Meica Process*. The membrane system utilises a simple gravity permeation system, which minimised the need for auxiliary plant and sophisticated control.

Designed to treat a population of 16,000 it is one of the largest Municipal membrane treatment plants in the UK. The works constructed at Cardigan is also the first “double decker” IMBR installation in the UK, and presents a more efficient use of the air supplied to the activated sludge process. The double decker system utilises upper and lower decks of membranes with process and scouring air provided by coarse bubble aeration.

The reduced footprint of the double decker system meant that the membranes were installed in two basins in a modified single SBR lane.

Work at Cardigan WwTW and the catchment is the latest in a growing list of integrated catchment schemes. The combination of the expertise of Welsh Water Capital Alliance main partners *Meica Process* and *Morrison Construction* has delivered the best value by integrating the CSOs and process works into a complete sewerage network solution.

Positive benefits from this approach are that at no extra cost it has delivered greater development potential for Ceredigion and environmental benefits than funded for in AMP3. ■

Truly a Win Win Project

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Note: The author of this article, Gareth Withers, is Project Manager with Welsh Water Capital Alliances South West Team. The Capital Alliance is Dwr Cymru Welsh Water's strategic partnering team delivering the majority of its Capital Investment programme.