

“Basin at the 16th”; Deganwy, Wales



SuDS used

- *Attenuation basin (retrofitted)*

Benefits

- *Ecologically enhances the landscape by creating different habitats within the basin through a mixture of planting, boulder, dry and wet zones*
- *Attractive landscaping and choice of plants to provide visual interest throughout the year create greater amenity for golf club users and neighbouring residents.*
- *Use of landscaping and planting allows natural processes within the basin to improve the water quality*
- *The scheme manages water quantity by limiting the pass forward flow in the adjacent watercourse using a timber weir, with the basin providing attenuation volume for surface water*

1. Location

Llandudno (Maesdu) Golf Club, Hospital Road, Llandudno, LL30 1HU

2. Description

The "Basin at the 16th" in Deganwy has delivered the first Welsh Water green infrastructure RainScape scheme in north Wales. It is a large attenuation basin for managing stormwater generated through upstream surface water separation, retrofitted on previous scrubland, next to the 16th hole of a golf course. It is part of an overall national environment programme (NEP) being delivered by Welsh Water to reduce spills to the Afon Conwy estuary.

The design consists of an open planted attenuation basin sited immediately adjacent to the 16th hole of the Maesdu Golf Course. The retrofitted basin is providing offline storage which is hydraulically controlled using a simple timber weir with a low flow slot in the adjacent watercourse. Associated works included realigning a short section of the watercourse, providing new access bridges, and associated landscaping to reduce the amount of soil transported off site.

3. Main SuDS components used

Retrofitted planted attenuation basin

4. How it works

The basin provides offline storage volumes for attenuating increased surface water flows passing down the adjacent watercourse (see Figure 1) as a result of diverting more surface water into it from the upstream catchment.

A weir with a low flow slot controls the flow rate continuing downstream, to reduce flood risk. The excess water backs up behind the weir to fill the basin, emptying under gravity once the storm has passed.

5. Specific project details

Due to historic town development, approximately 8,000 m² of impermeable area in Deganwy was discharging surface water to a combined sewer, contributing to the downstream combined sewer overflow (CSO) exceeding its average annual spill limit. A nearby local watercourse was identified as a suitable receptor to divert this additional catchment area to, as it already served other parts of the same catchment. After separating and diverting the additional area via 150 m of new sewer, the additional surface water flows entering the watercourse needed to be controlled and attenuated to prevent increasing the downstream flood risk.

The options considered for attenuation were a green infrastructure sustainable drainage system or traditional buried storage tanks under the local roads. An open planted attenuation basin sited immediately adjacent to the existing watercourse, on land leased and operated by the Maesdu Golf club, was determined to be the best way to provide the attenuation as it would meet the objectives of Welsh Water's RainScape programme whilst adding biodiversity habitats and amenity value.

The scheme delivers better value for money for Welsh Water and its customers as a comparably sized below-ground tank within nearby streets. This was costed as being twice the capital cost to build and would have brought significantly greater disruption to the lives of the local residents during construction.

The design of the basin enabled an effective solution to be delivered to attenuate the flows while adding extra benefit to the local area. The bracken scrubland that was present next to the 16th hole was transformed to a biodiverse and aesthetically pleasing planted basin for the players, and neighbouring houses to enjoy. The plants, grass mixes and boulders were specifically chosen with the team's landscape architects and ecologists working to enhance the biodiversity of the basin.

The timber weir, footbridge and new crossing were designed to be sympathetic to the aesthetic of the existing golf course. The new crossing's headwalls are precast by a local company and faced with a stone to match the area. The timber weir was designed to match the existing timber banks to the

watercourse whilst also providing for relatively easy replacement in the future when the timber has reached its design life.

A key objective embraced by the design team was making sure the design was environmentally sympathetic to aid easy long-term maintenance by the golf club.

6. Maintenance & operation

As part of the design the team wrote a comprehensive maintenance schedule for the basin as part of the project. This was provided to the golf club who are taking on the maintenance. The schedule covered all items, including regular plant maintenance through to items that need very infrequent replacement.

7. Monitoring and evaluation

No detailed monitoring study is currently planned but this could change if Welsh Water choose to, as demonstrated with some of the research that has taken place on the their projects in Cardiff and Llanelli.

8. Benefits and achievements

Green infrastructure offers many benefits to both Welsh Water but also the environment and local communities. However, as with all engineering, poor design can limit those multiple benefits. The team recognised that diverse skills were needed to ensure the benefits were maximised. As such the design involved the familiar skills of geotechnical and civil engineers but also used the expertise of ecologists and landscape architects in the design to create a biodiverse and aesthetically pleasing basin, whilst minimising maintenance and offsite landfill.

The result has created a basin that maximises best practice with the four objectives of multi-functional SuDS design plus wider benefits.

Biodiversity: The plants, grass mixes, and boulders were specifically chosen with the team's landscape architects and ecologists to enhance the biodiversity of the basin, in accordance with Welsh Water's RainScape objectives.

Amenity: The bracken scrubland that was present in the chosen location was transformed into an aesthetically pleasing planted basin for the players and neighbouring houses to enjoy. The landscaping and choice of plants provides visual interest throughout the year from summer to winter. The works considered the golf course's original aesthetic and used timber to line the banks rather than concrete.

Water quality: The soft landscaping allows natural processes and plants to improve the water quality of the water leaving the basin.

Water quantity management: The scheme design limits the pass forward flow with the timber weir and the basin provides attenuation for the extra surface water flows the scheme has diverted to the watercourse.

Wider environment: The hydraulic model showed that removing approximately 8,000 m² of impermeable area from draining to the combined sewer would reduce peak flows at Deganwy Road CSO, reducing the frequency of spills occurring and the annual discharge volume to the estuary. As well as helping improve the estuary water quality, the removal of surface water from the combined system will mean savings in operational costs at the downstream sewer pumping stations (SPS) and Ganol wastewater treatment works, thus reducing Welsh Water’s carbon footprint - A major foundation of their 2050 vision.

9. Lessons learnt

Artists impressions are important for communicating the overall vision of a scheme early on to all stakeholders.

10. Interaction with local authority

The team liaised closely with both the Lead Local Flood Authority as well as the landowner. The basin required planning permission so the Local Planning Authority was also involved.

Considerable and proactive landowner communication work led by Welsh Water’s estates department was undertaken with significant collaboration with Morgan Sindall and Arup to address any concerns as they arose. This included meeting key representatives long before the design was finalised to discuss options, obtain their buy-in, and provide a drop-in session for members of the club to ask questions. Significant work was undertaken to help the landowner understand the risks that were present before the scheme was built and which the scheme removes. For example, using 2D modelling to illustrate the previous overland flood risks from the watercourse which the scheme reduced or removed.

The concerns of the local community were also taken into account in a number of ways. The team found ways to incorporate a significant volume of the excavated soil within the landscape design to add interest to the project while minimising the number of lorry journeys. Also, responding to local residents’ concern that the previously agreed trees would hinder their views of the sea, the team worked to find a solution that still provided the desired biodiversity for creatures while reducing the height of the planting.

11. Project details

Construction completed: 21/06/2019

Cost: n/a

Extent: Basin and works ~3,500m². Entire scheme size involves an additional ~8,000m² of surface water separation in the upstream catchment.

12. Project team

Funders	<ul style="list-style-type: none"> Welsh Water 	
Clients	<ul style="list-style-type: none"> Welsh Water’s Capital Delivery Alliance 	

Designers	<ul style="list-style-type: none"> Arup 	ARUP
Contractors	<ul style="list-style-type: none"> Morgan Sindall Infrastructure 	
Other		



Figure 1 Scheme plan



Figure 2 Prior to works



Figure 3 Photo on completion



Figure 4 Biodiverse design



Figure 5 Timber weir and footbridge



Figure 6 New crossing



Figure 7 Basin in-situ