

Coed Dolwyd Service Reservoir

Dŵr Cymru Welsh Water's £9m investment offers security of supply and storage to 70,000 customers in North Wales

The areas of Llandudno, Colwyn Bay and the Conwy valley are supplied with water from Llyn Cowlyd Reservoir. The water is treated at Bryn Cowlyd Water Treatment Works (WTW) and is fed to the Bryn Cowlyd Clear Water Tank (CWT) from where it passes to the trunk mains system in the Conwy Valley. Within the AMP5 Business Plan a proposal was supported within the supply/demand section to provide a new service reservoir and connecting mains within the Conwy Valley distribution zone. This paper details Dŵr Cymru Welsh Water's £9m investment to construct a new 25MI service reservoir in the picturesque Conwy Valley area of North Wales. The new Coed Dolwyd Service Reservoir (SRV) will ensure security of supply and storage of potable water for approximately 70,000 customers in the Colwyn Bay and Llandudno areas.



Concrete pump pouring base No. 16 - Courtesy of Costain Limited

Background

The total storage capacity in the local network was identified as requiring attention as it provided just 16 hours storage during average demand and 13 hours during peak demand. Bryn Cowlyd CWT, which is located approximately 12km south of Llandudno, provides 10 hours of the total network storage at peak demand. The trunk mains that connect the CWT to the main supply network were laid in 1900, 1920 and 1930 and operate at a pressure of up to 14 bar. Concerns were raised that should there be a failure of the trunk mains, this would sever the CWT from the main supply network.

It was also highlighted that the current level of storage within the network presents a significant restriction to the time available for a shutdown at Bryn Cowlyd WTW. This limited the extent of any maintenance or modification work that requires a plant shutdown. It is also a major cause for concern in the event of a reactive shutdown or flooding incident. Bryn Cowlyd WTW is sited in an area with moderate to high flood risk.

The design horizon for population predicted in 1997 for 2055 of 90,000 population equivalent was met in 2011, resulting from a significantly higher than the average population growth in the region. The consequence of the increase in population is a lack of hydraulic capacity in the trunk mains at peak demand. This problem will be exacerbated by an increase in population which is predicted to peak in 2056 with an equivalent population of 97,000.

Welsh Water operations report difficulties maintaining water levels in the SRVs in the network during periods of peak demand and many customers have reported issues with low pressure.

Design and construction

The scheme will provide 24 hours of storage at peak demand and will be located at the downstream end of the trunk main system. This will address the problems associated with lack of hydraulic capacity, future growth in population, and provide emergency storage in the event of failure of the trunk mains. It will also provide



The twin mains haul road overlooking the picturesque Conwy Valley
Courtesy of Costain Limited



Valve thrust chamber pipework and steel reinforcements
Courtesy of Costain Limited



New 600mm connection onto existing main
Courtesy of Costain Limited



Concrete pump pouring roof pour No. 8
Courtesy of Costain Limited

a considerable increase in the time available for shutdowns at Bryn Cowlyd WTW which will allow more time for maintenance activities and reduce the risks associated with emergency shutdowns.

The reservoir is a partially buried 112m x 56m x 6m high concrete tank. The volume of the SRV was calculated using the maximum population that is predicted to occur within the next 60 years by the Corporate Research and Information Unit of Conwy County Borough Council, and the per capita consumption rates for the various categories specified in DCWW's Water Distribution Design Manual (version 1.0). This resulted in a required operating volume of 22.24ML.

The service reservoir comprises of two reinforced concrete tanks each 53.75m x 53.75m x 5.17m high internally. The external walls of the reservoir have been designed to cantilever from the base slab. The walls taper from 550mm at the base to 300mm at the top. The tank base is 550mm thick around the edges and 250mm thick in between. The central dividing wall is 550mm wide constant width.

The service reservoir is not designed to resist flotation when empty. However the ground at the front of the site slopes away from the service reservoir. A system of perforated drainage pipes has been provided beneath the tank base to prevent any localised water pressure accumulations from developing.

The tanks are covered with a reinforced concrete cover slab which measures 300mm thick and supported on 350mm diameter reinforced concrete columns. The base slab of the service reservoir is thickened to 550mm locally beneath each column. The cover slab is designed for the loading resulting from a 300mm thickness of topsoil together with a 5kN/m² live load. The service reservoir will be set partly into the ground with the surrounding area raised around it to form embankments. The cover slab will be covered with topsoil and grassed.

In order to eliminate zones of stagnant water within the tanks, baffle curtains have been provided to create a flow path within each tank from the inlet to the outlet.

Flow into each tank of the service reservoir will be controlled by a DN600 actuated butterfly valve. These will operate as open/close valves, not modulating valves. They will be controlled to close when the water level in the tanks approaches the defined top water level, and open when the level drops. Manual isolation valves will also be provided on the inlet and outlet mains.

High level overflows were constructed in each tank which operate in the event of a control valve failure. Low level outlets are provided for each tank. These will draw water and any settled solids from a localised sump. They will normally be used as wash-outs for tank drain-down during cleaning. The drains, overflows and washouts will discharge into the site drainage system which will discharge into a ditch approximately 220m from the service reservoir site.

The team will also construct a control room which will house a control panel, incoming power metering, telemetry and chlorine dosing system. The design also includes the construction of a 1.5km long twin pipeline made of DN600 ductile iron that links the mains network with the SRV.

The inlet and outlet pipes are connected to an 18" diameter steel trunk main and 2 (No.) 15" diameter cast iron mains. The 18" main is located in a field, and the 2 (No.) 15" mains are located in a lay-by on the A470 road. The connections are valved to allow isolation of each pipe separately and isolation of the service reservoir completely with flows maintained in the trunk main system.

Health and Safety has been the number one priority throughout the project delivery process. The team working on Coed Dolwyd SRV is

proud of the exceptional standards that have been achieved over the project cycle and have demonstrated continuous improvement to the health and safety culture and performance on site.

Environmental

The project has been designed to allow for minimal impact on the local environment and measures have been put into place to enhance biodiversity. The project is reusing 100% of the excavated material (approximately 32,000m³) as backfill to reinstate the SRV and pipeline. Approximately 500m³ of excavated material was used for temporary roads and lay down areas. This has great environmental and cost benefits as it has reduced the need for excavated material being transported to landfill and reduced the amount of deliveries to site.

The pipeline route was designed to utilise existing gaps in the hedgerows and avoiding trees where ever possible. Upon completion, the hedgerows will be replanted and will be enhanced and widened via landscape planting which is intended to increase its potential to provide a suitable wildlife corridor. There will also be a new pond constructed which aims to provide significant wildlife enhancement in an area which has been identified as having a lack of suitable breeding sites for the protected Great Crested Newts.

Approximately 12.5ML of water was recycled during the leak and pressure testing of various structures.

Third parties

The project has received positive support from the local council, stakeholders and the Conwy County Borough Councils planning department from the outset. Gwynedd Archaeological Trust (Contracts Section) has been working with Costain during the scheme to monitor the groundworks for identifiable archaeological activity and to mitigate any activity found. Archaeologists identified a site within the workzone, which includes a hearth, associated with

various pits and postholes. A piece of decorated pottery, found in one pit, indicated a prehistoric date.

The local community was informed of the scheme via a public exhibition and extensive letter drop. The local community council has been updated on a frequent basis and a regular progress newsletter has been produced for the residents of Glan Conwy and surrounding areas.

There have been numerous site visits carried out during the construction phase. The local college was invited to the site to gain some working knowledge of a civil engineering project. The team have also welcomed many local MPs, Assembly Members and local councillors to the scheme who have received a presentation and tour of the construction works.

This Coed Dolwyd Service Reservoir has been delivered by Costain Limited as part of the AMP5 Capital Delivery programme for Welsh Water. Construction commenced on site in June 2012 and is programmed to be commissioned and in operation by the end of December 2013.

Key participants:	
Client	Dŵr Cymru Welsh Water
Principal Contractor	Costain Ltd
Design	Aecom
Main sub-contractors	Dawnus Construction Ltd LME Whitland Engineering Water-Lines Solutions Ltd

The editor and publishers wish to thank Costain Ltd and Dŵr Cymru Welsh Water for preparing the above article for publication.



Established in the 1980s, Whitland Engineering Ltd serves the engineering needs of the utilities, food and dairy industries across the UK in a wide range of disciplines including:

- ▶ Mechanical Fabrication ▶ Electrical ▶ Process Logic Control Systems
- ▶ Civil Construction ▶ Project Management.



Services provided to the utilities for the provision of both potable water and wastewater include:

- Turnkey project management & delivery.
- Detail design and drawings in AutoCAD 2013 or as 3D models in Autodesk Inventor 2013.
- Mechanical and plant installations, maintenance & refurbishment.
- Fabrications in stainless steel, aluminium, mild steel and GRP.
- Design & fabrication of pipework, bridges, access walkways and platforms, tanks & vessels, skid mounted process plant and clean in place systems.
- Electrical installations including control panels, PLCs, networking and automation.
- Civil engineering works associated with M&E installations.

Whitland Engineering
Unit B, West Street
Whitland
Carmarthenshire
SA34 0AE

Tel: 01994 240 442
Fax: 01994 240 937
info@whitlandengineering.co.uk
www.whitlandengineering.co.uk

