

Coundon Reservoir

a reservoir within a reservoir to improve Coventry's water quality without disturbing the people of Coundon

by Paul Higgins

Scots Lane is just 2 miles from Coventry city centre, and is home to Christ-the-King Catholic Junior School, 90 residential properties and the Coundon Reservoirs. In the late 19th century, Reservoirs 1 and 2 were constructed. They were built with 13,000 tonnes of brickwork, hand-crafted into two adjoining reservoirs of arches and domes. The two tanks provided 7ML of clean water each and sat alone on the plot of land until 1932, when demand proved such that a third reservoir was required. Reservoir 3 was a modern 35ML tank of mass concrete construction. All three were buried, showing off nothing more than undeveloped idyllic grass hills to the closely surrounding houses and Radford allotments that still remain to the north-east of the site today. At nearly 120m above sea level, this is the ideal storage location from which to supply 50,000 people from the city of Coventry with clean water.



Initial earthworks prior to the demolition of Reservoir 3 in close proximity to surrounding properties - Courtesy of Costain Ltd

History

Severn Trent Water (STW) have owned and operated the three reservoirs for the past 40 years and between 1932 and 1990 the site was operating at full capacity thanks in many ways to the bustling Coventry mining and manufacturing industries throughout the 1900s. In 1990 Reservoir 3 was taken out of service and Reservoir 1 is presently the only tank in use.

The problem

Reservoirs 1 and 2 are considered to be past the end of their asset life and water ingress into the operational Reservoir 1 has posed a significant threat to the water quality of the area for a number of years. Improvement works in the form of a loose laid membrane on the roof of Reservoir 1 has extended its life to some extent but ingress does still occur via the brick walls.

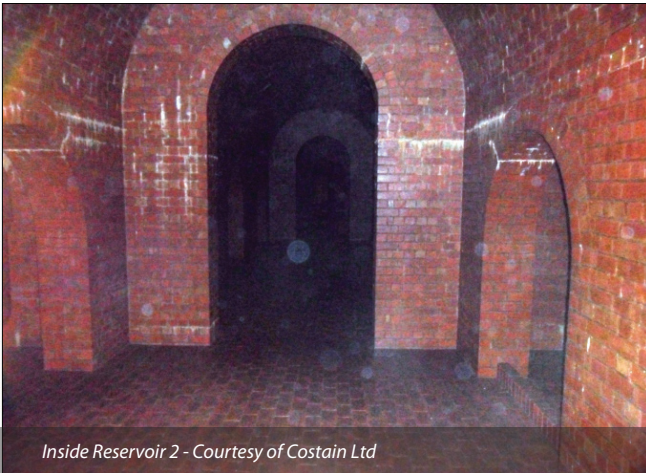
The inevitable worsening of this issue will soon put the reservoir out of service, meaning that the entire site would be bypassed and

2,000 properties put at DG2 risk (pressure/flow below the reference level). Reservoir 3 could not be utilised in such an occurrence as it has also suffered water quality issues, partially contributing to the need for decommissioning in 1990.

The solution

STW and their supply chain partners identified the need for improvement works for the reasons detailed above; the water quality and pressure issues associated with the site are increasing with few contingencies in place. Their solution was to construct a new reinforced concrete reservoir within the footprint of the existing Reservoir 3, and following commissioning and handover, to demolish Reservoirs 1 and 2.

The new 9.5ML tank was to be constructed with three of the four walls cast up against the old walls meaning that the new reservoir is nestled inside the shell and the respective grass banks of its 1930s predecessor.



Inside Reservoir 2 - Courtesy of Costain Ltd

As well as an upgraded two cell reservoir, the scope included the installation of new inlet and outlet pipelines and connections, as well as a new overflow/washout pipeline. Other works included the demolition of the remainder of Reservoir 3 and decommissioning and demolition of Reservoirs 1 and 2; improvements to the existing access from Scots Lane; a new grasscrete road and parking area; and the complete landscaping of the site following demolition, which includes burying the exposed extremities of the new tank to turn the site green once again.

Innovations and ideas

Long reach excavators: The 6,000m² Reservoir 3 roof had a covering of between 250-600mm of reusable subsoil and topsoil. However, there was not enough as-built structural information available to give permission for construction plant to operate on the very lightly reinforced roof slab. To be able to strip the reusable material off the roof, long-reach excavators were proposed by Armac Demolition.



Reinforced Concrete Works: the base slab and valve chamber walls already in place with the reservoir walls and columns mid construction
Courtesy of Costain Ltd

A reach of 29m meant that all but a 7m strip could be removed from the roof before demolition and crushing. This resulted in yet more environmental benefits in terms of segregation and reuse of materials on site. Topsoil could then be stored on site for the final landscaping and the concrete could be crushed without the need for further screening.

Single-sided wall shutters: Using the existing concrete walls to aid in the construction of the new tank carries benefits such as cost and time reductions of the demolition works and reduced environmental impacts to the local community. But it also raised methodology issues in terms of pouring the walls of the new reservoir as conventional wall formwork could not be used.

Everhall Ltd, the FRC subcontractor suggested using A-Frame single sided wall shutters. This system utilises cast-in anchor bolts at the foot of the pour and large A-Frames along the length of shutter to withstand the forces exerted on the forms by 6m head of wet concrete. A low rate of rise was stated on the temporary works design and this was a very important factor in the placing of concrete during each pour.



Single sided A-Frame wall shutters alongside the existing Reservoir 3 walls - Courtesy of Costain Ltd

Construction issues and restraints

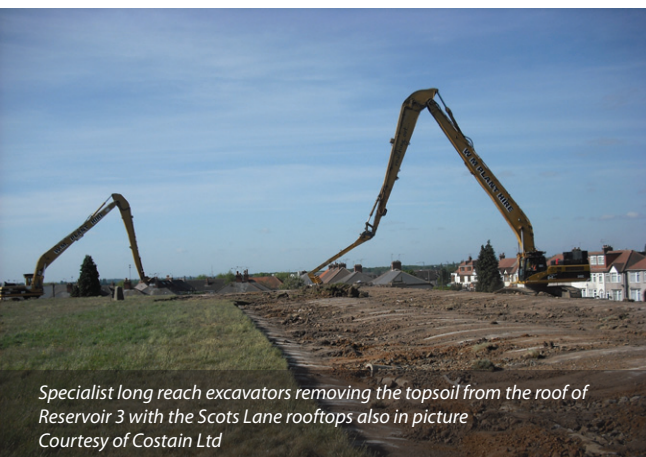
For numerous reasons the project was always going to be socially sensitive and the management of the many interfaces between residents, communities and committees was key to its success.

The site is bounded to the north, south, west and much of the east by residential dwellings which are intersected only by a junior school and local allotments, the latter of which borders the site and actually forms part of the construction area.

Part of the scope was to install a new 350mm diameter overflow/washout pipeline over a linear distance of 350m through the allotments to discharge into a local watercourse, Radford Brook. Washouts of existing reservoirs had previously resulted in the flooding of allotment plots and neighbouring properties, something that had not been forgotten by the locals; another contributing factor in STW's decision to complete the works.

This installation would disturb 17 individual plots on the site and would restrict access to many more; the timing and management of the works were crucial. With many potentially disgruntled plot holders, STW and Costain-MWH highlighted this as a high risk operation and arranged meetings with the allotment committee long before the works were scheduled to commence.

The installation of the pipeline was programmed to take place over the winter months to minimise disruption to individuals. Furthermore; close liaison was ensured prior to, throughout and after the works with an agreement to replace everything that was removed like-for-like or to a higher standard.



Specialist long reach excavators removing the topsoil from the roof of Reservoir 3 with the Scots Lane rooftops also in picture
Courtesy of Costain Ltd

Keeping the noise down: 1,800 properties are located within a 300m radius of the site, 45 of which actually share a fenceline. A construction site was never going to go unnoticed in Coundon. This was not helped by the fact that the perfectly green 6 acre site had sat there on Scots Lane silently and relatively untouched for over 70 years.

STW and Costain-MWH were well aware of this issue, so mitigation measures introduced into the design were to keep the walls and embankments of Reservoir 3 in place during construction to act as a barrier for noise, vibration and dust and to shield the site visually from the neighbouring houses and community.

130m of the existing walls have permanently remained in place. These walls were used as 'rear shutters' for the East, South and West elevations of the new reservoir which they now enclose.

STW and Costain-MWH held several open days at local venues, kept site hours to weekdays only and employed specialists to undertake background noise and vibration monitoring to ensure that the utmost was done to reduce disruption to residents during the works. Specialist plant was also used to suppress dust in the unusually dry April of 2011.

Considerate constructors: The project enrolled on the Considerate Constructors scheme and, between June 2011 and March 2012, achieved continuously improving scores, each one putting the site in the top 10% in the UK. A score of 37/40 helped the site achieve an *above and beyond compliance* award.

The categories that consistently scored the highest were 'Environment' and 'A Good Neighbour'. A key feature of the detailed design was that all materials arising from demolition would remain on site for reuse in the construction of the new reservoir and for landscaping. The concrete arising from demolition was crushed to 6F5 spec and used for under-slab drainage to the new structure and for crane mats and haul roads throughout the works.

This, along with 96% of all other waste being diverted from landfill, reduced the potential carbon footprint of the site enormously. It also dramatically reduced the number of vehicles entering and leaving site which again enabled the site team to manage other public interfaces from a stronger position.

In 2012 the site team won a golden RoSPA (Royal Society for the Prevention of Accidents) award for their hard work to date at Coundon. This honour recognises outstanding achievement in occupational health and safety management and is judged largely on the results of other internal and external scored audits.

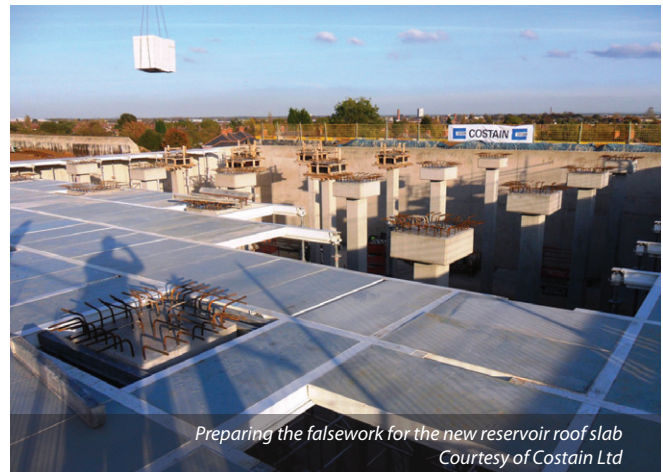
Progress

The installation of the new 350mm diameter overflow/washout pipeline in the allotments was completed in February 2012 with excellent feedback from the plot holders.

At the time of writing (April 2012) the new reservoir is currently in the commissioning stage and is due to go into service in the coming weeks, whilst Reservoir 1 is overdue a much deserved retirement and is scheduled to be demolished in the summer of 2012.

Despite the many challenges encountered during the feasibility, design and construction stages, STW and Costain-MWH have collaborated, innovated and overcome to make this project a success at many different levels. And perhaps most importantly, the people of Coventry can be assured of quality drinking water for many years to come.

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Preparing the falsework for the new reservoir roof slab
Courtesy of Costain Ltd



Crushing the concrete arising from the Reservoir 3 roof slab with a Dust Boss dust suppression system in place - Courtesy of Costain Ltd



Demolishing the roof of Reservoir 3
Courtesy of Costain Ltd



An access track through Radford allotments after the pipeline installation - Courtesy of Costain Ltd