

Allington Reservoir

capacity upgrade

by Joe Edmunds BEng(Hons) ACSM

Allington Reservoir is situated at Kington St Michael between Chippenham and the M4 Motorway. The existing site provided an effective volume of 3.35MI serving a local population of approximately 6,500 via gravity to the distribution network to the north of Chippenham. The site was first identified within the AMP5 programme of reservoir upgrades. As part of Wessex Water's Water Supply Grid programme of works it was determined that storage at the site needed to be increased by 5MI in order to ensure security of supply to customers and meet future demand in the area. Providing additional strategic storage at Allington within the network will also allow release of excess water in the Malmesbury area and meet with the statutory duty to balance the supply of and demand for water up to the year 2035 as set out in the Water Resources Management Plan approved by Defra in 2010. This paper summarises the design considerations and construction of a £4m new 5MI reservoir at the existing site to meet the required output.



Construction of the walls and columns - Courtesy of Wessex Water

Existing reservoir and operation

The existing reservoir has a gross capacity of 6.8MI. The reservoir is a twin cell structure with baffle walls in each cell and it receives flows into both cells via a single 21" pumped main from Rodbourne WTW some 10km to the north of site. Distribution from the existing reservoir was via two outlet mains, one feeding to Hardenhuish reservoir and the second to the pump station feeding to Fiveways reservoir and to Yatton Keynell.

Contractual Arrangements

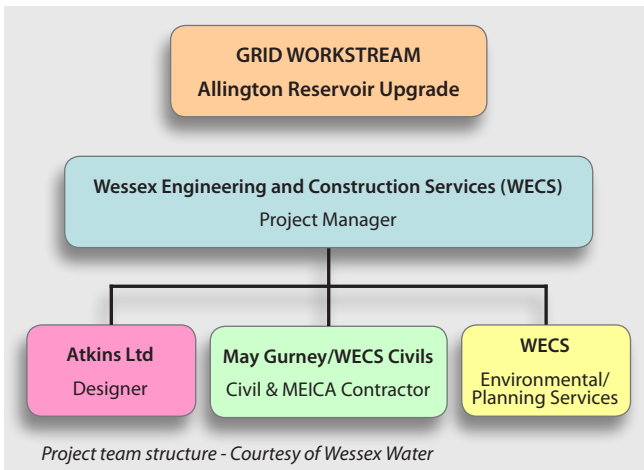
Wessex Water's internal engineering and construction services business, Wessex Engineering and Construction Services (WECS) is responsible for managing the overall delivery of the Water Supply Grid programme of works, with both WECS, Atkins Ltd and AECOM providing engineering design, planning and environmental services. Individual projects within the water supply grid programme of works are delivered in close partnership with the

scheme contractor. For Allington, design services were provided by Atkins Ltd, with CDMC, planning and environmental services provided by WECS. The scheme civil and M&E contractor was initially May Gurney; however the scheme was later transferred to WECS Civils.

Design

The water supply grid programme of works represents the largest single programme of service reservoir construction and includes the construction of 12 new service reservoirs.

Previously service reservoirs have been built as required with no common designer or construction team. The programme gave the opportunity to standardise elements of the design and construction process. Therefore within the operational and site constraints for each reservoir structural design and detailing has been standardised leading to efficiency of design and construction.



Extensive discussions with the operational and maintenance teams have led to standardised roof waterproofing and coverings, slope angles, maintenance ramps and footpaths and reservoir access covers including orientation and ladder arrangements. Discussion with the reservoir cleaning teams has also resulted in standardised internal pipework arrangements, channel and sump details and washout sizing.

Option selection

It was determined at option stage that the existing reservoir did not meet the Wessex Water design standard in terms of storage provision and it was agreed with the client that an additional 5ML of additional storage was required to meet the scheme output. The works identified were:

- A new 5ML reservoir.
- A new off site washout to mitigate off site flooding caused by inadequate highway drainage.

To achieve the additional storage requirement three options were considered:

- A single cell reservoir in parallel with the existing reservoir, providing 5ML
- A double cell reservoir in series with the existing reservoir, providing 5ML
- A double cell reservoir in series with reduced footprint.

Not considered were alternative materials for construction (i.e. other than in situ reinforced concrete due to durability concerns and operator preference) and construction common with the existing reservoir structure.

The preferred option was a double cell reservoir operating in series with the existing reservoir and providing 5ML of storage. Although more complex and potentially more expensive to construct than the single cell parallel option, it offered greater operational flexibility, reduced velocities through parallel outlets and hence reduced submergence and greater storage capacity, less complex pipework, no requirement for controlled inlet flow splitting and a reduced risk of sediment carry over when operating at low reservoir levels.

Outline and detailed design was completed by the water supply grid workstream design partner, Atkins Ltd, with early contractor involvement provided by the workstream civil and M&E contractor. This approach facilitated optimisation of design detail to the contractor's preferred method of working, early identification of temporary works and specialist plant requirements, definition of earthworks quantities and storage facilities required and diversion of services to facilitate the contractors method of working.

It also enabled working areas and access requirements to be identified early and arrangements to be made in good time with land owners to minimise impact of the works on use of the land and any impact on local businesses.

The final agreed design comprised:

- A new partially buried and impounded 5ML twin cell reinforced concrete reservoir arranged downstream and in series with the existing reservoir on the site.
- A new 2.7km 500mm diameter washout with dechlorination and flow monitoring discharging to a watercourse and bypassing existing highways drainage.

Environmental

During the design process extensive consultation with stakeholders and the undertaking of extensive environmental and ecological investigations allowed the scheme to progress without the requirement for an Environmental Impact Assessment.

ADS FORMWORK LTD

ADS Formwork Ltd was formed in August 2011 as a specialist subcontractor providing formwork, steelfixing and concreting services to the civil engineering and building industry. The Company Directors, Alan Rosindell, Darrell Legg and Shaun Legg have considerable experience in reinforced concrete construction with particular emphasis on the Water Industry and the Rail Industry for which we are Link-up approved.



ADS Formwork are pleased to have worked with Wessex Water Services Ltd in the successful completion of Allington Reservoir

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Ecological investigations were undertaken by the Wessex Water environmental team and included protected species surveys. These surveys identified the presence of a main badger sett on the reservoir site located directly above the new inlet pipework location. Prior to any works on site it was necessary to construct an artificial sett in an alternative location on the reservoir site and move the badgers under licence from Natural England.

Construction

The workstream contractor, May Gurney, commenced works on site in November 2012 to establish the work site. Due to the requirement to store approximately 8,000m³ of excavated material on site for back filling the reservoir after construction a substantial temporary work area of 22,000m² was required.

Due to the requirement to divert the Fiveways main, it was decided to construct the base excavation and slab in two stages. Excavation to formation over the southern section of the base was completed and blinded in January 2014.

This section was then poured and wall construction commenced on the south walls while the Fiveways main was diverted and the north base section was then excavated and poured.

As soon as practical and prior to completion of the walls roof construction was commenced. This concurrent construction allowed efficient use of labour, plant and formwork and resulted in a programme saving to mitigate earlier time lost due to poor weather. The reservoir structure was structurally complete in July 2014.

Concurrently with construction of the reservoir structure the new 2km 500mm ID washout was constructed. This was required to be complete in time to allow draining of the new reservoir after water testing.

During construction of the reservoir it was agreed with May Gurney that the construction would be handed over to the Wessex Water civil contractor, WECS Civils. Handover was completed without delay to the scheme.

On completion of the structure it was internally cleaned and successfully water tested. This then allowed waterproofing, drainage installation and backfilling to commence and the external inlet and outlet pipework to be installed.

After making the final connections and installation of instrumentation, sampling facilities and telemetry modifications the new reservoir was cleaned, disinfected and filled. Particular care and attention to cleanliness was taken during construction to prevent any contamination of the internal surfaces of the reservoir surfaces.

Potential contaminants were strictly controlled and not allowed on the base slab or in the structure at any time. The attention to detail even extended to the type of wheels used on the mobile access platforms. The measures taken ensured that the reservoir passed all water quality testing first time ensuring that the reservoir was placed put into service ahead of programme.

Conclusions

Construction of the new 5ML storage tank was commenced in November 2012 and was put into service in 12 months later, ahead of programme and within budget. The new storage facility at Allington provides an additional level of security of supply to Wessex Water customers in the Chippenham area for at least the next 25 years and providing additional strategic storage.

The Editor and Publishers would like to thank Joe Edmunds, Project Manager (Water Supply Grid) with Wessex Water Construction Services, for preparing this article for publication.



Construction of the base slab - Courtesy of Wessex Water