

Middleham Service Reservoir

rebuilding reservoir in area of outstanding national beauty

by
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Middleham service reservoir (SR) was one of Yorkshire Water's (YW) aging assets, located in the Yorkshire Dales National Park and was constructed in the late 1880's to serve the local town of Middleham. It is believed that the structure originally had masonry walls and floors with a clay backing. Over time, concrete was added to the reservoir and it is thought that the walls were rendered with mortar in the late 1950's. At this time, a steel beam roof with pre-cast concrete units was added.



Middleham' Aerial photo showing finished structure of reservoir

courtesy Yorkshire Water

Problem

An inspection in May 2003 showed the reservoir had major bacteriological problems. The inspection also showed that the roof was structurally unsound leading to a great deal of water infiltration. The reservoir was deemed to be past the end of its asset life and was taken out of service.

As a result of this, the Middleham area was supplied from Witton Moor SR, approximately 8 miles away via a pressure relief valve. This reservoir was originally designed with existing storage capacity at Middleham SR being available. Without this storage capacity, demand was on occasions in excess of the available storage capacity at Witton Moor SR, due to the additional demand from the Middleham area. This situation led to a requirement for tankering supplies to Witton Moor SR in order to supply the area.

It was determined that supplying Middleham from Witton Moor SR proved to be unsuitable as a long term solution, as there were two DG3 (loss of supply) reportable failures from 2003 to 2005. The first occasion was in December 2003, where supply was lost for over six hours affecting 400 properties, including a number of race horse trainers who are based in the town (the gallops are located next to

Middleham SR). The second occurrence was in June 2004, where supplies were lost for just under six hours.

With Middleham SR excluded from the network, adequate storage was compromised. Therefore, storage at Middleham SR was required to mitigate the risk of losing supplies to the area,

Reservoir construction

Working with YW's AMP4 Contract Partner Costain, the solution to this problem was to provide a new service reservoir at the Middleham SR site. This consisted of constructing a new 323m³ reservoir within the existing reservoir footprint, without altering the existing reservoir profile.

The project contract stated a 'like for like', 450m³ reservoir was required, but this was not feasible within the existing footprint of the SR as there was not enough space available. The project team agreed that utilising the existing space and profile was an innovative, environmentally friendly approach to the problem and was acceptable to Yorkshire Water. Therefore, the maximum size reservoir that could be constructed within the existing site was 323m³. This was acceptable because it maintained customer supplies in the area,



Middleham Service Reservoir during construction

courtesy Yorkshire Water

Construction involved removal of the roof off the abandoned reservoir and construction of a new 323m³ in-situ reinforced concrete, twin compartment reservoir in the existing footprint. The inner face of the existing reservoir was retained to act as a permanent shutter for the outside walls of the new twin cell tank. *Zemdrain* was also used to ensure a smooth finish to the interior walls and columns, mitigating the risk of bacteriological failure of the reservoir once it was in service. The reservoir roof was constructed using *Omniadeck* panels. This removed the need to temporarily shutter the roof for in situ concrete, as the *Omniadeck* forms part of the overall final construction.

Financial benefit

Instead of constructing the new reservoir on new land, it was constructed within the footprint of the existing service reservoir.

The capital savings attributable to this approach were:

- * avoidance of land purchase;
- * avoidance of excavating 720m³ of earth;
- * avoiding having to dispose of 360m³ of excavated material;
- * reduced lengths of pipework, drainage & ducts required, as existing were modified;
- * existing access and fencing could be retained.

Outperforming customer expectations

The major benefits of taking this approach to construction were that it allowed excellent relationships with the local neighbours and landowners to be maintained and it reduced the environmental impact on the area in which the reservoir was located.

Middleham village is located in the Yorkshire Dales, an area of outstanding natural beauty and a National Park. This means that development is restricted and strict planning guidelines are applied. If the reservoir had not been constructed on the existing site, it would have been extremely difficult to gain planning permission to construct on a green piece of land, as well as expensive to ensure it fit with the surroundings of the area. As the new reservoir was constructed on the existing site, planning restrictions were minimal and the size of the reservoir meant that not only could it be constructed in the existing footprint, it could also be constructed to the same profile as it was, meaning there was no change to the profile of the land.

The local planning authority praised Yorkshire Water for taking this approach and constructing a hugely beneficial environmental project.

Another major success story for this scheme was that the liaison with the local population was excellent. The reservoir is located within horse racing gallops, where prized horses are trained daily. This needed to be taken into account during construction, thereby minimising disruption in terms of noise, dust and dirt and danger to horses. The local landowners, YW and Costain worked together throughout this scheme to ensure that it was a success. ■

Conclusion

Construction of Middleham Service Reservoir was completed in August 2006. The reservoir is now delivering a much improved service to customers in an area of outstanding, natural beauty.

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