The Reservoirs Act 1975 and the Protection of our Cultural Heritage

Das Talsperrengesetz von 1975 und der Schutz unseres kulturellen Erbes

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Abstract

This paper outlines some of the responsibilities which face the owner/undertaker of reservoirs subject to the Reservoirs Act 1975. In some cases those reservoirs form part of our Cultural Heritage and in many cases the sites are 'protected' against damage and environment and other changes which are deemed to require consideration.

Zusammenfassung

Der vorliegende Beitrag umreißt einige der Verantwortlichkeiten, denen sich die Eigner und Betreiber von Talsperren, die unter das Talsperrengesetz von 1975 fallen, stellen müssen. In einigen Fällen bilden diese Talsperren Teile unseres kulturellen Erbes und in vielen Fällen werden diese Standorte gegen Schäden, Umwelteinflüsse und andere Veränderung, die in Betracht gezogen werden müssen, geschützt.

1 Legal Foundation

All reservoirs with a capacity of more than 25,000 cubic metres of water above the level of the natural ground surrounding the reservoir are subject to the Reservoirs Act 1975. As such, the owner or undertaker (the organization who uses the water) has to employ a Supervising Engineer 'at all times' to supervise the reservoir and watch for signs of change which might be indicative of a failure mode, and also an Inspecting Engineer to carry out a 'periodic inspection'.

The Inspecting Engineer carries out a statutory inspection at least once every 10 years or when the Supervising Engineer so recommends.

Under the provisions of the Reservoir Act, 1975 the Inspecting Engineer writes a report 'as soon as practicable' after the inspection and includes in it "any recommendation he sees fit to make as to the time of the next inspection, or as to measures that should be taken in the interests of safety".

It is these recommendations in the interests of safety that are legally enforceable and thus they have to be done, in fact, unless the owner takes the matter to a referee, the undertakers 'shall as soon as practicable carry the recommendation into effect'.

2 Recommendations in the Interest of Safety

In the preamble to the Act there is no clearly stated definition of safety. Safety is discussed in relation to its effect on the public, 'persons and property' and this on the consequence of failure and thus it is normal practice for Inspecting Engineers only to make recommendations in the

interests of safety if they are necessary to prevent an escape of water which poses a threat to persons and property.

The Inspecting Engineer may state a date by which measures in the interests of safety should be completed but this is not a specific requirement of the Act. Since the Water Act 2003, where the Environment Agency became the Enforcement Authority in England and Wales it is being suggested that for a Category A dam, - a dam where a breach could endanger lives in a community (> than 10 persons) that recommendations should be complete within 3 years; for a Category B dam – a dam where a breach could endanger lives not in a community, within 4 years and for Category C and D dams where no loss of life is foreseen – within 5 years.

Where an owner/undertaker feels aggrieved by any recommendation they may refer their complaint to a referee appointed under Section 19 of the Act. Following investigation of the complaint the referee has the power to make modifications to the recommendations in the report and such recommendations supersede the recommendations contained in the original report.

Recommendations made in the interests of safety by an Inspecting Engineer should be written with care to allow the owner/undertaker and the qualified Civil Engineer action under Section 10(6) who put the recommendations into effect some flexibility in the means of implementing the recommendations. These recommendations should avoid being prescriptive and they should be written in a form that allows certification as being complete.

3 The Reservoirs Act 1975, Recommendations and Money

Whereas the Act has many clauses which puts time periods on activities and is not very prescriptive, and indeed some phrases require and, are being interpreted in ways that owners have to carry out recommendations in the interests of safety, which will affect owners. However, the Act does not make any reference to money and the ability of an owner to pay to meet his obligations, with regard to safety.

Obviously with the requirements to employ a Supervising Engineer, an Inspecting Engineer, the need to develop ‘Flood Plans’ under the Water Act 2003, and then a need to carry out recommendations in the ‘interests of safety’ quite severe financial demands can be made on an owner/undertaker particularly when that owner is a private individual, a small business, a charitable organisation or a trust.

In the UK, competitive tendering and poor procurement policies adopted by some companies, especially large ones, who impose charging rates on engineers associated with reservoir safety, in fact the charges made by Inspecting Engineer, Qualified Civil Engineer and Supervising Engineer are very low when compared with the charges made by other professionals such as lawyers, solicitors, doctors, accountants etc. Unfortunately our clients seem to be happy to pay other professionals a reasonable rate for their services but not reservoir safety engineers!

4 Case Histories

The National Trust as a registered charity founded in 1895 exists to look after places of historic interest or natural beauty permanently for the benefit of the nation across England, Wales and Northern Ireland.

As an organisation it is independant of Government and receives no direct state grant or subsidy for its general work.

In the 1990's the National Trust purchased an estate in Gloucestershire known as Woodchester Park. This is described as a beautiful secluded Cotswold valley. The valley of Woodchester Park contains a 'lost' garden - the remains of an 18th and 19th century landscape park with a chain of five lakes, fringed by woodland pasture. The valley is designated an 'Area of Outstanding Natural Beauty, a Site of Special Scientific Interest and a Cotswold Hills Environmentally Sensitive Area' – all of these designations mean that third parties have a say in what is done in the valley including reservoir safety issues.

Before the estate was purchased the Trust asked an engineer, a Supervising Engineer, whether the dams which impounded the 5 lakes were in a satisfactory condition without the need for any large expenditure. The estate was purchased on the recommendation of this engineer who said no large expenditure was necessary but unfortunately when the statutory inspections under Section 10 of the Reservoirs Act, 1975 were undertaken the Inspecting Engineer made a number of recommendations in the interests of safety at each dam, primarily associated with inadequate spillway capacity.

To compound the problems faced by the National Trust the estate was 'restricted' by a number of covenants which meant that funds to carry out repairs to the estate were limited to those raised by the estate, and then the recommendations made in the interests of safety were very prescriptive – the Trust being faced with the construction of very expensive reinforced concrete structures at most of the dams.

Faced with the problems of limited finance and a limited time period in which to carry out the work when the discussions with the Inspecting Engineer failed to achieve a satisfactory outcome the 'Trust' felt they had no alternative but to seek resolution of the problems by appointment of a referee under Section 19 of the Act. The author acted as referee in the dispute and found that he agreed in general with the recommendations of the Inspecting Engineer and the conclusions that the existing spillway capacity of each were significantly under capacity.

However, the referee did modify the reports so that the recommendations were less prescriptive in their wording, thus allowing the owner in consultation with his engineer to devise the most "appropriate" solution to the problem being faced – both in terms of the site and the engineered solution.

The referee was subsequently engaged to engineer the solutions for the Trust.

In working for the 'Trust' or any organisation which seeks to 'look after' places of historic or natural beauty it must be recognised that they seek, quite rightly to try to 'restore' the properties and estates to their former glory and to often return them to how they looked on the day that they were built.

Thus the imposition of modern standards whether they be standards associated with floods or seismic action are always going to be difficult to achieve with the objectives set by the organisation! Indeed it is often impossible and a sensible compromise often has to be found – a process which the author calls the adoption of 'appropriate engineering'.

Appropriate in these terms can mean:-

– those that do not affect the outward appearance of the structure
– those that have the least visual impact
– those that don't touch the structure at all!
– those that can use a volunteer labour force, perhaps unskilled labour force, to undertake some or all of the works
– those that involve no digging which might affect the surrounding archaelogy!
– those that can be engineered in the 'closed' season so as not to inconvenience the public – in the worst weather of any construction year
– those that can be done at least cost

It can thus be seen that the engineer is trying to sort a number of conflicting demands and the engineer must be able to explore the many options with the client and be able to communicate well with the client to explain the solution, its visual appearance and the impact both on the estate or property and also financially on the 'Trust'.

The client at this stage will often include regional and area building surveyors, project managers, estate managers, property managers, environmentalists, ecologists, archaelogists and safety managers to mention just a few. These individuals will often have different and conflisting demands that the engineer has to try to reconcile.

The five dams in the Woodchester Valley all needed work to improve their ability to safely pass the design flood flows.

Figure 1: Aerial view of valley

Downstream of the dams is a fairly substantial residential area making them Category A dams as defined by the publication 'Floods and Reservoir Safety: An Engineering Guide' published by the Institution of Civil Engineers in 1996. This categorisation applies to a dam where a breach could endanger lives in a community ie > than 10 persons, in which case the design flood is the Probable Maximum Flood (PMF).

The highest dam in the cascade at the Woodchester had in fact been breached many years before. As one went down the cascade and the individual catchment areas increased the apparent deficiency in spillway capacity increased.

Dam	Existing Spillway Capacity (cumecs)	Required Spillway Capacity (cumecs)
Brick Kiln Pond	Breached (0.5)	22.1
Kennel Pond	1.3	23.6
Middle Pond	1.2	31.6
Old Pond	3.4	46.1
Park Mill Pond	5.5	49.3

In working through the design process it became clear that whilst there were a list of solutions to the problems, ranging from discontinuance (breaching of the dams) to expensive and obtrusive new reinforced concrete spillways, the most appropriate solution for the middle three dams would be to repair the existing spillways where they could be repaired, to supplement the capacity of spillway with a reinforced grass spillway at a slightly higher invert level at one end of each dam, and to provide more freeboard.

Dam	Length (m)	Height (m)	Surface Area (m^2)	Capacity (m^3)
Brick Kiln Pond	65	8	10500	20000
Kennel Pond	55	6	9700	18000
Middle Pond	110	11	39000	135000
Old Pond	70	6	21000	50000
Park Mill Pond	90	16	31000	125000

However, to provide additional freeboard, it was necessary to raise the dams and with a narrow crest, the need for access for forestry and farming activities it was not possible to carry out a raising by just extending the upstream and downstream slopes and could only be achieved by the construction of a reinforced earthfill, reinforced grass embankment on the upstream side of the crest.

This work was carried out at the dams in one season.

Each of the dams were heavily overgrown when the work started so as the works were uncovered a number of interesting features emerged, in the form of walls and culverts which necessitated 'modification' of the design to accommodate the findings. Consultation with the archaelogists was thus necessary at short notice.

The works on the lowest dam in the cascade, which is also the highest dam and the one which has to pass the largest flood, involves a new reinforced concrete spillway over the crest and a stilling basin at the base to destroy the energy. The design was developed last year and is now on site being constructed. The design sought to 'hide' the spillway channel in the downstream face by minimising the height of the side walls and mounding soil against the wall to make them visible. Shortly after the design was finalised the archaelogist decided that the eel trap and other stonework at the base of the original spillway should be protected and so the design was modified to pipe the flows from the stilling basin to the stream.

Care also had to be exercised when carrying excavation on the dam because there were worries, without supporting evidence(!) that there may be a low level outlet pipe – probably with downstream control and also culverts associated with a mill building which it was thought to exist on the toe of the dam. Again the design had to be modified on site as the design progressed.

Other problems we had to face during the development of the project included the need to apply for planning permission via the local authority. This process then involved the Environment Agency, as a statutory consultee, and it was the flood management department of that organisation which caused significant problems and cost by objecting to the planning permission because the new spillway would cause increase depth of flood flows downstream of the dam. After extended discussions, and extensive calculations, common sense prevailed, but only after the author threatened to demolish the dam and remove any benefit caused by attenuation of the flood by the reservoir!

5 Conclusion

As the work in the Woodchester valley comes to an end it is clear that the process has not been easy. The work has tried to minimise the cost for the client who has very limited funds, it has tried to accommodate all of the often conflicting demands of the many 'interested parties', has met the needs of the planners and its consultees, and lastly the requirements of the Reservoirs Act 1975 and associated engineering standards. The engineering is the easy part!

Literature

[1] The Reservoirs Act 1975 – HMSO – 1975

[2] Floods and Reservoirs Safety: An Engineering Guide – ICE – 1996

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