



News: BDS response to consultation on the Environment Agency's approach to designating large raised reservoirs as high risk

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The article below reproduces the response provided to the Environment Agency by the BDS Committee during its consultation on risk categorisation of reservoirs under the new Flood and Water Management Act 2010 legislation.

1. Preamble

The British Dam Society (BDS) is a charity that exists to advance the education of the public and the profession in technical subjects relating to the planning, design, construction, maintenance, operation, safety, environmental and social issues relating to dams and reservoirs. It has over 500 members and is the foremost specialist engineering society in the sector.

The BDS supports all moves to improve reservoir safety throughout the country and welcomes change. However, its officers and committee have strong reservations concerning some of the proposals that have been put forward as part of the current consultation. The views of the BDS membership were therefore solicited for the purpose of submitting a formal response.

It is noted that the central purpose of the consultation is to help guide the Environment Agency (EA) in the designation of high-risk reservoirs. It is acknowledged that reservoir safety management should move towards a 'risk-based' approach. However, the current proposals for the designation of reservoirs are based solely upon the consequences of a reservoir failure and take no account of the likelihood of that failure. Hence the proposals are, strictly speaking, 'consequence-based' rather than 'risk-based' and the BDS is concerned that the misuse of the word 'risk' instead of 'consequence' will only lead to confusion and misunderstanding.

The current proposals are based upon two primary elements

- the recently published reservoir flood maps, despite the fact that these maps were not created for the purpose and were clearly marked '... for emergency planning purposes only ...' and '... not intended for any other use ...'
- the likely loss of life (LLOL) figures estimated from that exercise.

The BDS consider that adoption of the latter is flawed because the Flood and Water Management Act 2010 (2010), schedule 4, reservoirs item 7, section 2C subsection (1)(a) is clear in its definition of the meaning of the term high-risk reservoir – that is, '...in the event of an uncontrolled release of water from the reservoir, human life could be endangered ...'. It is immaterial whether the LLOL is 100%, 1% or 0.01% of the population at risk (PAR): the key to the definition is whether *human life is endangered*.

The BDS respectfully recommends that the Agency reconsiders its position and amends its proposals. The BDS offers its continued support and will strive to ensure that the high standard of reservoir safety in the UK is strengthened rather than being eroded.

The BDS considers that a reduction in dam safety regulation would not promote business. As an example, it notes that the annual cost of supervising and inspecting the reservoirs that may be subject to deregulation in the near future is of the order of £0.4M while the direct cost of the incident at Ulley reservoir in 2008, a potential candidate for deregulation, is estimated to be 25 × greater. The indirect cost to business, which resulted from the consequential closure of the M1 motorway has not been included.

2. Response to specific consultation questions

Taking due account of these fundamental concerns, the BDS responses to the questions raised in the consultation process are outlined below.

Q1. Potential loss of human life is the key factor in assessing whether a reservoir is high risk (as defined in the Flood and Water Management Act). We will assess this based on the

potential loss of life as a direct result of downstream flooding (for example, where people live, stay or work in areas subject to flooding) and not include any loss of life that may result from secondary impacts (for example, as a result of power failures) or a controlled release of water (e.g. water flowing down a reservoir spillway).

A1. No. It is agreed that potential loss of life is a key factor, but it is not the only factor.

Q1a. Do you agree with this approach? If not, please tell us what you think we should include when we are assessing the potential risk to human life.

A1a. BDS are of the opinion that secondary impacts such as infrastructure damage or interruption must be considered, as these may be even more dangerous to persons living downstream. Dam break floods could result in a loss of essential public services, which might then threaten the lives, health and well-being of the population downstream. It is possible that the disruption of potable water supplies, sewage treatment works, electricity supplies, gas and oil pipelines, the road and rail network and telecommunication facilities, either during an evacuation or else in the aftermath of the event, could lead to further loss of life. Serious pollution is also conceivable: the escape of toxic materials into the environment could lead to an adverse impact upon the health of the wider population for decades into the future.

Q2. We need to decide whether or not to provisionally designate a reservoir as high risk. To do this, we will primarily use the current dam category assigned by the inspecting engineer and the LLOL calculation taken from the reservoir flood maps. Do you think this is the best available information to enable us to make this decision?

A2. No.

Q2a. If not, what other information do you think we should use to make our provisional designation? How do you think it should be collected (if it is not already available to the EA) and used?

A2a. The BDS respectfully points out that the proposed designation is *consequence*-based rather than *risk*-based. By definition, risk reflects both hazard (i.e. the consequence of failure) and the probability of the failure happening. That probability will depend on the age, design, method of construction, improvements and condition of the dam and so on, and hence will vary considerably from structure to structure.

The BDS believes that the PAR should be taken into consideration and given equal, if not greater consideration

than LLOL. It is understood that the EA already has estimates of the number of people living in the potential flooding zone downstream; however, it is not known whether estimates have also been made with regard to transient and temporary occupation in these areas – that is, persons at work or leisure (including camp and caravan sites) or simply travelling through on railways, roads and footpaths.

The BDS considers that the current system used for categorising impounding reservoirs, as set out in the guidance document *Floods and Reservoir Safety* (which was first published in 1978; ICE, 1996) remains valid and could be extended to cover non-impounding and other reservoirs. This system was based on a combination of the threat to life and damage to property and infrastructure. Reservoirs in the two lower categories were defined as ones where there would be negligible (C) or no (D) risk to life.

The BDS considers that it would be appropriate to provisionally place all large raised reservoirs with an existing category of A, B or C into the new 'high risk' designation, as the new Act refers to endangerment of human life, rather than estimated LLOL.

The BDS acknowledges that the current system is by no means perfect and that inspecting engineers have found the recent flood maps very useful when reviewing the existing dam category. However, it is aware that some of the current flood maps are flawed and that this information needs to be used with judgement. It is noted that the EA does not warrant this information and states categorically that the information is for emergency planning purposes only.

The BDS therefore considers that competent, experienced reservoir professionals must visit all dams and the valleys downstream prior to designation. Particular attention also needs to be given both to uncategorised reservoirs and those that currently lie in category C, as it suspected that some existing reservoirs in this category may indeed pose a threat to life (i.e. $PAR > 1$).

Q3. We propose that in most cases, if the current dam category is A, B or C and/or the LLOL is one or more persons, then we will provisionally designate a reservoir as high risk. Do you agree with this approach?

A3. No.

Q3a. If not, why?

A3a. The proposal is unclear and is open to many interpretations. In particular the use of the term 'and/or' will add to the uncertainty. The BDS believes that the designation process

should adopt consistent criteria and follow common practice throughout the country.

The new Act defines the meaning of a high risk reservoir as one where 'human life could be endangered'. The BDS recognises that there is a significant difference between the endangering of life and the estimated LLOL: the former is described by PAR, the latter by LLOL. The LLOL value reflects several factors, including distance from the reservoir, available warning time, etc. The BDS wish to point out that a very large community might be threatened by a dam break flood, but the estimated LLOL might be less than 1.0 persons.

Taking these points into account the BDS believes that the proposal should be amended to read as follows.

We propose that, if the current dam category is A, B or C and the PAR is > 1 , then we will provisionally designate a reservoir as high risk.

This revised proposal follows a precautionary approach that the BDS believes to be appropriate. It is accepted that the designations can only be as good as the quality of data that are available, hence BDS would recommend that category C reservoirs should only be omitted from the list of high-risk reservoirs if there is supportable evidence that the PAR is < 1 .

Q4. We suggest that representations against the provisional designation should be made within 12 months. Do you agree?

A4. Yes. There needs to be sufficient time to allow the necessary information to be gathered so as to support a representation. BDS is of the opinion that a 12-month period is sufficient for the representation, but considers that further time may be needed to execute and complete the challenge process if such a challenge were feasible.

Q5. We propose using suitably trained EA or engineering consultancy staff to visit sites to collect data to inform the provisional designation of reservoirs in phase 2. Do you think it is appropriate to use EA or engineering consultancy staff for this work instead of supervising or inspecting engineers? If not, why?

A5. Yes. In principle this proposal is acceptable. It is recognised that for the phase 2 reservoirs, which are not currently covered by the Reservoirs Act, there will not in normal circumstances be either an inspecting engineer or a supervising engineer who has specific knowledge of the reservoir. However, the key phrase in the proposal is 'suitably trained'. It is essential that trained and experienced reservoir industry professionals are used to gather and manage data and ultimately be responsible for the final designation of reservoirs. In this respect it seems likely that the level of training and

experience that is required for the designation process will be similar to that which is currently needed to be appointed as a supervising engineer. In addition they will need to work to appropriate guidelines and in some cases consult with inspecting engineers to ensure a consistent approach.

The duty of reservoir categorisation is one of the key duties of the current inspecting engineer from which, for example, the necessary flood security is then defined. Selection of both inspecting engineers and supervising engineers is based on extensive experience and interview by peers and even then has to be renewed every 5 years. Any dilution of this basic principle must be seen for what it is, which would be a lowering of standards and a compromising of public protection.

Q6. Option C proposes that reservoir undertakers are able to challenge our provisional designation without seeking professional advice if they want to. Do you think this is appropriate? If not, why?

A6. Yes. Reservoir undertakers should be able to challenge the provisional designation without seeking professional advice, if they should wish to do so. The important point is the quality of information that is provided in the challenge. If the undertakers feel that they are able to mount a detailed and credible challenge without additional, professional advice, then it will be up to the EA to assess the validity and merit of the challenge.

Q7. Please tell us which option for the period of representation you prefer (A, B or C) and why.

A7. It is understood that this question refers to the representation and challenge process that will follow the provisional designation. All reservoirs are different and the consequences of a failure are also different and are dependent upon many factors. As such there can be no preference with regards to which option to be followed. As noted in the answer to question 6, the undertaker should have the right to mount a challenge and he or she need not be obliged to seek professional advice.

Hence it could be argued that the starting point for any representation might be the option C approach. However, if the undertaker felt that the challenge would benefit from the professional advice of either a supervising engineer or inspecting engineer he or she might seek this advice from the outset in order to demonstrate the validity of the challenge. Likewise, if the EA was not satisfied with the quality or validity of the initial challenge, they may recommend to the undertaker that professional advice should be sought. In this way the process would move along from option C to option B and perhaps on to option A.

Hence it is the BDS view that the representation/challenge process cannot be simply taken as either option A, B or C, but instead each representation would need to be considered on a case by case basis.

Q8. Please tell us which option for the period of representation (A, B or C) is your second choice and why.

A8. See answer A7.

Q9. Please tell us if you have any additional comments you wish to make on our proposals for designating reservoirs as high risk.

3. Additional comments from BDS

There are a number of issues that the BDS feels have yet to be addressed adequately, which are as outlined below.

A. Method of calculation of LLOL

The estimation of LLOL is an inexact science. Estimates are imprecise and there are very little statistical data to validate the empirical methods currently available. The BDS notes that different methods can produce widely differing estimates for the same reservoir. The state of the art could be described as embryonic and while techniques will improve as knowledge grows, it is conceivable nevertheless that the currently adopted method may significantly underestimate the actual value. Hence the use of LLOL as the primary criterion for designation is potentially flawed.

B. Potential deregulation of existing large raised reservoirs

The BDS is concerned that the current proposals would result in some 900 existing large raised reservoirs no longer being subject to regular surveillance or independent inspection. In the absence of a regulatory driver, dam owners would not be compelled to watch over or carry out maintenance and under these circumstances businesses/individuals would be less likely to carry out essential repairs or improvements. The BDS foresees that the upkeep of many reservoirs will be neglected and that the dams will fall into disrepair. As time passes, these dams will become progressively more dangerous and hence there will be an ever-increasing risk of failure.

C. Number of consequence categories

The current proposals involve only two categories. In other words the reservoir is either high hazard (risk) or it is not, in which case it will simply be registered and will not be subject to either statutory inspections or regular surveillance. This move to only two categories is a change from the original proposals to amend reservoir safety legislation, which incorporated three

consequence categories. The basic rationale behind the three categories was statutory inspections of the highest category, supervision of the medium category and registration only of the lowest category reservoirs. Incidentally an approach similar to this is being proposed with the revised reservoir safety legislation that is being proposed in Scotland. The BDS considers that the loss of the middle category is a backward step that does not enhance reservoir safety and, pending upon the outcome of the designation exercise, could potentially make matters worse.

D. Engagement with stakeholders downstream of reservoirs

The BDS is concerned that there has been little engagement with stakeholders other than undertakers, dam owners and industry professionals so far during the consultation process. There has been apparently been little or no dialogue with communities/individuals living downstream of dams that may be subject to deregulation, if the current proposals are carried into effect.

E. Bias against the general public

The BDS notes that the proposals outlined in the consultation document are biased toward undertakers/dam owners and biased against the communities and individuals that lie in the flood paths downstream of reservoirs. The potential impacts of the proposed changes have not been explained to the latter group and they will be unaware if a dam located upstream of them is to become deregulated and ultimately less safe. If the information was more widely disseminated then opposition is likely and representation would be made. The current proposals make allowance for the compensation of undertakers in the event of a successful challenge but no other stakeholders, which is unfair.

F. Quality and reliability of existing flood maps

The BDS notes a widespread concern about the quality and reliability of the flood maps for existing large raised reservoirs. These concerns will almost certainly magnify if and when the exercise is extended to non-statutory reservoirs. The accuracy of the base digital terrain models and the potential impact of minor physical features such as culverts, openings, embankments and so on become even more significant, especially when large quantities of debris and trash are mobilised in a dynamic and rapidly changing flood.

REFERENCES

- Flood and Water Management Act 2010 (2010) *Elizabeth II. Chapter 29*. Her Majesty's Stationery Office, London, UK.
ICE (Institution of Civil Engineers) (1996) *Floods and Reservoir Safety*, 3rd edn. Thomas Telford, London, UK.