Design of a new grout curtain for Wimbleball Dam

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SYNOPSIS Wimbleball Dam was constructed in the late 1970s. The reservoir is a strategic water resource asset operated jointly by South West Water and Wessex Water. It is a 50m high buttress dam on a tributary of the River Exe in Somerset. The dam has a single line grout curtain drilled from a concrete plinth at the upstream toe of the dam. Leakage beneath the south abutment of the dam was observed during first filling. Despite undertaking remedial grouting at the time of construction and again in 2003, leakage flows have continued to rise. In 2010 the Inspecting Engineer judged the increasing flows to be a risk to the long term safety of the dam and recommended that measures be put in place to reduce the leakage. Implementation of remedial measures was complicated by a requirement that the reservoir could not be drawn down during construction works.

This paper describes the development of the design of a new grout curtain from an initial concept of drilling grout holes from a tunnel beneath the upstream toe to the adopted solution of drilling an inclined grout curtain from ground level from the areas between the buttress webs. It will also cover finite element analysis undertaken to identify the location of tensile zones in the dam foundations and to assess the impact on stability of moving the grout curtain downstream, evaluation of instrumentation data and design of a replacement pressure relief system.