



THE PROBLEM

The presence of highly erodible joint infill in the dam foundation that is vulnerable to piping erosion. This combined with near-lake pressure in areas under the dam due to open fractures in the ignimbrite rock foundation pose a risk of a major leak under the dam.

ENGINEERING INVESTIGATION

An extensive programme of investigative core drilling and detailed foundation mapping was completed to determine the extent and nature of the fissure systems. The investigation findings allowed partial cutoffs to be designed to specifically target each of four sets of identified vertical fractures. Joint infill is removed and the open joint cut off by a grout or concrete wall in order to create stable permanent barriers, one across each of the fissure sets.

CLIENT

Mighty River Power Limited

LOCATION

Arapuni Dam, Waikato River, New Zealand

THE DAM

Built in the 1920s, the dam is a 64m high curved concrete gravity dam with a crest length of 94m.

SCHEME COMPONENTS

- 64m high concrete gravity dam
- 186 MW power station
- Diversion tunnel through right abutment.

BACKGROUND

Historical records show the dam has had previous seepage problems – a grout curtain was installed in 1929 following significant leakage from the dam during its first two years of operation. Seepage changes have often involved sudden and significant increases and cannot usually be related to external events such as earthquakes.

PROJECT OBJECTIVE

A targeted and cost effective fix appropriate to the nature of the problem, removing the potential for future leaks, that will not impact on the operation of the reservoir or electricity generation.

- Quality systems development for construction
- Design support during construction

ENGINEERING SOLUTION

Construction of the four overlapping bored pile walls at Arapuni Dam consisted of 400mm diameter holes drilled at 350mm centres while the reservoir remained full. The 95m deep holes from the dam crest extend through the concrete dam and 40 to 60m into the vertically jointed ignimbrite. The cutoff wall was constructed in discrete segments to limit the construction induced tensile stresses on the unreinforced upstream face of the dam and avoid collapse of the weak foundation rock.

An innovative project working with the contractor extending international cutoff wall practice for dams.



DAMWATCH SERVICES TO THE REMEDIATION PROJECT:

- Geological and groundwater investigation of the dam site
- Dam safety instrumentation installation and 24 hour monitoring
- Investigation of cutoff options
- Trial of new techniques
- Contractor procurement documentation and contractor selection for Alliance contract
- Cutoff wall design and specification
- Participation in construction methodology selection with contractor
- On site dam safety supervision during construction

