

RESERVOIRS AND LANDSLIDES – THE CLYDE DAM EXPERIENCE

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ABSTRACT

Most dams and reservoirs are located in natural valleys resulting from fluvial or glacial erosion. In valleys with geologic structure that involves layering parallel or sub-parallel to the topographic slope there is greater potential for landslides into reservoirs.

The risk of landslide occurrence into reservoirs is enhanced by the submergence of the slope toe and by rapid drawdown conditions. Rapid failures may cause waves that endanger the dam.

Clyde dam (and its power station) was always controversial and was eventually completed 15 years after site works began. But then lake filling was delayed by the need to stabilise large landslides in the very mica-rich schist around the perimeter.

Between 1988 and 1992 New Zealand's Clyde Power Project was responsible for the investigation, analysis and design, and then construction of stabilisation works on 10 large landslides in the Otago Schist, mostly in the Cromwell Gorge, a 20 km section of the reservoir waiting to be formed upstream from the Clyde Dam. The engineering geology team was responsible for planning, supervising and assessing the site investigations which were undertaken concurrently with design and construction. Key issues confronted by the team were complex geological conditions, highly variable groundwater conditions and tight deadlines. No two landslides were the same. Lake filling and power generation was delayed by three years.

Regional studies of landslides, seismic hazard assessment and interactive groundwater modelling were key inputs but ultimately the success of the project was due to teamwork and commitment. The geologists eventually logged 42 km of cored holes, 100 km of drain holes and 16 km of tunnels. Plus mapping the foundations for buttresses at 4 landslides and for a raincoat over another.

This is the summary story of what we did and how we did it. With a bit about why.... The focus is on the role of the engineering geologists – because without us the project would not have been completed in the timeframe achieved.

Background References

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