

Reservoir Embankment Investigation & Stabilisation

BACKGROUND

The 600m long and 100m wide embankment is situated on the north-eastern section of a reservoir, in southern England and stands at a gradient of between 5–14°. Historical Ordnance Survey maps drawn prior to the construction of the reservoir showed the area as rural farmland, with a meandering river passing along the bottom of the slope. Later aerial photographs showed erosion of the riverbanks that may have induced some localised shallow land sliding.

A recent walkover survey and mapping exercise identified many features that were indicative of slope instability, notably lateral ridges and tension cracks. The most well-defined were located in the centre of the bank where the gradient was steepest, and ties in with the instability identified from the historic aerial photographs.



INVESTIGATION

A hydrographic survey was undertaken to map the reservoir bed. An 'echo sounding' plot identified 'bulge' features and undulated ground that may be indicative of slope instability. These features were mapped and overlaid using GIS, demonstrating that the most significant 'bulges' were in the central and western parts of the site, although undulating ground was also observed along the entire length of the slope.

Boreholes up to 20m bgl were drilled with cable percussive, flight-auger and windowless sampler equipment with installation of standpipe piezometers and inclinometers. Inspection of undisturbed samples identified pre-existing slip surfaces, indicative of historical slope failures.



ANALYSIS & REMEDIAL DESIGN

Computer based circular slip analyses were used to assess the stability of the slope under various groundwater and reservoir level scenarios; this demonstrated continuing instability and risk from deep seated and shallow failure.

As a result of access restrictions and the sensitive nature of the site (an SSSI) a number of innovative and sustainable management measures were proposed. These included:

- Repair of the shoreline with new gabion walls.
- Introduction of bioengineered structures to absorb some wave energy on the banks, provide support to soils, increase wildlife habitats and screen sections of the gabion wall from view.
- Introduction of a 40m long floating island pontoon to further reduce the impact from wind and wave action on the banks.

Detailed designs and tenders have also been sought and trials along the foreshore are expected in the near future. Monitoring of inclinometer wells across the site is ongoing.

