



GROUND ENGINEERING

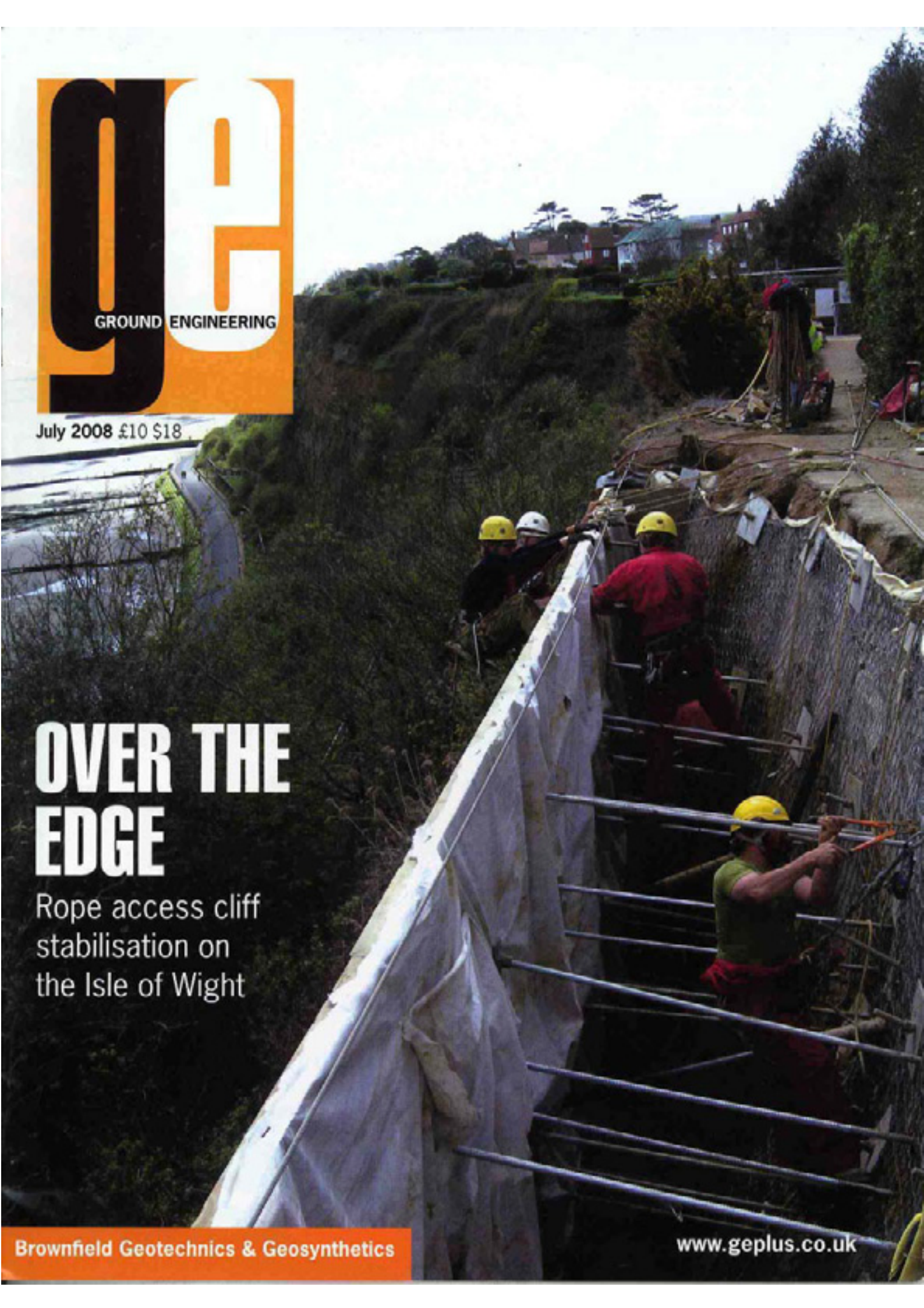
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# OVER THE EDGE

Rope access cliff  
stabilisation on  
the Isle of Wight

Brownfield Geotechnics & Geosynthetics

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## SLOPE STABILISATION

# THE WIGHT STUFF

Cliff repair works at Lake, near Shanklin on the Isle of Wight, required close co-operation on a confined site. Peter Phipps explains.



In early 2008, Isle of Wight Council commissioned Mott MacDonald to undertake a review of a failed section of existing cliff stabilisation works at Lake, near Shanklin on the island off the south coast of England, and develop a design for repair of the section.

Design development began immediately in January. Following the main works tendering process, the contract was awarded to Graham Attrill Civil Engineering, which has a wealth of experience on previous cliff works on the island. Its rope access subcontractor was Vertical Technology.

Construction began on 25 March and was completed at the start of the summer.

The works were procured using the Institution of Civil Engineers sixth edition *Conditions of Contract* and the value of the works was just over £80,000.

A 12m section of cliff had

### SITE HISTORY

The cliff would have been eroding naturally because of slope instability driven by coastal processes. However, because of the Victorian popularity for walking along an esplanade, the coastal frontage of Sandown and Shanklin became pinned in place with a large concrete seawall and promenade.

The cliffs had been subject to failure and recession that led to a series of hazard and risk studies undertaken by Rendel Geotechnics in the early 1990s. Subsequent phases of cliff remediation and management approaches were implemented.

failed beneath the existing cliff top restraint, which comprised timber shuttering bolted on to the cliff face. The failure caused the loss of the shuttering and part of the cliff top footpath.

The original works had been constructed in the early 1990s. The cliff path had to be shut following the failure leading to a diversion via the main A3055 Sandown Road. If the failure had been allowed to develop

it may have threatened residential land and led to destabilisation of adjacent sections of timber shuttering.

Isle of Wight Council required that the repair should be similar to those on the surrounding cliffs in Sandown Bay, a major tourist attraction. This meant a decision was made early on to replace the failed timber shuttering with a similar solution.

The working area of the site was extremely constrained as the footpath ran between the failed cliff top and garden walls, a distance only 600mm wide at its narrowest point. The equipment used by the roped access personnel was as small and light as possible so that working on the ropes and in the confined space was made more manageable.

The scheme involved initial spalling of the cliff face, followed by installation of 48, 20mm diameter fully-threaded rock bolts 3m or 4m in length. The bolts were full-column grouted into 50mm diameter holes, drilled perpendicular to the prepared cliff profile, which saw them going in at 10° to 20° from the horizontal.

Two layers of Weldgrip 3mm PVC-coated rock mesh was fixed flush on to the cliff face on the rock bolts using 250mm square galvanized steel face plates and hemispherical nuts. Drainage within the

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cliff was improved using two rows of fin drains.

Site workers then built timber shuttering up the cliff from a ledge excavated into the face. The timber shutters were 300mm by 75mm and up to 4.5m long, and cut to fit the repaired profile. They were fixed to the cliff face using similar rock bolts to the mesh system, although only with 2m full column grouted lengths.

A concrete soffit was formed between the lowest timber shutters and the cliff face, with plywood soffits used where required higher up the repair and between the new and old sections.

Workers fixed Terram 1000 geotextile inside of the timber shutter face and around the base, over the soffits. The design called for Maxis lightweight expanded clay aggregate fill Class 1D to be placed and compacted where practical within the void between the timber shuttering and the cliff face.

The scheme was finished off with topsoil replacement and the provision of a new footpath and fence line along the prior alignment.

The previous solution used timber facing bolted directly on to the cliff face, using rigid polystyrene as a void former. The main difference was that the loss of cliff prevented

the previous solution being implemented exactly to regain the existing cliff line.

The solution combined steep slope stabilisation with a sympathetic reinstatement, while recovering the ground lost in the previous failure. This enabled Isle of Wight Council to open up the cliff top walk.

Mott MacDonald and Graham Attrill Civil Engineering, along with Isle of Wight Council, combined on site to modify the initial designs to arrive at a practical solution.

Mott MacDonald was able to use its own Industrial Rope Access Trade Association-trained geotechnical engineers to supervise the work done by Vertical Technology, which meant that key decisions could be made quickly.

*Peter Phipps is head of coastal management at Mott MacDonald*



## GROUND CONDITIONS

The cliff is formed of Lower Greensand, which is typically a weak sandstone that locally has the characteristics of a locked sand, owing to depositional and weathering effects. Once disturbed the material can lose its inherent cohesion and behave like a sand, rather than a sandstone.

During drilling for the rock bolts and fin drains, thin layers of clay and shale were found in the Lower Greensand. Although part of the natural variation of the ground conditions, such materials did lead to slow progress on the holes for the rock anchors at times.

