

Nab Scar

Lake District, Cumbria

Automated monitoring ensures structural stability to maintain Manchester water supply

Twenty percent of the drinking water to Manchester is routed through a conduit situated in the heart of the Lake District National Park. This conduit is located under a Victorian screed slope which is known to be unstable.

During extensive slope remedial works, it has been necessary to provide a broad range of monitoring techniques to ensure that failure of both the slope and structure did not occur and to determine the success of the remedial works after works were completed.

A four week outage period was programmed, which allowed work inside the conduit. SolData provided engineers and technicians familiar with working in confined space environments and skilled in the instrumentation commissioning required.

To provide surface monitoring characteristics along the slope, our CYCLOPS system was used. Incorporating 2 CYCLOPS working together, a 5m grid of monitoring prisms was positioned over the slope. The CYCLOPS units were fixed within the zone of influence and monitored their own position using reference prisms located on rock outcrops.

To determine vertical conduit deformations a 30m chain of horizontal In-Place Inclinometers (IPIs) were installed within the conduit. Due to the conduit being a carrier of drinking water, the IPI units were constructed from high grade stainless steel and the epoxy resin.

Vertical profiles of the slope were obtained using IPI strings installed within boreholes drilled directly into the hillside. To ensure that the conduit integrity was not compromised during the strengthening works a combination of strain gauges and crackmeters were placed at strategic points within the conduit.

Induced vibration was considered to be a potential problem during the remedial works on this sensitive slope therefore portable geophones were used around the conduit.

The data was acquired, stored and managed by a datalogging solution on site which imported the information into SolData's Geoscope software. The Geoscope software was also provided to the client, providing them with 'real-time' access to the monitoring data as well as the ability to run fully customisable reports as required.

Nab Scar Area of outstanding natural beauty Lake District



Installing within the conduit during the outage.

Cyclops providing real time slope displacements to the client



OWNER :	UNITED UTILITIES
CONTRACTOR :	BACHY SOLETANCHE
PROJECT DURATION :	AUGUST 2009 – MARCH 2010
SCOPE OF WORKS :	
<ul style="list-style-type: none">- 2 No. CYCLOPS monitoring a 5m grid of pole-mounted prisms positioned on the slope.- 30 m chain of In Place Inclinometers mounted horizontally within the conduit.- Vertical In Place Inclinometers installed within boreholes in the hillside.- 10 no. each of Strain Gauges and Crack Meters monitoring the stability of the conduit structure.- A Vibrox unit for monitoring levels of vibration during drilling/excavation.- 'Real-time' monitoring and instant client access to data via Geoscope.- Text message, visual and audible alarms.- Remote archiving of all data on secure servers at Sol Data HQ.	