

CASE HISTORY

Application: **Bridge Development**

Technology: **PS Logger® | Mini Winch**

Location: **Lantau Island, Hong Kong**



Robertson Geo Operational Services were contracted to conduct logging operations as part of the initial phase for bridge development on Lantau Island, Hong Kong.

The Highways Department plans to build two cross-harbour bridges to divert the traffic in the Lantau Link, aiming to open by 2033. The Tsing Yi - Lantau Link will be extended for approximately 5.2 kilometres and located on the south side of the current Lantau Link. The two cross-harbour bridges, which will parallel the Lantau Link, will span the Ma Wan Fairway and the Kap Shui Mun Fairway.

Requirement:

The requirement was to collect compressional and shear wave velocity profiles using the Robertson Geo PS Logger® probe. The geology encountered on Lantau Island was mostly rhyolite and granite, overlain with near surface sand/cobbles. Rhyolite is an extrusive igneous rock that is the volcanic equivalent of granite. Three boreholes of 70m, 32m and 50m depth were surveyed.

Equipment:

A portable setup was used to gain access to the difficult borehole positions. The lightweight Robertson Geo Mini Winch was used, taking power from a 12V car type battery, which also powered the Micrologger2 surface acquisition module and the logging laptop. All the equipment was hand carried into position, over often difficult terrain.



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The Probe:

The PS Logger® probe measures P (compression) and S (shear) wave velocities in a single fluid filled borehole without the need for external energy sources, making it simple and quick to deploy and therefore cost effective when compared to alternative methods.

The PS Logger® is ideally suited to measuring velocities, and therefore strength, in terrain with the hardest of rocks where other methods are difficult operationally or, in the case CPT, impossible.

Readings were taken statically at a predetermined spacing over the length of the borehole and the data QC checked in real time. Upon completion of the logging the velocities were picked from the waveforms and profiles automatically plotted. When combined with bulk density values, small strain moduli (Young's, Shear and Bulk), could be calculated using simple formulae.



Challenges and Solutions:

Mountainous terrain – Use of hand portable lightweight equipment.

Extremely hard rock – The PS Logger® method works equally well in hard rock and soft formations.

End value to client:

High quality data was successfully collected quickly and efficiently, in an area with high elevations, to provide the client with reliable in-situ strength data to allow the bridge design to be best optimised.