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ROBERTSON GEO
Unlocking Your GeoData

GeoUnlocked©

GLOBAL GEODATA NEWS

ISSUE 01 | SUMMER 2018

Antarctica

NOT ALWAYS THE EASIEST JOB

Research team attempting CTD logging through the sea ice and into the underlying ocean at the edge of King Baudouin Ice Shelf, East Antarctica

The results indicated that the water mix beneath the ice shelf was bringing warm ocean water into contact with the ice front.

EDITORIAL

ROBERTSON GEO

Unlocking Your GeoData

Since 1979 Robertson Geologging Ltd has been the pioneer developer of geophysical logging technologies and techniques.

We are presently engaged in a programme of technical development and investment to future-proof our products and services.

With customers globally referring to us as **Robertson Geo** we are taking this opportunity to rebrand and to review our marketing approach.

This is the first of our regular newsletter **GeoUnlocked©** - it carries our newly registered trademark devised to reflect our modernised business objectives, supported by what is a proven reputation for quality products, services and techniques earned over nearly 40 years of industry leadership.

I hope it gives you an insight into the diversity and global scale of our operation. I do assure you there is no project that's too small or too large that we can't respond to your needs within our specialist areas of service.

Simon Garantini
Managing Director

GOLD MINING UNDERGROUND

Successfully logging multiple inclined bore holes in difficult space and application positioning

USING A HIGH resolution acoustic televiewer (HRAT) to log data to assist management with mineralisation modelling, development planning and extraction projections; the application was used to identify and characterise stacked veins, fault breccia, mineralisation zones, foliation characteristics, secondary micro-faults, fractures and fault patterns. It required 9 boreholes to be logged during site visits staged over 3 months. The boreholes were 400 through 500m deep and typically inclined at 35 to 45 degrees, core drilled with an OD of 76mm.

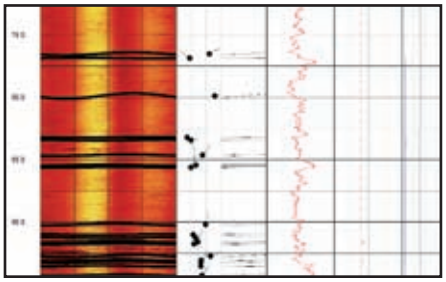
Underground logging at angles in small outside diameter boreholes required a chamfered cable head to be developed with a method of retrieving probes through an inclined hole of 75mm OD into 45mm ID of drill pipe, a tight tolerance between pipe and the 42mm probe.

The logging rig had to be modified for each location within the mine and adapted to suit the positioning and available space. By installing into the mine roof drill rig pulley wheels or suspended lightweight sheave wheels, access was gained for all the required boreholes.

The boreholes were logged in stages to minimise the increased risk of collapse of the inclined holes. To gain maximum data coverage the drill pipe was left in the hole to a point just beyond known areas of suspect ground with logging achieved at this depth, then more pipe removed with the overlap logged in the newly exposed open hole.

The Acoustic Televiewer was deployed with 100% reliability and the mapping of faults and fractures was successfully completed. WellCAD™ software was used for data handling, processing and presentation of data as image log and tabulated format.

Surface equipment was a 2,000m winch with a 4 core cable connected to a Micrologger system. The winch was modified for underground working and in line with HSE guidelines include a fully lockable guard on the drum, cable and moving parts, conversion of the operating voltage to 110v and skid mounting for ease of use underground.



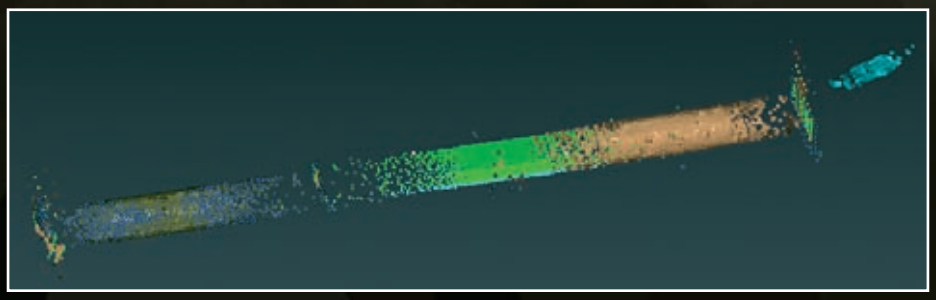
As part of the proposed development of Battersea Power Station, the iconic London landmark, it was necessary to carry out a subsurface multi-beam survey to identify the location and structure of inlet and outlet tunnels. The exact location of the tunnels was unknown as accurate survey maps of the historic building were unavailable.

WHERE ARE THE TUNNELS AT BATTERSEA?

USING A SPECIALLY commissioned multibeam sonar system together with a verticality probe, RG partnered with specialist technology companies, Geoterra and Flodim. A subsurface multibeam sonar survey was undertaken, focussing on the coolant water outlet tunnel via pre-drilled boreholes.

The boreholes and tunnel were geo-referenced to OSGB 36 and Newlyn level datum. Site conditions were very challenging as surveying had to be carried out in tunnels which were either filled with water containing sediment or thick mud.

The partners provided the contractor with a complete set of geo-referenced 3D point cloud data and updated topographical survey plans of the outlet tunnel, combining each of the sonar surveys. Surveying of the inlet tunnel was not possible as this was completely full of hard, compacted mud. The multibeam sonar data would then be analysed and interpreted, together with an updated topographical survey plan, to plan detailed design of the future building works above.



Axle deep in mud AT MERTHYR TYDFIL IN South Wales

WORKING IN DIFFICULT, muddy and wet off-road terrain, experienced and radiation-trained Robertson Geo Logging Engineers were deployed to run the radioactive Trisonde to log boreholes adjacent to an existing quarry for the identification of potential coal seam extensions.

The information would then be used to assist with quarry development, planning and feasibility of resource extraction projections.

Boreholes were up to 150m deep, with inclinations typically less than 10°. The surface equipment used was a 500m winch with 3/16" 4-core cable mounted into the back of an in-house adapted 4WD vehicle, connected to a Micrologger System.

Logging of over 60 holes was successfully completed during multiple site visits, over a period of three months. Due to the risk of hole collapse, logging was conducted through the drill rods.

The Trisonde was successfully deployed with 100% reliability, and mapping of coal seams was completed to the customer's satisfaction.

OFFSHORE WIND FARM

Robertson Geo seabed investigation

THE PROJECT WAS to investigate the small strain moduli of the sea bed down to 45m using the Robertson Geo PS Logger. The acquired data would then be used to calculate the parameters for constructing the Vesterhav offshore wind farm off the North West coast of Denmark. The geologic formations were typically sands, clays and mudstone.

Logging was conducted from the support vessel Freja, which has a compensated drilling platform. The PS Logger provided high resolution, shear wave and compressional velocity data in rock and soils at depths up to 500m, from measurements within a single borehole. Often it proves technically superior and more cost effective than a downhole or cross-hole seismic survey.

Thirteen boreholes were logged over a period of 10 weeks to obtain the P and S wave velocities of the sea bed down to approximately 45m at 1m intervals. These velocities were then applied to the small strain moduli equations with the addition of density, to give Shear, Bulk and Youngs modulus.

The logging probe was successfully deployed with 100% reliability; boreholes were logged from approximately 45m up to the overburden casing. Following logging operations, the operator would quickly process the data acquired. Robertson Geo Engineers were on-board the Freja throughout the project and available for logging through 24 hours each day.

PROVEN GLOBALLY IN OVER 150 COUNTRIES

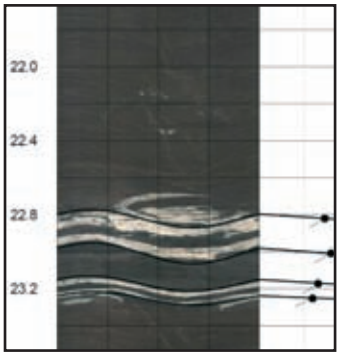
Robertson Geo is the market leader of slim-hole logging instrumentation, with in house design and manufacturing facilities.

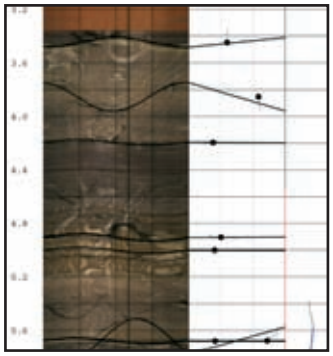
CUSTOMERS INCLUDE WATER authorities, mining houses, civil engineering consultants, aid organisations, drilling contractors and oil companies. Its logging equipment is in action in around 150 countries worldwide. As a first choice provider of proven and results driven products, services and techniques, Robertson Geo is committed to certified quality management and the confidence it brings to its customer relationships - it is ISO 9001:2008 certified by TÜV.

All tools that leave for the field are tested at the **Deganwy calibration and test well facility** prior to despatch. With no other European manufacturer offering this combination of onsite testing and calibration capability, customers can be confident that Robertson Geo tools are good to go, tested and fully operational prior to downhole use.

Can't get there with a 4 x 4 vehicle?

NOT A PROBLEM FOR ROBERTSON GEO





THE TERRAIN ALONG the proposed new 22km of the N22 road in County Cork, Ireland will require over 20 bridges to be constructed.

Robertson Geo was commissioned to log 17 shallow boreholes with the resulting information to be used to assist fracture identification and slope stability analysis. The borehole depth ranged from 9 through 33m, with an 86mm OD.

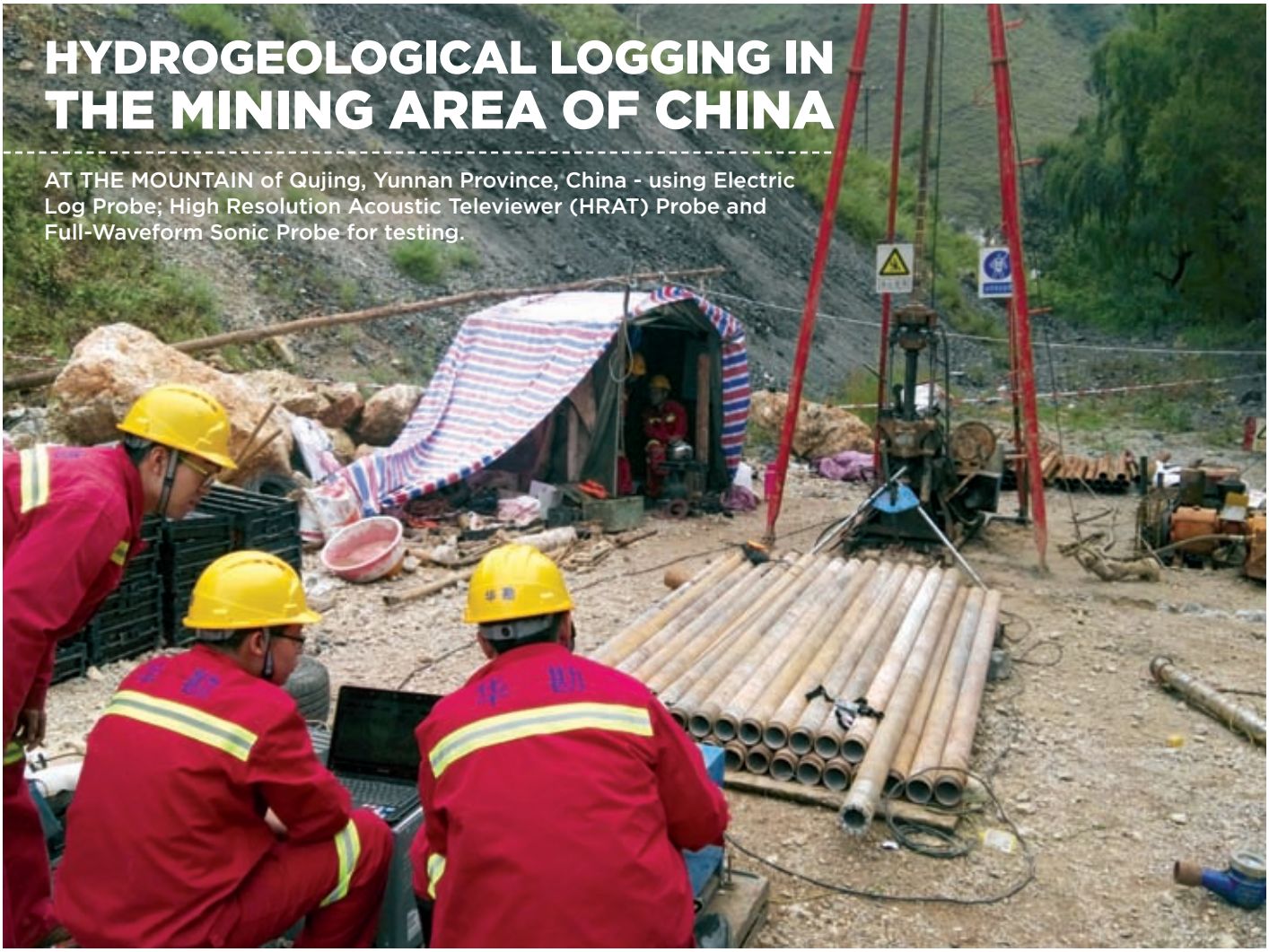
Working in remote and boggy areas, often inaccessible by 4x4 vehicles, Engineers were able to employ the portable 150m capacity Mini Winch system, which can be carried to any location to complete logging services. Its 3/16" 4-core cable was connected to a Micrologger system.

Logging of the 17 boreholes was successfully completed during a single site mobilisation over a period of 3 days. The Optical Televiewer was successfully deployed with 100% reliability, and mapping of faults and fractures was completed to the customer satisfaction.

WellCAD™ software was used for data handling, processing and presentation of the data in image log and tabulated format.

HYDROGEOLOGICAL LOGGING IN THE MINING AREA OF CHINA

AT THE MOUNTAIN of Qujing, Yunnan Province, China - using Electric Log Probe; High Resolution Acoustic Televiewer (HRAT) Probe and Full-Waveform Sonic Probe for testing.



GEOPHYSICAL LOGGING
on the world's highest glacier

ROBERTSON GEO IS proud to have been the technology partner supporting climate-change scientists from Aberystwyth and Leeds Universities who travelled to the Himalayas to drill and acquire geophysical logging data through the world's highest glacier.

Half of the EverDrill teams 1,500kg (236-stone) equipment was airlifted onto the glacier by helicopter in several trips, while the other half was guided by Sherpas and yaks as the team worked at an altitude of 5,000m (16,400ft). The 10-mile (17km) long glacier, in north eastern Nepal, flows from as high as 7,600m (25,000ft) down to 4,900m (16,000ft) and is often used by climbers on their way to Everest base camp.

According to the Project leader Professor Bryn Hubbard, "Working in the field is challenging at best, but this mission presented some particular challenges. We didn't know how well our equipment will perform at altitude; let alone how we will be able to contend with the thin air."

Robertson Geo delivered a flawless performance of its technology on this important mission, tasked to develop a better understanding of what happens in glaciers in response to climate change.

The logging systems proved yet again to be capable of surviving rugged conditions uncounted in challenging research projects.

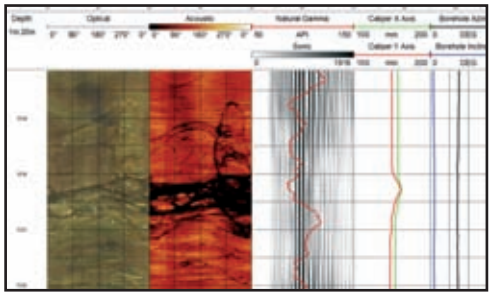
With special thanks to Professor Bryn Hubbard of Aberystwyth University.

BOREHOLE INVESTIGATION
in a seawater tidal area

THE CUSTOMER REQUIRED information to assist with constraining parameters for modelling a development and planning of a proposed sea wall and port.

This required logging a framework to investigate boreholes in a shallow water tidal area where the proposed sea wall and marine offloading facility would be constructed off the north coast of Anglesey.

Borehole depth was 10-80m - a suite of probes was used to identify fractures, fault patterns and ground stability, including Optical Televiewer, High Resolution Acoustic Televiewer, Full Waveform Sonic and Borehole Geometry with inbuilt X and Y calliper. Surface equipment was a 2,000m winch with 3/16" core cable, connected to a Micrologger system.



Logging of 26 holes was successfully completed over a period of two months. The Robertson Geo team supported two jack-up rigs, with Engineers on 24 hours availability over the duration of the project. The jack-up rigs were accessed from a small rib boat that docked at nearby Cemaes Bay.

Engineers working on the project were required to undertake an offshore training course.

OPERATIONAL TRAINING

BY EXPERT FIELD PERSONNEL

ROBERTSON GEO OFFERS operational training for winch use, probe deployment, logging techniques, data capture, and equipment maintenance and troubleshooting.

These Training schedules are flexible (from one to five days) and customised, depending on the experience levels and focus of attendees.

Training certificates and electronic copies of manuals and test data are provided and whilst it is preferable that training is undertaken at the **Deganwy calibration and test well facility**, training can also be conducted at the customers' site, including international locations.

Here's an example of a one day training schedule for: Winch; Televiewer; Temperature/Conductivity Probe; Water Sampler; Winlogger.

HSE and Site Induction

Logging Overview
- Winch Overview/Safety
- Depth System
- Logging System Setup
- Borehole Safety
- Power Safety

Optical Televiewer
- Software Overview
- Centralisation
- Basic Usage

Data Export

Temperature/Conductivity
- Winlogger Overview
- NGAM calibration
- Depth Setup (Up/Down logs)
- Basic Usage

Water Sampler
- Basic Usage

Winlogger
- Depth Matching
- Data Merging
- Data Export
- PDF conversion

Summation and additional software overview (eg. WellCAD™)

A dedicated support team can provide after training assistance for technical queries and can be contacted direct on **support@robertson-geo.com**

Customised training quotation • **sales@robertson-geo.com** • **+44 (0)1492 582323**

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