

## Geotechnical Courses

Soil Description Workshop

9th December 2015

15th January 2016

Rock Description Workshop

27th November 2015

21st January 2016



## Health & Safety Courses

IOSH Safe Supervision (3 Day)

11th - 13th November 2015

IOSH Avoiding Danger (1 Day)

20th November 2015

IOSH Working Safely (1 Day)

29th January 2016



## Geotechnical Courses

In Situ Testing

5th January 2016

22nd March 2016

Geotech' Lab Testing Awareness

1st December 2015

1st March 2016



## Technical Seminars

CPT in Geotechnical Practice

24th - 25th November 2015



# theGeotechnica

November 2015 | Issue 46

## Sensing the future for rotary drilling

An exclusive look at Equipe Group's  
new sensor-based rotary rig  
guarding system - SAFER G



### Next in Piling for Aarsleff

Piling firm Aarsleff reveal  
details of work on the new  
Next distribution centre

### The Mystery behind Russian Maps

Martyn Lufkin of Landmark  
looks at Russian maps of  
Britain

### A tribute to Tony Milne

An obituary for one of  
the founding Directors of  
Geotechnical Engineering Ltd

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# EQUIPE TRAINING

## Health and Safety Courses

DELIVERED IN PARTNERSHIP WITH: **RPA SAFETY SERVICES LTD**

### IOSH Safe Supervision of Geotechnical Sites

This three day geotechnically focussed health and safety course has been developed by industry specialists and is a unique course for managers and supervisors involved in projects in the drilling and geotechnical industry. The course is certified by IOSH and has been approved by The Environment Agency, Thames Water, AGS and BDA and also meets all of the requirements of the UKCG (formerly the Main Contractor's Group).

**NEXT COURSE DATES:** 11th - 13th November 2015  
6th - 8th January 2016

### IOSH Avoiding Danger from Underground Services

This one day geotechnically focussed health and safety course follows the requirements and guidance set out within HSG47 and includes the four chapters; identifying and managing the dangers; planning the work; detecting, identifying and marking and safe excavation. Important aspects include the use of real examples from the geotechnical industry and delivery by chartered advisors who are from within the industry.

**NEXT COURSE DATES:** 20th November 2015  
14th January 2016

### IOSH Working Safely (on Geotechnical Sites)

This one day geotechnically focussed health and safety course has been developed by industry specialists as a foundation to site safety for all personnel involved in projects in the drilling and geotechnical industry. Its aim is to impart the core safety skills required of those working on geotechnical sites by building on their existing specialist technical skills and making it relevant to their place of work.

**NEXT COURSE DATES:** 29th January 2016  
8th April 2016

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AGS Association of Geotechnical & Geoenvironmental Specialists



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In his article for this month's issue of theGeotechnica, Calum Spires speaks to Equipe Group's Managing Director Julian Lovell and Operations Director Keith Spires about SAFER G - the sensor-based rotary rig guard that could revolutionise rotary guarding on geotechnical sites across the world.

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## Securing 300 tonnes

Contributing to theGeotechnica this month is Jeff Laverack of Holmes Media on behalf of geotechnical specialists Maccaferri. This month Jeff provides details of Maccaferri's recent work restraining a huge, 300 tonne boulder perched high above the landslip-prone, Rest and be Thankful Pass in Argyll and Bute.

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## Directory

# GEOTECHNICAL COURSES

## SOIL DESCRIPTION WORKSHOP - £265 + VAT

9th December 2015  
15th January 2016  
18th February 2016

## ROCK DESCRIPTION WORKSHOP - £265 + VAT

27th November 2015  
21st January 2016  
11th March 2016

## GEOTECHNICAL FOUNDATION DESIGN - £225 + VAT

10th December 2015  
24th February 2016  
6th April 2016

## IN SITU TESTING - £225 + VAT

5th January 2016  
22nd March 2016  
31st May 2016

## GEOTECHNICAL LABORATORY TESTING AWARENESS - £225 + VAT

1st December 2015  
1st March 2016  
10th May 2016

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# UPCOMING COURSES IN 2015 - 2016

FROM THE UK'S LEADING GEOTECHNICAL TRAINING PROVIDER

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# Welcome

Welcome to the 46th Edition of **theGeotechnica** - the UK's fastest growing online geotechnically focussed e-magazine.

The opening article of this month's issue comes from Debbie Darling of Jooce Marketing & PR on behalf of Aarsleff. This month Debbie reveals details of Aarsleff's recent work on the new Doncaster Distribution Centre for Next.

Following this is an unfortunate news update. Recently Tony Milne, one of the founding Directors of Geotechnical Engineering Ltd, passed away. In this month's issue of **theGeotechnica**, we pay tribute to Tony

Next up is Martyn Lufkin, Data Team Leader at Landmark Information Group. In this excellent contribution, Martyn explores the intrigue behind highly detailed maps of over 100 strategic locations in Britain that were mapped by Russia during the Cold War. Martyn also considers the mystery of how they were created as well as consider just how the maps are today being used by GIS, land and property professionals.

Following this is our cover article, in which we take a look at Equipe's latest innovation - SAFER G. In this article Calum Spires speaks to Managing Director Julian Lovell and Operations Director Keith Spires about the sensor-based rotary rig guard that could revolutionise rotary guarding on geotechnical sites across the world.

Our final contribution comes from Jeff Laverack of Holmes Media on behalf of geotechnical specialists Maccaferri. This month Jeff provides details of Maccaferri's recent work restraining a huge, 300 tonne boulder perched high above the landslip-prone, Rest and be Thankful Pass in Argyll and Bute.

As with every new edition of the magazine, the Editorial Team here at **theGeotechnica** will be on the lookout for even more new, original and interesting content from all corners of the sector, and would actively encourage all readers to come forward with any appropriate and relevant content - whether it be a small news item or a detailed case study of works recently completed or being undertaken. If this content is media rich and interactive, then all the better. We are looking to increase the already large readership of the magazine through better social media integration and promotion, as well as improving content month on month.

Finally, for any content that is submitted we will ensure that an advertising space, proportionate to the quality of content provided, is reserved should you wish to place an advert in that single edition of the magazine. We hope you enjoy this month's edition of the magazine and are inspired to contribute your own content for the coming editions of **theGeotechnica**.

**Editorial Team,  
theGeotechnica**



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# NEXT IN PILING

## AARSLEFF'S PRECAST PILING DELIVERS FOR NEXT'S DISTRIBUTION CENTRE DEVELOPMENT

*Writing for the Geotechnica this month is Debbie Darling of Jooco Marketing & PR on behalf of [Aarsleff](#). This month Debbie reveals details of Aarsleff's recent work on the new Doncaster Distribution Centre for Next.*

Aarsleff, recognised as one of the UK's leading precast concrete piling contractors, has successfully completed the foundation works for the construction of retail giant Next's 625,000 ft sq. ft. distribution centre at the site of its existing warehouse at West Moor Park in Doncaster. The project, which commenced February 2015, involved

Aarsleff installing over 9500 driven precast concrete piles and steel tubes, with piles varying between 2 and 22-metres in length. The 17-week project was undertaken to an extremely tight schedule, such is the speed of the development, with the Engineer only finalising the design for the structure just

ahead of where Aarsleff were piling. Aarsleff also responded by providing a set of maximum loads that piles can cater for and once exceeded the design could be stepped up to the next pile size, reducing the number of differing pile types on site. Aarsleff's sister company, pile manufacturer, Centrum Pile Ltd also employed a flexible

**“With such a large area of working platform to prepare, Aarsleff was keen to assist in reducing costs to the client by offering a suite of piling rigs with low bearing pressures.”**

manufacturing strategy to allow it to react quickly to provide the piles required.

With such a large area of working platform to prepare, Aarsleff was keen to assist in reducing costs to the client by offering a suite of piling rigs with low bearing pressures. This additional resource was sourced from Aarsleff's companies on the continent and Junttan UK.

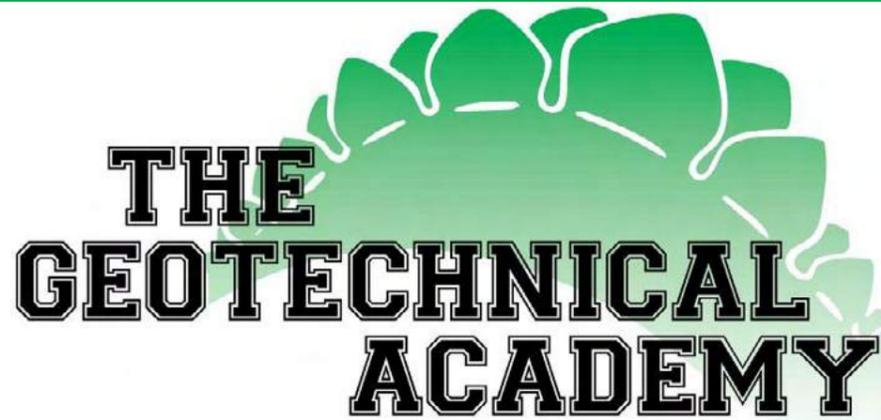
**“The geology provided a number of challenges, with the site investigation originally suggesting pile lengths to vary between 7 and 17-metres.”**

The geology provided a number of challenges, with the site investigation originally suggesting pile lengths to vary between 7 and 17-metres.

However, in reality pile lengths of 4 – 14 metres were required, with variations in lengths over short spaces. This difference was successfully managed within the project's testing regime by testing the piles that were driven to different lengths, whilst maintaining the project's checking 'set' criteria.

One of the keys to the successful delivery of this major project was the support of key supply chain partners Dewey Solutions Limited, from initial scope discussions to the completion of works. The quick start-up of the project demanded a nimble and proactive plan to implement a resource support strategy and Dewey managed to succeed and deliver this service to Aarsleff. This is one of the first times Aarsleff have used this approach to engineering and resource solutions to support a major project delivery. Aarsleff have the capability of offering a full resourced team of engineers, supervisors and skilled operatives into the construction market to service the delivery of major projects with the support of key supply chain partner Dewey Solutions Limited.

The complexity, scale and profile of the project, which was managed by main contractor Bowmer & Kirkland Ltd, required Aarsleff to employ a full-time project manager on-site to manage all elements - from pile deliveries on-site, rigs, site teams and site logistics. ■



# THE GEOTECHNICAL ACADEMY

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Or visit our website: [www.geotechnicalacademy.co.uk](http://www.geotechnicalacademy.co.uk)

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## CPD Approved Courses for Geotechnical Academy Alumni

### Specifying Site Investigations

This one day course will look at the various methods available to carry out intrusive and non intrusive investigation. Whilst the course will concentrate on geotechnical methods some geo-environmental methods will be briefly discussed. The course will look at the aims of SI and categorise the various stages in an investigation.

### Soil Description Workshop

From 2007 new European Standards have started replacing the British Standards (Codes) under which investigations in the UK have been carried out. UK working practice will have to change to meet these new requirements but few practitioners are aware of the changes or the timetable. The workshop will comprise a series of lectures on the changes, and lectures on soil description followed by practical sessions describing soil samples.

### Rock Description Workshop

From 2007 new European Standards have started replacing the British Standards (Codes) under which investigations in the UK have been carried out. UK working practice will have to change to meet these new requirements but few practitioners are aware of the changes or the timetable. The workshop will comprise a series of lectures on the changes, and lectures on rock description followed by practical sessions describing rock and compiling mechanical logs of rock core.

### In Situ Testing

The course will cover both the theory and the practice of various In Situ Testing techniques used on typical geotechnical projects. In addition the courses will consider the effect that Eurocodes will have on the UK's current practice. This course provides an overview of in situ tests used in common practice and some of the more specialist tests together with their advantages and limitations.

### Field Instrumentation and Monitoring

The course comprises a comprehensive one day appreciation of the complete process involved in Instrumentation and Monitoring in the geotechnical environment. The course provides an overview of the current guidance documents and their requirements. The course will consider the design of both individual installations and the installation of suites of instruments in the wider site context.

### Geotechnical Foundation Design

This one day course will provide a general overview of foundation design. It will include an assessment of the use and choice of shallow foundations and piles. It will cover the derivation of bearing capacity formula and their use. Exercises will be carried out to calculate the working loads and settlement of simple foundations. The methods used to calculate these will be in accordance with those described in Eurocode.

### IOSH Working Safely (on Geotechnical Sites)

This one day course is developed by industry specialists within RPA Safety Services and Equipe Training as a foundation to site safety. Its aim is to impart the core safety skills required of those working on geotechnical sites by building on their existing specialist technical skills. After attending the course, candidates should be able to identify hazards on site, understand basic safety legislation, participate fully and confidently in site safety consultation and manage priority risks to a sufficient standard.

### IOSH Avoiding Danger from Underground Services

Partnering with RPA Safety Services once again, Equipe provide another IOSH certified health and safety course. This one day course is aimed at anybody involved in specifying, instructing, managing, supervising or actually breaking ground and really addresses the problems and risks related to underground services, which may be encountered during both planning and execution of geotechnical projects.

### IOSH Safe Supervision of Geotechnical Sites

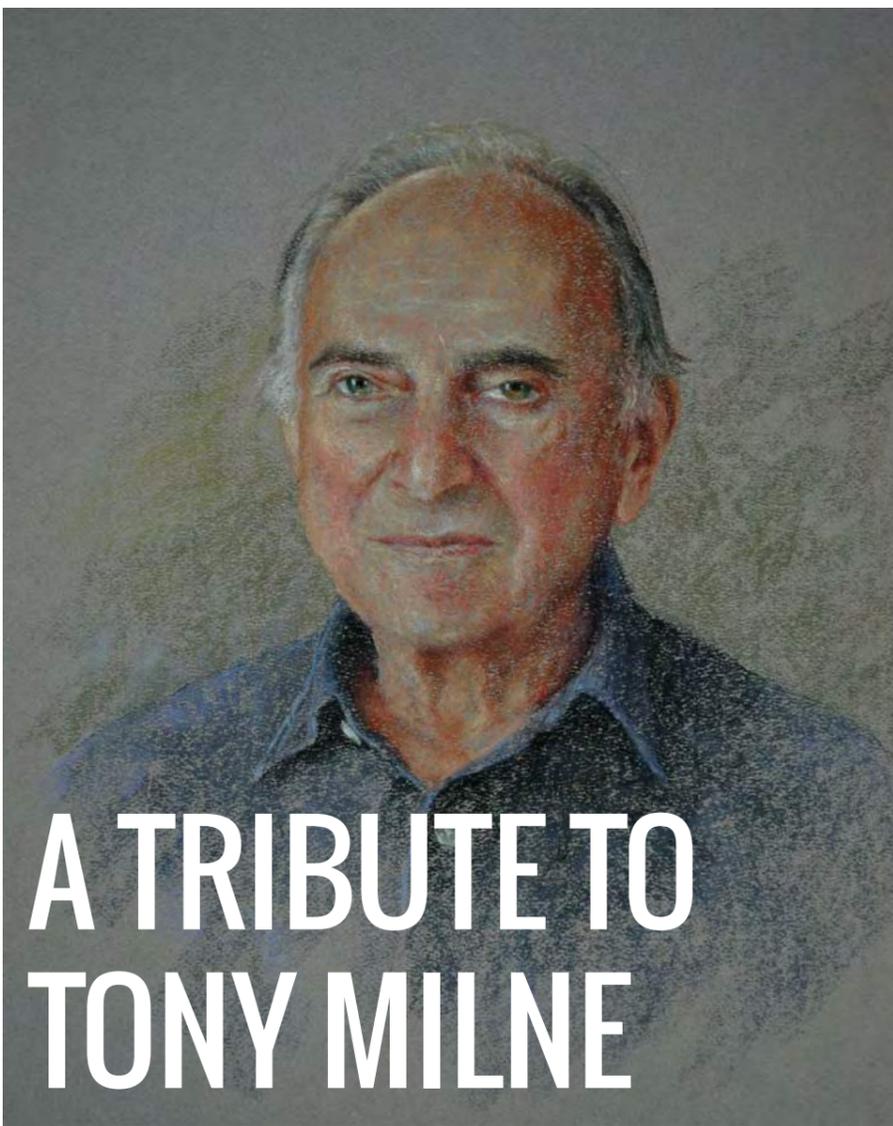
Equipe has partnered with RPA Safety Services, an independent occupational health and safety specialist, to provide a unique IOSH certified course for the Drilling and Geotechnics industry. The three day course is certified by IOSH, is specifically focussed on the geotechnical industry and provides a totally unique and relevant Health and Safety course for managers and supervisors.

Visit our websites for more details:  
[www.geotechnicalacademy.co.uk](http://www.geotechnicalacademy.co.uk)  
[www.equipgroup.com](http://www.equipgroup.com)



A collaboration between





# A TRIBUTE TO TONY MILNE

The following is a notice from [Geotechnical Engineering Ltd](http://www.geotech.co.uk) regarding the recent passing of one of its much beloved founding Directors - Tony Milne.

It is with great sadness that we announce the death of Tony Milne, one of the founders of Geotechnical Engineering Limited, and its Managing Director from 1963 to 1990.

Having obtained a degree in Mechanical Engineering from Imperial College, London in 1943, Tony joined the British army, in REME, and was training in Ghana for an assault on the Japanese when the war ended. He demobbed from the army in 1947, and worked as an oil Drilling Engineer, for four years

in Trinidad, West Indies, and for another four years in Alberta, Canada. He joined Craelius in London, and soon was posted to Naivasha, Kenya for a year to lead their drilling operations for geothermal steam. On his return, he worked for yet another four years at Craelius HQ in a Technical Sales role.

Tony started Geotechnical Engineering Limited in 1961 with his colleagues Roger West (another Drilling Engineer from their days in Trinidad, who left after 2 years) and

Sven Ronnback (one of the fine 'crop' of Exploration Drillers from Craelius). They chose to base themselves in Gloucester - it seemed like a good place at the time! The company was initially set up to provide rotary core drilling services in the UK, for which they developed their small trailer-mounted 'Sitemaster' drilling rig, based on the Craelius D750, and towed behind a Landrover. They chose to train up their Drillers from scratch, so as to instil in them directly, from the start, the high standards and professional attitudes for which the company has always been known. In due course, they became involved in general site investigation, taking on Geologists and establishing a soil and rock testing laboratory. Together with the many talented people who worked for them, and with a lot of hard work, they built up the company over the years; it was directly employing a hundred people when they retired.

**"Tony had strong views on the culture and standards in the UK drilling industry, and was determined to change and improve them..."**

Tony had strong views on the culture and standards in the UK drilling industry, and was determined to change and

improve them, with some success. For example, Drillers at 'Geotech' were always paid a salary and overtime; this was believed to involve them more with the overall aims of the company and to treat them with the respect they deserved as professionals. The prevailing culture in the industry at the time, which continues in some companies today, was to pay drillers 'piece-work'; Tony believed that this often led to a drop in technical standards, and a tension with Clients.

Another example was the conversion of the 'Sitemaster' drilling rig into a multi-purpose drilling rig, capable of producing a continuous soil sample to rock-head (with SPTs and undisturbed samples), and then proceeding with

rotary coring of the underlying rocks. One Driller, one rig, one process, one report. At the time (and again, even today in some parts of the industry), there was a structured, but artificial, divide between 'soft' and 'hard' ground. Two Drillers, two rigs, two processes, two reports. So often the key information was/is to be found at the interface between 'soils' and 'rocks'. In due course, the Sitemaster gave way to the company's multi-purpose 'Pioneer' rig, the concept of which is increasingly emulated by others in the industry.

The company that Tony founded is still going strongly today - 54 years and counting, with 180 directly employed staff! It is now run by his son, Andrew, who is determined

**"Tony enjoyed a long and happy retirement, and died at the age of 90 on 12th October 2015, peacefully at home, with his family around him."**

to maintain the culture and standards which have underpinned the company's reputation as a major player in the UK ground investigation industry.

Tony enjoyed a long and happy retirement, and died at the age of 90 on 12th October 2015, peacefully at home, with his family around him. ■



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# THE MYSTERY BEHIND RUSSIA'S MAPS OF BRITAIN

Writing for theGeotechnica this month is Martyn Lufkin, Data Team Leader at [Landmark Information Group](#). In this excellent contribution, Martyn explores the intrigue behind highly detailed maps of over 100 strategic locations in Britain that were mapped by Russia during the Cold War. Martyn also considers the mystery of how they were created as well as consider just how the maps are today being used by GIS, land and property professionals.

In today's digitally connected world of smartphones, mobile apps and limitless data, it has become simple for anyone to access street maps, aerial imagery of any location or other similar geospatial-based data in a matter of minutes. It is easy to forget just how difficult it once was to obtain such information before the days of the Internet, when physical paper maps were instead used to plot projects and undertake land investigations.

Not only has the ability to access mapping become easier with the digital revolution, but the technology behind the creation of mapped data has evolved and become more advanced.

As every land, GIS or surveying professional will confirm, the foundation of all successful projects is based on the quality of the mapping data used and,

as a nation, we are fortunate to have access to a huge source of Ordnance Survey (OS) maps that range in detail, intricacy and age.

A recent documentary by BBC's Timeshift series took us back through the 220-year history of the OS. During the programme, it was interesting to recall the original, traditional methods that were used to create the huge range of maps that we today take for granted and rely on for our work. It reminded us of the huge amount of time and work taken to develop the intricate details of each map, from surveying the land, to drawing the detail, and then printing.

However, working in parallel to OS, and unbeknown to us, the Russian military have also mapped many parts of Great Britain in highly accurate, exacting detail. Since their



discovery in the late 1980s, the 103 maps have brought with them a huge sense of intrigue and mystery, not only due to what they were to be used for, but how they were so accurately captured and produced.

The historical Russian maps, which Landmark was the first to digitally capture and geo-reference, include a highly detailed view of 80 towns and cities. It transpires that the maps were produced between 1950 and 1997 by the Soviet Union military at a time

when Britain's security was considered to be at potential risk from Russia.

Our involvement with these maps came as a result of a by-product of some research that had been undertaken to source and capture Goad Fire Insurance Plans. We learned that Russian maps existed and so explored further to identify a source. Whilst we were looking to access paper maps, we identified a supplier who could source high resolution digital images.

Having obtained the map

**“In fact the level of detail contained in each map prompts many questions as to just how they were produced with such intricacy...”**

images, we were immediately impressed by precision of each location. In fact the level of detail contained in each map prompts many questions as to just how they were produced

with such intricacy, at a time when technology wasn't where it is today.

With locations written in Cyrillic, with town names translated phonetically, the maps are available in 1:5,000, 1:10,000 and 1:25,000 scale and include numerous features that are not necessarily visible on many Ordnance Survey maps from the same eras.

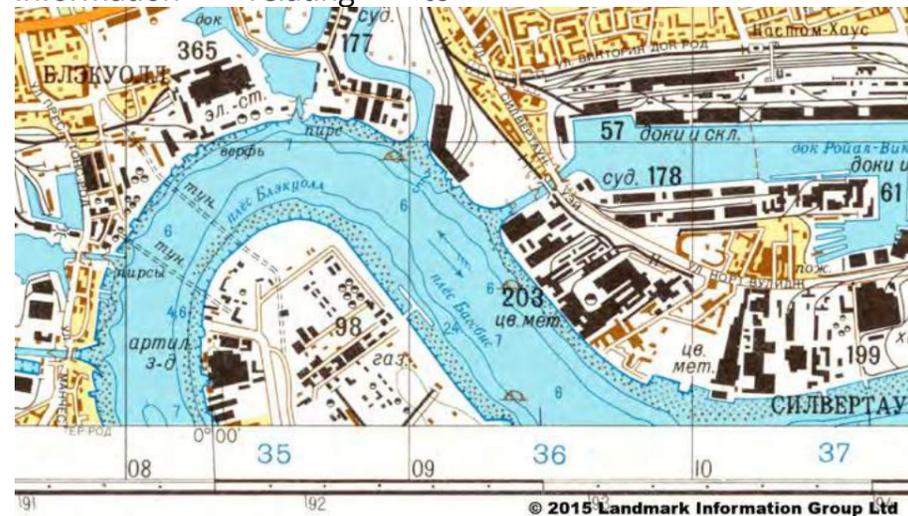
Strategically important features such as military installations, telephone exchanges, government buildings, look-out points, industrial

sites and power stations were all mapped, colour-coded and identified with a key. Plotted with exacting measure, the Russian's certainly had an eye for detail, even including prominent trees or other landscape features.

**"...the maps also include data related to our highways and energy installations and significant infrastructure."**

It doesn't stop there: the maps also include data related to our highways and energy installations and significant infrastructure. For example, details such as road-width information, road surface materials, load-bearing bridge capacities, details of construction materials, underground networks such as gas pipeworks, and even details regarding the condition of roadways are all precisely noted.

The Russian's also plotted information relating to



waterways, with data recorded regarding the depth of channel clearance, speed of flow and whether a river is tidal or otherwise.

It prompts the question as to not only why the maps were created, but how they were developed. It is the level of exacting detail that really creates the intrigue.

It must have taken many many man hours on site at each location, not to mention the time subsequently spent translating the data and drawing the maps, to come up with the maps that they have. Although we can speculate as to what the maps would have been created and used for, there has never been any official acknowledgement from Russia itself.

Neither has any confirmation ever been provided in terms of how the data was physically gathered. There are many anecdotal musings of undercover Russians being located on-the-ground to obtain the information they needed. This includes stories of individuals picnicking near

military sites in the guise of sightseers, as well as others going out to sea as fisherman across the coastlines in order to plot key information, including measuring river depths or studying tidal flows, however all this is anecdotal and no details have ever been confirmed.

**"As well as having feet on the ground, there is also speculation that data has been captured via satellite imagery..."**

As well as having feet on the ground, there is also



speculation that data has been captured via satellite imagery, as well as potentially from data taken by the Luftwaffe during the Second World War

When we took on the maps here at Landmark, there were some initial obstacles in digitally capturing the maps. One example was that the maps were not projected onto National Grid tiles, which meant there was a task for us to geo-reference every map using a combination of current maps as well as mapping of a similar age. This was no mean feat with the team having to locate key map features, including corners of buildings or road junctions to help position the maps accurately and in-line with other mapping.

**"This also involved translating every detail into English language before categorising each map..."**

We then had to quality assess the details of all 103 locations, which was followed by the painstaking task of capturing all numbered points and coloured polygons. This also involved translating every detail into English language before categorising each map into broader groups, including assessing each map and location for details such as contaminative risks. All in all, the geo-referencing took us approximately 12 weeks

to complete, with a further six months to run through the contaminative points and polygons capture.

As a self-confessed map fan, for me personally, the Russian drawings really capture the imagination particularly when you give consideration to their potentially sinister origination. Today however the maps play an active role in supporting the commercial activities of land, property and environmental professionals across the country. By overlaying all types of mapping data together, it builds a very clear picture of current and past land use, therefore greatly supporting our redevelopment or planning projects both today and in the future. ■

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# CONE PENETRATION TESTING IN GEOTECHNICAL PRACTICE

**Seminar Date: 24th - 25th November 2015**

An essential comprehensive training course and refresher for geotechnical and geo-environmental practitioners involved in Cone Penetration Testing for Onshore and Offshore Geotechnics. The course is devoted to raising awareness of current test procedures, advances, data derived from the tests and the importance of quality control.

## What delegates will learn

- Have an understanding of the importance of using CPT specialists
- Advantages and limitations of CPT tools and techniques
- Have an understanding of how CPT data can be used for soil interpretation
- Have an understanding of how CPT data can be used for design
- Have an appreciation of recognising suspect/erroneous data

## Who should attend?

Onshore and offshore specifiers, procurers and users of Cone Penetration Testing. Geotechnical Engineers, Engineering Geologists, Consulting Engineers, Civil Engineers, Designers, Developers and Clients involved in onshore and offshore ground investigations.

## Seminar Programme

### Day 1

08:45 – 09:00	Registration – Tea/Coffee
09:00 – 09:15	Introduction
09:15 – 10:00	Historic overview, equipment and procedures, data acquisition
10:00 – 10:45	Standards and guidelines. Data processing and corrections
10:45 – 11:10	Quality control – with examples offshore and onshore
11:10 – 11:30	Morning Break
11:30 – 12:15	Soil profiling and soil identification
12:15 – 13:00	Interpretation in terms of soil parameters in sand
13:00 – 14:00	Lunch
13:30 – 14:30	Demonstrations
14:30 – 15:15	Interpretation in terms of soil parameters in clay
15:15 – 15:30	Afternoon Break
15:30 – 16:15	Question and answer session
16:15 – 16:30	Summary and Close

### Day 2

08:45 – 09:00	Tea/Coffee
09:00 – 09:30	Interpretation in other soil types (silt, chalk, peat --)
09:30 – 10:00	Full flow penetrometers in very soft clays
10:00 – 10:45	Advantages of other sensors (seismic cone, electrical resistivity, nuclear density etc)
10:45 – 11:00	Morning Break
11:00 – 11:35	Direct application of CPT data (pile design, compaction control, correlation to SPT)
11:35 – 12:10	Sampling with CPT equipment
12:10 – 13:00	Case histories onshore and offshore
13:00 – 14:00	Lunch
13:30 – 14:30	Demonstrations
14:30 – 15:30	Work shop on CPT interpretation
15:30 – 15:45	Afternoon Break
15:45 – 16:00	Summary and Close



In collaboration with



### Speakers:

Dr John Powell,  
Technical Director,  
GEOLABS Ltd

Tom Lunne,  
Expert Advisor, NGI

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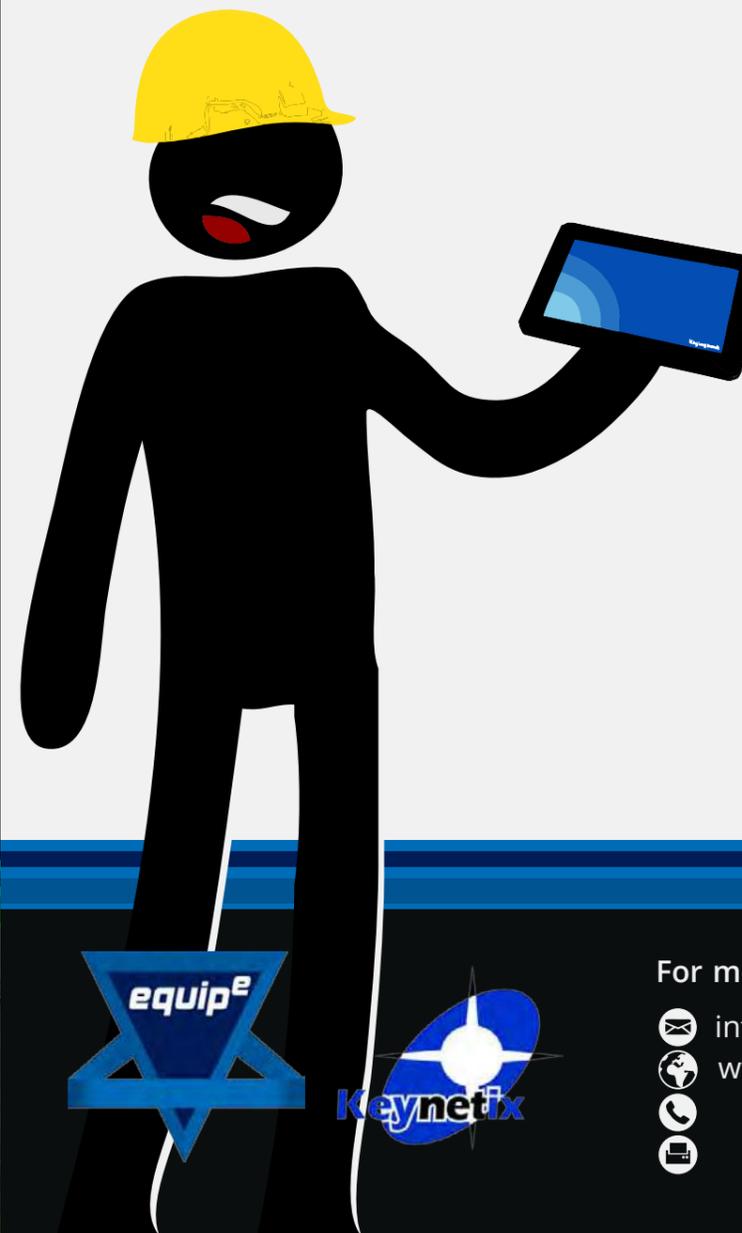


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# SENSING THE FUTURE FOR ROTARY RIGS

In his article for this month's issue of the *Geotechnica*, Calum Spires speaks to [Equipe Group's Managing Director Julian Lovell](#) and Operations Director Keith Spires about SAFER G - the sensor-based rotary rig guard that could revolutionise rotary guarding on geotechnical sites across the world.

Rotary drilling rigs are used extensively in many economic sectors including; quarrying, piling, geothermal, water wells, ground anchors and numerous other investigations, mining and civil engineering applications.

All of these sectors utilise rotary drilling in order to complete on-site works at some point or another, works which are of substantial size and value both in the UK and worldwide. However, land based drilling operations are still in many ways unsophisticated and only very recently regulated despite

significant health and safety risks.

Rotary drilling rigs operate using a drill string which rotates, often at very high speeds, and a number of accidents in recent memory [1] [2] have occurred when persons have become entangled within this rotating part, or the rotation has otherwise combined with other on-site tools such as stilsons to lead to life-threatening injuries.

**“Current rig guarding solutions, if fitted at all, are often low tech, unsophisticated and fail to provide adequate protection for users or bystanders.”**

Current rig guarding solutions, if fitted at all, are often low tech, unsophisticated and fail

to provide adequate protection for users or bystanders. It is commonly accepted that users believe fixed/interlocked physical guards hinder operation, reduce productivity and in some circumstances make the operation less safe. The current fixed/interlocked guards are also often cumbersome and poorly designed which can lead to inefficient working practices and unstable, top heavy machines. Even when guards have been fitted, they are often quite easily bypassed and interfered with by the very people they are supposed to protect.

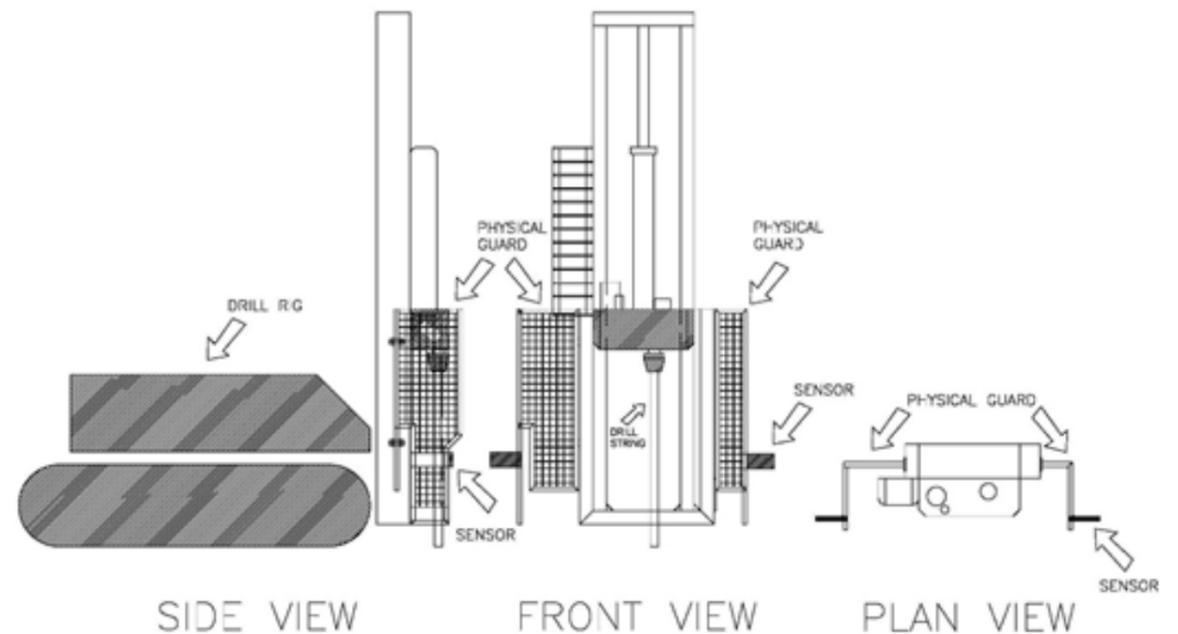
Driven by the continual requirement to improve efficiency and productivity and a genuine need to improve safety, Equipe have developed a cutting edge solution to this issue – SAFER G.

Equipe's sensor activated failsafe enabled rig guard (SAFER G) is an innovative

**“SAFER G is a self-checking, sensor activated safety device for the protection of persons encroaching too close to the rotating part of a drilling rig (the drill string).”**

solution to the problems stated previously regarding the inherent risk of a rotary drilling rig. SAFER G is a self-checking, sensor activated safety device for the protection of persons encroaching too close to the rotating part of a drilling rig (the drill string). The system uses state of the art sensor technologies to detect persons encroaching within pre-defined safeguarded zone/s. Once a detection is made, the system generates a signal to switch off rotation to prevent any ▶

FIGURE 1 SENSOR ACTIVATED FAIL-SAFE ENABLED DRILL RIG GUARD





**“The current rig guards are unfortunately still often poorly designed and the drillers are often not consulted leading to a safety device which does not compliment the drilling process.”**

process. This has led to them being easily overridden and often easily damaged in the harsh working environment. They also rarely comply to CE legislation as they should bear an independent CE mark to show that it has been designed and tested in accordance with the standards and is fully compliant.

Keith Spires, Equipe Director, explains “Our goal when developing the SAFER G technology was primarily to find a better method of guarding rotary rigs which was developed around the driller’s requirements and not just to satisfy legislation. That said, the new legislation requires rig manufacturers to design a safety system which goes way beyond a physical guard and switch mechanism (see below). We now believe that we have developed a system which does not hinder the driller in his daily work, improves safety, is fully compliant and also greatly improves productivity.

Keith recently discussed the requirements of BS EN 16228: 2014 at the Health and Safety Forum held for the industry by Equipe. He explained that the guarding system must incorporate the following:

- Must not be easily overridden;
- When activated must stop rotation immediately;
- Once rotation has stopped it can only be re-activated by a positive re-start by the driller;
- If the safety system is still active (a person is still in the danger zone or the gate is open) the rig can only start in Restricted Operating Mode (ROM) which is slow rotation or ‘inching’;
- Normal Operating Mode can only be re-started once the danger zone has been cleared or the gate is closed.

**“It is clear that despite the UK being a decade ahead of the rest of the EU in respect of guarding rotary rigs that some still do not comply with these basic requirements.”**

It is clear that despite the UK being a decade ahead of the rest of the EU in respect of



guarding rotary rigs that some still do not comply with these basic requirements.

Julian Lovell, Managing Director of Equipe told us: “Being the industry’s leading supplier of NVQ assessments, we spend a large portion of time on working sites with rotary drillers. One of the things that we noticed and were also informed of by the drillers themselves, was the cumbersome and time-consuming nature of rotary drilling guarding. Opening and closing the gates every two time a rod or piece of casing needed to be added takes a considerable amount of time, meaning less time is actually spent drilling boreholes. That seemed not only irritating to on-site operatives, but also detrimental to business. We have even found override buttons fitted on rigs to act as a work around to the guards.”

The development of sensor

**“The development of sensor based guards for drilling rigs has major challenges and many organisations have attempted and failed.”**

based guards for drilling rigs has major challenges and many organisations have attempted and failed. The two most significant challenges are; that such a device requires CE Certification under Annex IV of the Machinery Directive and the other is the technical aspect.

Keith explained, “We spent a considerable amount of time in the research and development phase getting the balance right between being able to sense physical persons, ►►

potential entanglement.

Physical guarding for machinery with dangerous rotating parts has been compulsory throughout the UK for over 20 years and is enforced through the EU Machinery Directive and the Provision and Use of Work Equipment Regulations; 1998. However, despite numerous deaths across the world it has only become accepted within the UK rotary drilling world within the last 10 years and is rarely seen anywhere else. In

October 2014, EN 16228 Drilling and foundation equipment – Safety was adopted across the EU and spells out the specifications and functionality required both from the guards themselves and the rotary drills.

The current rig guards are unfortunately still often poorly designed and the drillers are often not consulted during design, leading to a safety device which does not compliment the drilling

whilst maintaining the ability to discount things like muds, liquids and dust particles kicked up in the act of drilling.”

“A significant requirement when developing SAFER G was to ensure that it can operate outdoors and in all weathers...”

Julian continued, explaining more of the system’s functions: “A significant requirement when developing SAFER G was to ensure that it can operate outdoors and in all weathers, function in harsh working conditions and is able to withstand impact from airborne particulates and water travelling at high velocity. Given the demanding nature of most drill-sites, we needed the guarding solution to be as robust as possible to ensure its integrity.”

The technical functionality of SAFER G comprises:

- Enclosure of the rotating drill string on all sides either with incorporation into fixed guards or with additional sensors.
- Ability to define zones between 0.5m from the floor to at least 1.8m from the floor where entry by persons will not be allowed.
- Inability of being easily bypassed or disabled.

- Inclusion of a switching system which creates a fail to safe mode.

- Integration of self-checking diagnostics to prevent rotation on its own or restart whilst device has been triggered or persons are still in the zone.

- Ability to detect an object moving anywhere within a safeguarded zone.

- Ability to differentiate between small and large objects.

- Self-check at start up and constantly during operation.

SAFER G has overcome some of the technical challenges by combining technologies which are able to detect persons within the proximity of the drill string and can distinguish between problem items (e.g. hands, arms etc) and non-problematic items (foreign bodies such as particles and so on). The requirement for CE Certification is a massive undertaking even for large companies and requires component testing, environmental testing, functionality testing, software analysis and proven compliance against the relevant harmonised Standards. The significance of an Annex IV product means that a Notified Body has to be involved in the conformity assessment process which adds a level of complexity to the process as well as significant costs and time.

“SAFER G will not only revolutionise rotary rig guarding, but overcome the significant health and safety challenge posed by the danger of the rotating drill-string...”

SAFER G will not only revolutionise rotary rig guarding, but overcome the significant health and safety challenge posed by the danger of the rotating drill-string, resulting in fewer injuries and deaths both in the UK and globally. Couple the increased health and safety advantages with the reduction of time spent opening and closing large physical guards, and the incentives for utilising the SAFER G technology soon start to mount up.

For more information about SAFER G, contact the Equipe Group via +44 (0)1295 670990, [info@equipegroup.com](mailto:info@equipegroup.com) or visit [www.equipegroup.com](http://www.equipegroup.com). ■

[1] [http://www.britishdrillingassociation.co.uk/user\\_uploads/2014-12%20drill%20string%20incident%20\(fugro\)%20-%20debadged.pdf](http://www.britishdrillingassociation.co.uk/user_uploads/2014-12%20drill%20string%20incident%20(fugro)%20-%20debadged.pdf)

[2] [http://www.dmp.wa.gov.au/documents/Significant\\_Incident\\_Reports/MS\\_GMP\\_SIR\\_113drillersoffsiderstruck.pdf](http://www.dmp.wa.gov.au/documents/Significant_Incident_Reports/MS_GMP_SIR_113drillersoffsiderstruck.pdf)

# SAFER | G



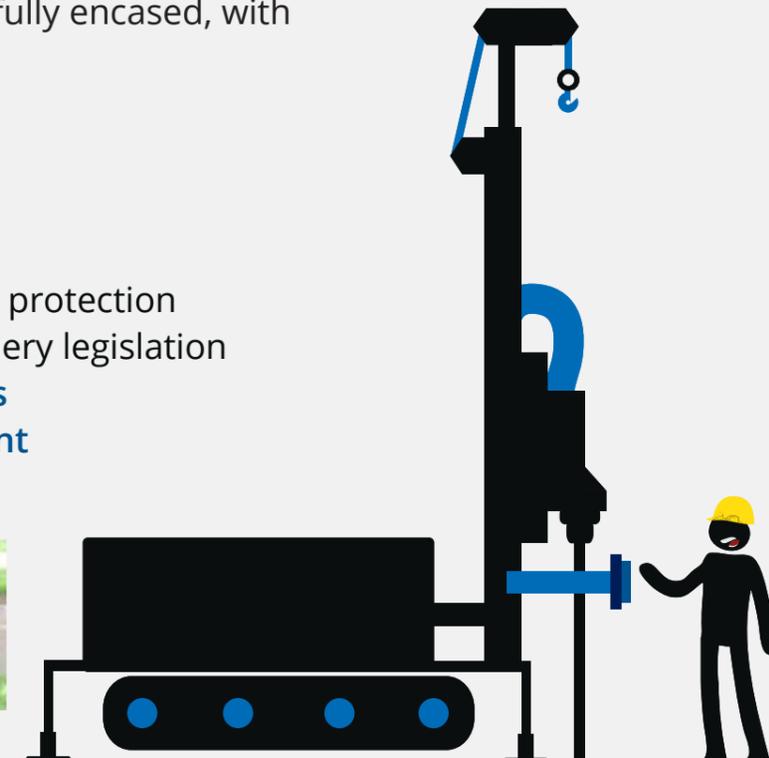
## THE WORLD’S FIRST SENSOR BASED ROTARY RIG GUARD

Introducing Equipe Geosolutions’ latest product innovation: SAFER G. Primarily aimed at land based rotary drilling rigs, SAFER G is a sensor-based guarding system that allows for increased access and productivity whilst operating on site, removing the need for restrictive and fully enclosing guarding systems. A less obstructive method of guarding, the sensors operate outdoor in all weathers and function in even the most harsh conditions and environments including: Rain, sleet, snow, ice and associated low temperatures; Sun and associated high temperatures; Dust, dirt (including mud, soil, gravel, vegetation, etc); High volumes of water, air, mist, foam and other flush medium. The sensors are fully encased, with no moving parts and ultra-robust.



## THE BENEFITS OF SAFER G

- Improves rig productivity
- Improves reliability in personnel protection
- Complies with safety and machinery legislation
- Fully compatible with all rig types
- Creates a safer work environment



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# SECURING 300 TONNES

## MACCAFERRI'S KEVLAR TENDON RESTRAINT SYSTEMS

Contributing to the *Geotechnica* this month is Jeff Laverack of Holmes Media on behalf of geotechnical specialists [Maccaferri](#). This month Jeff provides details of Maccaferri's recent work restraining a huge, 300 tonne boulder perched high above the landslip-prone, Rest and Be Thankful Pass in Argyll and Bute.

The Rest and Be Thankful carries the busy A83 trunk road between Arrochar and Inveraray through mountainous terrain in the west of Scotland. The pass has suffered frequent debris flows over recent years triggered by heavy rainfall events. However, thanks to continued investment from Transport Scotland, through their trunk roads operating company BEAR Scotland, a series of mitigation measures installed on the hillside are dramatically reducing the impact of debris

flows on the trunk road.

A network of catch fences of heavy duty, steel wire ring-mesh panels has been installed over recent years. These barriers have proved successful in preventing debris flows from reaching the road.

Site investigation work undertaken in response to a debris flow that initiated 350m above the road identified the vulnerability of a boulder, assessed to be in the order of 300 tonnes. The near under-mining of the boulder by the

debris flow highlighted the need for protective action and a plan was put in place to prevent a potentially catastrophic failure.

In response to the situation a partnership was brought together by specialist geotechnical contractor Geo-Rope including Perth-based Consulting Engineers Waterman Infrastructure and rockfall mitigation specialists Maccaferri. A design concept was quickly developed and put forward by Georope to BEAR for consideration.

Waterman Principal Geotechnical Engineer Chris Gell, takes up the story. "Controlled removal of the boulder was discounted at an



**"Controlled removal of the boulder was discounted at an early stage due to concerns that this may result in a subsequent debris flow..."**

early stage due to concerns that this may result in a subsequent debris flow – site assessments by Geo-Rope suggest that the boulder is currently acting as a 'choke' to material behind and above. As well as this, the safety and cost of disposal of the large quantity of blasted material that would

be produced, could not be assured at reasonable cost."

"The installation of some form of restraint system was therefore proposed. The design required a bespoke approach in order to achieve a solution that would successfully restrain the boulder, whilst also being practical to install 350m up a hillside. At the same time, we had to achieve Transport Scotland's requirement for a 60 year design life for the system." explained Gell.

At an early stage, it was determined that the best solution would be to utilise stable areas of the hillside located twenty to thirty metres above the boulder. A series of ground anchors would be

installed into this region and these would then be connected to the boulder by means of high strength tendons – effectively tethering it in place.

Gell continued, "Our previous work with Maccaferri, who supplied many of the debris flow barriers in place at Rest and Be Thankful, helped guide our thinking as to how best to create a suitable means of permanent restraint for the boulder."

**"As the design evolved, it became apparent that ultra-high strength, Kevlar tendons... would be an ideal method of linking the boulder to the ground anchors above the boulder."**

As the design evolved, it became apparent that ultra-high strength, Kevlar tendons manufactured by Maccaferri subsidiary, Linear Composites, would be an ideal method of linking the boulder to the ground anchors above the boulder.

Following temporary stabilisation and monitoring of the boulder by Georope, anchors fitted with bespoke high-strength termination plates were installed into the slopes above. 90 mm diameter holes were then cored





**“It was critical to achieve an accurate alignment of the drill holes in order that tendons would correctly align with anchor positions higher up the hill.”**

through the boulder to accept the tendons.

It was critical to achieve an accurate alignment of the drill holes in order that tendons would correctly align with anchor positions higher up the hill. Geo-Rope’s specialist access, pneumatically powered

drill rig proved ideal and diamond tipped core bits were used to ensure a smooth and accurate bore profile.

Each of the seven tendons was connected to the bespoke, high-strength steel anchor plates using proprietary Crosby shackles before being fed through the boulder drill-holes and tensioned against the down-hill face of the boulder.

Dr David Cheer, Rockfall Mitigation Specialist for Maccaferri explained the process. “The tendons chosen were from the Kevlar fibre, Parafil range, manufactured in UK by, Linear Composites. They are of the same system specification as those used in launching the UK military’s

**“Each tendon has a capacity of 45 tonnes and, being made from sheathed polymer fibres, has near unlimited environmental durability...”**

Longbow tank bridges.

“Each tendon has a capacity of 45 tonnes and, being made from sheathed polymer fibres, has near unlimited environmental durability, while the Kevlar fibres exhibit virtually no long-term loss of



mechanical performance.” Cheer added.

According to Maccaferri, the extremely low weight (less than 0.6 kg/m) of the Parafil makes them easy to handle without the need for mechanical handling equipment, hydraulic manipulators or heavy tools etc, all of-which removes a variety risks and costs from the site works.

The tendons were fitted with anodised, high grade aluminium alloy terminations also supplied by Linear Composites. The terminations positioned on the downhill face of the boulder are adjustable allowing the facility to add tension to the tendons after installation. This also allows direct and full transmission of the forces from the boulder through the tendons and the upslope non-adjustable terminals then on through the shackles and into the anchored steel plates.

The tendons are positioned in a fanning arrangement which will maintain the stability of the boulder in both the along-strike and down-dip directions on the slope. This is particularly important given that the exact failure mode of the boulder cannot be predicted with any precision.

**“Ground anchors were high-yield hollow bar type, installed with sacrificial drill heads as have been used successfully in designs by Waterman on previous work...”**

Ground anchors were high-yield hollow bar type, installed with sacrificial drill heads as have been used successfully

in designs by Waterman on previous works at the Rest and Be Thankful. Design of ground anchors was undertaken in accordance with BS 8081, noting the requirements of BS EN 1537.

This complex and demanding phase of site work at Rest and Be Thankful was undertaken by locally based geotechnical contractor, Geo-rope working in contract to BEAR Scotland. It builds on site condition and stability surveys by Geo-Rope and previous detailed geomorphological assessments by Geomorph Consulting.

Work to maintain the viability of the Rest and Be Thankful Pass is a high priority, with the Scottish Transport Minister Derek Mackay, recently announcing further investment to improve resilience and mitigate the effects of future landslips to the A83 corridor. ■

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