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27th September 2013

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Welcome

Welcome to the 24th Edition of **theGeotechnica** - the UK's fastest growing online geotechnically focussed e-magazine.

The first article in this month's issue is also our cover article. At Geotechnica 2013 – The UK's Largest Geotechnical Trade Show and Exhibition – Professor Eddie Bromhead delivered an incredibly well received presentation on the dangers of rising sea levels. Professor Bromhead is a highly acclaimed expert on slope stability, and he has penned an article for **theGeotechnica** based upon his presentation from Geotechnica 2013. The article is a must-read, with Eddie's sharp wit combining perfectly with the relevant facts about the influence of rising sea levels on land stability to create a highly interesting and insightful entry into this month's magazine.

Following on from Eddie's excellent piece is another highly valuable entry from **theGeotechnica**'s resident Health and Safety expert – Tom Phillips of RPA Safety Services. This month Tom writes for **theGeotechnica** about the revision of HSG47 – 'Avoiding Danger from Underground Services', and what these revisions may mean for you.

Writing to **theGeotechnica** for the first time this month is Darrell Hall, Laboratory Director at Chemtest. In our third article of this issue, Darrell explains where the responsibility for petroleum hydrocarbon pollution lies.

Article number four of this month's issue comes from another regular and valued contributor, Technical Director of the Equipe Group, Peter Reading. This month Pete introduces a lesser-discussed issue facing many geotechnical sites across the UK, the problem of invasive plant species and how to properly circumnavigate the issues caused by them.

Our final article this month comes from Managing Director of geotechnical technology specialists, Dr Roger Chandler. In this month's article, Roger gives readers a highly insightful look into the future of geotechnical mapping data.

This month we have a number of recruitment advertisements being placed throughout the magazine, notably from Soil Consultants, Geotechnical Engineering and VJ Tech. We also have entries in the Directory and Jobs sections, with positions available as a drilling specialist for the Equipe Group as well as Gardline Geosciences.

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 even the slightest bit of 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 advertising space, proportionate to the quality of content provided, is available for that single edition of the magazine. From then on, if you have submitted content, you will receive a discount on all further advertisements placed within **theGeotechnica.** 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

SHOULD WE BE WORRIED ABOUT RISING SEA LEVELS?

Over the last couple of years, and in particular the last winter, the UK coast has seen a large number of coastal landslips, many of which were reported accompanied with headlines of doom by the press. But what is the truth? Is the UK going to slip into the sea? Should we be building massive coastal defences to combat the incoming tide? At Geotechnica 2013, Professor Eddie Bromhead delivered a highly insightful presentation which looked at the data available concerning these landslides and tried to unravel the truth about sea level rising due to global warming. The following is an article penned by Eddie based on the incredibly well received presentation.

Engineers and other professionals dealing with the coast have long been aware that the level of the sea is not constant, despite the attractions of "mean sea level" for use as a datum for national mapping, and therefore the public perception that it is constant. Why should it be constant, after all? And how do we measure it – especially since the influence of waves and tides makes it difficult to pin down exactly what the mean is anyway. Moreover, storm patterns change the sea level. Finally, let us suppose that one did dump a lot of water in the sea – say somewhere off Australia – it would be quite a while before we became aware of it up here in Britain.

"The "news" is that sea levels are rising round the world. There are predictions that the rate of rise will increase. There are even alarmists who tell us that the rates of rise are or will be catastrophic..."

The "news" is that sea levels are rising round the world. There are predictions that the rate of rise will increase. There are even alarmists who tell us that the rates of rise are or will be catastrophic, if not in our lifetimes, then in our childrens'.

"It is a bit difficult to sift the truth out of the morass of conflicting data and opinions (especially since the rise of the internet!), and an even worse problem is what to do about it all."

It is a bit difficult to sift the truth out of the morass of conflicting data and opinions (especially since the rise of the internet!), and an even worse problem is what to do about it all.

We might (and I write as an engineer here) simply take on board the predictions made, select the worst, and design and build something to suit the problem. At least, that is where the money lies. Some of the most worrisome predictions might even be lived with in Britain say, if we were no bolder than the Dutch. For people living in Colorado Springs (where a research group ponders on global sea level), 2000m above present sea level, just ignoring the problem is a sensible strategy!

"So what is the truth, what does it matter, and how are we going to deal with it if it genuinely is a problem?"

So what is the truth, what does it matter, and how are we going to deal with it if it genuinely is a problem?

There is only a finite amount of water on this planet, and short of a bombardment with icy comets, this total volume is not going the change much. It is a lot, by the way, and if the earth were a perfect sphere, it would be entirely covered. Turning to my trusty "Blyth and De Freitas", for example, I discover that the average depth of water in the sea is about 3.8km, and the average height of the continental land masses above sea level is less than 1km (just), so that with seas covering ¾ of the earth's surface, "Waterworld" is a theoretical possibility – it just isn't a practical one. There seems to be enough water locked up in glaciers on Greenland to raise sea levels by about 7m, and enough ice in Antarctica to do 10 times that (70m), but the rest of the world's ice is rather insignificant. What is there in the seas might expand a bit if its temperature changed, but not by much.

The National Geographic magazine recently showed a picture of the Statue of Liberty with water at waist height. The sceptical website

"Bishop Hill"[1] made an estimate that at present rates of sea level rise, this theoretical possibility of a 65m rise would be reached in about 23.5 thousand years hence, although predicting that far ahead is rather silly: going back 23.5 thousand years puts us back to the height of the last glaciation!

Rather fascinatingly, the ice in the Arctic (North Pole – ish) is sea ice, and it floats. Thus, even if it all melted, it wouldn't influence sea levels at all or not much. Amazingly, it is so thin at the North Pole that submarines can pop up through it. The first to do so was USS Nautilus in the mid 1950's, and it has been done regularly since. Ice breakers (usually Russian) plough through it, and if one wanted to worry about this ice cap breaking up and moving around, my money would back stopping this rather than worrying about Global Warming. (The sea is also rather deep at the North Pole, about 4km as it happens).

"It stays rather cold in the winter at both Poles, and any amount of Global Warming that could thaw them out would be rather terminal for the rest of the planet."

Floating ice shelves around the Antarctic break up and float away, but this is about as much of their natural behaviour as of bears doing their business in the woods. It stays rather cold in the winter at both Poles, and any amount of Global Warming that could thaw them out would be rather terminal for the rest of the planet.

If we want to know what sea level has been doing in the past, then we have to look to direct measurements, via tide gauges (going back perhaps a century and a half), satellite measurements (going back a decade or so), or proxy evidence, which goes back much, much longer. If you want to cut to the chase, the satellite measurements do show sea levels rising. In this, they generally agree with the tide gauge information, although the latter is often patchy in coverage and incomplete. Holgate, from the Proudman Observatory, looked at it all, and came to the conclusion that there were only nine really reliable gauges (on the criteria of consistency, longevity, etc – and including the tectonic stability of the land masses on which the gauges was mounted). Together, they showed a rise of around 170mm for the 20th century[2]. This wasn't a uniform rise, but had periods of faster rise, some periods of stasis, and a few times when the levels actually dropped. Interestingly, there was no "hockey stick" (i.e. a fast rise post mid-century), and the rise in the latter half of the century was slower than in the first half.

"If you want to cut to the chase, the satellite measurements do show sea levels rising."

Now 170mm (let's round it to 0.2m shall we) taken over an area of 360 million km2, represents a vast amount of water. Some of this may well be expansion, but undoubtedly, most represents a transfer from ice on land to water in the sea. For many of us, it is insignificant. Where I sometimes take my holidays, 0.2m rise represents the high tide line being about 4 or 5m or so different from where it was a century ago, something difficult to represent on a large scale OS map. Things don't appear to have changed dramatically since 2000 either.

If I put my alarmist hat on instead of the sceptical hat, then even this does make a difference. For example, if I imagine a coastal cliff fronted by a gravel beach, the sea may well rarely make it all the way to the foot of the cliff: only in the highest of tides, with strong onshore winds. Imagine that this happens a handful of times a year – let's guess 4 times. Now, make everything 0.2m higher, and suppose that this puts the sea at the cliff foot an extra 2 times in a year.

"Even forgetting the slightly extra erosion in the original 4 instances, the extra 2 instances make the whole process 50% more severe..."

Even forgetting the slightly extra erosion in the original 4 instances, the extra 2 instances make the whole process 50% more severe – at least, until the beach profile responds to the changed littoral climate. But even so, it is likely to be more erosive, and disproportionately more erosive than the 0.2m rise

suggests. Before we get carried away with this, even, it is worth reading the paper by Lee, about erosion at Holderness (Lee, 2011) [3]. He can't discern any changing pattern in recent time. If you want a different perspective, then the papers by Bray & Hooke (1997) [4], or by Hall et al. (2000) [5] form useful starting points.

"Climate modellers have made numerous predictions of what they think will happen in the future."

Climate modellers have made numerous predictions of what they think will happen in the future. Predictions are always enjoyed by the great unwashed masses – take Nostradamus, for instance. The more alarmist the prophet, the more devoted the follower. Many thousands of worshippers hang on the words of the great IPCC, for example. This August organisation has reported on a family of predictions, many of which, it turns out, are less than what we have experienced, reach a maximum of just short of 0.6m per century, and that is not just the extreme value from the extreme prediction, it is a value that will either require Nature to step up its game, or is already in some doubt – as we are 13% of our way through the prediction period already!

The whole debate is rather sullied by lunatics, and political extremists. Forget as to whether I am in the pay of Big Oil (I'm not, as a matter of fact, although they did pay me once or twice for various things. However, compared to the amount of money that Big Oil has had from me in the past to run my cars, it has been a small payback!). It simply doesn't help the debate to make up data. It doesn't help to call sceptics liars, or to lie yourself. It doesn't help to try to re-write the past (shades of 1984). It doesn't help to cherry pick the data, or to conceal the whole pattern by selecting start and end dates to make a variable pattern look like a rapid rate of rise (or fall, if that is what you want). And it certainly doesn't help if you don't seem to know the difference between a foot and a metre, or a rise and a fall, or can't separate out the effects of changing land level from those of changing sea level! (See, for example, Maine Geological Survey [6]). And finally, an active imagination is a prerequisite for the novelist, but most of us have no idea how many things have been attributed to Global Warming [7] - my favourite being staff shortages in Bulgarian brothels!

There aren't many people who remember what the coast was like 100 years ago, and few enough of us alive today will be in a position to compare today with a century in the future. Looking back even further than our memories or the written records, we need proxies for sea level. These come in the form of submerged or raised coastal features (remembering that the land sometimes goes up and down as well), of which coral is an excellent indicator.

"These come in the form of submerged or raised coastal features … of which coral is an excellent indicator."

"Some species of coral only live a small depth below the surface, and dead examples at greater depth can be radio-carbon dated."

Some species of coral only live a small depth below the surface, and dead examples at greater depth can be radio-carbon dated. Using a huge archive of data, Balsillie & Donoghue (2004) [8] produced a rising sea level curve since the last glacial maximum (only 22,000 years ago!). Others have done similar work, and even Wikipedia (generally an alarmist organisation) mirrors the curve. We note a rise, from about 125m below present sea level then, to more or less present day levels about 6000 years ago. At times, the rate of rise has been more like 2m per century – 10x the last century rate. These proxy curves do not have the precision or resolution of tide gauges and satellite measurements, but I do not see why I should be taken to task for saying that 0.2m per century looks like stasis compared to 2m per century. Most of Britain's coast wasn't anywhere near the sea at the height of the last glacial period, and as that was by no means a severe glaciation anyway, things had been even more extreme several times in the previous million years.

Anyone who knows me knows that I am interested in coastal


Photo: Atelier Joly

landslides, and therefore apparently rather more concerned about eroding hills than flooding plains. This isn't entirely true. But one important thing is that rising sea levels don't just flood valuable coastal land – they raise it, often keeping pace with those rising sea levels. As the sea floods further and further up coastal inlets, they make the river sediment drop more easily further from the river mouth. One only has to look at the dating of salt marsh sediments to see the truth in this. Of course, rivers like the Thames with multiple weirs presumably don't transport historical levels of sediment down to the mouths of their estuaries any more, but many do. Letting coastal plains flood is a good way to capture this sediment – and of course, one can emulate the Dutch and accelerate the natural process by appropriate reclamation techniques.

So, to summarise, the sea level is rising. It does have the potential to rise a lot, but this would require some rather extreme and highly unlikely things to happen first. It could rise quicker than it does at present, or slower, or the rate could even reverse due to natural processes that we don't understand – in my view, a probable outcome, but not in the very near future.

"Rising sea levels do have the potential to cause difficulties for coastal communities…"

Rising sea levels do have the potential to cause difficulties for coastal communities and installations, but nothing that seems insuperable to wealthy first-world nations, and indeed, simply abandoning some coastal horrors might well improve the living standards of society at large!

As for advice to Engineers: my best advice is to accept every dire prediction at face value, and extract the maximum amount of money out of the scaremongers at every possible opportunity. But do make it abundantly clear who is driving it, because when the backlash comes – and it will – the right people can carry the can for the misspent funds. ■

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HSG(47) ALL CHANGE?

*Writing for **theGeotechnica** this month is highly valued contributor Tom Phillips of RPA Safety Services. This month Tom discusses the revision of HSG47 - 'Avoiding Danger from Underground Services', and what the revisions may mean for you.*

Many readers will be aware that the Health and Safety Executive (HSE) are in the process of revising HSE guidance document 'Avoiding Danger from Underground Services (HSG47)'. Although intended for publication earlier this year, it has been delayed due to resource issues and no planned update time has been given (although it is likely to be this year).

Having spoken with the inspector responsible for this project, having been asked to review and comment on a draft and being familiar with other changes to legislation, I felt it timely to provide a summary of the potential changes.

When looking at a HSG document and anticipating changes, to second guess what they are likely to contain, it is important to understand that a HSG is not a legal document. Its contents illustrate good practice and are a snapshot in time, rather than a definitive guide as to how to do the work.

"...it is important to understand that a HSG is not a legal document."

Unlike an ACoP, which outlines the minimal legal standards, a HSG document is used as a summary and may be used to judge if a company has done sufficient to comply broadly with the scope of existing regulations.

The greatest change to HSG47 that we know about is the removal of one of the four 'steps' in the safe system of work. 'Maps and plans' is likely to disappear as a discrete stage and instead be incorporated into the 'planning' section. This makes sense, as it is further reinforces the need to have access to maps and plans as part of the pre construction safety process.

Other changes are updated summaries of more recent

technologies such as vacuum excavation, ground penetrating radar and the use of 3rd party mapping systems. Essentially, HSG47 will still be a snapshot of the best available techniques and technologies, against which an organisation (and an inspector) will be able to decide if everything is being done, so far as reasonably practicable, to protect employees and others.

"Essentially, HSG47 will still be a snapshot of the best available techniques and technologies..."

When looking at other possible changes to HSG47, we should look at changes to the wider legislative picture since the current version was published in 2000. The greatest changes to health and safety since then, have been imposed through the implementation of CDM2007. HSG47 is based around the 1994 version of CDM and therefore does not reflect the current CDM ACoP and must be therefore be updated to include it.

"The new version of HSG47 is likely to reinforce the duty of the Client to ensure all the appointees are competent in line with CDM..."

The new version of HSG47 is likely to reinforce the duty of the Client to ensure all the appointees are competent in line with CDM, a process seen as overly bureaucratic and largely ineffective. To this end, HSG47 is likely to stress the need for training of employees to risk assess their work, recognising it is highly dynamic, rather than just training them how to operate a CAT and Genny.

Additionally, the role of the CDM Coordinator as outlined in CDM2007 and the importance of construction phase plans (neither of these existed in 2000) are likely to be outlined in the new version of HSG47.

To further complicate matters, the CDM2007 ACoP is currently being revised as the UK is not in full compliance with the EU Directive 92/57/EEC – 'temporary or mobile construction sites'. In the next revision there is likely to be an extension of the definition of Client to include domestic individuals under the scope of some CDM projects, which may mean many more geotechnical sites fall under scope of notifiability of some sort.

As an interesting aside, a document (PAS128) is currently being developed by British Standards – sponsored by the ICE, to standardise underground service surveys. Clients, designers, CDM Coordinators and contractors will all be able to specify the type of survey required, to improve consistency. It will be interesting to see how much of the industry picks this standard up and how Clients adopt it.

The delays in HSG47 and the forthcoming changes to CDM cannot be used to claim a lack of knowledge or for a delay in implementing a safe system of work. The legal standard that the employer is responsible for assessing is that which is 'reasonably foreseeable' and this includes both industry and expert knowledge. Despite the delays in publication there is still enough information and guidance out there for anyone with responsibilities for underground services, to be judged against this threshold.

"The changes to CDM2007 (expected in 2014) are likely to have far more effect on geotechnical projects..."

The changes to CDM2007 (expected in 2014) are likely to have far more effect on geotechnical projects than HSG47, but that's another article, when we know more about what is likely to be included. So I'll hopefully be back again next year, with more updates on CDM and by then we should know the contents of HSG47 (fingers crossed). ■

ENVIRONMENTAL FORENSICS
OIL AND PETROLEUM HYDROCARBONS

*Darrell Hall is the Laboratory Director at Chemtest, he has a BSc in Chemistry, is a Chartered Chemist (CChem), Chartered Scientist (CSci) and Member of the Royal Society of Chemistry (MRSC). Darrell is an expert in the field of organic chemistry and has 25 years' experience specialising in environmental analysis. This month Darrell explains for **theGeotechnica** where the responsibility for Petroleum Hydrocarbon pollution lies.*

The Polluter Pays!

This is a principal which is commonly accepted practice in the UK. Those who are responsible for producing the pollution should bear the costs of managing it to prevent damage to human health or the environment. This principal underpins most legislation affecting land and air pollution. However, it is not always completely clear who is ultimately responsible for causing the pollution. A common cause of pollution is hydrocarbon spills and with these the role of environmental forensics can play a pivotal part in the investigation to determine 'who is to blame?'

Chemistry, interpretations and expertise

There are a number of techniques available to the analytical chemist to assist in determining the source of the hydrocarbon pollution: age dating, hydrocarbon fingerprinting, the use of additives and dyes plus oxygenates and weathering patterns.

Firstly the identity of the material needs to be established using gas chromatography; the reference to libraries of spectral data will confirm the unknown. This data can also be compared to any potential sources in the locality. Once in possession of the spectral data the analytical expert needs to understand the weathering pattern for different fuel types.

"Any additives and oxygenates used can also aid in the identification and ageing of the unknown pollutant."

Any additives and oxygenates used can also aid in the identification and ageing of the unknown pollutant. A good example of this is organolead compounds, these were added to gasoline and later phased out in most countries by the early 2000's, replaced by oxygenates such as MTBE, TAME and ETBE. The presence of these compounds assists both with the identity and age.

Weathering and ageing

The process of weathering of a petroleum hydrocarbon spill includes the affects of evaporation, water washing, adsorption and biodegradation. The forensic expert is aware of the features this weathering has on different hydrocarbons.

"Middle distillates such as diesel are weathered mainly by biodegradation..."

Middle distillates such as diesel are weathered mainly by biodegradation whereas evaporation is the main factor affecting gasoline and light hydrocarbons like BTEX tend to be washed into ground water.

Pristane and phytane

Pristane and phytane are isoprenoids whose ratio has been used to differentiate between sources of crude oil. The isoprenoid C-19 pristane degrades very slowly compared to the nC-17 hydrocarbon so age estimates can be based on their linear ratio over time. This technique was derived over a period of 20 years by Christensen and Larson. Care should be taken by any chemist reviewing this data as the specific conditions associated with the site of the pollution can have a marked affect on the degradation model and hence the calculated age.

Conclusions

"The application of forensic techniques in environmental chemistry is wide and complex, conclusions require an in depth knowledge of the chemistry of hydrocarbons and interpretation of analytical techniques."

The application of forensic techniques in environmental chemistry is wide and complex, conclusions require an in depth knowledge of the chemistry of hydrocarbons and interpretation of analytical techniques. In addition many factors associated with the particular site and conditions locally, the likely source of the pollution and its age all

"In summary, environmental forensics associated with petroleum hydrocarbons is not a 'text book' exercise; it requires real knowledge, experience and expertise."

need to be considered before reaching valuable conclusions to the investigation. In summary, environmental forensics associated with petroleum hydrocarbons is not a 'text book' exercise; it requires real knowledge, experience and expertise.

Case Study

Evidence of a Light Nonaqueous-Phase Liquid (LNAPL) layer was found in a watercourse at a military airbase in 2005. The Client required the source of the LNAPL layer to be determined. Potential sources were storage tanks containing JP-4 and JP-8 aviation fuels.

"Standards of all fuels were sourced and analysed by GC-FID and fingerprint interpretation performed on the extracted LNAPL samples."

Standards of all fuels were sourced and analysed by GC-FID and fingerprint interpretation performed on the extracted LNAPL samples. BTEX analysis was also performed using GC-MS and compared with the standards and literature composition of JP-4 and JP-8 fuel types.

JP-4 was phased out in all military airbases by 1996 and completely replaced with JP-8. As their compositions are different, identification should have been relatively straightforward. JP-4 is a kerosene/gasoline mix and has a percentage of volatile components. As JP-4 had not been used on the site for at least 9 years however, the potential weathering effect of any JP-4 LNAPL may have caused ambiguous results.

The fingerprinting analysis did match broadly with the JP-4 standard but was missing the majority of the volatile components. GC-MS analysis of the LNAPL showed the presence of BTEX components which are only present in JP-4, but at much reduced levels than would be expected in fresh JP-4.

Examination of a weathering study for JP-4 showed the primary weathering mechanism to be dissolution, and further analysis of the corresponding aqueous phase confirmed elevated levels of BTEX components.

It was concluded that the LNAPL phase originated from JP-4 and the age was estimated from the first-order reduction rate of Benzene. ■

A GUIDE TO INVASIVE SPECIES AND CURRENT LEGISLATION

*Writing for **theGeotechnica** once more is Technical Director of the Equipe Group, Peter Reading .This month Pete introduces a lesser-discussed issue facing many geotechnical sites across the UK, the problem of invasive plant species and how to properly circumnavigate the issues caused by them.*

Did you know that it is an offence to transport or dispose of certain plant species in the UK? These species are often found on development sites, so it is essential that the engineer on site knows what these species are and how to avoid disturbing them and potentially failing foul of legislation.

There are some 39 species which are currently termed 'invasive non-native species of plant' which are now found in the UK. These plants are covered by Schedule 9 of the Wildlife and Countryside Act of 1981, which states:

"It is an offence to plant or otherwise cause to grow in the wild any plant listed in Schedule 9 of the act."

This means it is an offence to cut down or dig up or disturb these species in any way which might cause them to propagate. Many of the listed plants are water plants. The three most commonly found on development sites and probably the most invasive are Japanese Knotweed, Himalayan or Indian Balsam and the Giant Hogweed.

When investigating sites it is important to be able to recognise these plants and to take appropriate action so as not to fall foul of the act.

"Japanese Knotweed is a monster. It was introduced into the UK in the mid-nineteenth century as an ornamental garden plant."

Japanese Knotweed is a monster. It was introduced into the UK in the mid-nineteenth century as an ornamental garden plant. During this period there was a garden revival and well off individuals would travel the world to bring back exotic species to display in their lavish gardens.

Unfortunately this plant does not stay where it is put and it has now spread across most of the UK and Ireland. There is a move to try to halt its progress and where possible remove it, however once established this plant is extremely difficult to destroy, it has a highly regenerative capacity. It has caused serious problems and can survive in a wide range of habitats such along roadsides and rivers, but it is on derelict sites where it has become particularly prolific. The young shots can be particularly damaging, forcing their way through tarmac and concrete. The plant produces a thick clump of stems which quickly displaces the native flora. Whilst only female plants exist in the UK it is the rhizomes and crowns which cause the problem.

It only takes a small segment of the node on a stem, the rhizome or the crown for the plant to regenerate. For this reason the plant should not

"Where the plant is present the client should be informed the area should be fenced and access denied if exploratory holes are scheduled close by..."

be cut by flailing. Where the plant is present the client should be informed the area should be fenced and access denied if exploratory holes are scheduled close by or, in areas where the plant

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“The roots of the plant can extend at least 7m from the mother plant…The rhizomes will reach depths of up to 3m…”

exists, it is advised that the holes are relocated. The roots of the plant can extend at least 7m from the mother plant. The avoidance zone should therefore be more than 7m from the plant and ideally at least 10m. The rhizomes will reach depths of up to 3m, well below any topsoil which may be present. The rhizomes can survive for years in a dormant state before regenerating. Just a small section of stem can quickly grow and spread. In 2010 the Psyllid bug Aphalara itadori was released in the UK in an attempt to control Knotweed organically; there has been some reduction however there are still many areas where knotweed persists.

Be aware that it is an offence to remove the plant remains from site without a waste license. If Knotweed is present on site it is best to avoid areas where it is growing with an exclusion zone and avoid clearing it form the site without proper controls or ideally using a competent contractor. Any vehicles on site should be checked to ensure they are not carrying fragments of the plant in the tyre tread before they leave site.

Our second immigrant is Himalayan Balsam - this is a relative of the “Bizzy Lizzy” but is a much larger plant. This is an annual, which means it dies back during the winter. The plant was introduced into the UK in 1839 when it quickly escaped from the ornamental gardens it was brought to adorn to colonise verges and river banks. The plant has a rather pretty purplish pink flower which was probably the attraction of this plant. When full grown it is the tallest annual plant in Britain.

“The plant has a rather pretty purplish pink flower which was probably the attraction of this plant. When full grown it is the tallest annual plant in Britain.”

This plant, like the Knotweed, suppresses the growth of native plants. It is particularly damaging to river banks because when it dies back in the winter it leaves the bank bare and open to erosion from the higher winter water levels.
The plant propagates from the seeds which ripen from July to October, there are up to 14 seeds per pod which when touched explode sending the seeds up to 7m away.

Control measures should prevent the plant from flowering however when it has flowered control is very difficult to obtain because the slightest disturbance will cause the seed heads to scatter their contents. This plant should be avoided with at least a 7m exclusion zone around it.

Our third monster is Giant Hogweed. This is a much larger version of our own hogweed and grows to a height of up to 5m. This was brought into the UK in 1893 from the Caucasus Mountains, again as a plant collectors’ trophy for gardens, but with up to 50,000 seeds per seed head it has taken over the verges of many roads and river banks.

“Once it has established, the Giant Hogweed is very difficult to eradicate…”

Once it has established, the Giant Hogweed is very difficult to eradicate, it is now present over most of the British Isles. The seeds are scattered along large stretches of the road network, spread by passing lorries and vehicles. This plant will again supress the indigenous flora.

Personnel should be wary when working around this plant, the seeds can irritate the skin much like itching powder, in acute cases of contact they can cause sores. With its towering height it can appear like a forest. As with the other species, affected areas should be avoided and exclusion zones set up to keep personnel and plant from coming into contact with the plant.

To conclude, it is important that staff working on site can identify these particular invasive non-native species, and the implications they impose through legislation. ■

A full list of the plants in Schedule 9:

- All species of the genus *Elodea* (waterweeds) (eg Canadian waterweed *Elodea canadensis*).
- Curly waterweed *Lagarosiphon major*
- Duck potato *Sagittaria latifolia*
- Entire-leaved cotoneaster *Cotoneaster integrifolius*
- *Fallopia japonica x Fallopia sachalinensis* (a hybrid knotweed)
- False Virginia creeper *Parthenocissus inserta*
- Fanwort (Carolina water-shield) *Cabomba caroliniana*
- Few-flowered leek *Allium paradoxum*
- Floating pennywort *Hydrocotyle ranunculoides*
- Floating water primrose *Ludwigia peploides*
- Giant Hogweed *Heracleum mantegazzianum*
- Giant knotweed *Fallopia sachalinensis*
- Giant rhubarb *Gunnera tinctoria*
- Giant salvinia *Salvinia molesta*
- Green seafingers *Codium fragile*
- Himalayan cotoneaster *Cotoneaster simonsii*
- Hollyberry cotoneaster *Cotoneaster bullatus*
- Hottentot-fig *Carpobrotus edulis*
- Indian balsam *Impatiens glandulifera*
- Japanese knotweed *Fallopia japonica*
- Japanese rose *Rosa rugosa*
- Montbretia *Crocosmia x crocosmiiflora*
- New Zealand pigmyweed (Australian swamp-stonecrop) *Crassula helmsii*
- Parrot’s-feather *Myriophyllum aquaticum*
- Perfoliate Alexanders *Smyrnium perfoliatum*
- Purple dewplant *Disphyma crassifolium*
- Red algae *Grateloupia luxurians*
- Rhododendron *Rhododendron ponticum*
- Rhododendron *Rhododendron ponticum x Rhododendron maximum*
- Small-leaved cotoneaster *Cotoneaster microphyllus*
- Shallon *Gaultheria shallon*
- Three-cornered garlic *Allium triquetrum*
- Variegated yellow archangel *Lamiastrum galeobdolon subsp. argentatum*
- Virginia creeper *Parthenocissus quinquefolia*
- Water fern *Azolla filiculoides*
- Water hyacinth *Eichhornia crassipes*
- Water lettuce *Pistia stratiotes*
- Water primrose *Ludwigia grandiflora / Ludwigia uruguayensis*
- Yellow azalea *Rhododendron luteum*

THE FUTURE OF GEOTECHNICAL MAPPING DATA?

*Writing for **theGeotechnica** for once again is Managing Director of Keynetix, Dr Roger Chandler. In this month's article, Roger gives readers a highly insightful look into the future of geotechnical mapping data.*

Free mapping datasets have become more readily available over the last couple of years with the advent of the government's OpenData policy. Initially, access to electronic Ordnance Survey Mapping Data was made available but

"...in the last couple of years the Environment Agency and BGS have provided datasets via their DataShare and OpenGeoscience initiatives."

in the last couple of years the Environment Agency and BGS have provided datasets via their DataShare and OpenGeoscience initiatives.

The availability of this data has streamlined the process of researching a site, as it is now much quicker to gather the basic facts and history for a site for a geotechnical or geoenvironmental engineer. However the process still requires a number of websites or software programs to view the data, or a GIS professional to combine these mapping sets into a single system for the engineer using a program such as ArcGIS or AutoCAD Map.

"At our Geotechnica 2013 exhibition, Keynetix announced and previewed the integration of exciting new mapping technology..."

At our Geotechnica 2013 exhibition, Keynetix announced and previewed the integration of exciting new mapping technology that allows the incorporation of datasets from the BGS and Bing Mapping into HoleBASE SI; their borehole logging and geotechnical data management software. The functionality was launched last week and is included in HoleBASE SI Professional free of charge. This allows clients access to commercial use licences of worldwide road mapping, aerial photography and 15 mapping layers from the BGS OpenGeoscience catalogue.

The importance of the announcement was emphasised by Geraldine Wildman from the BGS in a statement released at Geotechnica 2013 who said

"The key drivers behind OpenGeoscience was to allow more people to access core geological information and to encourage businesses to innovate with our data."

"The key drivers behind OpenGeoscience was to allow more people to access core geological information and to encourage businesses to innovate with our data. We are delighted that Keynetix have implemented BGS OpenGeoscience Mapping in a desktop product and are really excited by how this move will increase the use of BGS data within the geotechnical industry."

"Ever since this alert there has been a debate as to whether it is a breach of the Google Earth Licencing conditions or not."

In 2012 the AGS released a loss prevention alert on the use of Google Earth images in geotechnical reports http://www.ags.org.uk/aboutlossprevention/lp50.php. Ever since this alert there has been a debate as to whether it is a breach of the Google Earth Licencing conditions or not. This argument can now be laid to rest as the Bing Aerial Photography and BGS mapping in HoleBASE SI are licenced for commercial use, including the supply of hard copy reports.

The final hurdle for many engineers is the quantity of data available. With very large downloads from the BGS and especially the Ordnance Survey it can be an IT challenge to find the most efficient way to store and distribute the data. However with the new HoleBASE SI solution, mapping data is streamed from servers on the internet using Web Mapping Service Technology so customers do not need the IT infrastructure previously required.

"With this recent addition to the HoleBASE SI package it appears that Geotechnical Engineers can finally take advantage of the freely available mapping data..."

With this recent addition to the HoleBASE SI package it appears that Geotechnical Engineers can finally take advantage of the freely available mapping data without the hurdles that have previously restricted the use to GIS users.

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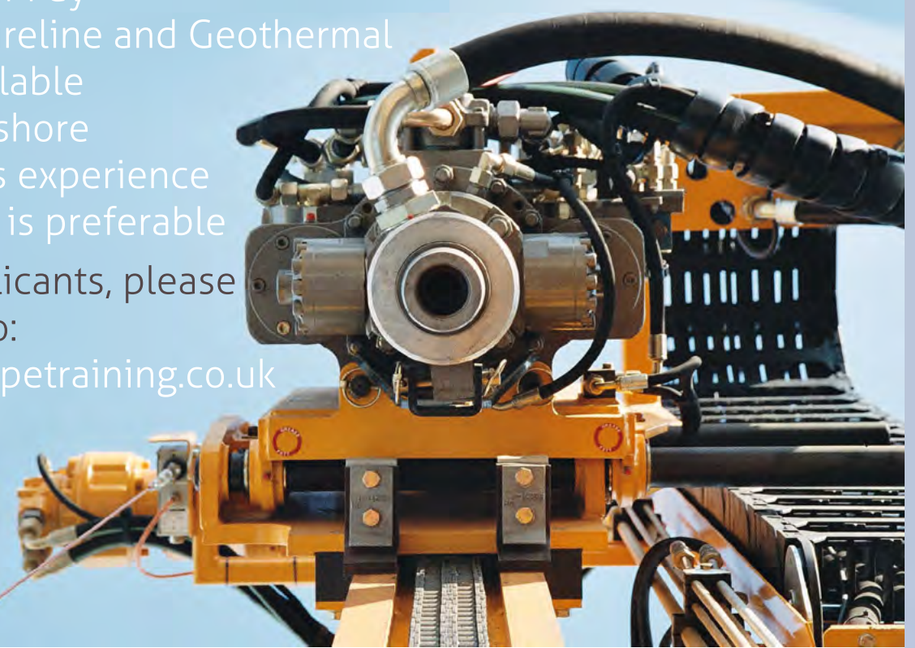

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