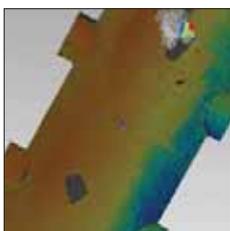


Surveying for geographical and spatial information in the 21st century

Monitoring railway infrastructure with non-contact systems



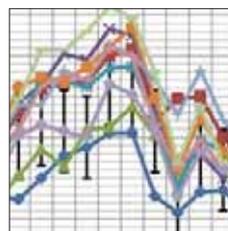
Grand designs for a Grade II listed water tower!



Coastal Monitoring in landlocked Oxfordshire



Dam deformation surveying in the United States



Hot topics at Colorado's LiDAR Mapping Forum



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COVER STORY

London Bridge Station in the heart of London is undergoing major redevelopment. Monitoring for deformation is essential. But is laser scanning the answer? Turn to page 12 to learn more.

Contents

p.06 News

- First fix for Gallileo
- Underground tunnel pierced

p.12 Monitoring railway infrastructure

At UCL Anita Soni is investigating non-contact measurement systems for railway monitoring. Here are her preliminary findings.

p.15 It all started two decades ago. . .

In this revealing interview, Maria Toth talks to Robin McLaren of Know Edge about his experience in modernising Hungary's land registration system.

p.20 LiDAR Mapping Forum

All the hot topics including Esri in 3D, plus Adam Spring talks to Nick Palatiello about MAPPS and professional photogrammetrists.

p.22 Ocean Business

A brief report on this annual event that included the "Blue Economy", ahead of our major hydrographic feature in the next issue of GW.

p.23 Grand designs for a water tower

A detailed measured survey was necessary ahead of converting this Grade II listed 19th century structure into a home, explains John Withenden.

p.26 Coastal Monitoring. . . indoors!

3D Laser scanning is being used for coastal and marine infrastructure research at HR Wallingford's Oxford base.

p.26 Dam deformation surveying in the US

The US has many flood control dams and structures: John Hamilton looks at the various techniques used today in monitoring them.

p.29 Structural subsidence in Wales

Remote monitoring techniques gave advance warning of a partial house collapse, explains Alex Keal.

REGULARS

p.05	Editorial	p.10	Policy Watch
p.06	News	p.14	Books
p.08	Calendar	p.30	Down Undercurrents
p.09	Chair's column	p.35	Classified

We're growing: GW's Digital Extras

With the increasing amount of high quality editorial material that we receive and restrictions in sustaining an economically sized printed publication, we plan to publish more material on the web. To read GW's "Digital Extras" go to: <http://www.pvpubs.com/archives.php?titleid=1&issueid=210>

Please note that this link is free of any restrictions to readers but does not allow access beyond the currency of this issue or to the archives.

Would you like notice of the electronic version via email?

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UK and Irish readers as well as subscribers can also receive notice of a new digital edition (sent at least a week ahead of the printed edition) by emailing a request to barbara@pvpubs.demon.co.uk

• **Note: the electronic version can now be downloaded as a PDF and printed.**

Next issue

The next issue of GW will be that for July / August 2013.

Copy dates are: Editorial: **10 June** Advertising: **14 June 2013**

Being an Intelligent Client

a guide to successful commissioning and managing of land and engineering surveys



By Richard Groom

- a simple guide for managers, engineers, architects, surveyors and all who commission or manage survey projects, or needs to discover more about survey techniques and technologies

The concept of risk is well understood in relation to health & safety. But with surveying, people tend to focus on accuracy and precision.

Nevertheless, there *are* technical and commercial hazards in surveying and they come with expensive risks for clients.

The consequences of a survey 'accident' can be significant. Projects can be delayed. Cost implications can be substantial. Sometimes they can be catastrophic and render a project unfit for purpose – like an Olympic-sized swimming pool built too short.

This guide is intended to help those who commission and manage surveys to recognise the hazards and manage the associated risks.

In two parts, Part 1 deals with **Managing Survey Projects** and includes 20 key topics in preparing contracts and specifications as well as managing the work once a survey firm has been appointed. This is essential reading for professionals working in the built environment who appoint or manage survey companies.

Part 2 sets out the **Principles of Surveying** and covers over 30 topics, which may help reveal the hazards that can lurk in surveying processes. Engineers, architects, other professional disciplines as well as older surveyors in need of a reference point or a refresher course, will find this a reliable reference point.

The Guide is therefore intended as an essential reference source. It can also be an ideal source book on surveying for academic courses. Younger readers will find all of the essential techniques presented together with current technology and its applications.

The author is an experienced chartered surveyor with many years experience working in both the private and public sectors as well as in the UK and overseas.

Copies of *Being an Intelligent Client* price £9.95 are available from www.pvpubs.com

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Monitoring brings opportunities but heed the lessons learned

This issue majors on monitoring but we also talk to someone with words of wisdom and experience of big computer and digitisation projects.

Much of Europe and the UK is congested with over development. Green space is at a premium and where available, is often marginal land that requires careful geotechnical investigation before construction. It is easy to get it wrong as one of this issue's articles reveals (Structural subsidence in Wales, p.29).

So brown space it often has to be. But this puts enormous pressure on contractors and engineers to ensure that adjacent buildings and structures are not affected by demolition and new construction. It also creates opportunities for those in geomatics to demonstrate our skills and technologies.

This issue's focus is monitoring and our technical editor has done readers proud with four articles ranging from current research into the problems of monitoring railways, including those in tunnels, using a laser scanner for marine structure modelling, current techniques for monitoring dams in the US and the previously mentioned Welsh housing problem. It makes great reading and should whet appetites for opportunities out there.

Hopeless metrics

We are all aware of the endless failure and cost overruns of projects for digitisation and new computer systems. The UK government is littered with them. Why do they go wrong? One reason was revealed by **John Naughton** in one of his regular columns in *The Observer* newspaper. Almost 30 years ago a former IBM programmer wrote a book revealing how in the 1960s he led the "Big Blue's" team of software engineers and programmers to develop the operating system for the IBM 360 mainframe computer. It fell behind schedule. More programmers were recruited; it fell back further. Eventually it was realised that man-months are a hopeless metric for assessing the size of a complex software project because it ignored the unproductive but essential element of coordinating the programmers. The book, *The Mythical Man Month and Other Essays on Software Engineering*, by **Fred Brooks** has never been out of print since 1975.

Get a champion

Under estimating is therefore clearly part of the problem. But there is another aspect, revealed in our interview by **Maria Toth** of **Robin McLaren**, whose company won a contract over 20 years ago to develop a

modern land registration system for Hungary. Since then McLaren has been involved in many similar systems around the world. One of the many true pearls of wisdom he offers in the interview under lessons learned is that projects only succeed if the politicians and the funders understand the benefits of their investments. A different set of terminology and language has to be used in this on-going engagement between the two. Projects succeed if they have a senior, high profile champion supporting them. That is true, whether it's land registration or big computer systems.

We're also trailering next issue's hydrographic survey feature with a brief report on the Ocean Business event in April, which included a separate conference entitled the Blue Economy. **James Kavanagh** will be reporting on that and the opportunities that lie ahead for geomatics.

Enjoy this issue and for those in the UK, prey the good weather continues!


Stephen Booth, Editor

TEN YEARS AGO: GW May / June 2003

Looking back at what *GW* was reporting a decade ago it is surprising how rapidly new technologies were being adopted. The issue included articles on micro satellites and using a laser scanner to capture the Rock of Gibraltar to track erosion. These technologies are common place today; back then they really were cutting edge.

What is striking too about the May/June 2003 issue is the difference these technologies were already beginning to make by making projects that would either have been too expensive to undertake by traditional survey techniques or would just never have been contemplated.

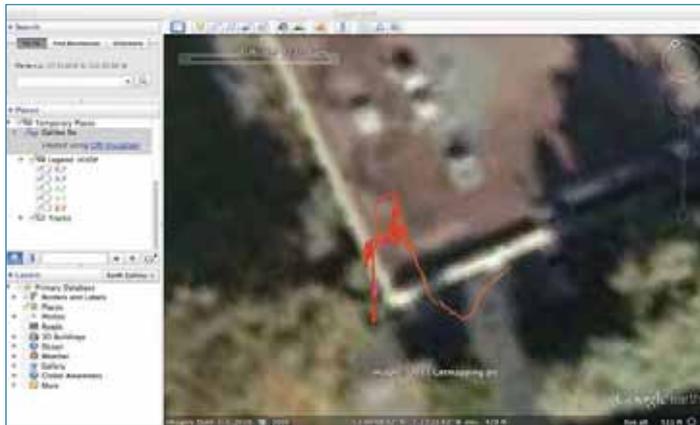
Typical was Frank Hobbs work in helping the Maldives establish a local national grid reference system using post-processed data from a \$200 handheld GPS.

Another area of practice beginning to undergo a technological revolution was measured building survey. The previous issue had reported the traditional approach of tape and Disto. In this issue Andy Roberts set out a convincing case for bringing CAD into the field on handheld devices.

The editor welcomes your comments and editorial contributions by e-mail: editor@pvpubs.demon.co.uk or by post:

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First fix for Galileo



Plot showing the scatter of the solutions. It shows clearly the initial convergence period and the final drift as the DOP degraded towards the end of the short observational window.

The Nottingham Geospatial Institute has successfully computed a first positioning solution using only the four Galileo IOV satellites. The data was recorded during the MSc field courses at the Hayes Conference Centre in Derbyshire, using a Javad Triumph-1 receiver connected to a Leica AR10 antenna. E1 and E5a data were recorded for about 26 minutes on 26th March.

Beidou improves precision

The precision of China's BeiDou satellite navigation system will be improved by implementing the BeiDou Ground Base Enhancement System (BGBES) – a network of thirty ground base stations, an operating system and a precision positioning system.

It is expected to improve positioning precision to 2cms horizontally and 5cms vertically via tri-band real-time precision positioning technology, and to 1.5m with the single-frequency differential navigation technology.

Rights to Light

The Law Commission is investigating whether the law by which rights to light are acquired and enforced provides an appropriate balance between the interests of landowners and the need to facilitate the development of land.

A "right to light" is an easement that gives landowners the right to receive light through defined apertures in buildings on their land. The owners of land burdened by the right cannot substantially interfere with it – for example by erecting a building in a way that blocks the light –

without the consent of the benefiting owner.

In the consultation paper, the commission makes the following provisional proposals:

- to introduce a new statutory test to clarify the current law on when courts may order a person to pay damages instead of ordering that person to demolish or stop constructing a building that interferes with a right to light.
- to introduce a new statutory notice procedure, which requires those with the benefit of rights to light to make clear whether they intend to apply to the court for an injunction (ordering a neighbouring landowner not to build in a way that infringes their right to light), with the aim of introducing greater certainty into rights to light disputes.
- that the Lands Chamber of the Upper Tribunal should be able to extinguish rights to light that are obsolete or have no practical benefit, with payment of compensation in appropriate cases, as it can do under the present law in respect of restrictive covenants.

More at <http://lawcommission.justice.gov.uk/consultations/rights-to-light.htm>. Closing date for the consultation is 16th May 2013

Calling young entrepreneurs

The Open Geospatial Consortium has announced the OGC Student Map App Challenge, sponsored by Google, an OGC principal member. The challenge is a contest for students with programming skills and an interest in maps and location services.

Open standards from the OGC unlock the potential of the "spatial Web," creating opportunities for app developers to make all kinds of location information available to users, independent of platform. The OGC has launched the challenge to make entrepreneurial students aware of the enormous social and commercial potential of these open standards.

Three winning applicants will receive an OGC Student Map App Challenge Award and recognition on the OGC website. The winner will receive an expenses-paid trip to receive his / her award at one of next year's OGC Technical Committee meetings, a Nexus Tablet from Google and two year OGC membership for the student's academic institution.

Students must register by 15 June 2013 and submit their apps by 15 July 2013. Contestants and the public will be notified of the results on 30 August 2013.

RICS hosts US land surveyors

A five-strong delegation of Licensed Professional Land Surveyor representatives from the states of Virginia, Iowa, Georgia and Tennessee visited RICS HQ on 6th March.

The USA operates a state-by-state licensing system for professional land surveyors but has recently formed a national surveying body (National Society of Professional Surveyors <http://www.nspss.com>). The delegation were on a fact-finding mission to the UK and also managed to visit places of geographic and surveying significance such as Greenwich. James Kavanagh, director Land Group hosted the delegation and discussions ranged from the

historic links and shared surveying heritage of the UK and USA, presentations on the UK system of mapping, land registration and property ownership, to developments in professional practice and technology.

The US delegation were especially interested in the broad ranging remit of RICS professional practice compared to some parts of the world and the evolution of the profession in the UK. The group invited RICS to participate in the forthcoming celebrations planned in Philadelphia for late August 2013 to mark the grave of **Charles Mason**, the UK land surveyor of Mason–Dixon line fame. US land surveyors tend to be acutely aware of their history and the Mason-Dixon Line has gained a hold on the US national memory as the division between North and South, Yankees and Dixy, freedom and slavery. Far more prosaically, its original intention was to quell a 1760's bloody boundary dispute between the states of Maryland and Pennsylvania.

RICS Land has a strong and growing relationship with our colleagues in the US and this visit will hopefully be the start of developing opportunities within the state licensed sectors which employs over 20,000 professional land surveyors in the USA.

One hour warning

The BBC website reports that Professor **Kosuke Heki** of Hokkaido University in Japan has been able to show that about an hour before the magnitude 9.0 earthquake that rocked Japan in March 2012, the total electron count (TEC) in the ionosphere started to increase unexpectedly. It seems that the build-up of forces within the earth somehow energised electrons in the ionosphere. The change in TEC appears as a disruption of GNSS signals in the same way that solar activity also causes disruption. Professor Heki has observed the same phenomenon before other large earthquakes, so there is some hope that GNSS may one day be used to predict earthquakes. Source:

<http://www.bbc.co.uk/news/science-environment-17487482>

• there's lots more geospatial news, updated daily at our new site: www.location-source.com  Location-Source

GOCE detected quake

The BBC website also reported that the European Space Agency's precise satellite gravimeter, GOCE, detected the earthquake. GOCE has a low earth orbit so as to detect minute changes in gravity but it is now running out of fuel and coming to the end of its life. The Agency is planning to lower the spacecraft's orbit in June, to obtain even higher finer observations and the mission will finish in November.

New Forum for OGC

The Open Geospatial Consortium (OGC) established a Middle East and North Africa (MENA) Forum during its Technical and Planning Committee meetings held in March 2013 in Abu Dhabi. This was the first time the OGC Technical and Planning Committee meetings had been held in the Middle East.

Glasgow CASLE

The Commonwealth Association of Surveying and Land Economy is holding its conference at the University of Glasgow 7th – 10th July. The conference has three themes: Land Title, Registration and Cadastre; Marine Asset management and Environment and Resource impacts on property values and construction economics. Visit www.casle.org for more details.

Moving feature standards

The Open Geospatial Consortium announced the formation of the Moving Features Standards Working Group (Moving Features SWG). "Moving features" data describes such things as vehicles and pedestrians. This group is chartered to develop a candidate Moving Features standard from the discussion paper (OGC 12-117r1, OGC Standard for Moving Features; Requirements), which summarizes the requirements and basic idea of an encoding standard for moving feature data.

Sheds with beds

UK local authority Slough Borough Council is set to become the first local authority in the UK to use thermal imaging to clamp

down on people living illegally in outbuildings. It is not known exactly how many so-called "sheds with beds" there are in Slough, but estimates range from 700 to 3,000. The council has commissioned Bluesky International to produce a thermal map of the town, which officers will use to pin-point warm areas in outbuildings.

Pléiades twins in action

Pléiades 1B has successfully completed its technical commissioning. Together with Pléiades 1A, the Pléiades twin very-high-resolution optical Earth-imaging satellites now operate as a true constellation on the same orbit, allowing daily revisit capability.

Ideas for TfL

Transport for London (TfL) has launched an online Innovation Portal to enable staff, suppliers, industry and academia to share and capture pioneering and efficient solutions to TfL's biggest future challenges. The portal has been developed jointly by London Underground's Capital Programmes and Asset Performance Directorates, which are responsible for delivering the Tube upgrade and are at the forefront of hitting the Mayor's target of a further increase in reliability of 30 per cent by the end of 2015, compared to 2011. For more information visit: www.tfl.gov.uk/innovation

Chiefs to discuss future of mapping

For what is thought to be the first time ever, the heads of the five British mapping and charting agencies will come together to discuss the future of mapping in front of an audience of cartographic professionals and enthusiasts. The discussion will take place at the British Cartographic Society's 50th Annual Symposium. The theme this year is 'Today, Tomorrow and Beyond' reflecting the Society's forward looking vision for the future of cartography. The event is being held at the historic Hothorpe Hall, Leicestershire from 3-6 September 2013.

Train tunnel pierced



On Friday morning, 8 March 2013 the driver of a train on the London Northern City Line tunnel between Old Street and Essex Road in north London spotted water pouring through a hole in the tunnel roof. The hole was caused by two large piling drills protruding through the roof from a building site above. It was only chance and the alertness of the driver that prevented a serious rail crash. Investigations by the Health and Safety Executive, the Rail Accident Investigation Branch and the British Transport Police are in progress to ascertain the cause of the incident.

Funding for laser research

Laser scanning specialist 3D Laser Mapping has embarked on a multi-million pound research project, in a knowledge transfer partnership with Durham University. The project, which aims to develop new models for slope failure monitoring, will be used to improve the safety and operational efficiency of mining companies around the world. KTP Associate Dr Ashraf Afana will join the 3D Laser Mapping team from the University where he will work for a three-year placement on the integration of full waveform (FW) data processing into the 'SiteMonitor' product.

Vulcan for Mongolians

Mining technology developer Maptek has provided educational licences of Vulcan geological modelling and mine planning software to the Mongolian University of Science and Technology (MUST), based in Ulaanbaatar. Maptek reseller for the region, Information Technology Experts LLC will conduct the training of staff and ongoing teaching of fourth year students in the School of Mining Engineering. About 2400 students study mine engineering at MUST, with nine different specialisations offered.

Thames tidal monitoring

OceanWise, in collaboration with Valeport and Wood & Douglas, has been awarded a contract to deliver a Tidal Monitoring, Telemetry and

Display System (TMTDS) to the Port of London Authority (PLA). The TMTDS includes eight tidal monitoring stations in the Thames Estuary, plus a data feed from stations further upriver operated by the Environment Agency. Tidal monitoring equipment for the project will be supplied by Valeport and will include Valeport's new radar sensor, the VRS20. Radio and GSM telemetry equipment will be supplied by Wood & Douglas and Scannex, respectively. System design, integration, and all control, database and publishing hardware and software will be provided by OceanWise. The system replaces one which has been in operation since the early 1990s.

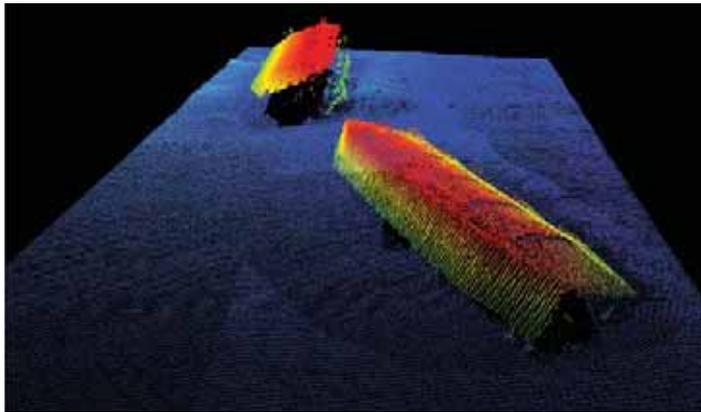
VectorMap revamp

A new version of OS VectorMap District is now available through OS OpenData. The enhanced product delivers improved representation of topographic features, (roads, roundabouts, railways etc.), better placement of cartographic text, upgraded cartographic styles and greater flexibility in its use, giving the user complete control of the content and look of the mapping. The dataset is specifically designed with web applications in mind and offers clear, customisable backdrop mapping, enabling users to easily display their own information and data on top of the mapping.

TSB focus on Rail

The Technology Strategy Board is

UKHO images WWII D-Day harbour



Spectacular sonar imagery of part of a Mulberry harbour used for the D-Day landings in Normandy have been released by UKHO. The two sunken concrete 'beetles' were the floats used to support the floating roadways that allowed stores landed on the pier heads to reach the shore. UKHO teamed up with commercial survey company Netsurvey to trial new methods and provide staff training while gathering this detailed 3D data of the harbour.

The images show the underwater remains, lying at a depth of about 5m and previously hidden from all but divers. Their construction and size testifies to the ingenuity, dedication and resolve of the WWII engineers and military personnel involved. Mulberry B, also known as Port Winston, saw heavy use in WWII being used over seven months to land over 220,000 men, 50,000 vehicles, and 600,000 tonnes of supplies, providing much needed reinforcements in France.

set to invest in two Knowledge Transfer Partnerships. One is in the area of modelling and simulation for any product or service relevant to the rail industry. The deadline for applications is 2nd October 2013. The second is collaborative R&D to encourage the use of innovative digital, ICT and satellite application technologies to address challenges faced by leading rail organisations. The deadline for expressions of interest is 15th May 2013. Visit: <http://www.innovateuk.org/>

HS2 steams ahead with Blom

Utilising wide-format aerial cameras and LiDAR, Blom has captured high resolution aerial imagery and laser data along the entire 225kms of the first phase (London to Birmingham) of Britain's proposed High Speed 2 (HS2) rail route to provide a complete 3D overview. The high-resolution 4cm imagery will be used for subsequent 1:2500 topographic mapping and provides a permanent time-stamped photographic record

along the route. Many planning decisions require more than just a vertical view and accurate mapping to be able to put the site into context with the surrounding area. Blom supported this need by capturing oblique aerial photography and video, giving a birdseye perspective to any location on the route.

Maps & Surveys 2013

The Defence Surveyors' Association's seventh Maps & Surveys seminar on historical military and hydrographic surveying, mapping and charting will take place at the Royal School of Military Survey, Denison Barracks, Hermitage near Newbury on Saturday 22nd June 2013, starting at 10am. The cost of attendance is £20, which will include tea and coffee breaks and a finger-buffet lunch with drinks. There is a full programme of talks ranging from **Adrian Webb** on Hurd's survey of Bermuda to **Alastair MacDonald** on international boundary surveys. Email: Mike Nolan maptolan@googlemail.com

Price joins SCCS

SCCS has announced the appointment of **David Price** as sales and marketing director to support future growth and further strengthen the existing senior leadership team. David has more than 22 years of experience in the surveying equipment market, both in the UK and internationally. He is probably best known in his former role as managing director at Leica Geosystems in UK and Ireland, a position he held from 2008 until the end of 2012.

Gregorius Joins Exprodat

Exprodat has announced the appointment of Thierry Gregorius as principal consultant: Strategic Consulting. Gregorius, formerly with Shell, moves following four years as group data manager with Landmark Information Group.

Arnold in Denver

3D Laser Mapping has appointed a vice president sales based out of its Denver, Colorado hq. **John Arnold** will be responsible for the continued development and roll out of laser scanning solutions including StreetMapper and the

ZEB1 handheld system.

Brayshaw joins Pitney Bowes

Pitney Bowes Software has appointed **James Brayshaw**, formerly a main board director with Ordnance Survey. He joins the MapInfo developer to address the belief that not enough businesses are utilising the potential that geospatial solutions can offer enterprises and to provide strong market insight into the capabilities and uses for LI and GIS solutions.

Bennett joins Topcon



David Bennett will join Topcon Great Britain as business manager for positioning products from 1st April. Formerly business development director for Korec, Bennett will be based at the Chester office and will be responsible for developing positioning business in the UK.

Events Calendar 2013

• SEMINARS • CONFERENCES • EXHIBITIONS • COURSES

We welcome advance details of events likely to be of interest to the Geomatics community. Please send details to: editor@pvpubs.demon.co.uk

Jeremiah Dixon Exhibition

Ends 6 October, The Bowes Museum, Barnard Castle, County Durham.
Contact: www.jeremiah-dixon.co.uk

Esri UK Annual Conference 2013

21 May 2013, Novotel London West, London UK.
Contact: www.esriuk.com/conference2013

2nd International Conference on Measurement Technologies in Surveying

23-25 May 2013, Warsaw University of Technology, Poland.
Contact: <http://english.gtp.edu.pl/portal/>

Hexagon 2013 Conference

3-6 June, Las Vegas, USA.
Contact: <http://conference.hexagon.com/about>

AGI London Showcase

24 June 2013, 1 Kensington Gore, London, SW7 2AR.
Contact: www.agi.org.uk/events/

British Cartographic Society (BCS) Annual Symposium

3-5 September 2013, Hothorpe Hotel, Leicestershire, UK.
Contact: www.cartography.org.uk/symposium

2nd Joint International Symposium on Deformation Monitoring (JISDM)

9-11 September 2013, University of Nottingham, UK.
Contact: www.nottingham.ac.uk/engineering/conference/jisd/index.aspx

AGI GeoCommunity '13: Open for Business

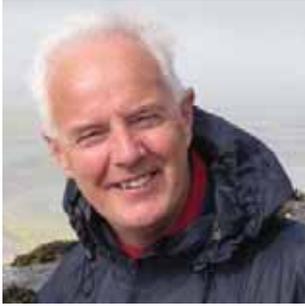
16-18 September 2013, Nottingham.
Contact: www.agi.org.uk/geocommunity/

GDI APAC: Geospatial Defence & Intelligence Asia-Pacific 2013

17-18 September 2013, Singapore.
Contact: www.geospatialdefenceasia.com

Intergeo 2013

8-10 October 2013, Essen, Germany.
Contact: www.intergeo.de/en/index.html



Chris Preston, chair of the Geomatics Global Professional Group Board, argues that we stand to gain more by providing high quality information that ultimately saves our client money.

Chris Preston welcomes your comments and thoughts so please email on the following address geochair.rics@gmail.com

Sustainability, carbon footprints and added value

As the long winter in the UK reluctantly gives way to warmer weather, a read of a recent edition of the RICS magazine *Modus* had the headline, "What's the embodied carbon in our built environment?" Well, this statement set me considering how we relate to this in our profession. Generally my mind is an open book on the subject but one thing that does come to mind is how we as individuals, and our companies in particular, can cut our carbon footprint. One idea is how we can advise our clients on the use of more appropriate techniques to gather information.

Although some commercially orientated suppliers may not like the idea of "Survey once, use many times," as it cuts out the opportunity for follow up work, I believe that we as a profession stand to gain more by providing high quality information that ultimately saves our client money and also cuts out returns to site, with all the additional safety concerns and costs involved. Where we as a profession need to get our act together is in providing the added value services associated with the use of this data.

How do we as Geomatics surveyors or Geospatial engineers generally relate to sustainability issues? Within the RICS hierarchy the Geomatics professional group sits within the Land Group, which also encompasses the Rural and Environmental & Resources groups, who one would hope have a more informed take on this. It was clear from our last professional group board meeting that we needed to be more aligned with others within the wider Land group, and it is with

sustainability issues that we should perhaps make a start. I would be interested to hear from the membership on what sustainability means to you within your branch of the profession.

By the time you read this the survey conference and exhibition season will have got underway and the new financial year will possibly release funds for investment in new technology. However, how do we assess the value of such kit? Does it represent actual value to your business enabling a better margin to be made on projects, or does it mean we pass on the savings to our clients? Too often our clients see us a simply pushing buttons to get results that anyone properly trained in how to use the kit can get. So again, what added value do we add over and above the simple provision of data? To be true to our board name of Geomatics it should involve modelling and managing of the data as well as measuring.

I was fortunate enough to attend the RICS BIM conference earlier in the year and it provided plenty of food for thought on many aspects of the subject not the least of which is that BIM is not just about buildings. The last edition of *GW* also had useful articles on BIM from several perspectives and I would be interested to hear from members who are now actively involved with BIM projects. Perhaps you too should be providing us all with thought provoking articles in *GW*.

As always, you may contact me on geochair.rics@gmail.com and I look forward to meeting and hearing from you.

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The RICS and the Land Group have been busy on members behalf. **James Kavanagh**, Director of the Land Group, updates readers on a raft of issues including the latest RICS Governing Council meeting in New Delhi, Rights to Light, a World Bank conference, new and imminent publications and a land surveyor who contributed greatly to the theory of evolution.

“... Land Group skill-sets would equate to a ‘land professional’ in the eyes of a number of international and national agencies.”

RICS Policy Watch

By James Kavanagh, Director of RICS Land Group

At long last spring has arrived in London and with it the final evening lecture of another popular session. Dates are already being planned for 2013-14 so do keep an eye out for RICS Geomatics emails, Geomatics World and social media updates.

Hopefully we should have a consultation open for Geomatics membership commentary on the 3rd edition of ‘Measured Surveys for Land, Buildings and Utilities GN’ this summer. A small but active working group is busy bringing the classic industry standard specification from 1997 up to date. RICS should also be consulting on a 3rd edition of our ‘Boundaries GN’ this summer with a probable launch date for autumn 2013. Members can access our extensive portfolio of RICS Geomatics guidance, client guides and research at www.rics.org/Geomatics

Land and Resources Global Strategy 2013

As many of you will be aware, RICS recently held its Governing Council in New Delhi, India. This major event featured conferences focused on ‘land economics’, the launch of the RICS School of the Built Environment (SBE) <http://www.ricsbe.org/> and Governing Council’s review and agreement on a Land & Resources Global Strategy. Geomatics is part of the 26k strong RICS Land Group (along with environment, minerals & waste, P&D and rural practice) and has heavily influenced many of the major elements of this global strategy, including:

- The establishment of an international combined ‘Land’ APC pathway (much like the combined AssocRICS pathway) and global board
- The production of a “robust model of engagement” for use with national and regional bodies
- Maintenance of support for individual professional group sectors and specifically for UK members
- Highlighting the primary importance of Land & Resource issues within RICS
- Developing and promoting the recognition of technical, professional and ethical standards and thought leadership
- Providing a globally recognised transferable and holistic qualification for surveying professionals in the Land & Resources sectors
- Targeted regional capacity development in India, Africa and Asia/Pacific
- To position RICS as a credible global commentator on land, marine and resource related issues.

Although each of the individual groups has its own long history and specialised areas of practice there is an ever increasing crossover of skill-sets amongst them. Indeed the Land Group skill-sets would equate to a ‘land professional’ in the eyes of a number of international and national agencies. The term ‘land professional’ is now being used by organisations such as the UN’s FAO (and other UN agencies such as UN-Habitat - GLTN), the World Bank and state agencies.

The current draft is being debated and discussed by the professional group boards and will then be open to consultation and discussion within the wider RICS membership later this summer. We are hoping for final agreement at Governing Council in November 2013.

RICS Routes to membership

As well as the ongoing Direct Entry RICS membership offer to members of ICES <http://www.rics.org/uk/knowledge/news-insight/news/rics-and-ices-sign-historic-mou/>

Contact hshankster@rics.org for more information. RICS has also recently updated several routes and processes to membership. The AssocRICS, Professional Experience and Senior Professional routes have all been streamlined and future proofed after extensive consultation and debate. More details on the new “fit for purpose” routes can be found @ <http://www.rics.org/uk/join/> or by contacting rwaterston@rics.org

RICS and the law

The Law Commission (UK) has been busy of late. As it nears the end of its current work programme into legislative reform it made sure to engage RICS on a number of issues. RICS provided an excellent response to the recent “Communications Code 2012” much of which was featured in the Law Commission report to Parliament <http://lawcommission.justice.gov.uk/news/electronic-communications-code-press.htm>

The first is the continuation of the Law Commission consultation on “Land Obligations – Restrictive/Positive Covenants 2009 on Rights of Light” <http://lawcommission.justice.gov.uk/consultations/rights-to-light.htm> Members are also advised to consult the RICS guidance note *Right of Light 1st Ed GN 2010*. We will be consulting our expert member working groups and all members are encouraged to submit their comments to jkavanagh@rics.org for collation into a final RICS submission.

A right to light is an easement that gives landowners the right to receive light through defined apertures in buildings on their land. The owners of land that is burdened by the right cannot substantially interfere with it – for example by erecting a building in a way that blocks the light – without the consent of the benefiting owner.

The Law Commission are also consulting at <http://lawcommission.justice.gov.uk/consultations/2317.htm>

A conservation covenant is a voluntary agreement between a landowner and a responsible body (charity, public body or local/central government) to do or not do something on their land for a conservation purpose. This might be, for example, an agreement to maintain a woodland and allow public access to it, or to refrain from using certain pesticides on native vegetation. These agreements are long lasting and continue after the landowner has parted with the land, ensuring that its conservation value is protected for the public benefit.

Conservation covenants are used in many other jurisdictions, but do not exist in the law of England and Wales. Instead, landowners and responsible bodies are relying on complex and expensive legal work-arounds, or the limited number of existing statutory covenants that enable certain covenants to be enforced by specified bodies (for example, the National Trust). The consultation finishes on 21st June.

World Bank's Land Poverty conference

Every April in Washington DC, the World Bank Conference on Land and Poverty brings together representatives from governments, the development community, civil society, academia, and the private sector to discuss issues of concern to communities, land practitioners and policymakers. This global conference – supported by UN agencies, FIG and other global bodies – aims to foster dialogue and sharing of good practices around the diversity of reforms, approaches and experiences that are being implemented in the land sector around the world.

The very nature of this high level conference makes it an excellent platform to influence senior policy makers, land economists of the World Bank and other practitioners. RICS has engaged with this event since its inception in 2010 and is again well represented with several excellent papers being presented on everything from the recent ground-breaking output on the value of ecosystems to international standards to crowd-sourcing.

A specific World Bank conference web resource will be built after this already oversubscribed event on 8-11 April 2013. RICS speakers include, among others:

Charles Cowap FRICS – *Value of ecosystems*

Robin McLaren FRICS – *Engaging the land sector through crowdsourced land administration*

Diane Dumashie FRICS – *Increasing access to affordable housing*

Dr Frances Plimmer FRICS – *Community growth through land taxation*

Alex Aronsohn FRICS – *Innovative approaches to spatially enabling land administration – international standards*

Dr Spike Boydell FRICS – *Sharing the resources of the deep ocean – minerals and extractive issues*

Under the theme of "Moving towards transparent land governance: Evidence-based next steps", the 2013 conference will provide a forum for an evidence-based discussion of innovative approaches to follow up on recent global and regional initiatives such as the FAO guidelines on the responsible governance of Land; and concrete steps to improve land governance at country level in a way that contributes to poverty reduction, gender equality, and sustainable economic growth. Six conference streams contained numerous papers focused on:

- Securing land rights and improving land use at the grassroots
- Adjusting laws and institutions to address urban expansion and governance
- Innovative approaches towards spatially enabling land administration and management
- Supporting a continuum of rights in a decentralized environment
- Mobilizing the private sector to improve land governance
- Sharing benefits from exploitation of land-based resources.

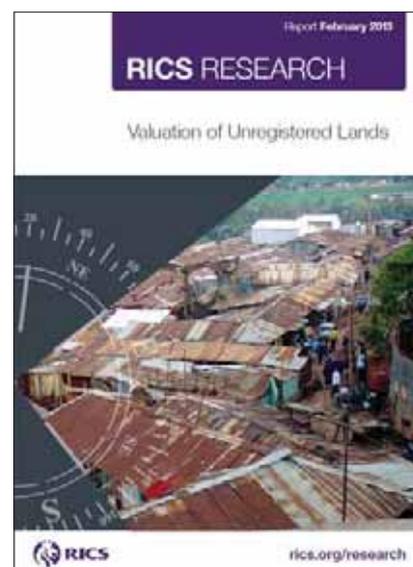
RICS has also launched the long awaited *Valuation of Unregistered Lands* research paper. The majority of urban and rural land in Kenya and much of East Africa is unregistered and consequently difficult to value because of the uncertainty of title. This research demonstrates the urgent need for an accepted and practical method for valuing unregistered land in Kenya.

<http://www.rics.org/uk/knowledge/research/research-reports/valuation-of-unregistered-land/>

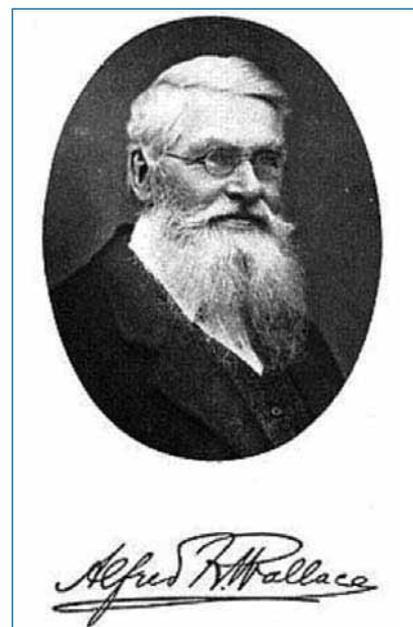
Alfred Russel Wallace

Following the recognition of the land surveying achievements of **Robert Burns** (the famous Scottish poet) earlier this year, RICS has acknowledged the life achievements of Alfred Russel Wallace, co-discoverer of the process of evolution (by natural selection) with his contemporary **Charles Darwin**, who began his career as a land surveyor.

Celebrations of his life achievements and contributions to evolutionary science will take place across the UK and further afield to mark



RICS Research's long awaited *Valuation of Unregistered Lands*.



Towards a better understanding of Urban Green Infrastructure is the latest research output from RICS

continued on page 14

Monitoring of railway infrastructure: is non-contact measurement the answer?

Anita Soni is studying non-contact measuring techniques for monitoring railway infrastructure at University College London. This article outlines the scope of the study and describes some preliminary test results.

“... surface models can provide sub-millimetre accuracy...”

The EngD is an Engineering Doctorate programme promoted and partly funded by the EPSRC (Engineering and Physical Sciences Research Council). It is a four-year study which is undertaken with an EngD centre at a UK university in collaboration with an industrial sponsor. This study is being carried out at the Virtual Environments, Imaging and Visualisation (VEIV) centre at University College London, with the Thameslink Programme (TLP) at Network Rail as the industrial sponsor. The TLP is the £6 billion upgrade of the railway line running north to south through Central London (more information on TLP can be found in “Laser scanning on the Thameslink Project” in *Geomatics World* July/August 2011 issue). The research study is currently in its third year and is due to be completed in September 2014.

A target-less solution

The study looks at monitoring in a railway environment, with a particular focus on the potential of non-contact measurement techniques for monitoring. These might include methods such as terrestrial laser scanning (TLS) and photogrammetry. Currently, typical railway monitoring activities involve direct contact through the placement of targets (e.g. prisms) or sensors onto the structures being monitored. This only provides discrete information and is an intrusive method where drilling, clamping or gluing is required. It can be expensive, whilst also creating safety and timing issues both at installation and for subsequent maintenance activities. Technologies such as laser scanning or photogrammetry could deliver a ‘target-less’ solution as well as providing continuous surface measurement information of railway

infrastructure.

Objectives of the study

The first objective for the study is to review the existing monitoring systems along the TLP and compare them to other rail industry peers (e.g. Crossrail Ltd) and non-UK rail projects, (e.g. Amsterdam Metro North-South line). As well as comparing the technologies being used, this provides an opportunity for TLP to assess whether lessons can be learnt from peer projects to enhance its monitoring.

The next objective is to identify where TLS and photogrammetry could enhance or supersede existing systems for railway monitoring in the future. The first two years of the study have involved evaluating current state-of-the-art monitoring practices, e.g. ground movement and structural monitoring, and seeing how these can be developed and applied in the railway environment. This is being done through a mixture of lab testing and site work.

Lab tests have been set up to look at the performance of total stations typically used for automatic or manual monitoring and comparing these to laser scanners. This includes looking at the accuracy and precision between the instruments when controlled movement of a target or feature is applied. The main challenge of implementing laser scanning for monitoring is to see whether the accuracies required can be reached and maintained. Some specifications dictate at least a 1mm accuracy of the measurements, which is not currently possible for a laser scanner. From literature it can be seen that surface models can provide sub-millimetre accuracy, providing a suitable solution to these requirements. Also proper calibration procedures need to be developed in order to model and correct for the systematic errors present in the scanner data measurement that could be hindering the potential for better accuracy and precision. These lab tests then provide information of what can be feasible on site.

Study test sites have been selected by searching for a series of real scenarios representative of railway monitoring (e.g. railway track, bridges, arches etc.), which would logistically allow for these alternative monitoring techniques to be adopted in parallel. This enables analysis of the different instruments and their comparative performance. The expected outputs for each of the sites include a qualitative and quantitative analysis between these

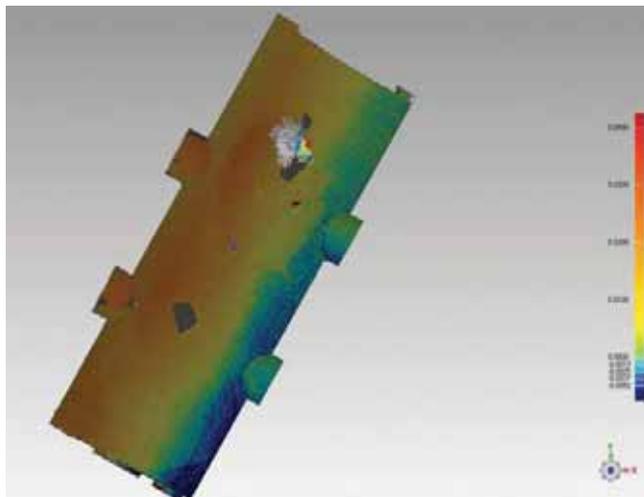


Figure 1 - Plan View of Arch Displacement Map

techniques. Two of these sites are discussed briefly.

London Bridge Station redevelopment project

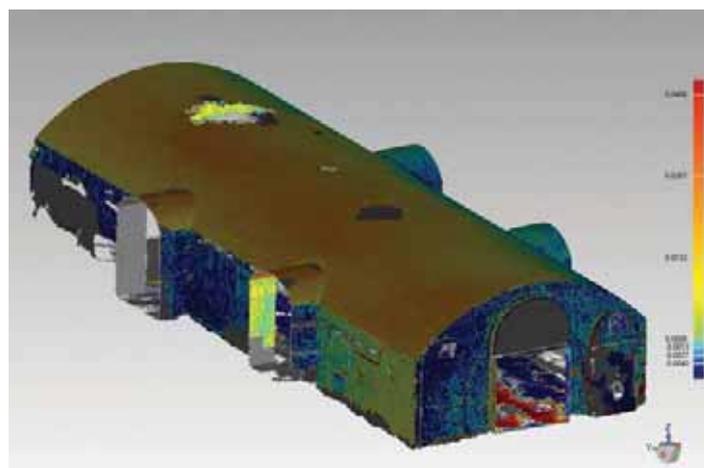
As part of the TLP, Key Output 2 (which runs from 2012-2018) involves a major redevelopment of London Bridge Station. Due to the planned construction work, many typical railway infrastructures are required to be monitored continuously throughout the project, in particular the railway track and arches. This has provided an ideal opportunity for setting up some of the test sites.

London Bridge Station Arches

The masonry arches of London Bridge Station are located at street level directly below the platform level of the station. The arches are required to be monitored prior to and during various stages of demolition and construction works. Manual monitoring has been implemented here on a daily and weekly basis, depending on proximity to works and their nature. Automated monitoring has not been applied at arch level to date due to restricted sight lines and continuing changes to work progress.

The manual monitoring, which includes prism measurement in arch arrays and level measurement along wall bases, has shown that some settlement has occurred during piling works. However the monitoring system can only show the movement of a particular prism or level measurement point and not of

Figure 2 -
Side view of arch displacement map.



how the full structure itself is settling. This provided an opportunity to use laser scanning to give a visual validation of the movement of the structure. Figures 1 and 2 show a displacement map of two epochs before and after the settlement had been measured. It shows how the crown and west pier of the arch has moved (yellow and red colours), whilst the east pier has remained relatively stable (green and blue colours). This coincides with the prism measurement information. It has also given engineers an enhanced 3D visual representation of the movement to carry out further analysis.

“... the monitoring system can only show the movement of a particular prism or level measurement point...”

London Bridge tracks and platforms

Real-time monitoring is required for all tracks

Figure 3 - Point cloud of Eastern Gantry at Platform 12 and 13, London Bridge Station.



Figure 4 - Cross-section of platform and rail track at London Bridge.



“... one of the major problems for track monitoring is that the prisms get knocked during engineering hours ...”

and platforms that fall within the demolition or construction zone. A combination of manual and real-time monitoring has been implemented here to date.

Currently one of the major problems for track monitoring is that the prisms get knocked during engineering hours as works take place. This sets off spurious movement triggers requiring analysis by engineers and continuous maintenance of the system. One of the aims of this site is to explore a fully “contactless” approach to monitoring of the tracks avoiding targets and therefore issues such as target disturbance and spurious movement reporting. The aim is to revisit a particular section of track and scan it at regular intervals over the year. The methods of producing models and the ability to extract relevant track geometry for monitoring purposes will be explored. Figure 3 shows the platforms where scans have taken place at London Bridge Station (yellow triangles represent scan positions). Figure 4 shows the initial cross-sectional view of the point cloud and the problems with occlusions that will need to be dealt with to obtain sufficient track geometry.

These are a few examples of the test sites

chosen to look at a non-contact approach for monitoring railway infrastructure. The remainder of the third year of study will focus on acquiring data for all the sites. Once the data has been acquired, the next step will be to explore data presentation methods in the monitoring context for each of these scenarios. Challenges will include handling the vast amount of data as well as visualising the most relevant information into a reporting system. This will be carried out in the final year of the study.

About the author

Anita Soni is currently an Engineering Doctorate Student at UCL/Thameslink Programme. Before this she worked as a surveyor at Plowman Craven Ltd, where she specialised in laser scanning (including terrestrial, close-range, head and body scanning) and worked on a variety of projects from construction work to entertainment. Whilst studying for her undergraduate degree, she had an internship there and was offered sponsorship for the last two years of her degree. She has a MEng in Geomatic Engineering and MRes in Virtual Environments Imaging and Visualisation, both from UCL.

RICS News - continued from page 11

the centenary of his death. RICS is very proud to be part of this momentous historical event in collaboration with the Natural History Museum.

The pinnacle of the year will be the unveiling of a bronze statue of Wallace at the museum by Sir **David Attenborough** on 7 November 2013 – the centenary of Wallace’s death. The statue will include a plaque on which RICS will appear as a contributor. Wallace began his career specialising as a land surveyor, practising at a firm with his older brother in and around the Herefordshire town of Kington, and later for a period in Neath, Wales. Following his brother’s death, he travelled to the Amazon and the Malay Archipelago between 1848 and 1862.

He centred his activities in the middle Amazon and Rio Negro regions. His work investigated the causes of organic evolution and established his permanent reputation as a leading naturalist and entomologist, and becoming one of the earliest bio-geographers in the world.

Wallace wrote at length on the subject, including the books *Palm Trees of the Amazon and Their Uses* and *A Narrative of Travels on the Amazon and Rio Negro*. His essay *On the Law Which Has Regulated the Introduction of New Species*, written during his time in the Malay Archipelago, was a key theoretical work that all but stated outright Wallace’s belief in

evolution. Throughout the year there will be a series of roadshows, exhibition, conferences and events on Wallace and his exploits, where RICS members can participate. Insight and details can be found at the Wallace100 Campaign website.

Further details on the life and work of Wallace are at <http://wallacefund.info/> and of course he features in the BBC series “Bill Bailey’s Jungle Heroes” (available on BBC iplayer).

The ‘Blue’ Economy

The biennial Ocean Business conference and exhibition brings together 1000’s of the great and good (and the adventurous) of the global marine and hydrographic survey profession. This year’s event was again packed out with amazing technology, service providers, surveyors, careers information and much more but one very special event stood out. A previous article in *GW* outlines the event in more detail but it is still worth mentioning again as is the recent FIG report on the “economic benefits of hydrographic survey” which went some way to addressing the balance and the ‘blue’ economy event went even further.

Now for FIG Abuja May 2013 and the Cambridge Conference July 2013. Of course all comments very gratefully accepted jkavanagh@rics.org

“Throughout the year there will be a series of roadshows, exhibition, conferences and events on Wallace and his exploits, where RICS members can participate.”

It all started two decades ago. . . – a sweet (and sour) Hungarian Rhapsody

Robin McLaren, Director of Know Edge Ltd recently celebrated a twenty year association with land registration in Hungary. **Maria Toth** took the opportunity to interview him over dinner on the Danube with former Hungarian colleagues.

Robin, please tell us how the unusual name of your firm was created and what its meaning is.

In 1986 I left my job in Toronto, Canada as the product manager of a then state-of-the-art GIS solution and sailed back to Scotland on a Polish ship to start a new life. The voyage lasted six days and I had plenty of time to contemplate starting and naming a new GIS consulting company. The idea for the unusual name came to me over the mid-Atlantic ridge. I didn't want to name the company with any terms such as 'geo', 'mapping' or 'GIS'. I wanted something different that people would remember; and it has certainly worked. As for its meaning – that is entirely up to the interpreter! However, I have thought about forming a ski touring company called 'Off the Edge' and a landscape architects company 'Know Hedge'.

Please introduce your firm, its past and present.

Prior to starting Know Edge, I was a software engineer and designed and developed GIS solutions in Scotland, Switzerland and Canada – this included land registration and cadastral solutions. In fact, I helped to develop the world's first Land Information System that was installed in Basel, Switzerland and Munich, Germany. Armed with this leading-edge technical knowledge I decided to form an independent consulting company in the UK – the company was the first of its type in the country. It was an exciting time as this was brand new technology and its introduction within organisations raised difficult, but stimulating challenges. Initial customers included utility companies, local government, financial

services and land and property agencies.

Although unknown in Hungary, my company had established a reputation and pedigree for being independent, for successfully implementing GIS solutions in complex organisations and delivering significant benefits. Although successful in the UK market, I was aware that the UK economy was about to dip into a serious recession in the early 1990s and strategically needed to identify markets outside of the UK to spread the risk. The Hungarian project was ideal and also perfect timing.

The company is now 27 years old and my enthusiasm for consulting projects hasn't diminished. I am trying to slow down a bit, but I have failed – the projects just get more interesting. This past year I have helped the Iraq government create a National Land Policy, supported the World Bank to improve state land management in Kuwait, launched an initiative to use crowd-sourcing to capture land rights and supported the Canadian government in visioning their Geomatics sector in 2020.

Why did you apply for this job in Hungary? Apart from business viewpoints, did you have any other reason?

In the late 1980s Prof Peter Dale had introduced me to international consulting in the land administration sector – I was part of a UN-FAO mission to North Yemen to improve their land registration and cadastral systems. I loved the challenge of these initiatives and to help citizens around the world achieve greater security of tenure. So when the opportunity arose in Hungary, I was enthusiastic to pursue the contract through the EU's PHARE programme. I am also an explorer at heart and get excited by new adventures.

What kind of expectations did you have when arriving in Hungary? How much did you know of the country, the people and the language?

I had briefly experienced Eastern Europe in 1968. As a Boy Scout I had travelled to Poland and Czechoslovakia to climb in the Tatra Mountains. We narrowly missed the Russian invasion of Czechoslovakia by a day. This started my fascination with Eastern Europe and established my desire to travel and experience new cultures. Therefore, when the opportunity arose to visit and work in Hungary and help the Hungarians transition from communism to a market economy, I was very enthusiastic. A key supporter in pursuing

Right: Robin and Jane McLaren with former Hungarian colleague Aladar Zichy.



Right: Robin McLaren celebrated the anniversary of his involvement with the Land Reform project with the former Hungarian colleagues in Budapest over dinner on the Danube last August.



the opportunity was Prof Peter Dale, who has been a great mentor over the years.

Although I had a Hungarian professor at the University of New Brunswick during my studies and worked with several Hungarians in Toronto, I knew very little about the country, the culture and the language. However, I knew I liked Hungarians very much; a proud race and full of life. I wasn't disappointed when I arrived.

What were your first impressions when entering the Ministry for the first time?

It was like entering a time machine and going back 40 years, both in the austere surroundings and the mentality of the Ministry after so many years under communist rule. I knew that our land reform project was going to be a real challenge. However, the project luckily had Hungarian members who understood and were enthusiastic about the changes required. I knew, even at this early stage, that we were going to be successful.

There was one lasting memory of the first days on the project: the 'paternoster' lift (a chain of open compartments that move in a loop up and down inside a building without stopping) in the Ministry. I still haven't been over the top.

How did you start the project? Did you have to face difficulties?

The initial task was to create a project team capable of responding to this significant challenge. I had to find Hungarian counterparts that could not only communicate and gain trust with the Ministry and Land Offices, but could also understand and work well with the Know Edge Ltd consultants (not always easy!). I was very fortunate to engage Mária Tóth as project assistant and PA, Ádám Podolcsák as counterpart project manager and Marta Jenei as project technical support. I also managed to persuade Richard Baldwin to leave his academic position in the UK to be the project manager. Top level support was provided by Aladár Zichy within the EU Office and his support proved invaluable for the success of the project.

Without this great team the project would have failed in the first few months.

The other major difficulty the project faced

was its relationship with the EU Delegation in Budapest. It was a difficult and sometimes hostile stakeholder to deal with. This relationship never improved over the lifecycle of the project and in the end it brought Know Edge Ltd's involvement to an end in a very unprofessional and unfair way.

However, my lasting memory of the start of the project was my first visit to the Budapest County Land Office located in a small house in the suburbs. When we arrived citizens were lined up for about 600 metres around the block and there were TV camera crews interviewing them. I knew then that we had a serious problem to solve and we had to solve it quickly!

What is your opinion of the Hungarian partners in your project?

The project was fortunate to have a set of Hungarian partners that not only intimately knew the current approach to land registration and cadastre in Hungary, but embraced the significant level of change, both technical and cultural, required in the Ministry and the Land Office network. They were also good communicators and were very influential in selling the proposed changes to their colleagues. László Niklasz, András Osskó and Piroska Zalaba were key success factors in this complex change management programme.

How was the project activity terminated?

This was one of the very few bad experiences on the project. Know Edge Ltd tendered and won two contracts with a total duration of four years. This continuity of the consulting team and the associated consistent strategic approach was instrumental in allowing this complex programme of work to succeed. However, despite obtaining confirmation from the EU Delegation that Know Edge Ltd could bid for a third contract, the EU Delegation cancelled it after Know Edge Ltd had won the tender. No explanation for the cancellation was provided by the EU Delegation and their hostile tactics forced Know Edge Ltd to abandon support of the project; a sad ending to one of my most enjoyable and successful projects.

What are the results, the success on your side?

The success of the project is reflected in the vibrant Budapest I visited at the end of 2012. Citizens have been able to secure their land and property rights, obtain mortgages and invest in their buildings. There is a robust and efficient land registration and cadastral system that citizens trust and this has led to a vibrant land market – the ultimate aim of the project.

Throughout the project I was determined to ensure that we transferred our skills and knowledge to effectively capacity-build in Hungary. What we started has continued and Hungary now has some very talented Land

“ No explanation for the cancellation was provided by the EU Delegation and their hostile tactics forced Know Edge Ltd to abandon support. . .”

Professionals who are not only changing Hungary, but other parts of the world as well. This is the best legacy.

What are the lessons you learned from working in Hungary?

I am continually learning from projects and the Hungarian experience was no exception. Some of the lessons learned included:

- Although the project was labelled as a 'computerisation' project, the technology aspect was the least important. The major challenge was the associated cultural and behavioural changes needed to take advantage of the technology – a change in mind-set. For many Hungarians this change was difficult because under the previous regime they were not taught to think outside of their box or even contemplate and propose change. Don't ever underestimate the time and energy required in change management.
- Although the majority of the change associated with the project impacted the operational staff, it is really important to spend time with senior management to ensure they understand and are comfortable with the proposed changes. The move to a service oriented organisation is a big one.
- Projects only succeed if the politicians and the funders of these initiatives understand

the benefits of their investments. A different set of terminology and language has to be used in this on-going engagement strategy. Projects succeed if they have a senior, high profile champion supporting them.

- Most ICT projects assume that solutions should be provided by major international technology suppliers. However, if there is local capacity then much more sustainable software solutions can be achieved using local suppliers, especially using open source solutions.
- Ensure that there is a common vision established and agreed across the stakeholder communities before starting implementation. In Hungary's case, the 'Takaros' vision was very successful in communicating this vision.

Could you use the experience you gained in Hungary somewhere else in the world?

I constantly use my Hungarian experience and have used it in projects as far afield as Mongolia, Philippines, Iraq, Kuwait, Kenya and Scotland. The Hungarian success has not just touched and improved my projects, but has been used as an exemplar in how to modernise land registration and cadastral systems across many regions of the world. It is a project that Hungary can be very proud of.

“Projects only succeed if the politicians and the funders of these initiatives understand the benefits of their investments.”

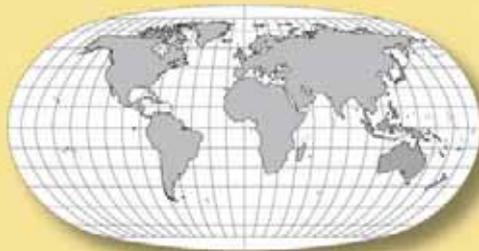
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March 2013 Contents

- Real time dynamic precise point positioning with mixture filtering
- Iteratively reweighted total least squares: a robust estimation in errors-in-variables models
- Research on least squares adjustment of high precision network of triangulation
- The land administration domain model (LADM) as the reference model for the Cyprus land information system (CLIS)
- ZigBee network positioning with support of Real-Time Kinematic GPS and terrestrial measurements
- Studies on renovation of cadastral sheets for urbanisation
- Statistical testing of directions observations independence
- Metaheuristic optimisation approach for designing reliable and robust geodetic networks
- Evolution of land registration and cadastral survey systems in Sri Lanka



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International LiDAR Mapping Forum 2013

By Adam Spring

There was plenty to interest our correspondent Adam Spring at this LiDAR focused event including general geospatial technologies like UAVs. He also found time to talk to Nick Palatiello of the Management Association for Private Photogrammetric Surveyors.

Combined sensor use and data fusion were key topics at the three-day International LiDAR Mapping Forum (ILMF) in Colorado, February 11-13th, 2013. Hosted for a second consecutive year at the Hyatt Regency in Denver, this US based forerunner to the European LiDAR Mapping Forum (ELMF) continues to grow each year, both in number of attendees and topics of discussion. On April 10th, 2013, it was announced that SPAR Point Group had acquired the rights to the ILMF and ELMF from UK based Intelligent Exhibitions. The first ILMF in 2000 had its roots in laser scanning solutions.

Introduction

This article explores the presentations and solutions featured at the ILMF 2013. The last ILMF to be organised through the UK based company Intelligent Exhibitions. An interview with **Nick Palatiello** of the Management Association for Private Photogrammetric Surveyors (MAPPS) is included also. MAPPS was formed as a lobbyist platform in 1982 and represents the interests and concerns of private sector companies.

ASPRS 'Hot Topics'

Thirty three presentations were given over three days. **Alistair McDonald** - the only founding committee member still involved in the running of the ILMF - chaired the eleven themed sessions and offered insights from his business activities in the oil and gas industry where relevant. The ASPRS 'Hot Topics' session started the event and was based around LiDAR and mobile mapping standards. Updates to LAS and its compatibility with other file formats like E57 were a key part of the agenda, as was standards for mobile applications of terrestrial laser scanners.

Plenary session

The plenary session opened with a presentation from **Christoph Strecha** of Pix4D. Owned in part by the French consumer product manufacturer Parrot, camera equipped Unmanned Aerial Vehicles (UAV) solutions were outlined by Switzerland based Christoph. Solutions that demonstrated comparative accuracies between point clouds / meshes generated by photographs and those from airborne LiDAR data. 3D data capture was explored using examples generated in Pix4UAV.

Christoph's discussion set the tone for a presentation given on the second day by **Lewis Graham**, GeoCue corporation and LiDAR division director for ASPRS. This focused on the rebranding of sensor equipped UAVs. As both Strecha and Graham noted, companies like Parrot continue to drive UAS prices down and open up mapping applications to general users. Smartphone and tablet operated systems like the Parrot AR were viewed as complementary to open hardware, such as those produced by the DIY Drone and MiKroKopter user communities (see *GEOinformatics 7, vol. 15: pp. 32-34*).

ESRI in 3D

An emerging 3D world was at the heart of the talk by director of imagery at ESRI, **Lawrie E. Jordan III**. Information models were seen as the backbone of 3D workflows and provided a framework for taking 3D data beyond visualisation uses. An analogy between hardware and software was given to exemplify this; the map layer featured in GIS software was likened to airborne LiDAR systems and the ability to get multi-layer data returns from one sensor. Jordan ended the plenary session with a quote from **Alan Kay** (see *GEOinformatics 2, vol. 16: pp. 30-32*): "The best way to predict the future is to invent it."

The main body of presentations were centred around data acquisition, management and applications. Whether sitting in on **Michael Twohig's** (Surface Search International) discussion of using both analogue and digital information to map cityscapes above and below ground, or **Mike Sekerka's** (Neptec Technologies) work on dust penetrating LiDAR, the buzz created from the sessions was, in part, a reflection of changes being felt throughout the geospatial sector in 2013. A recurring theme, for instance, was the way 3D technologies had crossed over to general consumer markets and users; technologies that were once exclusively specialist in use. The time of the 3D digital native had clearly arrived and had a clear



The LiDAR Forum is always a chance to talk face to face with suppliers and developers.

presence at the event.

Workshops

Overall, the workshop sessions were a sounding board for exhibitors at the ILMF. Nineteen presentations were given in total and a broad range of products were explored. For instance, multi-signal data return (Riegl USA) was intermingled with that of industry changing algorithms and display engines (Euclidean). The workshops even left room for **Stewart Walker**, the debonair Scotsman who didn't require help from Bruce Willis or Cybill Shepard when it came to moonlighting. Stewart represented BAE Systems and the American Society for Photogrammetry and Remote Sensing (in his role as vice-president) at the ILMF.

Exhibitors

Exhibitors at ILMF 2013 were a mix of old and new faces. Companies like Riegl showed off their enhanced airborne LiDAR solutions.



Talking to Nick Palatiello, the Management Association for Photogrammetric Professionals (MAPPS)

How did MAPPS come about?

MAPPS was formed by a handful of progressive firms in 1982 as a successor to the Legislative Council for Photogrammetry to provide a forum for firms in private practice photogrammetry. The organization has grown to more than 150 members based on a reputation of aggressive advocacy of the private photogrammetry, remote sensing, surveying, and GIS community. As the organization and technology have grown, its goals have expanded.

MAPPS is exclusively a private sector organization focused on the needs of the membership by providing a forum for the mutual benefit of its members. MAPPS' primary objective is to develop strength and unity on matters affecting the interests of its member firms. The organization monitors and works to affect legislation that impacts the profession. It is intended to promote a quality, profitable profession, interaction among firms and advance education, both professional and public.

Why do you think MAPPS is uniquely American in one respect yet international in scope?

MAPPS is on one hand uniquely American because the US has the strongest and most diverse free enterprise economy in the world. However, there are a few associations in other countries similar to MAPPS, such as The Survey Association (TSA) in the United Kingdom and the Geomatics Industry Association of Canada (GIAC). Like MAPPS, these organizations focus on the business interests of their members and provide a forum for education and networking. MAPPS has assisted and consulted to TSA and GIAC with their attention to government affairs.

Microsoft were hard at work promoting Ultracam.



While Microsoft were at the event promoting UltraCam - an airborne photogrammetry solution obtained through the acquisition of Vexcel in 2006. Fresh off the press copies of *The Manual of Airborne Topographic LiDAR* and key information about the new ASPRS accreditation courses were available too.

As a trade association, MAPPS is able to educate elected officials on the benefits of geospatial technology and advocate for the use of the private sector to collect and produce data products and services. It is through the lobbying efforts of MAPPS that it has been so successful and influential not only for the geospatial community in the US and the nation as a whole, but around the globe as well. MAPPS has attracted member firms from Canada, Australia, India, Israel, Germany, Austria, China, Sweden, Italy and several other countries, and MAPPS has assisted US firms with exporting their services in the global market.

How do you see MAPPS fitting into the ever changing face of the geospatial sector?

Since MAPPS was formed over 31 years ago, surveying and mapping technologies have transformed at a rapid pace. As the market changed, the MAPPS membership changed. While formed by firms primarily in photogrammetry in 1982, the MAPPS membership now spans the entire spectrum of the geospatial community, including member firms engaged in satellite and airborne remote sensing, surveying, photogrammetry, aerial photography, mobile mapping, LIDAR, building information models (BIM), 3D mapping, hydrography, bathymetry, charting, aerial and satellite image processing, GPS, and GIS data collection and conversion services.

MAPPS also includes Associate member firms, which are companies that provide hardware, software, products and services to the geospatial profession in the US and other firms from around the world. Independent Consultant members are sole proprietors

“As a trade association, MAPPS is able to educate elected officials on the benefits of geospatial technology. . .”

engaged in consulting in or to the geospatial profession, or providing a consulting service of interest to the geospatial profession.

The technology today provides more data and the general public is more familiar with the products and services that are provided because of the technology. However, many of the issues with regard to how data is collected and managed still exist. MAPPS has its pulse on the legislative and regulatory issues that affect the business interests of its member firms and the impact on the entire geospatial community. For example, MAPPS has been engaged with the Federal Aviation Administration (FAA) in the commercialization of unmanned aerial systems (UAS) to make the agency aware of the desire for the community to implement the technology into their workflow. MAPPS also has been out front on privacy issues that have been raised in the US with the misunderstanding of how UAS will be used and to make sure that geospatial is not unintentionally affected from legislation or regulations to seek to prohibit spying, surveillance, or weaponized drones.

How would you summarize your experience of ILMF 2013?

ILMF 2013 was a well organized and attended event with much excitement surrounding the

advancement of LIDAR applications. For MAPPS, the event allows our organization to educate the community on topics that have the potential to be business opportunities, as well as share information on emerging threats. MAPPS is tracking initiatives at the Federal level that could create a demand for LIDAR data benefiting both public and private entities. The programme needs public-private support so we are able to educate the community about what is needed to make such a programme a reality. In addition, we keep an eye out for threats to the community with regard to implementation of new technologies or how government policy, legislation or regulations could impact geospatial practitioners. MAPPS uses ILMF as a forum to educate the profession on issues that they may not be aware of, and to inform key constituents of the association's activities on these issues.

Summary

ILMF 2013 emphasised technology and data integration is shaping the way information is collected, processed and used. Its acquisition by SPAR Point Group, along with the ELMF, means it can only get bigger in number of attendees and scope of interest. The increased use of UAV or UAS systems will continue to shape impact upon its content, as will the changing ways in which 3D can be collected and used.



Ocean Business 2013

For those wondering how you could fit over three hundred exhibition stands in to the National Oceanography Centre in Southampton, the answer is two very large tents. The hydrographic world's annual get-together alternates with

Oceanology, which is held at the Excel Centre in east London. In many respects the two events are very similar. Both are large, have accompanying conferences and have demonstration vessels at the quayside. However, Ocean Business is perhaps more focused and relevant to hydrographers. Over the first two days the show had attracted 3600 visitors from 57 countries.

The event was packed with associated conferences and workshops including a one-day event on 'The Blue Economy', taking a high level look at ocean policy and on monitoring of the ocean environment. (see James Kavanagh's report in the next issue of GW.)

The Offshore Survey conference ran over two days and featured a full programme of talks, given by senior industry figures. There was also a careers event with industry presentations and speed-dating style sessions, affording a valuable opportunity for young hydrographers to find out about life on the ocean wave from experienced practitioners.

It was noticeable this year that there were many manufacturers offering multibeam systems and SAS swathe bathymetry systems. Autonomous underwater vehicles (AUV) is perhaps the technology of the moment. The government has highlighted robotics and autonomous systems technology as an area in which Britain could lead the world and a group of twenty-five or so delegates took part in a workshop looking at how the technology could be developed as a partnership between government, industry and academia. The discussions were led by Patrick Carnie from the Marine Industries Leadership Council. The group split into two workshops, one to discuss markets and customers and the other, technology. For more information contact Patrick Carnie (PKCARNIE@qinetiq.com).

The next issue of GW will have a strong hydrographic focus. **Richard Groom** provides a taster here with an early report on the recent Ocean Business event.



A detailed survey of what was once a water tank in South London but was to become a highly “des-res” (below) meant first dealing with over 200 dead pigeons, reports **John Witherden**.



Grand Designs for Lambeth Hospital Water Tower *by John Witherden*

Channel 4's flagship design programme *Grand Designs* celebrated the 100th episode of the show on 17th October by featuring the transformation of the landmark 99ft high Lambeth Hospital Water Tower in Kennington, London, converting it from a building that was in a rough state of disrepair into one of the most lavish and eccentric residences in central London. The renovation and conversion project involved building two additional contemporary structures at the base: a new lift shaft connected to the tower by a series of glass tunnels, and a modern living space nicknamed the 'Cube'.

Altogether this cluster of buildings creates a four-bedroom luxury home, over nine floors, crowned with a viewing room offering spectacular 360-degree views across London.

Chaplin inmate

The tower, built in 1877, is a Grade II listed building with walls over five feet thick and crowned with a huge iron tank that originally held over 750,000 gallons of water. The building was part of the Lambeth Workhouse and Infirmary which latterly became Lambeth Hospital. The original workhouse was

designed to house 820 inmates with places for a further 600 'casuals'. In 1896 the future star of the silent screen **Charles Chaplin**, then aged seven, briefly became an inmate of the Lambeth Workhouse together with his mother and younger brother.

Record survey

Property developer and owner of the tower, **Leigh Osborne**, engaged ACR Architects of London to develop a detailed design for the project. One of the first hurdles they had to overcome was a condition of planning approval that required detailed and precise records of the upper part of the tower. Aworth Survey Consultants of London were recommended to

carry out the measured survey with photographic records of the tower inside and out, including the tank construction and pipework.

Through discussion with English Heritage and the planning authority, Aworth Surveys developed the exact specification needed to satisfy the surveying requirement of the planning conditions, to provide detailed survey plans, elevations and sections for this extraordinary project.

In spring 2011 the survey commenced. But before the survey could begin on the interior, the tower and the tank had to be thoroughly cleaned as it had been occupied by pigeons for decades, which had left a significant amount of mess in all parts of the building. Over 200 dead pigeons and guano up to welly-boot level were removed!

Reflectorless outside

The first part of the survey was to measure the upper part of the tower and tank exterior. To avoid the obvious and significant safety issues of measuring the exterior of a building 99 feet up, the detailed survey was carried out by precise remote observations using Leica reflectorless EDM total station instruments set up at ground level around the structure. The whole project was fully connected with closed traverse observations and radial measurements of building detail and equipment both inside and out.

Calipers inside

The survey specification required a detailed survey of the tank interior and the remaining water pipes and ironwork for an historical record. Precise measurement of these was made by hand using engineers callipers so that exact sizes could be stated.

The survey of the tank interior also presented special difficulties as the work was carried out under a confined space procedure, there being only a ladder access through a single hatch up to the tank. Aworth surveyors are specifically trained for safe working in confined spaces so this was not too much of a problem.

Today the hospital site has been redeveloped as modern housing and the water tower, once on the English Heritage 'At Risk Register', has been turned into one of the most striking and unusual residences in London.

• *John Witherden, FCIInstCES, MRICS is the managing director of Aworth Survey Consultants and vice president of the TSA (The Survey Association).*

Coastal Monitoring. . . indoors!

3D laser scanning is playing a central role in major coastal research and marine infrastructure projects. But this work is taking place just outside land-locked Oxford and in miniature.

“It is during testing that our laser scanner really delivers.”

South of the city of Oxford is HR Wallingford, an independent specialist for research and consultancy in civil engineering and environmental hydraulics. The company boasts an international track record of achievement in applied coastal research and consultancy, and key to this work is their advanced physical modelling facility in Wallingford. This facility includes six wave basins ranging in plan size from 25 x 32m to 75 x 32m and three wave flumes ranging from 45m to 100m in length.

Simulated cyclones

Housed in a purpose built modelling hall, these basins are used to investigate how breakwaters and other coastal structures behave when subjected to both ‘frequent’ i.e. day-to-day wave conditions as well as ‘storm’ conditions including hurricanes or cyclones. Waves can be modelled up to 0.25m (model scale) in height allowing HR Wallingford’s engineers to assess each structure’s ability to withstand damage and provide sufficient shelter.

These criteria are best tested by creating a scaled physical model of the structure in question, running waves at it under frequent and storm conditions and then accurately measuring the outcome. To achieve this HR Wallingford uses a Focus 3D laser scanner supplied by KOREC to take before and after millimetre accurate scans of the model, allowing the movement of elements of the coastal structures or the mobile bed material to be monitored.

Having joined HR Wallingford in 1973, coastal engineer **Andrew Steele** has project managed many studies for the company’s Coastal Structures Group. “These models are scaled to represent real world situations,” explains Steele, “whether existing coastal frontages or new port developments.

Depending on the scale, our basins can accommodate real world frontages of 100m to 2km, with local seabed bathymetry recreated in order to simulate wave conditions as accurately as possible.”

International client base

HR Wallingford’s clients are from all over the world. “They provide the details we need to replicate the coastline” explains Steele, “a process which can take around two to three weeks to build. This is then followed by a further three- to five-week period to construct and test the coastal structures in the wave basin. For example, when we construct a breakwater, we create it in exactly the same way as in the real-world, starting with the smallest material in the core of the structure. We then add possibly several layers of larger size rocks over this core finishing with the main rock or concrete armour units. It is during testing that our laser scanner really delivers.”

Previously Steele and his colleagues had detected any movement in the model structures either by using manual methods or an older style scanner with an oscillating beam but they found both processes slow and dated. “When KOREC first showed us the laser scanner, it was obvious that it was going to be 100 times faster than our old-style manual methods and at least ten times faster than our existing scanner.” Steele comments. “On top of its phenomenal speed, it is compact and lightweight, making it easy to move around our large modelling area. We tend to use the scanner at its highest resolution because generally we are looking for movements of the order 2–3mm. This movement would translate to movements of the order 60-180mm in the real-world.”

The scanner works at the touch of a button and HR Wallingford were up and running after just one day of training.

Using the Data

HR Wallingford uses its scanned data in two ways. In the first method, one surface model is subtracted from another to derive changes over the whole structure. The second method is based on cross sections. Before testing, along a 1m length of the model (equivalent to maybe 30m in the real world), ten cross section profiles are typically taken at regular intervals of around 100mm. These profiles are then combined to produce an ‘average’ profile representing the 1m length of the model.

After each test, each of which represents a storm wave condition, the scan is repeated



The laser scanner in situ

and profiles generated along the same ten profile lines. Again an average profile is generated. At the end of testing, the difference between each average profile is calculated.

These differences allow HR Wallingford to determine areas of erosion and accretion on the structure. From this information it is possible to assess the suitability of the structure design to withstand waves of a particular intensity.

Seabed scour

Although much of the Coastal Structures Group's work is confidential, Andrew Steele cites a UK project studying seabed scour at wind farm foundations as a typical example of where a laser scanner would be used before and after, to assess scour performance on foundation designs.

As part of the Future Energy Solutions research project (0216) on The Application of Suction Caisson Foundations for Offshore Wind Turbines, HR Wallingford investigated the volume of seabed scour that might take place around such foundations. The scour performance of four different model foundation designs was tested and laser scanning used to compare the results.

Physical model tests determined the extent of the scour around suction caisson (skirted) foundations due to wave and current action in the marine environment. The testing was carried out at a geometric scale of 1:40 in a wave-current test basin. The height and period of irregular waves was representative of a one-year condition as well as standard peak currents that might occur in British coastal waters. The waves were generated at 90 degrees to the current direction. A scaled sand bed represented the real life seabed sediments. The effectiveness of a rock armour scour protection layer was demonstrated for the conditions tested. The results obtained were generic and of a research nature.

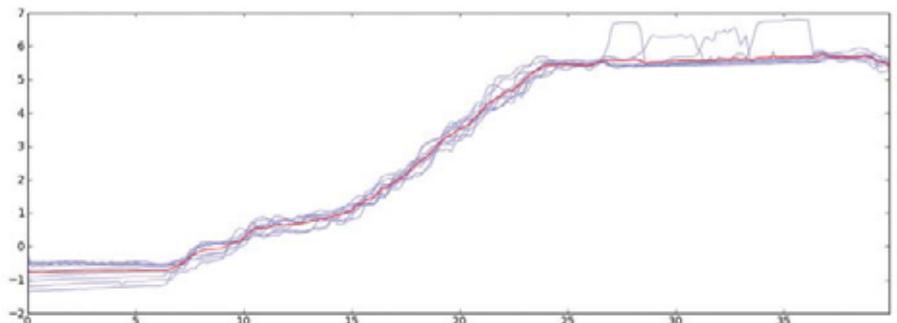
• Acknowledgement: Many thanks to Andrew Steele, www.hrwallingford.com



Above: Example of wave basin and breakwater model.



Right: Model showing seabed scour.



Above: a typical set of profiles - the red line represents the average profile

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Dam deformation surveying in the USA

by John Hamilton

Terrasurv, has been surveying flood control dams and other structures in the north eastern United States since 2005. In this paper company president, **John Hamilton** discusses the modernised surveying methods that he has developed to monitor these important structures.

The US Army Corps of Engineers (USACE) is a US federal agency under the Department of Defense made up of approximately 34,600 civilian and 650 military personnel, making it the world's largest public engineering, design, and construction management agency. Although generally associated with dams, canals and flood protection in the United States, USACE is involved in a wide range of public works throughout the world. In addition to providing design and construction management of military facilities for the various military branches, two of the Corps main missions in the US are the planning, design, building, and operation of navigation locks and dams and flood control projects, including reservoirs, dams, flood control channels, and levees.

The Corps is organised into eight divisions, and each division has several districts whose geographical limits are defined by watershed boundaries. This paper presents the current methodologies employed in the Pittsburgh District of The Great Lakes and Ohio River division to monitor the twenty-three locks, sixteen major multi-purpose flood damage reduction reservoirs and forty local flood damage reduction projects, which the USACE owns and operates.

Terrasurv, Inc of Pittsburgh, Pennsylvania is part of a team lead by Photo Science of Lexington, Kentucky that is under contract with the Pittsburgh District to provide Surveying and Mapping services, and has been performing alignment and settlement surveys for the locks and major reservoirs since 2005.

Guidance

The US Army Corps of Engineers publishes a wide variety of Engineer Manuals (<http://publications.usace.army.mil/publication/s/eng-manuals/>). Table 1 specifies the accuracy requirements for surveying deformation monitoring points and comes from Structural Deformation Surveying (EM 1110-2-1009), which "provides technical guidance for performing precise structural deformation surveys of locks, dams, and other hydraulic flood control or navigation structures. Accuracy, procedural, and quality control

standards are defined for monitoring displacements in hydraulic structures."

To summarise Table 1, the required accuracy for concrete structures is ± 5 -10 mm horizontally, and ± 2 mm vertically, while the required accuracy for embankment structures is ± 20 -30 mm horizontally and ± 10 mm vertically. Based on these criteria, the monitoring surveys performed in the USACE Pittsburgh District are designed to meet the following accuracies (least squares adjustment, station confidence regions at 95% confidence):

Concrete (navigation locks and dams, concrete gravity dams):

- Horizontal: ± 3 mm (total station)
- Vertical: ± 1 mm (invar rods)

Embankment structures (earth and rock fill dams):

- Horizontal: 10 mm (GNSS Static)
- Vertical: 5 mm (invar or fiberglass rods)

Terrasurv uses a Trimble S6 total station (or Zeiss S10 total station (limited use on select projects)) with 1" angular accuracy and distance precision of 1 mm \pm 1 ppm; a Trimble Dini 12 digital level with 2m and 3m invar rods or 1m and 4m fibreglass rods; and Trimble dual-frequency GNSS receivers (4400, 4700, 5700, and R8 models).

Early deformation surveys

Deformation surveys began on most of the structures in the Pittsburgh District in the early 1970's. The method for horizontal deformation surveys utilised fixed reference points and a series of alignment pins nominally placed on line between the reference points. For flood control dams, the reference points typically consisted of instrument pedestals set 1 to 2 metres in the ground, protruding about 1.3 metres above ground. Additional pedestals were established off structure to be used for verification of the reference network.

For navigation locks and dams (weirs), the reference monuments typically consisted of discs set in gate monoliths, which were usually constructed down to bedrock. Off structure pedestals were also used at the locks to verify the gate monolith monuments.

A Wild T2 theodolite was used to measure the offset of each alignment pin from the alignment line.

For lines that run parallel to the direction of flow (i.e. lock wall), the displacement is recorded as riverward-landward, and for lines

Table 1:
Accuracy Requirements for Structure Target Points (95% RMS)

Concrete Structures – Dams, Outlet Works, Locks, Intake Structures	
Long Term Movement	± 5 to 10 mm
Relative Short Term Deflections	
Crack / Joint Movements	± 0.2 mm
Monolith Alignment	
Vertical Stability / Settlement	± 2 mm
Embankment Structures – Earth-Rockfill Dams, Levees	
Slope / crest Stability	± 20 to 30 mm
Crest alignment	± 20 to 30 mm
Settlement measurements	± 10 mm
Control Structures – Spillways, Stilling Basins, Approach/Outlet Channels, Reservoirs	
Scour / Erosion / Silting	± 60 to 150 mm



Figure 1: Reference Monument pedestal



Figure 3: Gate Monoliths to bedrock

Figure 2: Reservoir reference network

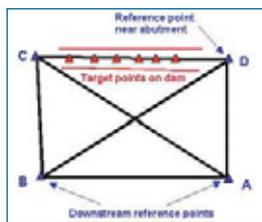
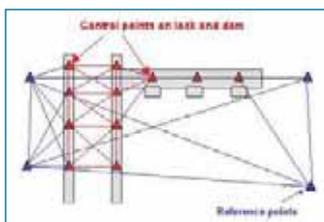


Figure 4: Locks reference network



that are perpendicular to the flow (dam), the displacement is recorded as upstream-downstream. The advantage of this system is that it directly measures the parameter of interest to the structural engineer. For example, a lock guide wall, constructed similar to a retaining wall, would be expected to move in a direction perpendicular to flow, and movement riverward would be of most concern.

Similarly, on a gravity dam the direction downstream would be of most interest. The disadvantage is that as the distance from the instrument increases, it becomes more difficult to discern the cross hairs intersecting the moveable target due to shimmer and heat waves. This is of most concern on earth and rock fill embankment dams, which are generally much longer than concrete dams.

Modernised methodology

Static GPS procedures are used on embankment structures due to the lower accuracy requirement as compared to concrete structures and because, unlike optical instruments, GPS is not affected by heat shimmer. In this method, a base receiver is set-up off the structure. Two or more rover units are deployed to occupy each of the existing alignment pins. Minimum observation times of twenty minutes are observed between the base and each alignment pin and fifteen minutes between adjacent alignment pins.

The data is post processed using manufacturer supplied software (currently Trimble Business Center). In addition to processing the baselines from the base to each of the monitoring points, baselines are also processed from the base to surrounding Continuously Operating Reference Stations (CORS). After processing, the data (occupation information, vector components, covariance matrix, etc) are loaded into a database. After thorough data checking, an input file is created for a least squares adjustment using Geolab. A minimally constrained adjustment is performed, holding fixed the previously determined base coordinates. The misclosure is checked at each of the CORS to determine if any movement of the base point has occurred since the previous survey.

The resulting coordinates for each of the monitored points are then loaded into a spreadsheet as UTM Zone 17 coordinates. The coordinates are differenced with respect to a reference epoch (initial survey), and the ΔN and ΔE components are rotated to a system with the X axis parallel to the dam axis (as defined by the reference line). The Y component then represents displacement upstream or downstream.

Concrete gravity dams

The monitoring network for the reservoir dams consist of two pedestals defining the alignment reference line, and pins set in each monolith. Figure 5 shows the survey layout and the horizontal network that is observed using a Trimble S6 total station. The alignment pins are observed from both ends of the reference line.

As described above, the data is adjusted using least squares. However, in the case of

“Additional pedestals were established off structure to be used for verification of the reference network.”



Figure 5: Concrete gravity dam monitoring system. (Pedestal monuments indicated with yellow crosses, alignment pins shown as red crosses).

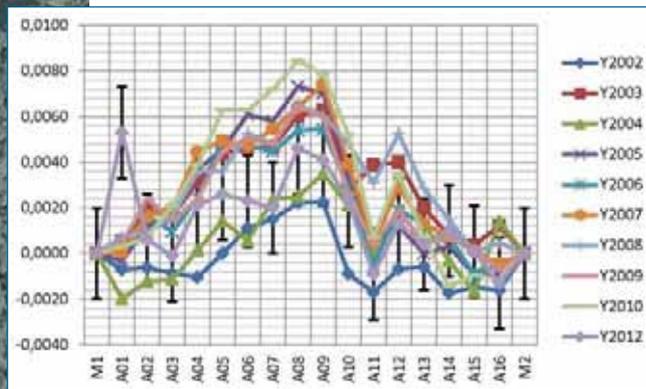


Figure 6: Alignment results

concrete gravity dams a routine is run which computes the offset of each pin from the reference line. The results are shown in figure 6, along with error bars on the 2012 data showing the computed 95% confidence region (0.002 m).

“...a routine is run which computes the offset of each pin from the reference line.”

Navigation Locks and dams

The navigation locks present a different type of monitoring problem, as there are several walls to monitor, and typically the reference points are located ON the structure rather than off the structure. Figure 7 presents an example of this type of project. The lock has two chambers, and therefore six gate monoliths. There are also three pedestals landward of the structure. There are ten separate alignment lines for the structure, nine of which are designed to detect riverward-landward movement and one, across the dam piers, to detect upstream-downstream movement. Each end of the land wall is also constrained for the alignment lines, but the end monoliths are, like the rest of the monoliths, built on pilings, whereas the gate monoliths are anchored to bedrock. Therefore a separate network is first run to determine coordinates for these endpoints. Each of the alignment pins being monitored is observed from two separate setups, preferably resulting in a near 90° angle at the observed pin.

Surveying settlement

Settlement surveys are performed in the same manner for all three types of structure, using a Trimble Dini 12 digital level and either invar rods (for concrete structures) or a fiberglass rod (for embankment structures). The only difference from previous methods is the use of a digital level rather than an optical level. Each project has one primary benchmark and two secondary benchmarks. The primary project benchmark is located off of the structure, while the secondary marks may be on or off. The same alignment pins are used for the settlement survey. Once the data is adjusted, a comparison is made to the initial values.

About the author

John Hamilton is a Professional Land Surveyor registered in Pennsylvania. He graduated from Purdue University with a Bachelor of Science degree in Civil Engineering, with a major in Geodesy and minors in Transportation and Geotechnical Engineering. Since 1997 he has been the president of Terrasurv, a small firm which specialises in Engineering Surveying. He has performed geodetic surveys in all fifty of the United States, and has worked in Asia, Africa and South America. Email: hamilton@terrasurv.com

• This article is a shortened version of a paper presented at the FIG Regional Conference 2012 in Uruguay (Session TS01B). Visit: <http://www.fig.net/uruguay/>



Figure 7 left & inset: Navigation Locks and dam. A large lock and a smaller lock are located in the upper part of the image and the dam (weir) in the lower part. Red crosses indicate reference stations and yellow crosses indicated alignment pins. Inset image: mini prism with monopole

Structural Subsidence in Wales

By Alex Keal

Alex Keal of Moniteye describes how remote monitoring techniques were used to monitor subsidence cracks and gave an early warning of partial building collapse.

In 2006 we were approached by an insurer to remotely monitor a number of properties on a 'new' hillside estate development, which were suspected of suffering damage due to landslip. The properties were located inland approximately half a mile from Aberporth Bay.

At that time, remote structural monitoring was very much in its infancy, but the benefits of remote real-time data for this project were clear, in that insurers concerns over ongoing foundation movement could be more readily detected when compared to existing labour intensive traditional monitoring techniques (i.e. use of digital vernier calipers and electronic level readings).

Utilising a unique sensor technology enabling horizontal and vertical vector measurements to be recorded, battery powered remote crack monitoring devices were fitted on a number of properties. As damage to the properties had occurred suddenly during a particularly heavy and prolonged period of rainfall, the devices were configured to take readings every eight hours and transmit them to a secure web gateway via mobile phone networks on a 24-hour basis. With alarm threshold reporting (via e-mail and text) for movements recorded in excess of 0.50mm, the client and occupants had peace of mind that the structural stability of their homes was being closely assessed.

With a unique capability to measure horizontal and vertical vectors (using magnetic induction sensor technology harnessed from the automobile industry), the devices were able to confirm the direction of movement and measure accurately to a resolution of 0.1mm. With temperature readings also taken alongside the crack readings the data received

REMOTE MONITORING

Utilising a GPRS and SMS capability, Moniteye's devices are used in a wide range of market sectors, including deployment on rail, road, river bridges and other important infrastructure structure assets. The company works closely with clients such as Amey, the Environment Agency, Connect Plus and local authorities deploying a number of technologies to assess the performance of assets. In addition to crack displacement, devices can remotely measure tilt, verticality, vibration and moisture content. Remote monitoring is now becoming a cost-effective alternative to traditional monitoring methods and has many benefits in that

- Sudden / dramatic movement can be tracked (i.e. where structural movement a concern)
- Provides invaluable evidence
- Provides peace of mind particularly on important strategic assets
- Provides the ability for pro-active handling, quicker decision making and a reduced timeline for repairs
- Reduces environmental disruption and is a green solution
- Particularly useful for high level / difficult access
- Provides high quality daily data with full transparency
- Ideal for remote locations and is a worldwide platform

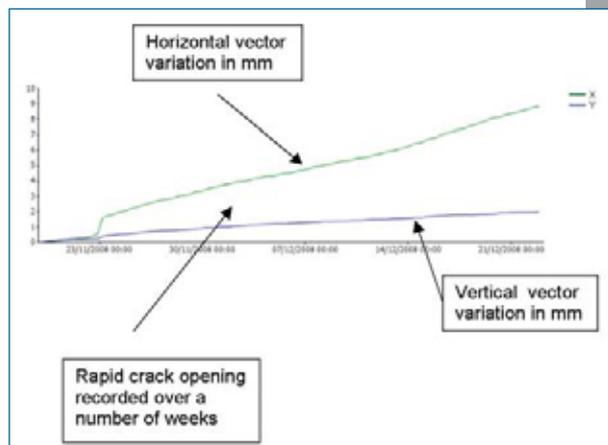
by the client was of great value, bearing in mind the sensitive nature of the problem.

The value of using the crack device was quickly demonstrated in that 8mm of rapid movement was recorded in one of the houses, resulting in the evacuation of a family with young children. With a further progression of movement in excess of 15mm, partial collapse of a roof truss occurred a few weeks later.

Following specialist ground investigations, the cause of the landslip was found to be related to underground water migration. Subsequently, ground stabilisation techniques were deployed to restore stability. Following these works, monitoring continued over a number of years and demonstrated that the properties eventually stabilised. However, due to the degree of movement and distortion to a number of the

dwellings, some are now planned for demolition.

In addition to crack displacement Moniteye have devices that can remotely measure tilt, verticality, vibration and moisture content.



Above: a battery powered remote monitoring unit inside a house.



Taking flight to paradise and choppy seas

By John Brock

Clearing up garbage on Norfolk Island, getting close and personal with a trig point and more cruises and tours on the trail of Australia's explorers and surveyors.

Gladly the bushfires and floods have subsided downunder with things recovering slowly and to start off the New Year we had our annual luncheon in NSW Parliament House Stranger's Dining Room, where I fit right in! The NSW Auditor-General **Peter Achterstraat** regaled us with tales of gross over-spending and dubious causes. On a more curious note and in true Brock style, my granddaughter said her first word last week – "Hooray" – followed by a round of applause!!! Another gregarious minion.

Norfolk Island with First Fleeters

If they offered a place on a garbage retrieval flight to Norfolk Island I would sign up for it, so when a group of First Fleet descendants asked for extra participants we jumped straight in. Being the safest place on earth, it is so relieving to return to the home of the descendants of the mutineers from The Bounty. Among the First Fleeters was our

former NSW Governor (1990-96), the Honorary **Peter Sinclair** and his sister **Ren Willard**, who travelled over to NI on the same plane as us from Sydney.

To my delight the esteemed ex-Gov and his sibling revealed to me that it was their brother James who authored *Mastamak*, the history of the surveyors of Papua New Guinea at which 2001 book launch I was in attendance in Port Moresby. I also caught up with the NI chief minister **David Buffett** in the cemetery with the sexton Shane Quintal then met the new Administrator **Neil Pope** at the Foundation Day Ceremony the following day just before introducing him to the former NSW Governor, which made his day! Meeting the island folk is a real treat and they really do love their island paradise. Anyone who has not been to Norfolk Island has to make an effort to get there because you will love it indeed.

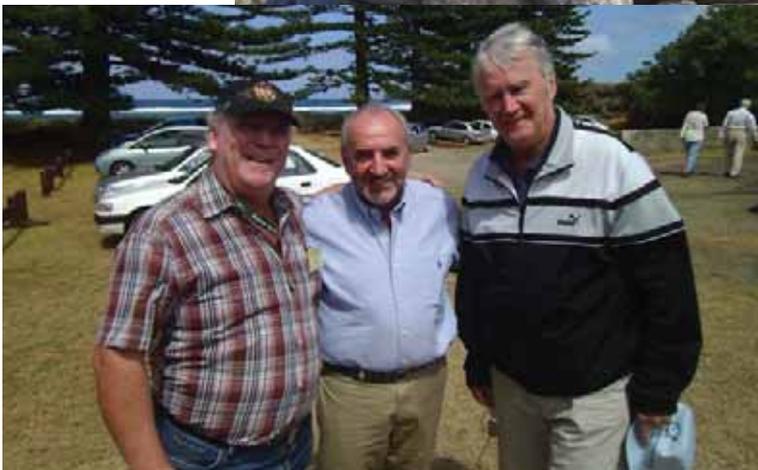
Trig Love

Rushing to our nation's capital city Canberra after one day back from NI I was driven to join the Annual Conference of the Association of Public Authority Surveyors (APAS) at which some great presentations were given, especially **Fred De Belin's** project to finally relocate the lost grave of the legendary Aboriginal Bennelong at Kissing Point (Ryde Council area). One great surprise was the launch of **Terry Birtles'** fantastic book *Charles Robert Scrivener – The Surveyor Who Sited Australia's National Capital Twice*. On the final day we walked to two old trig stations on the Australian Capital Territory border line named Gooroo and Old Joe. After a six km uphill ordeal our reward was 360° panoramic views accompanied by a delicious morning tea next to Old Joe. I got up close and personal with the historic Gooroo Trig 1880 stone cairn.

Two Cruises

In a small vessel on a choppy Sydney Harbour the Australian National Maritime Museum (ANMM) cruise to visit wreck sites took us to the spots where the wrecks of the *Centurian* (1870's), the *Centennial* (1880), the *Royal Shepherd* (1890) and the newest discovery made early this year of the *Herald* (1855) next to South Head. Our March Topp Tour cruise took us to parts of our harbour accessible only by a smaller craft such as a circumnavigation of Rodd Island and just clearing the underside

Right: a trig point, always the surveyor's first love.



Above: Norfolk Island garbage retrievers: John Brock, Neil Pope and former NSW Governor Peter Sinclair

of Pymont Bridge to take us into Cockle Bay next to Darling Harbour on St Patrick's Day.

Blackett Tour

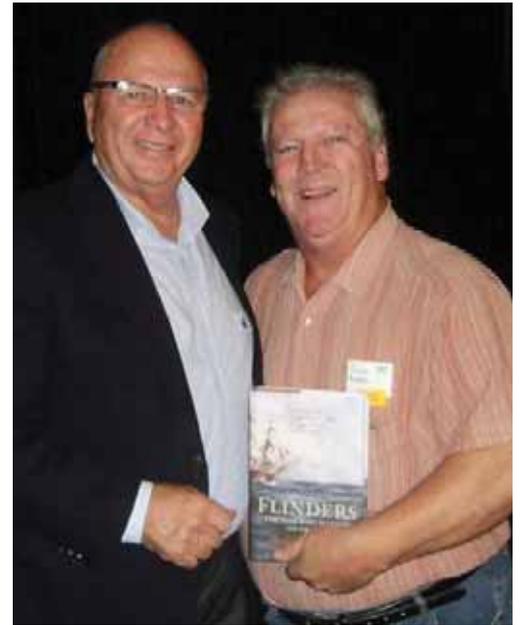
The Historic Houses Trust of NSW Colonial Architect bus tour took us to the pick of works by **Edmund Blackett**, who was prolific from the mid 1800's and early 1900's. St Mark's at Darling Point is a magnificent 1848 church in which the funeral service for Surveyor-General Sir **Thomas Mitchell** was conducted in 1855. Just around the corner we were shown the palatial private mansion "Greenoaks" (1840's-60) now home of the Anglican Archbishop of Sydney. We also visited St Phillip's (1848), Sydney University Quadrangle and Great Hall (1848); and my favourite colonial building, The Old Lands Department (1888), featuring statues of surveyors and explorers in niches on its facade including the most recent inductee, Irish emancipist early colonial surveyor **James Meehan** dedicated by our great Governor **Marie Bashir** in 2010.

Four explorers, a surveyor and the 1815 road

The ANMM author lecture saw renowned yachtsman/reporter/author **Rob Mundle**

highlight his excellent publication *Flinders – The Man Who Mapped Australia*. Blue Mountains Historical Society hosted Dr **Siobhan Lavelle** at their historic HQ "Turella" where she gave a talk about her new analysis of the first crossing of the Blue Mountains in 1813 - by Blaxland, Lawson and Wentworth and ultimately by surveyor **George Evans** contained in her recent release *1813 – A Tale That Grew in the Telling*. My final lecture was on the mysterious diaries of Lawson, Blaxland and Wentworth as told by **Paul Brunton** OAM from the Mitchell Library who showed copies of the first edition originals held by his prestigious establishment while dissecting their contents for the delight of the audience.

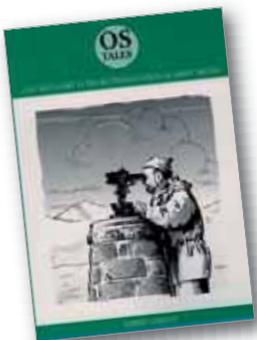
- *John Brock is a Registered Surveyor in Australia and is a stalwart of FIG and its Permanent Institution for the Art and History of Surveying.*



Above: with author Rob Mundle and his book on *Flinders*.

BOOK REVIEW

OS Tales: One Man's Part in the Re-Triangulation of Great Britain



Published by PV Publications Ltd, ISBN 0 946779 48 1 Price £7.95+ £0.61 p&p UK and Europe, £8.95 Rest of World.

Although this book has been reviewed before in *GW* we thought the time was ripe for an update from a younger reviewer. Neil Waghorn is a recent graduate in international affairs and defence studies and manages the website Location-Source.com on behalf of PV Publications.

a great insight into the re-triangulation of the UK from the 1930s to the 1960s

This book is a collection of tales of the late Barrie Corlson's experiences of working for the Ordnance Survey on the re-triangulation of Great Britain. The tales were originally published in the ICES Journal *Civil Engineering Surveyor* over several years, but are bought together here in one illuminating and humorous collection.

After the end of the Second World War there were large numbers of people for whom the idea of sitting behind a desk was torture. The author was one and upon leaving the Royal Navy, heard that the Ordnance Survey was looking for adventurous chaps. Off Corlson went and some adventures did he have!

One Man's Part includes the author's run-ins and experiences with assault craft, gypsies, battery acid, tank shells, tobogganing down mountains, multiple car accidents, getting locked in church towers, exploding biscuits tins, atomic research stations and lugging his

survey party's equipment up and down mountains to sit in fog and rain. It also details their experiences with the local wildlife and population including red stags, midges, ornithologists, monks, tourists and even more midges.

Corlson gives a great insight into the effort that went into the re-triangulation of the UK from the 1930s till the 1960s. The stories portray the torment of spending night after night at the top of a mountain in freezing fog in the hope that visibility might improve enough to see the other team's lights and take measurements.

Also portrayed in One Man's Part is the spirit of improvisation, with the book detailing the lengths that the author and his colleagues would go to to get the job done and, if possible, somehow turn things to their advantage. Sometimes their schemes worked but often not, but in dire circumstances the author always had his Ordnance

Survey warrant card to get him and his colleagues (or co-conspirators) out of a tight spot.

Some of the tales within One Man's Part would almost seem too incredible and farcical to be believed were it not for the collection of photographs printed in the middle of the book. These photos help the reader picture both the beauty and bareness of the locations that the author and colleagues involved in the re-triangulation were exposed to.

One Man's Part is an easy read and, at only 90 pages, can be devoured in a few short hours. It will appeal to a wide spectrum of readers, providing a humorous yet interesting insight on how things used to be done before the advent of GPS, lasers and digital surveying equipment. I heartily recommend it. OS Tales: One Man's Part in the Re-Triangulation of Great Britain is available for purchase from PV Publications at: <http://www.pvpubs.com/books.php>

Z/I sensor software update



Above: construction image of the 50,000-seat Stade Lille with a retractable roof. The project was completed in August last year.

Image courtesy: APEI France

Z/I Imaging has released V6.6 of its sensor software PPS, introducing 'PureColor Technology'. As part of a broader focus on radiometric enhancements and simplified processing, the technology boosts the dynamic range of the output image and protects all information collected even in high illuminated and shadow areas. The new version reduces the time needed for manual adjustments and provides a significantly higher automation level for post-processing parameter settings. To address customers' requirements for very large mapping projects, radiometric characteristics for all Z/I DMC and Z/I DMC II cameras have been standardized, allowing users to fly large projects with multiple cameras.

Trimble updates RealWorks

Trimble has announced version 8 of its RealWorks software that includes a new 3D database engine, automated targetless registration and web viewing capability incorporating RealWorks' Scan Explorer interface. A new 3D database engine will allow up to five times more data to be visualised and managed, compared to the previous version.

The automated targetless registration function, together with additional workflow enhancements, will provide further productivity gains for customers. The automated targetless registration function identifies planar objects in each scan and matches the planes from multiple stations, creating a combined dataset. The function enhances productivity in the field by eliminating target placement prior to data capture in applicable environments. Office processing time is also reduced

by the fully automated function.

Sharing of data with clients has been enhanced by the addition of a Publisher function within the Trimble RealWorks software that allows projects to be custom packaged for viewing via Microsoft Internet Explorer. The Scan Explorer interface, embedded inside an HTML web page, allows clients to navigate and explore the scan data as well as take measurements and add notes.

Autodesk ReCap

Autodesk ReCap is a key addition to the 2014 portfolio of Autodesk software. A family of reality capture software and cloud services, it simplifies the process of creating intelligent 3D data of physical objects and environments using laser scans and photos, allowing customers to bring the actual job site or physical objects into their design and engineering process.

Also available is Autodesk 360, which connects the desktop to secure and virtually infinite

computing power in the cloud. Autodesk has also introduced Infracore and Infracore 360 cloud services for its Infrastructure and Building Design Suites.

TweetM8

Ohmex has devised a social media solution to provide tide and weather information to pilots when the harbour office is closed. Twitter was the answer because it is available for both web-based users and via SMS text messages. For more information visit <http://www.ohmex.net/>.

Zeno software update

Leica Geosystems has announced updates for its Zeno Office v3.1 and MobileMatriX v5.1 software, with support for the Leica CS25 GNSS tablet computer and high accuracy data collector, Esri ArcGIS 10.0/10.1 and post-processing accuracy improvements. With the CS25, asset collection and post-processing of GNSS raw data can now be done in one application and on one device, bringing field and office application together into a highly portable solution. Support for file based geodatabases, ensures that the user can take data into the field.

Scanning under water

The new INSCAN underwater laser imaging system provides fast, high resolution 3D data capture for surveying, as-builts and monitoring. It uses proprietary technology developed by 3D at Depth and engineered by subsea engineering company CDL for use at depths of up to 3000m. The system collects up to 40,000 points per second, provides a 360° x 30° field of view and can either provide real-time operator measurements or output to industry standard point clouds.

New Trimble controller

The Trimble Slate Controller combines the convenience and ease-of-use of a smartphone with rugged durability and optimised for Trimble's Access field software and the R4 GNSS receiver.

Offering voice, SMS text, and 3.75G cellular data transfer capabilities on GSM cellular networks worldwide, the controller

is a rugged device that enables enhanced connectivity in the field. Its wireless communication capabilities keep surveyors in the field connected to the office. It has a 4.3" capacitive touch, Gorilla glass display providing superior sunlight readability.

Theft deterrent

Surveying and Engineering equipment theft is on the rise as instruments are becoming a more likely target for thieves. M&P Survey Equipment (www.mpsurvey.co.uk) is offering a solution involving an alarmed wire which is looped through the equipment and can be attached to a specially adapted survey nail or Feno marker.

A billion points

Overwatch has announced the release of version 5.1 of its LiDAR Analyst software with a new 3D Viewer enabling visualization, analysis and dissemination of 3D data. It loads and displays datasets in excess of a billion points. The viewer is tightly integrated into the software and handles all of the standard data formats used by geospatial intelligence analysts.

LiDAR Analyst users are now able to perform real-time data analysis, including radial line-of-sight, buffer zone analysis, landing zones and 3D mensuration. The software also includes an option for distributed processing that breaks data into manageable pieces to distribute across a cluster of workstations. This enhancement can reduce overall processing time by orders of magnitude, dramatically increasing efficiency.



Trimble's Slate Controller comes with voice, SMS texting and a 3.75G cellular data transfer.

ProMark 700

Spectra Precision has introduced the ProMark 700 GNSS RTK rover specifically designed for network RTK applications. Weighing only 650 grams, the receiver is believed to be the lightest GP+GLONASS RTK smart antenna available on the market today. The unit has a ten-hour battery life between recharges, a rugged, waterproof design and a wide operating temperature range for harsh outdoor environments.

Update for iCONstruct

Leica Geosystems has released a new, enhanced version of the iCONstruct field software for its iCON portfolio. The software significantly improves and further optimizes construction workflow efficiency with the CC50 and CC60/61 field controllers and the gps 60 and robot 50 positioning sensors to better meet the different needs of construction personnel on site. A new Roading application is an option for the iCON build and iCON site software. It is also available for the CC60/61 controllers with their 7" inch large display. Roading enables users to stakeout individual road lines and slope elements providing different views for easy and straightforward use.

Users working with a Leica iCON gps 60 antenna can now receive coordinate systems via the RTCM v3.1. message format using Leica's SmartNet network RTK correction service.

Storm GeoRiver

Storm GeoRiver is river model data preparation software for river surveyors and hydraulic engineers. The software automates two-way exchanges between ISIS, Mike 11 and Hec-Ras river model formats. It provides tools that quickly create river models from survey or existing data. GeoRiver is a partnership between Storm Geomatics and software specialists Borwell Ltd. This expert partnership has provided a dual approach to a software package that offers surveying companies and consulting engineers value for money and improved output. The software is

available on a 30-day cloud licence or through annual subscription.

New Optech aerial digital camera

Optech has announced the release of its new CS-6500 aerial camera system featuring a new 29-Mpx interline CCD which increases the camera's operational window, makes data collection 80% more efficient, and reduces readout leakage output – enabling operators to gather high-quality imagery even faster than before. The camera also features simplified operations, high versatility, and a large 6500×4300 pixel footprint that enables integration with Optech's ALTM lidar sensors and CS-series of thermal and multispectral cameras.

New airborne sensor

Leica Geosystems has announced the new generation of its leading airborne digital sensor, the ADS100. Introducing a unique focal plate design, the Leica ADS100 offers a swath width of 20,000 pixels for all multispectral bands (RGBN) and multispectral capability in forward, nadir and backward, making it the most productive airborne sensor available today. The ADS100 provides the world's first large format CCD line with TDI (Time Delay and Integration) to increase sensitivity despite a smaller pixel size. By doubling the cycle rate, high-resolution images can now be acquired at much higher ground speeds. A new gyro-stabilised mount, the PAV100, is



The ADS 100 has a unique focal plate design and swath width of 20k pixels.

Underground scanner



The I-Site 820 is a new laser scanner designed specifically for underground applications. It can be coupled with a range of accessories to provide a complete scanning system for underground drives, tunnels and stopes as well as surface stockpiles and silos. Processing of scan data can be undertaken in I-Site Studio and I-Site Void software.

equipped with revolutionary adaptive control technology.

Spherical camera

Point Grey has released the Ladybug5 camera. The new LD5-U3-5155C is a 30 Mpx camera that covers 90% of a full sphere, has a 5Gbit/sec USB 3.0 interface, provides high dynamic range, superb image quality and maximum user flexibility.

The camera uses six high sensitivity 5Mpx Sony ICX655 CCD image sensors. The five CCDs are positioned in a horizontal ring and one is positioned vertically pointing upwards. Unlike rolling shutter CMOS, global shutter CCD technology prevents motion artifacts when capturing images from a moving vehicle. All six Ladybug5 imagers are pre-calibrated in Point Grey's manufacturing facility, removing the need for in-field calibration. The Ladybug5 captures, optionally compresses, and transmits full bit-depth (12-bit) images to the host PC where a unique software post-processing workflow can be used to apply white balance, gamma, smear correction, fall-off correction and other image processing functions.

Crowdsource for Google!

Google has announced Map Maker, an online tool that allows people to contribute and edit map data for certain regions

around the world, including the UK. Users can locate, draw, label and provide attributes for local map features, in effect, becoming "citizen cartographers".

The product helps users improve the quality of maps since they can more precisely map places like their local neighbourhoods, footpaths and forests, parks and golf courses, "where maps have traditionally been less comprehensive" say Google. Once approved, improvements will appear across Google Maps, Google Earth, and Google Maps for Mobile.

Riegl and Applanix take flight on UAV

Riegl and Applanix have integrated the Applanix AP50 GNSS-Inertial sensor system with Riegl's VQ-820-GU topographic airborne laser scanner, which is designed for combined land and hydrographic airborne survey, on board the SCHIEBEL Camcopter S-100 UAV.

Virtual Classroom

Exprodat, the oil and gas software, consultancy and training supplier, has made their suite of petroleum ArcGIS training courses available through a "virtual classroom". For more information, visit <http://www.exprodat.com/Training/Booking/Virtual-Classroom>. The ArcGIS software and data needed for the training courses is hosted remotely, which means attendees only need to log-in and learn.

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StarNet	p.35
Survey Review	p.17
Topcon GB (recruitment)	p.34

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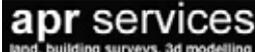


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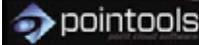
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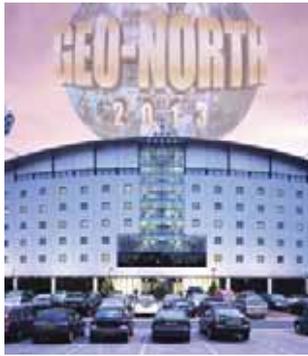


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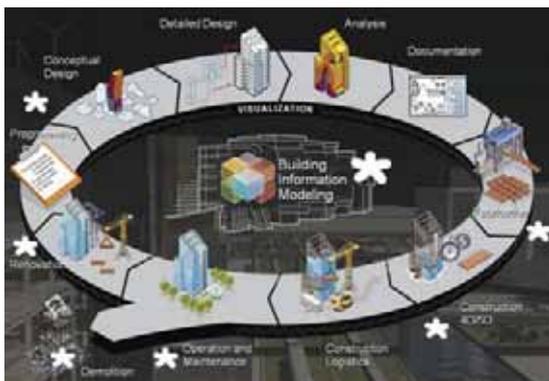
Geo goes North

Geo-North was a slimmer version of its southern sister with a packed day of seminars accompanying the exhibition. Testing the water? If so, then the results should be encouraging for future shows.

A day after Manchester United succumbed to Real Madrid, the first of this year's Geo events travelled north to the Reebok Stadium at Bolton, home of Bolton Wanderers, for the away leg of the year's dual-venue event, reports **Richard Groom.**

“These are all questions that have not been fully answered by the BIM fraternity.”

Below: Where the land surveyor needs to be in the BIM process.



The rise of the digital native

Bob McEwan, chief technologist at Hewlett Packard UK, kicked off the seminar programme with a keynote presentation entitled “Trends and Thoughts on Change in a Changing World”. He ranged from the early punch-card driven main frame computers to emerging technologies such as Google’s digital glasses or 3D printers that can reproduce human organs.

A new technology can create a competitive advantage, but it is only a question of time before the competition catch up and erode it. He looked at the ways in which manufacturers can retain competitive advantage and took Rolls Royce as an example. Nowadays, they don’t sell jet engines: they sell time on jet engines, which comes with the obligation for service and maintenance.

There is a scary world ahead of us as data volumes increase exponentially. There are currently around two billion people online around the world generating 294 billion emails every day. By 2020 four billion are expected to be online. The data we generate currently is about 2 zettabytes. ‘Zetta...’ what? A zettabyte (ZB) is 10^{21} bytes. By 2020 the number is expected to reach 35 zettabytes. And by the way, by my calculation a zettabyte is 1 billion times a terabyte... we’re talking very big numbers.

McEwan also looked at the rise and fall of free application access. The future he foresees is one in which the free part of the deal is a taster for the part that you pay for. The ‘metadata’ that we all generate just by visiting sites is also valuable and traded for targeted marketing. Big Brother is watching you but this is something that digital natives accept. They (digital natives) have grown up with this

technology and have a whole new way of looking at life and work.

The cloud is also with us and looks set to dominate GIS in the next ten to fifteen years, but it is not so obvious that other developments will be winners. McEwan reeled through a list. He reckons we will have the terabit Ethernet by 2020; four-wall screens and flexible

electronic paper; there will be a revolution in personalised medical care including 3D printing of replacement organs; sensors will be everywhere which will probably be intelligent. He was not so sure about Google glasses or GPS shoes...!

BIM: geospatial perspectives

BIM is the topic of the moment and took centre stage during the morning seminars. Dr **Anne Kemp**, from Atkins Global, gave up the microphone and static presenting to roam amongst the audience to get her message across. I have heard her speak on several occasions and this one was no less engaging. BIM means different things to different people and Kemp approaches it from a GI perspective. The name ‘BIM’ is a rallying point for the movement but can restrict our thinking, so she tried GIM (Geographical Information Modelling) and a title “GIM’ll fix it!”; but that does not sound quite so wholesome as it once did. Then SIM (Surveying Information Modelling), but that sounds too similar to SIN. So the point is that BIM is just another acronym. She sees an opportunity for surveyors to be the ‘single point of truth’ – position is the unifying element in BIM.

Consultant, **Chris Little**, followed with an inspiring talk. He asked what should be the role of the surveyor. But before tackling that question there remain others that should be considered, such as, ‘What is the model?’ Is it survey, design (or as-built), laser scans, or a combination? These are all questions that have not been fully answered by the BIM fraternity. Then there is the question of grid, scale and accuracy. Comprehension of these concepts by the architects and engineers controlling BIM is still alarmingly low. So, where does the surveyor fit in? As is so often the case, he could fit in almost anywhere – in which case he will probably end up nowhere, or he could be central to the BIM enterprise, as BIM manager; ensuring all the data that goes into the BIM fits together.

The session concluded with a brief discussion of the issues. **Richard Groom** claimed that dimensional surveying is not currently represented on the bodies involved in the development of BIM due to a lack of leadership from both the RICS and the ICES. If the fifty people in the room were to write to the chairs of their professional bodies, what should they say? Anne Kemp responded that there are a number of bodies on which geomatics could be represented.

There is an AGI special interest group, which has support from ICE (<http://www.ice.org.uk/topics/BIM/ICE-BIM-Action-Group>). This group has arranged a conference on 25th June at

the Royal Geographical Society entitled 'BIM meets Geospatial'. More details will be released in early April - but booking is already open on the AGI site. The link for the government's BIM task group is: <http://www.bimtaskgroup.org/bim-4-infrastructure-uk/>. (In addition there are the BuildingSmart regional hubs, which were discussed in the March/April 2013 issue of *Geomatics World*).

The age of open data

Dr **Bob Barr** is visiting professor at the University of Liverpool and campaigner for open data. If there has been a blocker to progress it has to be closely-guarded intellectual property rights; but times are changing. The Government's white paper on Open Data champions open data as a resource that can bring economic growth as well the transparency that can hold government and public servants to account.

Barr's sights are set firmly on natural monopolies, of which the ultimate must be the Post Office Address file (PAF) and statutory registers, such as the Land Register. These core datasets hold data that is needed in order to complete a public task, regardless of whether it is resold or reused. In Europe the view is that they should be made available "at marginal cost of redistribution".

Returning to PAF, as an example, Barr suggested that if property centroids were stored in satnavs, navigation would be improved which would result in efficiency gains. Royal Mail justifies its charges for PAF data by claiming that the cost of maintaining the dataset is £27 million per year, a figure that is clearly laughable. Further 'justification' for charging comes from the PAF Advisory Board (sponsored by Royal Mail) stating that there is no evidence that more use would be made of PAF data if the cost were reduced. And yet it is now covered by the Public Sector Mapping Agreement and distributed freely to local authorities – presumably so that they will make more use of it! Barr produced a list of 36 excuses from government departments for not making datasets available, but the real reason, he asserts, boils down to vested interest.

Open data is a movement that now has the wind in its sails and we are approaching a situation where datasets will be 'open' by default, unless there is a good reason for them to be restricted.

GIS helps save county £5m

Richard Groombridge explained how the use of GIS can improve the inspection and management of Kent's 8500 kms of roads. His project involved optimising inspection routes so as to reduce costs and carbon footprint, fix defects before they become potholes and improve business efficiency and services. The project is expected to save the county £5m and won a well deserved Improvement & Efficiency Award at last year's GeoPlace Awards Day.

UAVs

Next we entered the world of UAVs, with talks from **Andrew Blogg** of Digital Mapping and Survey, speaking as a service provider and **Brecht Lonneville** of Gatewing, which supplies UAV technology. This is a viable technology that can deliver absolute position and height for orthophoto mapping and digital elevation models with an RMS precision of a few centimetres. The concepts are the same as for conventional aerial photography but UAV aerial photography is cheaper and more flexible. The technology is finding its niche for mapping of small sites where it competes with ground surveying techniques. Both presentations were based upon articles in the Jan/Feb 2013 issue of *Geomatics World*.

Point clouds from HDR imagery

The afternoon continued with an update from **Peter Taylor** on the Spheron-VR 360° HDR camera. Its defining characteristic is that it records light from the scene using up to 26 f-stops, which means that a single image can record all detail without over-exposure of light areas or under-exposure in dark areas. Taylor's talk concentrated on Spheron's SceneWorks software that can be used to manage these images and enable walk-throughs of sites.

The Spheron VR camera can now be used to produce 3D point clouds from stereo pairs of images and it is also possible to observe concentric HDR images and laser scans from the same tripod set-up to produce co-registered VR photography with point cloud data. In another development a single image (set of RGB values) can now be generated from the optimum exposure value for each pixel in an image.

Monitoring with Leica

Leica's account manager for Northern England **Mike Workman** wound up the programme with a talk on the company's monitoring solutions. He argues that geotechnical sensors have traditionally made up 75% of the monitoring market, compared with 25% geodetic sensors, but this is changing. Traditional monitoring is still suitable for many applications but most development has taken place with automated real-time systems. From the hardware point of view, customers are looking for consistency and precision over a long period of use, whilst the software has to be able to combine data from geodetic and geotechnical sensors and manage and archive the data reliably.



Above: Gatewing's X-100 UAV can deliver position and height for orthophoto mapping.

"The technology is finding its niche for mapping of small sites where it competes with ground surveying techniques."

Registration and Regulation: a lesson from Ontario?

By Richard Groom

Qualifying and regulating surveyors is a worldwide issue. Should it be comprehensive and codified or a light touch, self-regulating regime? **Richard Groom** looks at how a Canadian state dealt with a recent case and sets out a possible way forward.

Geomatics World last touched on the subject of regulation in the Sept / Oct issue of 2008. Our article: The State of Self Regulation, was prompted by a paper in *Ontario Professional Surveyor* from earlier that year. The *GW* article argued that self regulation, as implemented by the RICS following the Carsberg Report, did not go nearly far enough in protecting the interests of geomatics surveyors' clients or the interests of the profession. To some this may have seemed provocative stuff. But following the article, far from receiving a page full of letters and a vigorous debate, there was not a whisper, for or against.

Balancing quality and quantity

There is in fact a specific problem. Clients want to select tenderers and contractors on the basis of best value for money. For government contracts this is a requirement and involves balancing the quality on offer with the price; quality being a qualitative measure and price being quantitative. The challenge is to merge qualitative and quantitative measures openly, fairly and efficiently. How can this be done?

In an ideal world, the most efficient method is to trust companies that claim to be able to carry out the work proficiently. In other words, quality is a given. On this basis, tenders can be sent to all proficient companies that wish to bid and the successful tenderer will be the company that submits the lowest price. From the client's point of view this approach has the great benefit of being simple, transparent, fair and unequivocal. 'Fair', of course comes with provisos, because there are aspects of selection by price alone that can be considered unfair: such as pricing mistakes and under-pricing for wider commercial reasons. However, tendering on this basis is more likely to fail through reliance on its fundamental assumption – that companies claiming to be capable are telling the truth, the whole truth and nothing but the truth. For this reason assessment of bids has to include assessment of quality.

Prequalification

Procurement of larger survey projects is generally a two-stage process: prequalification followed by tender. The primary purpose of prequalification is to identify and select companies that reach the standard required, so that they can go on to a tender list. For this purpose, the client will send a list of general prequalification questions on subjects including

company finance, technical ability and resources, management, health and safety etc.

Choosing the right questions is critical, and so many questions become honed through experience and then become more or less standard. There is generally a 'right' answer and the client has little choice but to believe the answer even though it could be heavily laced with 'spin'. The answers are then marked by converting generally qualitative responses into scores out of ten. The scoring involves judgement and therefore each scored answer comes with a margin of error which is very difficult to quantify. It is possible that a superlative score on one question can outweigh a poor score on another. Although, if a poor score dips below a threshold value, the whole submission should be rejected.

Ideally, the prequalification process should result in a list of contractors who have the resources and capability to do the work but how often do clients employ technically qualified experts to assess prequalifiers' submissions?

Tender assessment

Tendering is the second phase of the procurement process in which the selected tenderers are sent the project scope and submit price and quality proposals. This time the tenders are assessed on the basis of price and quality – weighted according to the complexity of the work: higher quality weighting for more complex work. For well understood less complex projects there is arguably no need for quality assessment, especially if it has been assessed sufficiently at prequalification stage.

Efficient regulation could sweep away some of the analogue-to-digital conversion that goes into selection based upon quality. For example, diners know that a restaurant that has gained Michelin stars has met a quality standard. An essential part of this 'regulatory system' is that, if standards fall, the restaurant loses a star, or stars, with serious consequences for the business: quite an incentive to maintain standards.

The British problem

In Britain there is no single qualification for companies that fits the bill as a gatekeeper qualification or enables companies to be ranked. RICS regulation is not adequate on its own because its only requirement is that the company has a complaints handling process. Only if a client is dissatisfied with the company's handling of a client's complaint can it be referred to RICS regulation. It is

“There is generally a 'right' answer and the client has little choice but to believe the answer even though it could be heavily laced with 'spin'.”

therefore equipped only to pick up the most serious complaints and it is notable that none of the complaints that have made it through to the RICS disciplinary committee have been geomatics-related. Perhaps the client's response to a poor quality geomatics survey is to go elsewhere to place the next commission.

The Survey Association (TSA) is a trade body and as such is in existence to help its members and provide guidance to clients. As secretary general **Rory Stanbridge** explains:

"TSA is not a regulatory body but does insist on certain standards being achieved and maintained on joining the association and in continuing membership." New applicants have to be able to provide numerous references and acceptable samples of work to be judged by a committee as to their suitability for membership. Once a company is in membership, an annual return process ensures that the member complies with current legislation and is financially sound, although TSA relies on feedback from clients as to the ongoing performance of its members. "To the best of my knowledge there have only been a handful of complaints against members in the last thirty years" says Stanbridge. A complaints procedure and a complaints committee is established to examine any case that might be brought forward and report back to both the member and the complainant. Wherever possible the process is designed to assist the member to improve, if it is proven that they have erred in the first place, to ensure that it is not repeated. In extreme cases expulsion from TSA can be invoked although this has only occurred once to date.

Admirable though this is, TSA is, as Stanbridge points out, a trade body. But it appears to be doing a more thorough job than the professional bodies who should take on the responsibility to regulate.

Back to Ontario

Ontario Professional Surveyor returned to the subject of regulation in its Summer 2011 issue (Vol 54, No 3). Three pages of the magazine were devoted to a disciplinary case which raised a few points that are worth considering.

Surveyors who carry out cadastral survey work in Ontario have to be licensed and abide by the Surveyors Act 1990. In February 2010, the complaints committee of the governing body, the Association of Ontario Land Surveyors (AOLS), received a complaint alleging that a surveyor had failed to fulfil his professional obligation to follow and maintain the Performance Standards for the Practice of Cadastral Surveying and went on to specifics about failing to conduct proper research, failure to properly catalogue field notes and failure to respond to a request from a fellow surveyor.

An important aspect of regulation is a set of performance standards. In Ontario these are enshrined in the Act. But in the UK, apart from a few guidance documents, the RICS

does not have performance standards; this hinders effective regulation.

The surveyor prepared a draft Reference Plan in 1994, which he did not deposit with the Land Registry. In 2009, he updated the draft plan and then deposited it without carrying out research on a neighbouring plan that had been deposited in 2006. He did not have field notes to support the deposited plan, which had not been produced following quality control procedures.

In this case it is not totally clear who raised the initial complaint but, as one of the charges was "failing to respond to a request from a fellow surveyor", it seems likely that the fellow surveyor was involved in raising the complaint with the Ontario Land Surveyors. There is a clear contrast here, in that the RICS website states that failure to respond to correspondence is not a matter that RICS Regulation deals with and furthermore that complaints can only be raised by the client.

The Complaints Committee referred the case to the Disciplinary Committee for a disciplinary hearing at which the parties tabled a joint submission in which the surveyor agreed to a 16-month deferred suspension, during which he would be supervised by another Ontario Land Surveyor. He would pay all costs and his case would be publicised.

So, what do we need?

Modern surveying is a team exercise and it is not uncommon to find that although an organisation employs qualified surveyors, the principal is not a member of a professional body. This can present difficulties for the qualified surveyor and is the reason why quality has to be a corporate responsibility. Clients hire companies, not individuals.

To establish basic standards, we need a best practice manual. This is the equivalent of the survey laws of the cadastral surveyor. Such a manual was proposed over twenty years ago. It never materialised and consequently, to fill the void, major survey clients such as Network Rail and the Environment Agency have had to write their own. The best practice manual, together with a disciplinary system that investigates complaints from anyone affected by the survey can lead to effective survey company registration – a gatekeeper for technical quality.

Successful regulation, or conversely charter-marking, would not be a 'negative' exercise. A successful system would have benefits for surveyors, for survey organisations, and for their clients. It would also benefit the professional body by raising its reputation.

- For the complete article from *Ontario Professional Surveyor*, visit <http://www.aols.org/lib/db2file.asp?fileid=10973>

“...a complaint alleging that a surveyor had failed to fulfil his professional obligation to follow and maintain the Performance Standards for the Practice of Cadastral Surveying...”



The Annual Meetings of Teachers of Surveying

With a cast of intriguing characters and comics, former academics **Arthur Allan** and **Keith Atkinson** look back on the founding and history of the Teachers of Surveying Meetings which used to take place annually.

The 1960s witnessed an explosion of surveying activities both in the UK and worldwide. This was the heyday of medium sized companies like BKS, Fairey, Hunting, Meridian and Story, together with colonial surveying departments and the Directorate of Overseas Surveys. To meet the demand for qualified staff, surveying departments emerged or expanded in several UK academic institutions. There was even a GCE A Level course in Land Surveying.

In 1963 at the Conference of Commonwealth Survey Officers in Cambridge, Gordon Petrie called together a few colleagues, including **Pat Carmody**, **John Hollwey** and **Arthur Allan**, to propose the creation of an annual meeting of all interested teachers, so that all could benefit from discussion and interaction. As a result, the first Meeting was arranged for 18th to 20th December, 1964 at Lincoln Hall, University of Nottingham, where **Bernard Chiat** was the host organiser. The cost of a single room and all meals was £3 12s 0d (£3.60).

Network and pooling ideas drove respect

Over the years, lecturers and teachers from a wide range of institutions were able to discuss curricula, syllabus content, the value (or otherwise) of practical classes and fieldwork, what instruments to buy, what the latest research work was, what conferences had taken place and so on. This networking and pooling of ideas also gave us immense respect for each other. Additionally, it was extremely useful to those lecturers working in isolation, many in Departments of Civil Engineering. There is no doubt that these Meetings did more than anything else to raise the average level of surveying teaching in the UK and Ireland.

But it was not all work and no play. Amongst the teachers of surveying were many talented musicians and singers. Who will forget **John Muskett** and his music group, or the singers, many of whom indulged in comic opera? John Garner from Leeds was perhaps the best of this bunch, well known for his fine bass voice and his role as Pooh-Bah in *The Mikado*! Then at dinner in Glasgow on 21st December, 1987, the entry of haggis royale was accompanied by the pipes. Even travelling to meetings involved pleasures which it is no longer possible to enjoy. On the way to Sheffield in 1973, lunch was taken in the restaurant car of the train between Birmingham and the destination. Travel to Newcastle from London in 1983 was by overnight sleeper, a service long since withdrawn.

“A hole was made in the ground and a mixture of manure, urine and straw was used as a flux.”

Ground not to spec and bell goes dung

Off-the-cuff remarks during meetings were endemic. Some examples come to mind. Acting as devil's advocate to spark off discussion, Pat Carmody made a sweeping statement about the future development of electromagnetic distance measurement, closing his impassioned statement with the words “and, what's more, I'll stake my reputation on it!” A voice was heard to say “How is that?” to which a second voice added “Because he's got nothing to lose!” Another intervention came during a very heated argument about computer terrain modelling, when the authors of some software complained that very nearly flat ground could not be modelled. “So”, said **Joe Olliver** “I see! It's the ground that doesn't meet the software specification”.

Most Teachers' meetings were enriched by technical visits and special lectures. Two of these stand out in our memory. One was the visit to John Taylor & Co. Loughborough Bell Foundry. At the foundry we were told that, because transporting a heavy bell would have been well nigh impossible, in former times bells were cast in situ. A hole was made in the ground and a mixture of manure, urine and straw was used as a flux. Someone was heard to remark. “I see! So the dung is needed to make the make the dong!”

Another visit was to Green's Windmill. Although this windmill at Sneinton, Nottingham is well worth a visit per se, the biography of **George Green** (1793 – 1841) is even more impressive. Green made a massive contribution to the mathematics of vector fields. But he also had to earn a living as a miller to feed his great many children. When asked how he managed to find the opportunity to work on his mathematics, he replied: “From time stolen from sleep”.

Survey control is like . . .

Other memorable occasions included a demonstration of optical phenomena in Glasgow and a talk and demonstration about boomerangs by the aeronautical engineer, Professor W. H. Witterick, at Birmingham University. From time to time the meetings were enriched by presentations from practicing professional surveyors. We remember especially **Stan Longdin's** comment about survey control. He said that “Survey control is like sex. When it's good it's very, very good, and when it's bad, it's still pretty good!”

If we were to select the most humorous man ever to talk to the Meeting, **John Ayres** would be he. His 1979 talk on the hysterical

[sic] architecture of Bradford was quite trouser wetting. Long before the end of his discourse, **Bill Barnes** was pleading with him to stop, such was the agony induced by laughter. There is no way we can adequately describe this funny clever man - with eyes that seemed to view his audience with divergent axes, but whose humour was based on academic excellence in three related disciplines: surveying, architecture and civil engineering.

Osborne what?

We wonder how many knew that **Tony Jones**, who taught surveying at Bangor, appeared on the TV programme *This is your life*. To our amazement, a description was given of the dedicated service given by Dr **Anthony Jones** MBE to Mountain Rescue in Snowdonia, where he had saved at least four lives. We must also mention **Osborne Jelly**, who began the formal surveying teaching at the University of Glasgow. He was famed for his vastly complicated schedules which depicted all the surveying field courses in the country, the most spectacular being **Ron Bird's** Birmingham University camps alongside the Welshpool and Llanfair Light Railway in Wales. Yes! Ron ran his field schemes under canvas, dressed in shorts like the scout leader he used to be! Yet another contributor was **John Keates** of Glasgow, whose ideas on the psychological

aspects of cartography were always most stimulating. We always welcomed the contributions made by the Royal School of Military Survey, Hermitage and the Royal Military College of Science at Shrivenham.

In so little space we have only given a snapshot of events. All teachers enhanced the Meetings with comments and ideas. At their peak in the early 1990s, the Meetings gathered over 100 persons together, including UK and Irish participants and the occasional visitor from further afield. They were self-financing and could not have taken place without the devoted service of the staff of the host departments and those who maintained the continuity of records. It was even agreed to design a tie to be worn by teachers of surveying. Following a competition open to teachers, the winning design was manufactured and sold out quickly.

Some years ago, one of us made a study of the education of the geometers in 17 countries of Europe, visiting technical colleges, universities and professional firms and departments in the process. In almost every country, he was dismayed at the insularity of most departments, who jealously guarded their own narrow interests at the expense of the general well being. We believe that these Meetings of Teachers of Surveying greatly reduced such insularity and narrow-mindedness here.

“...the insularity of most departments, who jealously guarded their own narrow interests at the expense of the general well being.”



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