

June 2021 #105

SURVEYING + SPATIAL

Magazine

Preparing for the Future

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FUTURE WITH LiDAR**

**ANALYSIS FROM THE
PRIVATE SECTOR**

**RAPID DAMAGE
MAPPING – THE FUTURE
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Preparing for the future

Rachel Harris

As New Zealand's built environment sector continues to quickly grow and gather pace, focusing on technology, innovation and professional development is becoming increasingly important in preparing for the future of the survey and spatial industries.

Survey and spatial professionals need to respond quickly to the changes and stay at the forefront of industry developments as well as learning new skills from peer groups and from the industry at large.

The future of the survey and spatial industries requires not only adapting to new and progressive ways of thinking but also developing new ways of communicating, writing and presenting data for an ever-increasing audience in need of easily accessible information.

The ability to think more creatively and divergently is important for professionals and organisations to enable them to strategically design how information is represented and disseminated in the public sphere.

Finding new and improved ways to condense complex data into simple, straightforward concepts and insights will ensure the future of survey and spatial information is within reach of everyone, and gain support and awareness of our sector along the way.

If we can find new ways to collaborate between teams and encourage better interaction within organisations, our industry

and associated professions, our roles within the survey and spatial industries can become stronger, and more adaptable.

Opportunities for the survey and spatial sectors are growing daily and the ability to recognise these opportunities beyond the current work systems will be important in future as many roles progressively take information and management skills into more diversified areas.

Many organisations within the surveying and spatial industries are increasingly overlapping with sectors such as engineering and construction, and this interaction is likely to increase further as the current construction boom continues to thrive.

As information and data specialists, survey and spatial professionals provide an essential role in a project and by enhancing your skillset through continuing professional development and taking advantage of newly emerging technologies and applications, professionals can continue to keep pace with ongoing developments.

In addition to support from Survey + Spatial NZ, there are many resources available online to help you with planning and preparing your professional development, career and business for the future. Here's a few useful links to look at: www.business.govt.nz; www.imnz.co.nz; and Regional Skills Leadership Groups – Ministry of Business, Innovation and



Employment www.mbie.govt.nz).

In our 'preparing for the future' theme this edition, we feature an article from Bjorn Johns on the importance of precise 3D maps and elevation data models for the future of New Zealand's land and infrastructure planning.

As pressure continues to mount on survey and spatial professionals in New Zealand, we asked four consultants what future opportunities and challenges the industry will face in our private sector perspective article.

Mark Fisher of Eighty4 Recruitment discusses the fast-paced recruitment industry and how to prepare for the resurgent post-Covid market that is affecting the current and future job market in New Zealand.

Tonkin + Taylor present s its award-winning rapid damage mapping (RDM) tool. Originally designed to rapidly gather integrated damage mapping information, this successful RDM technology has aided in efficient disaster response and recovery for several natural disasters including the Kaikōura earthquake, Tropical Cyclone Winston in Fiji, tropical cyclones Idai and Kenneth in Mozambique, and Tonga's Cyclone Gita.

The future of mobile 3D laser scanners and its applications is examined by Allan Hosking of Survey Solutions, and Surveyor-General Anselm Haanen discusses the past and future of New Zealand's trig beacons. ●

Survey and spatial professionals need to respond quickly to the changes and stay at the forefront of industry developments.

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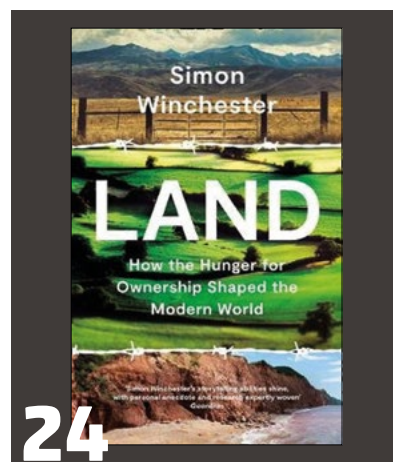
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Partnering to deliver confidence in property boundaries

The primary purpose of the Cadastral Survey Act 2002 is to promote and maintain the accuracy of the cadastre (s3). An accurate cadastre is important as it enables people to readily and confidently identify the location and extent of rights to land and real property. This, in turn, means that people can manage and enjoy the use of land.

The Act prescribes the role that various parties play in delivering this system outcome: licensed cadastral surveyors, Land Information NZ (including the Surveyor-General), and the Cadastral Surveyors Licensing Board. The Act also recognises that the bodies representing surveyors have a role to play in influencing the system.

It's easy to think that if each player in the cadastral system fulfils their prescribed role properly, the system will work fine – that the sum of the parts will deliver the whole. However, while each party does indeed have to fulfil its regulated functions, we will not deliver accuracy and integrity of the cadastre unless the parties work together – from the whole to the part.

Unlike some countries where surveyors hold on to their data, the

New Zealand cadastral survey system is built on the ability and willingness of the parties, and surveyors in particular, to share data and information (and backed up by the Act).

Each new survey is built on information recorded in the cadastre from previous surveyors, and a surveyor is sometimes judged by the legacy left behind for the next surveyor.

For its part, LINZ aims to provide ready access to the information it holds in the cadastre and shares with surveyors accurate positional information from surveys that have been adjusted into the network based on the control system.

LINZ and surveyors have been steadily improving the way that we work together. At the senior level we engage regularly with the leaders of Survey + Spatial NZ to share our plans and obtain feedback and advice. To help guide the Landonline enhancement programme, the Survey Working Group brings together LINZ staff and S+SNZ representatives.

Surveyors provided valuable input into the review on the Rules for Cadastral Survey and we are producing new cadastral survey guidelines in

response to feedback from surveyors. LINZ surveyors, many of whom have come from the private sector, are also playing an active role in S+SNZ affairs, such as playing a leadership role in the Cadastral Stream and contributing to S+SNZ webinars and workshops, often with surveyors from the private sector.

LINZ surveyors also increasingly provide advice directly to surveyors and find ways to work with them to resolve issues as part of the CSD validation and dispensation processes.

The LINZ auditing surveyor also provides a valuable mechanism to improve surveyors' processes and give them assurance that their systems and process are likely to deliver the surveys and CSDs that comply with the rules. These are all examples of ways in which we are working with surveyors to deliver the cadastral outcomes.

The Cadastral Surveyors Licensing Board, S+SNZ and myself are also collaborating to review the processes for assessing surveyors' applications for a licence. The current regime is overdue for an overhaul. With the right commitment of the partners, a new regime should help ensure a strong and sustainable profession as well as provide one of the primary controls for ensuring the integrity of the cadastre.

LINZ surveyors are careful not to undermine licensed surveyors' professional and statutory responsibility to certify the quality of their surveys and CSDs. Only licensed cadastral surveyors are given the right, and the responsibility, to undertake cadastral surveys including defining boundaries.

While LINZ can provide guidance and advice, particularly on more complex matters, surveyors need to continue to ensure they play their part

(continued page 20)

Our world is evolving rapidly and often unpredictably – and it is now, more than ever, a time to think about how we prepare for the future. This includes both the future of the communities and environment we help to build and shape as well as the future of our survey and spatial industry, and of our organisation, Survey and Spatial NZ Tātai Whenua.

We undoubtedly have a vital role to play in the future of the communities we serve. At the same time, we are facing significant global challenges, with increased emphasis being placed on the development of sustainable and resilient outcomes that support community wellbeing and liveability.

That means rethinking how we work, what we place importance on, and how we engage with stakeholders, other disciplines, and the broader interconnected elements that factor into our direction and decision making.

Technology is also changing the way we work as an industry, and in some cases threatening to significantly disrupt our ways of working. In a period of relentless change, we are

constantly having to consider how we keep up. However, technology also gives us an opportunity to work in more interconnected and integrated ways to improve our efficiency and outcomes.

This is not just about how we capture data and take measurements, but also how new positioning technology can impact other industries, how visualisation can help with understanding, and how making sense of data in new ways can help with decision making that can generate greater impact and improved outcomes.

Also, we need to consider the future of organisations such as Survey and Spatial NZ, and how we stay relevant, vibrant and future-ready. We have been working on ensuring we achieve this through the revision of our strategy, our letter of expectation, and some key initiatives and projects that have been undertaken over the past 18 months.

This includes projects such as the review and refresh of our certification, as well as some of the outward facing projects such as the Resilience Volunteer Group development to name just a couple.



I would also like to appeal to all members to consider how you might get more engaged and contribute back to our organisation and industry. Organisations like ours survive and thrive from the input of volunteers.

We have some dedicated and exceptional volunteers who currently contribute, but I'd like to encourage any of you who have been wondering whether you should, to take the plunge. It is rewarding, and you can help to contribute to and shape our future.

Finally, on a personal note and in the very near future, I'm really looking forward to the S+SNZ Conference in August – including the revamped awards dinner – which should be an exceptional event. If you haven't signed up yet, don't miss out. See you there!

Kat Salm





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ELEVATION AOTEAROA

Planning for New Zealand's future with LiDAR

*Bjorn Johns, Technical Leader,
Imagery and Elevation
at Toitū Te Whenua
Land Information New Zealand*

New Zealand's regions face serious challenges in planning for the future such as improving land productivity, smarter infrastructure investment and adaptation to climate change. Precise 3D maps and elevation data models are critical tools that can help in overcoming these challenges.

LiDAR produces the best data to help aid in that planning, and the Toitū Te Whenua Land Information New Zealand (LINZ) National Elevation Programme has been working with local and central government in a partnership approach to collect and deliver LiDAR-based elevation data for New Zealand's future.

The public sector benefits of elevation data include increasing the ability to identify, model, and plan for infrastructure and make better informed land use decisions in areas such as agriculture and forestry, as well as be better prepared for natural hazards such as flooding, landslides and erosion.

For example, for councils to carry out modelling for natural hazards such as coastal inundation and river flooding, it is essential to have accurate terrain models. This rich data and information will ensure new development occurs in the most appropriate locations or assist communities with protection options.

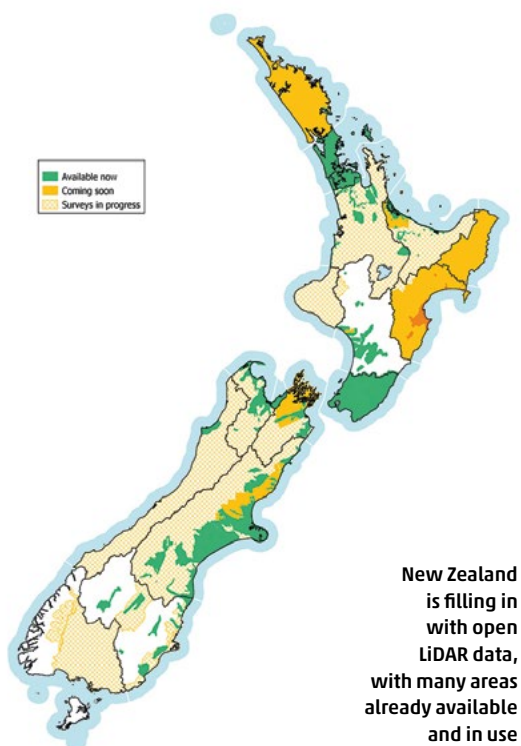
Multiple government agencies, including LINZ,

the Ministry of Business, Innovation and Employment, Ministry for Primary Industries, regional councils, and local councils are investing in the programme, which is set to deliver



A digital elevation model from the recent Westport area survey, part of the West Coast Regional Council's project to provide full regional coverage. The data revealed the detail of geomorphological features including past river channels and land altered by farming.

National LiDAR Availability



open data for about 80 per cent of New Zealand's land area across all the regions.

This LiDAR data will create a national 3D baseline dataset and deliver significant practical value with multiple uses over the coming decades to central government, councils and regional industries.

While driven by government needs, the data from this programme provides significant reuse value to the private sector for applications including 3D visualisation, surveying, engineering, construction, and communications, to name a few.

Once the data is collected, LINZ then ensures the data complies with national base specification requirements for quality and consistency before making it available from the LINZ Data Service in three formats to enable maximum reuse, including:

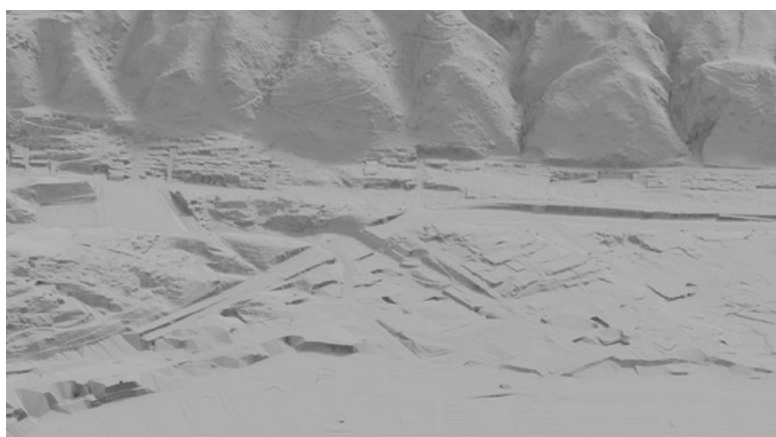
- 1 metre Digital Elevation Model (DEM)
- 1 metre Digital Surface Model (DSM)
- Point Cloud

Regular additions large and small will be made available as the data capture progresses.

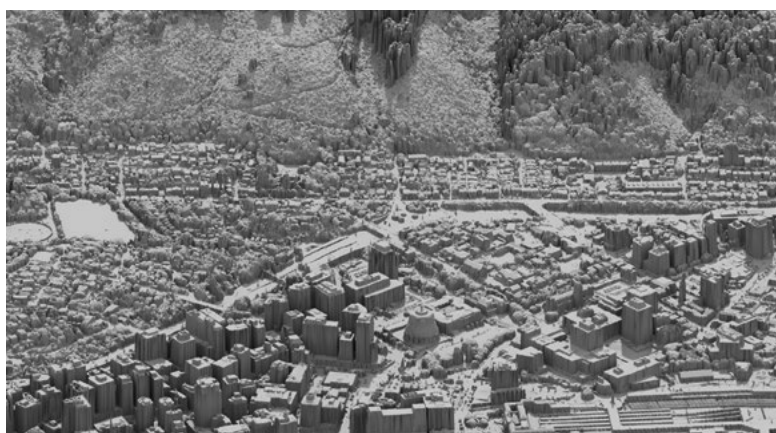
The programme partners are busy improving the information about data use, access and availability as more and more data comes online to maximise the value to all of New

Zealand from this treasure trove of open data.

To get the most up-to-date information on the future availability of LiDAR in your area or to find existing data, check out the information at www.linz.govt.nz/data/linz-data/elevation-data. ●



Wellington City 2019-2020 DEM. A DEM is a model of the bare earth (or actual ground). It excludes other features captured such as trees, buildings and objects.



Wellington City 2019-2020 DSM. A DSM in contrast shows every feature for a particular area, including non-ground features such as buildings and infrastructure.



Wellington City 2019-2020 Point Cloud. A point cloud is all the data points captured before they are processed to produce the DEM or DSM. Point clouds are often viewed in 3D as a cloud of points, hence the name. The data points are classified into feature types, including things like bare ground, water, vegetation groups and buildings. These further enable users to apply the data to many purposes.

A relic of the past, or a beacon for the future?

*Anselm Haanen, Surveyor-General, and Nic Donnelly, Manager Positioning
at Toitū Te Whenua Land Information New Zealand*

Surveyors may have heard that some prominent trig beacons have been removed or are proposed to be removed at a few sites around the country.

Some have expressed concern about the removal of beacons and noted that the beacons are one of the few tangible and enduring artefacts that the public associates with surveyors.

In many cases they represent the history of surveying in the area, and sometimes are associated with the early pioneer surveyors.

Surveyors have also indicated they still use many of these beacons, and many New Zealanders enjoy using them as reference points, including when interpreting maps.

The original purpose of trig beacons was to support triangulation – they reference the ‘trig stations’ underneath them.

The national survey control network was built by triangulation from various baselines around the country, particularly for the development of New Zealand Geodetic Datum 1949. The permanent beacons supported the triangulation, as well as other surveys, as it

was not necessary to install targets over the marks each time they were used.

The introduction of electronic distance measuring reduced the dependency on pure triangulation, although the beacons were still needed for theodolite observations. However, the biggest change came with the introduction of GNSS technologies.

Survey control marks no longer had to be placed where they were visible over long distances, usually on the highest points, and beacons were not needed for making GNSS measurements.

GNSS is now used for almost all control surveys, which are now focused on establishing a dense network of readily accessible marks – the vast majority without beacons.

Today, surveyors mainly use beacons on prominent high points to orient their surveys, or to check their orientation by comparing the calculated bearing with the orientation obtained from other means.

This demand is likely to decrease over time as theodolite observations diminish and GNSS and other technologies become increasingly accurate, reliable and usable in different environments.

Beacon Type	Number	Total
Two-metre beacon		4387
Wooden	22	
Metal	585	
Unspecified	3780	
Four-metre beacon		1419
Wooden	245	
Metal	33	
Unspecified	1141	
Non-standard beacon	71	71
TOTAL		5877

**Types and numbers of beacons.
Most of the ‘unspecified’ two-metre beacons
are metal and most of the ‘unspecified’ four-metre
beacons are wooden.**

Toitū Te Whenua Land Information New Zealand (LINZ) has a regular programme of maintenance for well-used beacons, which involves visiting them and carrying out maintenance work about every five years. The purpose of the programme is to ensure the beacon remains fit for purpose and safe.

The relative level of usage is assessed using Landonline data. Landonline records only those usages included in Cadastral Survey Datasets, which is often only a small proportion of the total usages of a beaconed mark.

Nevertheless, it provides useful information to help prioritise beaconed marks for the maintenance programme.

Other beacons are maintained as required, usually in response to feedback from surveyors and the public. All the maintenance work is undertaken by private survey firms under contract to LINZ.

The ongoing investment in beacons needs to be balanced with other components of a modern survey control system, such as higher density of 3D control marks. Over the long term, beacons can be expensive to maintain.

They are sometimes in remote locations, readily accessible only by helicopter or four-wheel-drive. Overall, the beacon infrastructure is ageing, which increases the costs of maintenance.

There is also a greater awareness of the need to ensure the safety of the public where beacons are in easily accessible locations.

Whenever a beacon gets to the point where it can no longer be maintained in a cost-effective manner, LINZ will first consider whether the beacon is required for the future.

In many cases, particularly in rural areas where GNSS is increasingly used for surveys, the answer may be no, in which case the beacon would not be replaced.

From time to time, but with increasing frequency, LINZ receives requests to remove (or not replace) beacons on iwi-owned land, or on land that is of particular significance to iwi.

Beacons are usually located at the highest point of a maunga. The summit, or tihi, is usually also the most sensitive part of the maunga from a Māori perspective, where the presence of a beacon may be seen as inconsistent with the cultural values of the site.

For some iwi, the beacon's association with surveying is a visual reminder of past loss of land. The removal of the beacon may be requested as part of a much larger body of work by an iwi, or an iwi/council partnership, to restore and enhance the traditional cultural values of the site.

Some of New Zealand's most-used beacons are on such maunga. In most cases, iwi are happy for the mark itself to remain, and for surveyors to occupy the marks on a

temporary basis where needed.

Such requests to remove beacons, whether from iwi or anyone else, are considered on a case-by-case basis.

Where the beacon is well used, its role in the survey system and the reasons it is still used is explained to the requestor.

LINZ will also ask for information about why the beacon is no longer wanted on the site.

Where there is a strong desire for the beacon to be removed, and surveyors still have a need for a survey reference object to orient their work, LINZ will look for alternatives.

Possibilities include prominent features such as towers or church spires. For sites of panoramic or historical significance, alternative structures may exist, such as an obelisk or monument, or suitable survey reference objects may be able to be incorporated into lookouts or similar structures.

It may be possible to install a more culturally appropriate object such as a pouwhenua (land-marking post) on the same site.

In cases where the beacon proposed for removal is well used, or otherwise known to be of significance to surveyors, LINZ will engage with local surveyors. As well as communicating their concerns, surveyors can provide input on alternative solutions and help through their contacts with local councils.

It is also an opportunity for surveyors to provide feedback more generally on any weaknesses in the survey control system in the area so that these can be addressed. For example, surveying additional control marks may mitigate, at least in part, the removal of a beacon.

In some cases, the public may have a strong interest in a beacon, in which case wider engagement would be considered.

While they can be complex to work through, requests to remove well-used beacons are also an opportunity for LINZ, iwi and surveyors to work together to find solutions that meet the needs of the survey system, while respecting the wishes of landowners and the unique cultural values of these sites. ●



Figure 1: Top of a transmission tower that could be suitable as a survey reference object.



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PREPARING FOR THE FUTURE OF THE INDUSTRY

A private sector perspective

Survey and spatial professionals are currently experiencing a period of rapid growth and demand for skills and knowledge across all sectors of the industry.

With all sectors under increasing pressure, *Surveying + Spatial* asked four high-profile consultancies what skills and preparations they think are necessary for the future of the industry.

FUTURE SKILLS

Rebecca Strang, Global Capability Leader, Land Infrastructure & Geospatial, Aurecon



Increased government investment in infrastructure means there is a very large pipeline of work ahead for our sector. The challenge we now face is resource capacity. In many cases we are competing for skills that are required by many.

Digital capability and strong communication skills are going to be our saving grace. The key skills required will include:

- The ability to manage large datasets through strong information management, i.e. understanding and adhering to data standards. This is a cornerstone of being a geospatial professional.

- Understanding the flow of data throughout the asset lifecycle, i.e. who will be using our data at various stages and the purpose for which it will be used. This is important as it informs us of the type of data required and its accuracy.
- Automation skills to integrate and transform outputs from various software.
- The ability to ask good questions and seek to understand the real problem that needs to be solved.

If we manage to keep our heads and pause regularly to consider what is the most efficient workflow, which parts do we need to do repeatedly and are therefore ripe for automation, and listen to what the end users of the information and data we produce actually need (as opposed to serving up what we've always produced), we may actually survive and thrive.

PREPARING YOUR COMPANY FOR THE FUTURE

Tereza Tutko,
HR Manager
Eliot Sinclair



Our internal brand message 'Shaping a better tomorrow' drives our enthusiasm

for continually improving how we do things. We've encountered many surprises over the years: from earthquakes to fires, floods, and the outbreak of a pandemic.

This all taught us a valuable lesson: to prepare your business for the future, you need to look after the wellbeing of your people. While we are enthusiastic about innovation and working with the latest technology, we have learned that building strong, resilient teams is what will see us through anything the future might throw at us.

We are passionate about our team and our culture. With staff from all around the world, we are strong through our diversity and people stay with us for a long time. We appreciate each individual for who they are and try to make sure they enjoy coming to the office every day. We create meaningful careers full of opportunity and focus on people's strengths to help them perform at their very best. We provide a comprehensive licensing program for our graduates, but our experienced staff learn just as much through the mentoring relationships they create.

We are moving with the times, offering flexible working hours to accommodate various individual circumstances. Our teams are currently trialling a Nine Day Fortnight working structure to enable our people to spend time on things that matter to them outside of the office. To further build our resilience and wellbeing,

we look after our team with a range of insurances, mental health support and many other benefits, which were designed to care for our team and their families.

The world is changing fast and we are excited to be part of this change by growing alongside our ES whanau and becoming stronger and more resilient together.

IS IT STILL WORTH PAYING FOR SPATIAL DATA?

Andrew Clouston,
Senior Consultant,
Critchlow Geospatial Limited



Government data services are playing a big part to democratise spatial data. They make government data available to all, empowering both the public and private sectors to uncover and exploit opportunities that relate to that data.

The conundrum is (and has been for many years) "Why buy data (i.e. through the private sector) when you can get it free?" (e.g. from LINZ, Ministry for the Environment, StatsNZ, etc). I believe that there is a place for both. What's needed is for project sponsors to establish their data requirements early, identify the data sources that are fit-for-purpose, and be prepared to set a budget to licence off-the-shelf spatial data from the private sector when staff productivity is important.

Let me explain. Government datasets such as cadastral data (one that I am very familiar with) tend to be a representation of a point in time or serve primary government functions. They are, by their nature, quite static and their scope does not change often. On the other hand, the private sector offers a plethora

of other geospatial datasets that government does not (e.g. satellite datasets that are refreshed every 24 hours, or a connected road transport network that is maintained daily).

According to the Forbes Insights and KPMG 2016 Global CEO Outlook, 84 percent of CEO's are concerned about the quality of the data they're basing their decisions on. If, as a country, New Zealand wants to truly innovate and increase productivity, and make better decisions, business and government leaders must accept that some "fit-for-purpose" data will come at a cost, whether it is purchased from other suppliers or enhanced through their own staff. Smart business leaders will assess alternative datasets against (or in combination with) the "free offerings" from government. These leaders will then be in a position ensure that risks of using free data that is not quite fit-for-purpose is mitigated.

My hope is that we can jointly encourage government officials to consider how to support the democratisation of all spatial data.

SKILLS FOR THE FUTURE GEOSYNC – A WRAP UP OF PAST PRESENT AND FUTURE

Belinda Willis,
Geosync

Beyond The Boundaries has been my business motto for about 10 years now – the first version was *Define Your*



Boundaries which stemmed from a personal need to define my own boundaries between work, family, and play, as well as a struggle with defining boundaries for my then

(continued page 40)



PREPARING FOR THE FUTURE

Enter the hypercompetitive talent war

Mark Fisher, Eighty4 Recruitment

Pinch yourself, could you have imagined 12 months ago that after an apocalyptic-type world event such as Covid-19 ravaging the world, the economy would have rebounded this quickly? My analogy of recent months seems to be a common one across many circles and industries – that it feels like a bowling ball went off a cliff in April 2020 and by January 2021 it had hit a trampoline and now was skyrocketing ahead with companies experiencing record sales month after month in almost all sectors.

In my 16 years in recruitment both in New Zealand and working after the GFC in the UK, I have never seen such a buoyant and active jobs market – we're literally getting three to four new clients calling our business every day, asking for our help.

It's compounded so badly however by having shut borders, cheap money and locals spending up large, drastically increasing the requirement for productivity. Never have I seen such desperation to hire and the future is somewhat scary, as this could likely

be only the beginning of a fascinating boom.

Here's the thing – there are multiple reasons this is happening and I'll do my best to highlight some of these risks as we enter an unknown world full of challenges and opportunity.

First, **supply and demand** – border closures are biting companies hard with the lack of talent available, without new fresh talent coming into the market from offshore (and we're certainly not seeing huge amounts of Kiwis returning as expected), we're

only circulating domestic talent.

When you have a supply and demand issue, no different to the housing market – salaries will and are rising fast! I heard of a digital/IT worker being offered \$200k (up from \$85k currently). But how crazy is this, his current employer matched the offer to stay (a 136% salary increase. Obscene but reality!) Not to mention that Seek is recording record numbers of adverts on its platform, because the desperation is real.

Counter offers are rife at the moment. We're seeing many companies scrambling too late to make amends. Don't forget that if your people are interested enough to go for an interview elsewhere, there is more misalignment than just money.

Throwing extra money at someone with one foot out the door is a Band-Aid at best and will often end in them leaving anyway, in fact 91 per cent of people that are countered to stay in their current business end up leaving within 18 months.

My advice, be proactive, not reactive. High levels of good quality communication is absolutely key to avoiding this situation even unfolding.

Focus on communicating with your team all the other reasons they're in your business other than money, but above all, make sure you're paying them fairly and creating an environment and culture that they can feel proud of and want to come to work for. Be firm but fair to what they're worth, have a robust conversation!

Charge rates must follow. As I've been saying for months, all our costs are going up as business owners or leaders – whether we like it or not, it's happening and it's happening fast. Cars, boats, timber, food, taxes, everything is going up, lead times are pushing out and fast – much faster than we've ever seen.

So while we focus on trying to keep up by hiring the right people, spending money on the right areas, don't forget the most vital element to be a sustainable business and that is charge enough money for your services.

Now is the time to have that robust conversation with your clients, demonstrate value and match your rising costs with increased charge rates. Failure to do this fast enough could have dramatic negative consequences. Be ahead of the game, proactive and plan for what's already here.

Productivity – Who hasn't said to you lately: "Isn't it crazy-busy out there, just can't keep up!" It's a real problem affecting all businesses across the board, even hospitality I've recently learnt!

Without people, we cannot deliver and if we don't deliver, it's only a matter of time before you lose that client or staff member and so on.

So keep in check your promises vs reality. With a tight candidate market and lack of fresh talent, you're far better off committing to less – doing a great job and retaining your brand value (and staff won't be overworked.).

Don't be afraid to say no early on, don't overcommit and let everyone down. But please keep the pressure on our Government to announce a border reopening plan – the country is in desperate need.

Focus on retention – if there is one thing that you can take away from this article, please focus on retention. The reason recruiters are in business is because most companies don't put enough effort and investment into the following areas, which are all key tactics to improve retention.

- **Personal growth.** Invest in your people's learning – get coaches, consultants or specialists to come

teach them something they're passionate about.

- **Culture.** Be clear about your values and, with strong leadership, uphold those, and create a fun place to work that make people feel good about coming to work.
- **Weeding.** Weed out the bad eggs quickly, the garden can quickly get overrun.
- **Leadership.** Do what you say you're going to do and don't make promises you cannot keep.
- **Authenticity.** Be yourself, and believe it or not, you're not perfect and sometimes you're wrong. Own it!

So the moral of the story is we're entering an extraordinary time in all of our lives where I'm predicting higher-than-expected inflation figures and rapidly rising costs, perhaps at a level we've not seen for many decades.

Prepare for the worst and protect your future, this boom may not last forever, so overpaying or not charging enough will soon come home to bite you where it hurts. Look at the horizon, take action now and protect your most important asset, your people. ●



Mark Fisher 021 347 445
mark@eighty4recruitment.com

5 differences between a good recruiter – and a cowboy...

Here are 5 tell-tale signs to help you discern a kick-ass recruiter from a drop-kick...

1. Good recruiters will meet you face to face

Clever recruiters have deep insights of the companies they represent so they'll meet you in real life to get an understanding of your personality. This will help them decide whether you'll be a good cultural fit for a business or not, which contributes massively to how much you'll enjoy working at your new company.

2. Good recruiters have in-depth knowledge of the industry

The best recruiters usually work with a specific industry and have in-depth knowledge of that industry. Amateur recruiters "dabble" in multiple industries. Good recruiters have built exceptional relationships with the decision-makers in their chosen industry and have access to those jobs that don't even get advertised – often the best roles...

3. Good recruiters keep you updated

If you find yourself desperately emailing your recruiter, pleading for progress, move on. A good recruiter will happily (but metaphorically) hold your hand through the process – they won't leave you feeling needy, like a bad recruiter will.

4. Good recruiters respect your career goals

If you're ever involved in a conversation where the recruiter's trying to persuade you to accept a role that you're not really interested in and it makes you feel undervalued, despite you being clear about what you want? Hang up as soon as you can.

5. Good recruiters focus on long-term relationships, bad recruiters on one-night stands

Bad recruiters dump your CV into the recruitment pipeline and only contact you if there's good news. Maybe they hate to be the bearers of bad news, or maybe they're just emotionless pimps. Either way, it's no good for a candidate or a business. A good recruiter walks the extra mile to ensure their clients and candidates achieve what they want.

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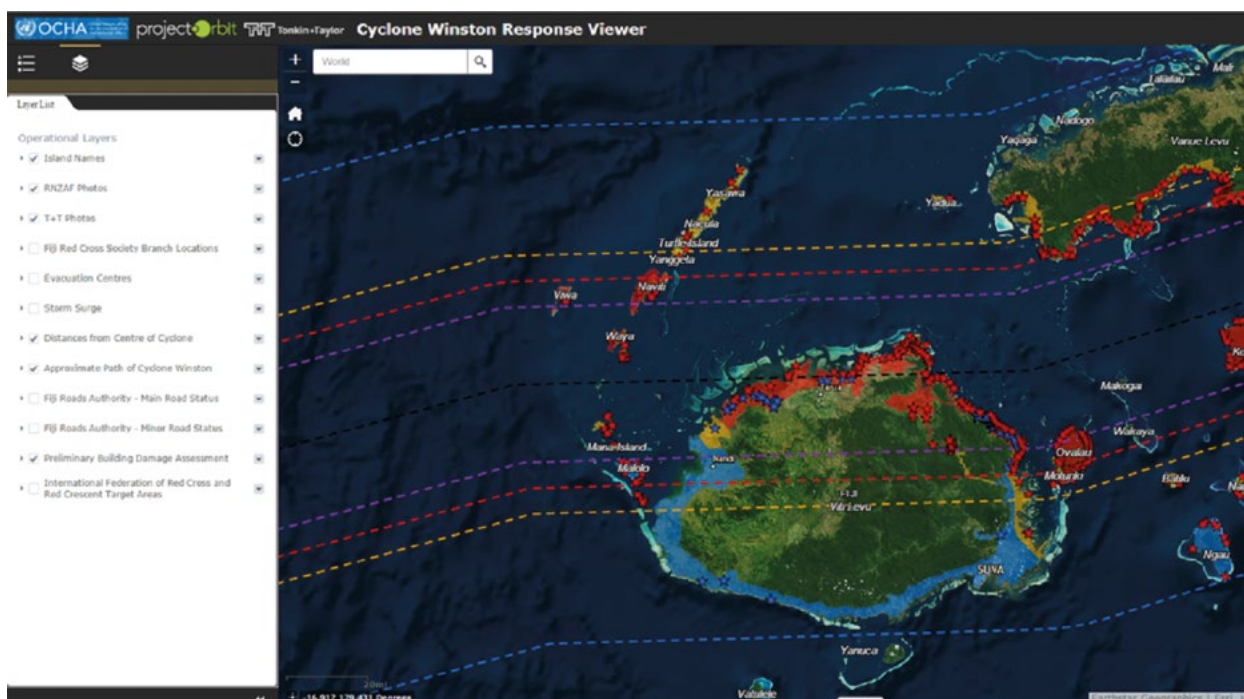
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Award-winning Rapid Damage Mapping tool supports sustainable post-disaster response

Tonkin + Taylor

The response in the first 24 to 72 hours after a disaster is critical in reducing the impact it will have on people's lives and livelihoods, and ensuring an efficient, well-coordinated emergency response. It's also the time when you usually have the least access to information to make the most important decisions. This is where damage mapping tools can help.

Tonkin + Taylor's Rapid Damage Mapping (RDM) tool was originally developed as part of the response to the Canterbury earthquake sequence between 2010-2011. Designed to rapidly gather integrated damage mapping information, the tool was

fundamental in aiding an efficient and effective disaster response and recovery.

The tool has since been tailored to support a range of other disaster responses, including for the Hurunui-Kaikōura earthquake, Whakatane's Edgecumbe flood, Cyclone Gita in Tonga, tropical cyclones Idai and Kenneth in Mozambique, the Sulawesi earthquake, the tsunami in Indonesia and Tropical Cyclone Winston in Fiji.

Tonkin + Taylor senior geotechnical engineer John Leeves says the rapid disaster mapping tool has really paid off when it comes to being prepared for emergency response efforts.

"Our tool was up and running within two days of Cyclone Winston in Fiji and our humanitarian partners used it to prioritise their emergency responses to those most in need. It was so good being able to help our close neighbours in some way, and because it was so useful in Fiji, we have provided the tool following many other disaster responses."

Rapid disaster mapping is now recognised as the gold standard for the collation, analysis and dissemination of data following natural disasters. As a result of continually adapting and using the RDM tool, Tonkin + Taylor, along with ChinaGEO CDDR, RADi, the CODATA Task Group on

"Our tool was up and running within two days of Cyclone Winston in Fiji and our humanitarian partners used it to prioritise their emergency responses to those most in need."



FAIR Data for Disaster Risk Research and IRDR, won a GEO Sustainability Development Goals Award in 2020 for the way it has supported significant social, economic and environmental benefits in the Asia-Pacific region.

The value of the tool lies in its simplicity, flexibility and ability to rapidly pull multiple sources of information together in one place

for the most comprehensive view of the situation on the ground. It helps to save lives by sending aid where it's most needed, reducing costs by avoiding unnecessary aid response in less severely affected areas, and identifying and prioritising repairs to damaged key infrastructure. Critically, it also helps to keep aid and response workers safe, by allowing them to

plan safe routes and ensure they are appropriately equipped.

But it's not only about being able to rapidly develop and manage the tool that makes it impactful after a disaster. It's the direct collaboration with engineers and scientists in gathering the right information and making sense of that information that makes RDM tools so valuable.



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in this partnership and take their professional responsibilities seriously.

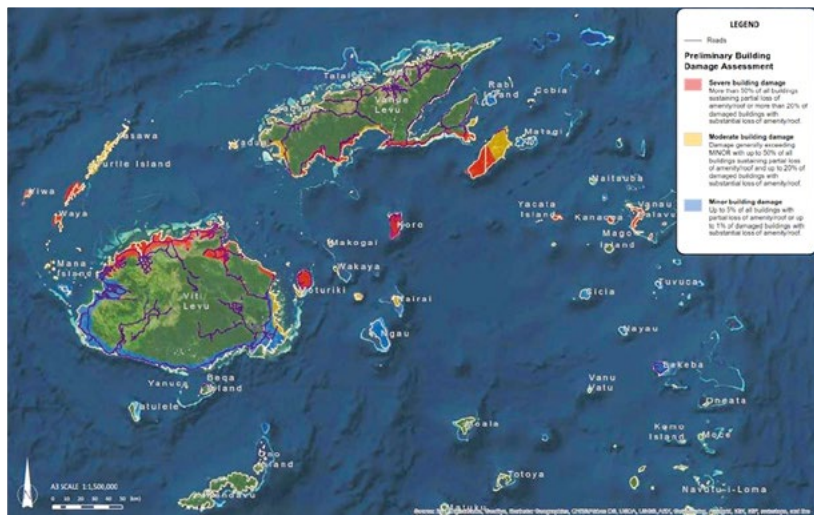
LINZ has a statutory responsibility to act when a surveyor fails to meet these responsibilities. This can undermine public confidence in the cadastre and in surveyors. It can also impact on other surveyors who rely on the certified survey and can incur additional costs in dealing with errors.

Fortunately most surveyors realise the significance of making errors and respond positively when we advise them of an error and require them to correct it. This too is an example of us working together to maintain the quality of the cadastre.

The cadastral survey system and the cadastre itself belong to us all – they are not just LINZ's responsibility. Working together, with our respective roles and responsibilities, will ultimately offer the most efficient way of achieving our collective outcome of an accurate cadastre.

He Waka Eke Noa! – We're All
in this Together! ●

Anselm Haanen
Surveyor-General/
Kairūri Matua



When the Hurunui-Kaikōura earthquake hit in 2016, Tonkin + Taylor was immediately able to deploy engineers to the area. Its teams slipped into rapid response mode, mapping land damage, compiling geospatial data from a range of sources and reconnaissance surveys to develop liquefaction, landslide and fault rupture maps, and shaking maps.

People living and working within disaster-affected areas were also able to supply images to help provide a comprehensive picture. All the while, Tonkin +Taylor's in-house geospatial team simultaneously worked on building a single open-access spatial online viewer to assist all agencies involved in the response and recovery.

Satellite imagery was used to augment the land-based mapping. When cloud cover obscured some areas vital to accurate visual assessment of the damage, Tonkin + Taylor could move

quickly to secure additional satellite imagery captured at different times after the earthquakes. By engaging with the Chinese Government, which provided additional, clearer satellite images, they were able to bring the full extent of the earthquake's effects into sharp relief within 17 hours.

The maps were updated daily as more detailed information became available. The building portfolio was overlaid to get an indication on the number of buildings likely to be affected by different levels of shaking, liquefaction, landslips and fault rupture to inform the insurance assessment response.

Users were also able to provide their own photos and observations to update the RDM tool, resulting in constantly evolving datasets offering improved accuracy and, subsequently, the best possible outcomes for all involved. ●



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DON'T GET CAUGHT STANDING STILL

The future of mobile 3D laser scanners

Allan Hosking, Survey Solutions



Technology is zooming ahead in leaps and bounds and mobile 3D laser scanning is no exception. Twenty years ago for 3D laser scanning, we needed a minivan to transport the 40-plus kilograms of boxes to site, which was an achievement in itself.

When turned on, the acquisition rate was an amazing 100 points per second. Today, the latest mobile 3D laser scanners weigh typically about 1kg and measure 300,000-plus points per second at distances of up to 100 metres. Mounted on a pole, the weight is similar to a GNSS receiver.

How mobile 3D laser scanners are deployed in the field has changed drastically. Until recently, they were typically a handheld unit. The

user walks through the work area mapping line of sight objects within a 30m range.

Today, the one model of mobile 3D scanner can be deployed in the field in a variety of techniques including:

1. **Pole mounted** to pickup survey control, boundary pegs and other points of interest during the survey
2. **Suspended on a cradle** and being lowered into a shaft or manhole to depths of 250m
3. **Vehicle/quad bike** mounted and being driven at speeds of up to 50km/h
4. **UAV/drone** mounted and mapping the site from the air

5. **Integrating with customers' existing GNSS** for georeferencing without ground control

These recent developments have made the mobile 3D scanner ideally suited for land survey applications.

Field procedure on survey pole

Accuracy is similar to using GNSS. A root mean square RMS accuracy report is created showing errors relative to the survey control on site.

When arriving on-site, the initial setup time is similar to GNSS except it's a mobile 3D laser scanner being mounted on the survey pole.

The survey time is how long it takes to walk or run through the work area and measured in minutes, not hours.

During the survey it is recommended to tie into the existing survey control on site. Plumb the pole over the control point for 10 seconds.

The system automatically logs the point as a survey control point via the IMU detecting no movement for 10 seconds. A minimum of three points is recommended but the more the better.

During the survey, pick up any other critical points of interest such as boundary pegs by plumbing the pole over the peg and waiting for 10 seconds. Each of these points will be exported at end of survey as a CSV file.

At the end of the survey, to download the data just plug a standard USB memory stick into the device and the data is automatically downloaded to the USB stick. The download time is typically a few minutes.

Land survey applications

This technology is now suitable for a range of land survey applications including:

1. Daylighting surveys
2. Topographical surveys
3. Volumes
4. Construction progress monitoring
5. BIM/as-built
6. BOMA surveys

For a field survey, to 3D scan an established 800sqm section with an existing house and lots of vegetation, pickup survey control and boundary pegs, the measurement time is five minutes.

To survey the same site using GNSS would take a minimum of one hour. Some points are not suitable for measurement by GNSS so a total station would also have to be used adding to the survey time.

Sites that are heavily covered in vegetation are very time consuming to survey by GNSS or robotic. A mobile 3D laser scanner performs effortlessly



in such demanding environments, making it a walk in the park.

Surveying a public area is always a challenge especially in inner city areas. GNSS often performs poorly in these areas and traversing with a robot is not fun. Lots of pedestrians and traffic are always in the way. Mobile 3D laser scanners do perform well in these environments.

Ground penetrating radar surveys (GPRS) to locate underground services and determine ground condition often rely on GNSS for positioning. This is often a problem in inner city areas where the GNSS performs poorly.

The mobile 3D laser scanner can be used for positioning of the GPRS system solving the GNSS outage issues. An accurate ground model is

generated from the LiDAR data.

Surveys of roads are often performed at night. The mobile 3D laser scanner records grey scale intensity (reflectivity) for each of the 300,000-plus points per second that it measures.

When the 3D point cloud is rendered to display intensity in the office CAD system, any line work and paint marks on the road are clearly displayed.

The most complex surveys are often completed in a few hours, not days or weeks as in other methods of survey.

Office processing

From the field the data is copied to the office PC via USB memory stick, which takes a few minutes.

The SLAM office processing software is used to process the data from the field consisting of LiDAR plus inertial motion unit (IMU) data. It's a drag and drop process of the data into the software. Have a cup of coffee while waiting for the results.

The ratio of office to field for this is typically 2:1 so for the above example of a five-minute scan time for the 800sqm property, the SLAM processing time is 10 minutes. A 3D point cloud is produced in LAS/LAZ format.

Then apply adjust to control (A2C) to link the control points measured in the field to the real-world coordinates and an accuracy RMS report is generated.

Control points are imported/exported as a CSV file.

Critical points of interest such as boundary pegs are exported as a CSV file.

The 3D point cloud is automatically stored as industry standard LAZ/LAS file but can be exported in other formats like e57 and when exported can be spatially sampled to reduce the volume of data.

For extracting deliverables from the 3D point cloud, there are many software options available on the market now. Some are starting to use artificial intelligence (AI) to train the software to process data efficiently. Deliverables include:

1. Digital orthophoto maps 2D (DOM)
2. Digital surface model /TIN 3D (DSM)
3. Contours
4. 3D models

When doing the above processing for deliverables, having a software to automatically classify the points is essential to speed up the process. Points are typically classified onto layers such as ground, buildings and vegetation. Each layer is then individually worked on.

Extracting basic deliverables using the right software can take 1-2 hours' CAD time for a small residential property of 800sqm.

Surveyor shortage

There is a shortage of land surveyors in New Zealand. The situation has worsened since Covid-19 due to the difficulties of immigration.

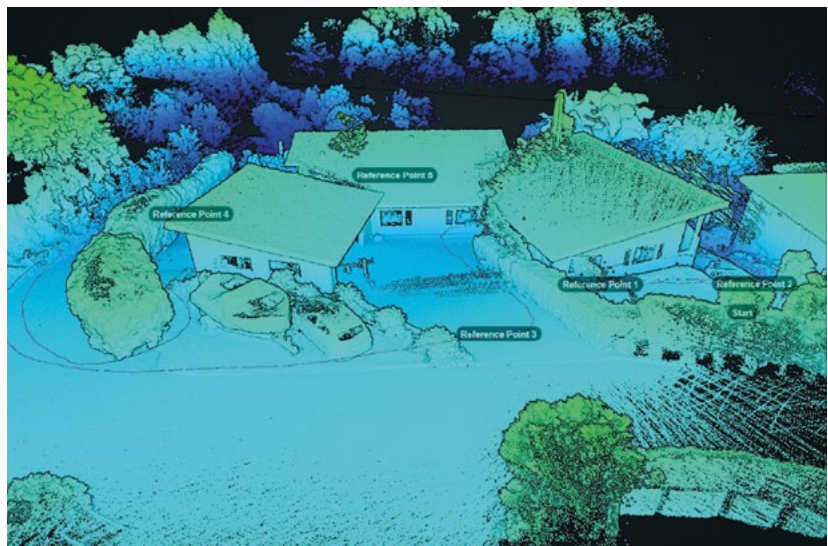
Workloads continue to grow for survey companies and the waiting time for clients is lengthy.

The use of a GeoSLAM HORIZON mobile 3D laser scanner can solve the above problem. Productivity can be drastically increased using existing numbers of land surveyors. For example, with each residential

property taking only five minutes to survey several more properties can be completed in one day. The larger the project, the more time is saved.

Increasing your charge-out rate and sending out more invoices per day is positive for business. The client gets the job completed faster (not cheaper) and the survey company increases its turnover.

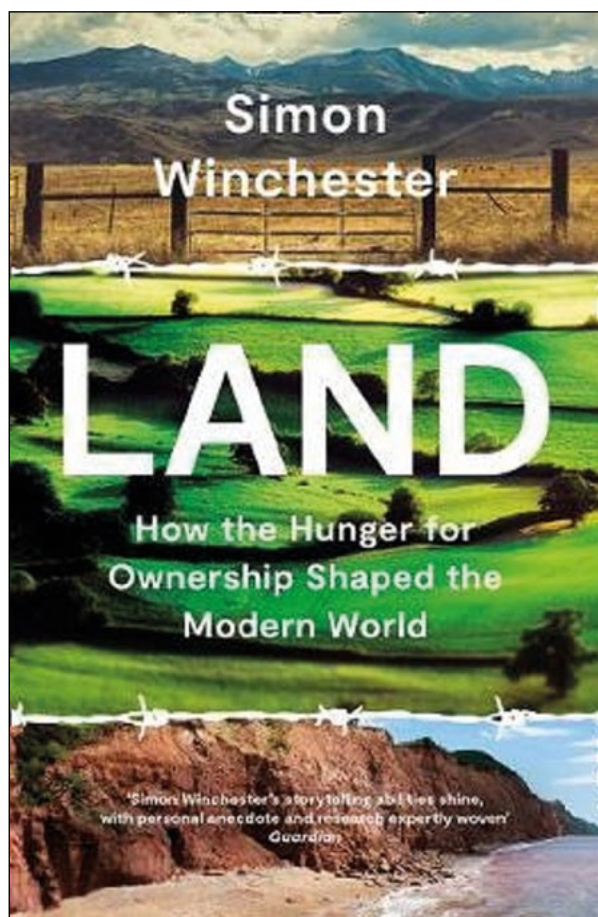
Office processing of 3D point clouds can take slightly longer than traditional GNSS or robotic survey data. However, with the right software and experience, it's no big deal. It's certainly a lot easier to recruit and train a CAD operator than it is to recruit and train a land surveyor. ●



3D point cloud-render elevation



3D point cloud-render intensity



Land: How the Hunger for Ownership Shaped the Modern World
by Simon Winchester

Reviewed by Mick Strack

Simon Winchester is a prolific storyteller. He has written several bestsellers, including *The Map that Changed the World* about the first geological map of England.

This time he has focused on land and the hunger for ownership – although I am sure he was tempted to use the word greed.

In its basic form, the book tells the story about how land is held around the world. It is also a story of power and wealth, and loss and conflict.

The book is structured in easily digestible bites, beginning with stories of measurement, mapping, surveying, title records, and boundaries.

Winchester tells stories of places and of people; heroes and villains; who have been influential in acquiring or retaining land, clearing and enclosing land, exploiting and conserving land.

Places featured include the USA, Scotland, Australia, Palestine, India, the Netherlands, Ukraine, New Zealand, and Africa; so we get an insight into some of the history,

conflicts and property arrangements in those places.

But Winchester's goal is not to provide a complete explanation of how land is held around the world nor of the varied relationships between states, occupiers and the land, but rather to tell stories that illustrate the centrality of land to modern life.

The theme about land ownership shaping society was well covered by Andro Linklater in his 2013 *Owning the Earth – The transforming history of land ownership* which, in a book of about the same size, includes a more scholarly investigation of what ownership is all about.

However, the anecdotes, personalities, and commentary included by Winchester set his book apart: this is more easily delved into for a casual read as some chapters stand as stories on their own.

By necessity and for readability, one suspects this book has been edited back from what could have been. The book is illustrated with black and white images but they seem rather randomly chosen and unevenly distributed throughout.

There is very uneven coverage of the 'modern world' – a chapter about New Zealand but nothing about South America or most of Asia.

Then some chapters seem unfinished, for example, a short chapter about an Irish couple; Protestant and Catholic, which merely hints at the troubles in Ireland.

Their story illustrates the point that when they emigrate, "their enmity subsides with distance and is replaced by the greater notion that all inhabitants of the land surface are simply humans with more reason to be united than divided".

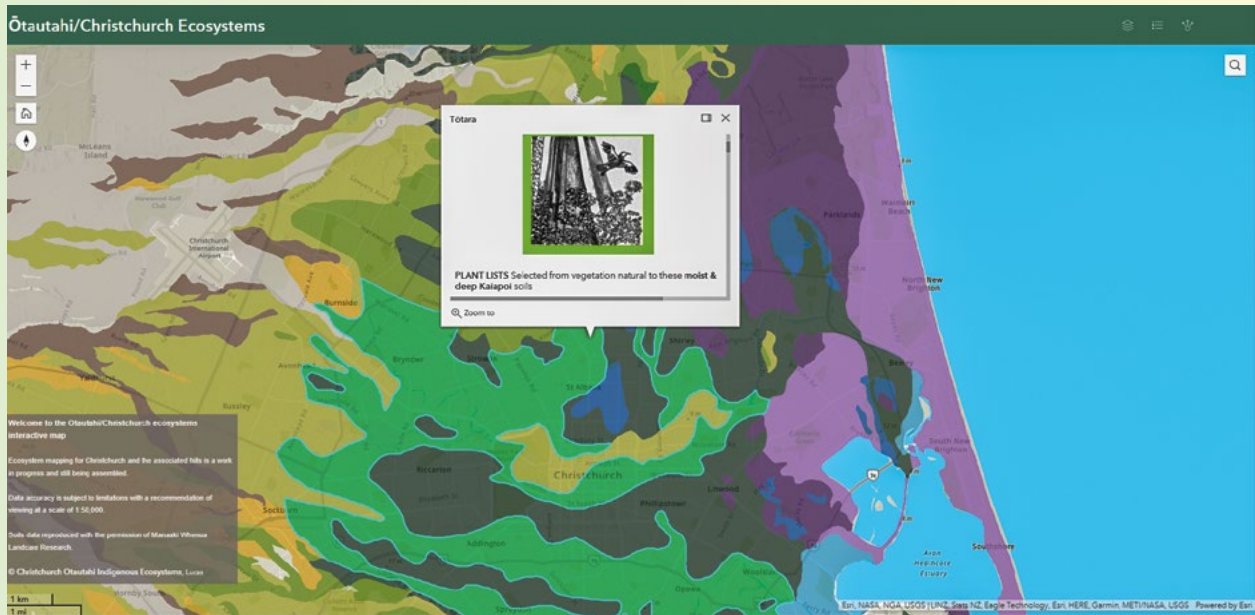
Winchester is well informed about the New Zealand land question. He discusses the Treaty of Waitangi adequately and his story highlights the efforts of Dame Whina Cooper in bringing the Māori dispossession of land to the front of political consideration.

But considering one of the themes of the book – the dispossession of indigenous peoples and the ravenous acquisition of their land by British settlers – the omission of the processes of the Native Land Court in the conversion of customary land to Crown title is a disappointment.

Winchester's language is often colourful and entertaining. When discussing the colonial process of converting customary title to an individualised title, he states: "One of the many failings of the British empire ... was the often bovine inability of Britons to even try to understand the subtleties and nuances of another and unfamiliar people."

I can easily picture those cows in the colonial office trying to make sense of their colonial possessions.

(continued page 40)



LANDSCAPING IN CANTERBURY WITH ArcGIS

Eagle Technology

A Christchurch landscape architecture firm has launched an interactive native plant guide for Cantabrians using ArcGIS.

The development of the digitised Ōtautahi Christchurch indigenous plant guide and ecosystems app represents what has been a 26-year labour of love for Christchurch-based landscape architect Di Lucas, of Lucas Associates. Starting with South Canterbury in 1981, Di has been involved in identifying the

different ecosystems of Canterbury and providing lists of native plants belonging there. Now the accumulated Christchurch data has been captured in a web mapping application via ArcGIS. In March 2021, this interactive ecosystem map went live on Christchurch City Council's website.

How it all began

From the mid-1990s, Lucas Associates had provided maps, booklets and sets of 21 different plant lists through council offices. Much of this hard-copy information disappeared after the city's earthquakes.

Di Lucas ONZM, who is well known as a passionate advocate for New

Di Lucas has privately funded the development of an interactive ArcGIS app containing all of this information and has gifted it to the Christchurch City Council. From March 2021, this precious resource became freely available for public access.

Zealand landscapes and the landscape architecture profession, has now taken this ecosystem information a step further. Di has privately funded the development of an interactive ArcGIS app containing all of this information and has gifted it to the Christchurch City Council. From March 2021, this precious resource became freely available for public access.

In 1993, as part of a project commissioned by the Canterbury Regional Council, Lucas Associates contracted Manaaki Whenua – Landcare Research scientists to identify the different land types across Canterbury to provide a framework of broad ecosystems that recognised underlying character.

In 1995, Lucas Associates was commissioned to build on this original

work by community boards, through the Ōtautahi Christchurch Agenda 21 committee, which promotes the need for greater native biodiversity around the city.

Di again contracted Manaaki Whenua – Landcare Research, working with geomorphologist and soil scientist Ian Lynn and ecologist Dr Colin Meurk. The city was divided into four land systems – dry plains, wet plains, coastal, and the Port Hills. Based on soil types, each land system was further divided into an ecosystem typology that homed in on the soil types and biota of Christchurch, using street maps as a base to seriously explore what's naturally local.

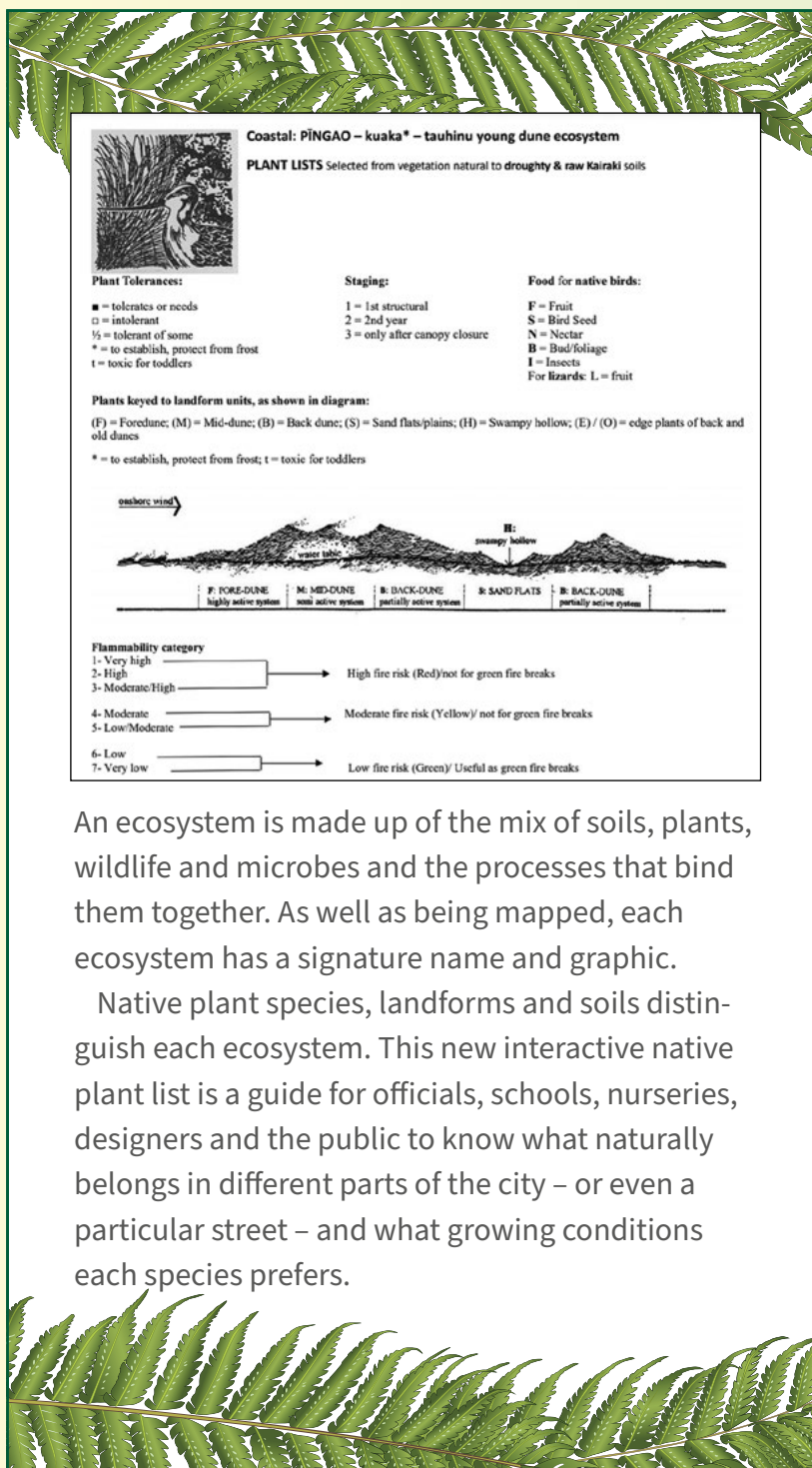
Di says she knew that Christchurch had not been 'just a flax swamp'.

"I wanted the public and designers to be able to understand more about the underlying natural diversity."

From remnant vegetation and historical data, each ecosystem was named to cue to the underlying land and particular biota that belonged there naturally. For example, on the wet plains, the "kahikatea, kererū, manatu, lush older plains ecosystem", and on the dry plains, the "kōwhai, pipit, mikimiki, young plains ecosystem".

A signature graphic was created for the biota of each ecosystem, along with a diagram showing the character of the land below. Colin Meurk then compiled lists of native trees, shrubs and groundcovers that would have grown naturally in each of the ecosystems.

For each ecosystem, information on each species' site preferences or tolerances is noted. Thus, tolerances to wetter or drier, sunny or shady, or of windy conditions, is identified to help people to plan the most appropriate planting locations. This can ensure the right native plant is planted in the right place.



An ecosystem is made up of the mix of soils, plants, wildlife and microbes and the processes that bind them together. As well as being mapped, each ecosystem has a signature name and graphic.

Native plant species, landforms and soils distinguish each ecosystem. This new interactive native plant list is a guide for officials, schools, nurseries, designers and the public to know what naturally belongs in different parts of the city – or even a particular street – and what growing conditions each species prefers.

As many projects begin with open sites – whether paddock, lawn, park or bare ground – there is also guidance on staging plantings to achieve long-term success. This means the colonisers, the first-stage plants, are planted, followed by the species that prefer to be established under their shelter and shade.

“Often people are in too big a hurry to establish the ultimate cover, when the best success rate will result from staged plantings to create the right microclimate for the main species. As a bonus, you can shade out weeds along the way.”

Lucas is excited that this long-term information project has now been given a new life in interactive form on the council’s website. “I hope that it will inspire people to take greater interest and care in planting what’s most suited to their particular area.”

The fourth and final component of the ArcGIS web mapping application, which will cover the hills ecosystems of Christchurch including the Port Hills and hills around Te Whakaraupō, Lyttelton Harbour, will be added soon.

“But of course it’s never finished, as more information comes to light, or the taxonomists change some plant names again. Many of the botanical names have been changed over the 26 years since we started the lists.”

Common names however, which may be easier to recognise, have also been included in the lists.

Getting Eagle Technology involved

Di involved her colleague landscape architect Leona deRidder to manage the process of converting the information gathered over the previous 26 years by Lucas Associates into a geospatial app. DeRidder approached Eagle Technology to create an ArcGIS app customised for purpose.

Eagle Technology Account Manager Ted Taylor believed this was the first time that data about local native plants, soils and ecosystems had been captured and built into a GIS application.

“Leona deRidder and Di Lucas recognised an opportunity to put together a sophisticated yet simple solution with Eagle Technology’s assistance.

“ArcGIS had the capability to put their years of hard work and research and that of Manaaki Whenua – Landcare Research scientists into the public domain for the benefit of all Christchurch property owners, designers, educators and plant nurseries.

“Eagle were very pleased to be given the opportunity to work alongside Di and Leona to bring their vision to life.”

Why the interactive plant app is so important

Leona deRidder says if people use the data in the app to inform their planting it will help encourage more local native plants. Canterbury and Christchurch has so little vegetation to tell the stories of the nature of the area.

Local natives can also be used in interesting design styles, including confined or formal styles, and not merely for a naturalistic style or the restoration of nature. Plantings can also link up odd patches that do remain, creating ecological linkages.

“For landscape practitioners, this new interactive app means that it’s now much easier to find out instantly the type of soil and the microclimate in which particular plants belong to each specific area of Christchurch.

“It’s a great tool not only for landscape designers but also for park planners, private gardeners and teachers. The new interactive map reveals a whole ecosystem.

“There’s also information about native birds and lizards and what plants they like to eat. People want the plants and shrubs they buy to be able to flourish. This provides guidance for them.

“We hope that nurseries and garden centres will be proactive and stock more local species, preferably propagated from natural remnants – eco-sourced.”

Being able to access this live interactive app of indigenous flora and fauna will help local residents to understand more about the different soils and indigenous vegetation in and around Christchurch.

Users click on the interactive map on the Christchurch City Council website, or type in their address, to find out which ecosystem their site belongs to, sourcing a list of plants native to that site. They can then print out a ‘shopping list’ to use in their design and take to a nursery or garden centre and avoid the usual haphazard planting of trees and shrubs that don’t belong in the particular soil type and microclimate of their area or their street.

Di says she hopes that Christchurch residents will gain a better understanding of their place and will use more local native plants.

“Using the native plants adapted to the locality means they will more likely thrive.

“We recognise the impact of climate change is challenging the ability of plants to withstand different conditions. There is now greater stress on all living plants and animals.

“If people understand the ecosystem in which they live they can choose the most drought-tolerant species for their increasingly dry area, or select those that withstand inundation from increased flooding for flood prone sites.”

Climate change has also led to

increased fire risk, as the February 2017 Port Hill fires showed when 1,600 hectares of land were burnt.

In 2021, high, medium and low fire-proneness has been added to the plant lists for the interactive map, so people can be guided in selecting low-flammability species for green firebreaks where that is appropriate.

Md Azharul Alam has assisted Lucas with this task, having recently completed his PhD on flammability at Lincoln University. Both Lucas and de Ridder urge local bodies around New Zealand to step up and create similar geospatial native planting resources unique to their own regions. With so many native plant projects being promoted, it would be extremely useful if there was more information available to guide people as to what is native to their area.

Visit the Ōtautahi-Christchurch ecosystems web mapping application: <https://ccc.govt.nz/environment/land/ecosystem-map>.

Summary of benefits

- People will gain a better understanding of the indigenous trees, shrubs, etc belonging in their specific environment.
- People will be inspired to use more local native plants.
- If the right native trees and shrubs are planted, they are more likely to survive and thrive.
- Less time and money will be wasted in ad hoc planting of inappropriate trees and shrubs for the conditions.
- People can find out which native plants are best suited not only

to their area but even to their particular street.

- The interactive mapping application is simple and easy to use by anyone with access to the internet who visits the Christchurch City Council website.
- The Ōtautahi Christchurch indigenous ecosystems guide can function as an inspiration not only to gardeners and landscape designers but also to other local bodies which may be galvanised to fund the same type of digital plant map resource for their own residents and to guide professionals.

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SWITCH MY FLEET

Geospatial data and technology enable the decarbonisation of New Zealand's commercial vehicle fleets.

Critchlow Geospatial

With the January 2021 release of the Climate Change Commission's draft report on decarbonising the New Zealand economy, most New Zealand businesses running a fleet of commercial vehicles will have realised that the switch to low emission electric vehicles is now imminent.

While the issue of decarbonisation is obviously pressing, caution and reticence on the part of fleet operators around switching to electric is perfectly understandable, with important factors like EV range, capacity and charging infrastructure to be considered.

Until very recently, there has been a lack of available data and tools (other than the total cost of ownership calculators) to aid fleet operators in making informed decisions about managing the switch to electric.

With co-funding from the New Zealand Government through the Low Emission Vehicles Contestable Fund, New Zealand-owned Critchlow Geospatial is addressing this issue with its launch of SwitchMyFleet, (www.critchlow.co.nz/products/switchmyfleet), a free-to-air website for fleet operators who are considering switching to electric vans and trucks.

This world-leading project demonstrates a compelling application of geospatial data and technology to help New Zealand tackle the challenge of meeting our emissions targets.

Using SwitchMyFleet, users forecast the operating costs of commercial EVs by specifying their typical travel routes with SwitchMyFleet calculating the kWh needed for the routes. Users can then specify the number and type of vehicles, and battery sizes.

By determining what's appropriate for their real-world requirements, fleet operators are able to determine the appropriate vehicle numbers and

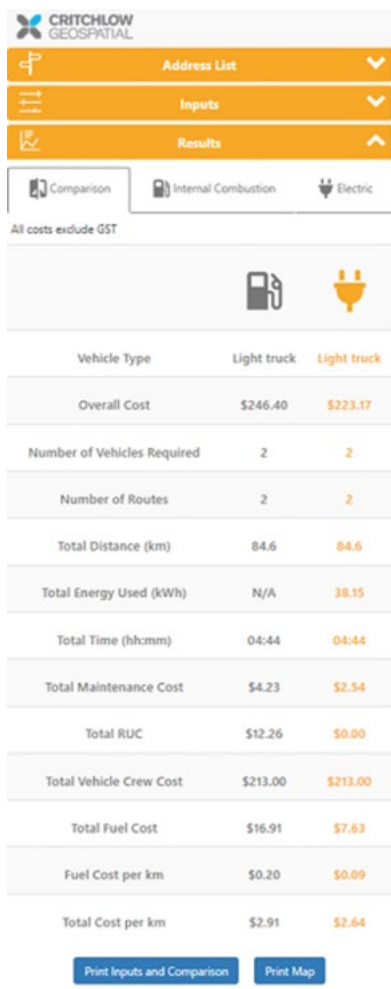


Figure 1: Sample results

types (van, light truck or medium truck), and battery sizes (this helps them avoid overcapitalising on unnecessary battery capacity).

Energy Efficiency Conservation Authority transport portfolio manager Richard Briggs says the free web tool will enable van and truck operators in multi-vehicle fleets to compare combustion engine and electric vehicles for typical routes that they travel.

"The tool uses geospatial data to calculate the optimal routes and can compare the benefits of different types of vehicles. This means operators in this cash-strapped sector will be able to make vehicle choices across their fleets based on their real-world scenarios, which will save them money and reduce emissions."

Importantly, SwitchMyFleet's sophisticated routing algorithms take into consideration New Zealand's unique terrain and the vehicles' changing payloads. SwitchMyFleet uses LiDAR-derived digital elevation models where available, matched to NationalMap's 2m accuracy road centrelines for predicting energy usage and recovery. This provides assurance that EVs will return to base with comfortable levels of spare battery capacity.

Critchlow Geospatial Ltd group managing director Steve Critchlow says this is a great endorsement of the value that route optimisation can provide to businesses looking to improve

their fleet's green credentials.

"This co-funding has enabled us to deliver credible operating cost forecasts and battery sizing to New Zealand transport businesses. We haven't seen anything like this anywhere else. It's possibly a world first."

Powered by NationalMap data, the SwitchMyFleet cost-benefit demonstration system provides New Zealand fleet operators with the data, tools and confidence they need to manage the switch to EV fleets.

For more information, visit <https://www.critchlow.co.nz/products/switchmyfleet>

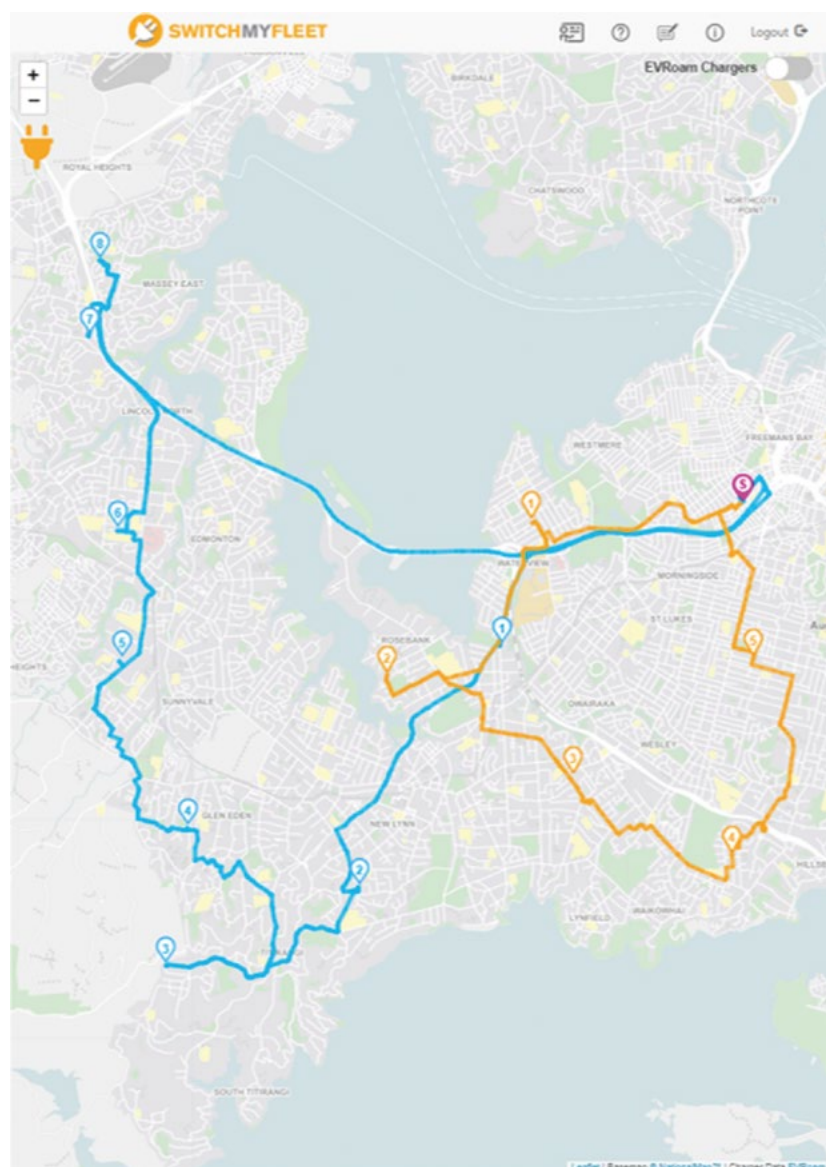


Figure 2: Optimised Routes



ADVANCED MAPPING WITH RECON AND FERNTECH

Ferntech

How are New Zealanders making the most of the latest mapping technology to change the surveying industry? We spoke to Jeremy Neilson and Ben Cook at advanced geospatial and survey specialists Recon to find out.

Jeremy, tell us about how Recon started. What problems were you looking to solve?

Jeremy: We recognised a need for mapping those “hard to reach” places, so we set about using drones, manned-helicopters and other mass data collection methods in situations where traditional surveying techniques wouldn’t be practical or cost-effective. Our focus is on quality, accuracy and the usability of the final deliverables that we supply to our clients. One problem we aimed to solve was that clients couldn’t utilise mass data themselves, such as large pointclouds and textured mesh models. We have refining and modelling techniques in place to ensure clients can receive and quickly get to work using the data we supply

them whether they use CAD, GIS or other specialist software.

What lead Recon to use drone LiDAR as opposed to photogrammetry?

Ben: The reason Recon made the decision to use drone LiDAR was because we knew photogrammetry alone would never provide the desired results under vegetation. Operating our own system would separate us from the competition. We were working on a rail project at the time and the use of drone LiDAR meant that we could map the landscape underneath vegetated areas that would be key for planning an upgrade project. The advantage of drone LiDAR over traditional aerial LiDAR systems is that we can get a high density of points over small to

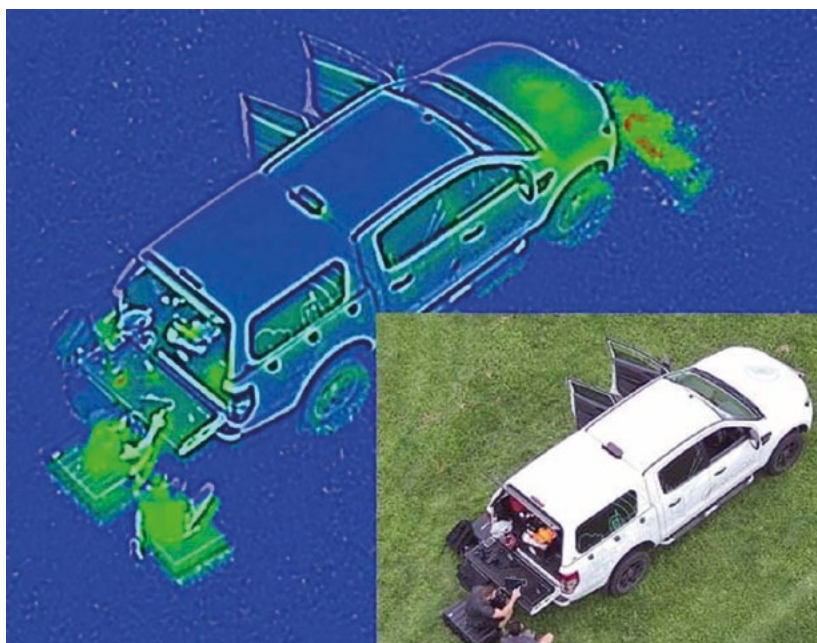
medium size areas at a lower cost for our clients.

How do you think LiDAR mapping technology is changing the surveying industry?

Jeremy: Like many industries, our clients demand quicker, better information as soon as (or often before) the tools exist to capture it. Drones can now scan ever-more challenging landscapes cost-effectively, particularly when compared to traditional field survey techniques. Days surveying large sites can be reduced to hours with an aerial approach – and no need to throw the gumboots on. Wetlands, quarries, steep coastlines or boggy farms are examples of landscapes that provide a number of physical hazards for field staff, so it's great to provide a solution without putting people in harm's way.

Ben, you are the UAV Prime Person at Recon. What does that job involve? What does your typical day look like?

Ben: As UAV Prime Person I am responsible for the planning and operation of our UAV systems. Jeremy and I decide how to efficiently conduct a project and which of our systems is best suited to the capture process. I make sure that the maintenance and condition of our equipment is at the high standard our clients expect. I communicate with the CAA with regards to the operation and training requirements on our



Recon thermal image

specialist projects, as well as operating the entire range of UAVs that Recon has at its disposal. My typical day ranges from planning operations to UAV capture or data processing. I am fortunate to be involved in all aspects of the new projects we get involved in.

What's in your kit?

Ben: Recon has a range of UAVs in its fleet all supplied by the team at Ferntech. Recon's latest purchase is a DJI Matrice 300 RTK which is equipped with the Share102 oblique mapping system for our reality modelling and photogrammetry projects. We have multiple payloads for the M300 which include inspection cameras with zoom lenses and thermal imaging cameras. We also have a DJI Matrice

M210 and DJI Phantom 4 Pro depending on what each project requires. We also have a range of ground-based laser scanners which tie in with our UAVs to complete the survey and reality modelling package we offer.

Recon uses aerial mapping to quickly and accurately provide maps for land devel-

opment, mining, transport, forestry and government projects. Can you tell us about your latest aerial mapping project?

Jeremy: Recon is currently capturing vertical and oblique imagery across a number of townships throughout the Waikato – from Pokeno down to Horotiu and across to Raglan. The Share102 camera is perfect for this as a single pass now captures five times the amount of imagery as a single camera system would. The deliverables on the project include a high resolution Reality Model, orthophotography and pointcloud, all loaded directly to a Skyline Globe cloud server.

And finally, what do you think the future holds for aerial surveying?

Jeremy: I expect a continuation of smaller, more capable payloads being attached to better and better drones. Battery technology will improve too – for example, we might soon see hydrogen fuel cell batteries that offer more than three times the airtime than current batteries, which will change the game. That's massive when it comes to efficiency on larger projects and we can't wait. ●

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Edward O'Leary, Abtrac

When employee engagement is lacking, more often than not it is the work systems that are at fault, not the individuals. Do you need to look at your businesses systems with fresh eyes?

In the second part of our 'Business Growth in 2021' blog, we ask you to consider the levels of employee engagement in your company.

How do you measure the productivity and profitability of your workforce?

Motivation is a driver of success, growth, contentment, and happiness. It propels you to perform at your peak. The purpose will differ from person to person and many people will claim money motivates them, yet this is more often than not a hollow stimulus. For inspiration and drive, motivation needs to be underpinned by complex and profound emotions.

Every person is motivated by something, the trick to business success is to generate an environment where that motivation is encouraged, flourishes, and becomes contagious.

1. Demonstrate trust by minimising rules and procedures.

- People like a well-organised workplace in which expectations are clear, people thrive

in an environment in which all employees live by the same rules. However, if you have too many rules and procedures, employees will feel that they work for an organisation that operates on the assumption that people are untrustworthy. This can be very demotivating.

- Enforce the minimum number of rules and policies needed for an ordered, professional workplace and to protect your organisation legally. Be clear in your communication of workplace expectations and guidelines. Rather than applying a blanket policy to address individual dysfunctional behaviour, adopt a need-to basis using counselling, performance improvement plans, and progressive discipline if required.
- **Legitimate policies and rules will receive support from the people in your company** and if

you create an environment that is viewed as consistent and fair, employees have less to push against – less to demotivate them.

2. Empower your employees and provide great feedback.

- Set tasks and let your staff work out the best way to achieve them. Involve your employees in decisions about their work. They are professionals, they must be good at what they do otherwise you wouldn't have hired them. Motivation comes from the expectation that people are competent to make their own decisions about their work every single day. If you give them the space to come to you with project updates and issues rather than constantly monitoring and checking up on them, your employees will want to get your approval and your input will be valuable to them.
- You will be time poor and have other priorities but providing feedback to your staff should be of great importance to you. It is easy to sweep things aside, to ignore an email or two, to keep rescheduling a review meeting, or fail to acknowledge a report. Demotivation creeps up very quickly when you don't receive feedback for time and effort spent on something. Everyone wants to be **relevant**, it's a big motivating factor. By providing regular feedback, both positive and constructive, you will increase your employees' feelings of relevancy and this will in turn improve the performance and loyalty of your staff.

3. A great team is a great motivation.

- Let employees feed off each other, both in the workplace and through the opportunity for staff activities. As mentioned above, your staff are professionals and talented at what they do. How much can you learn from your employees and how much can they learn from each other?
Encourage socialisation and mentoring, if one staff member is particularly strong in one area, how can they be used to bring on others in the team. People respond well to others on their level, and if you can build respect among team members by recognising success and utilising skill sets, your employees will be motivated by those they work with.
- Encourage competition, if used correctly it can stimulate and increase productivity. If the performance of staff members is made common knowledge, this can positively affect weaker performers. Use this method with caution, however, because it can

depend on the demographics of your employees. A 2009 study by Bellemare, Lepage and Shearer found that the productivity of men, in particular, was significantly affected by the awareness of another colleague's productivity and performance. However, women did not respond in the same way.

Have you got realistic and clear frameworks of goals and expectations for your employees to work within?

Employers should create the expectation for employee involvement and give employees control over decisions that affect their work without turning the workplace into a free-for-all.

If you can identify and then remove the barriers that discourage workplace motivation and low employee engagement, the consequent actions and inspiration displayed by ordinary people will surprise and delight you!

Productivity and profits will increase and your business will blossom as a result. ●

According to Gallup, only 13% of employees worldwide are engaged at work. If you are one of those many companies where the majority of your staff lack engagement and you don't know what to do, ask yourself this:

What about the work system is causing people to fail?

Preparing a future

Richard Hemi



School of Surveying
Te Kura Kairūri

While considering how to write an article about 'preparing for the future', I invariably find myself looking to the past – reading old *NZ Surveyor* journals, thumbing through books of old surveying yore – *Links in the Chain* or *Kairuri*.

What did surveyors 50 or 100 years ago predict of their survey future, and what did they think was important in preparing for change?

Archie Bogle's memoirs show surveyors around a dry totara log happily cutting up a good supply of boundary pegs, whereas now we can buy boundary pegs with inbuilt sensors for easy identification.

The peg may have changed but the surveyor is still at the centre of monumenting and spatially defining property.

How we go about a lot of our everyday work, and with what equipment, and the methods we use to do that work continues to change at pace, but most of our core roles in land, in property, in development continue.

In an old *NZ Surveyor* journal on the early 1960s, I found reports and commentary on the creation of the university course and the start of the School of Surveying.

With only two students in its first year, Professor Mackie and the university must have been somewhat nervous about its future.

In 2023, however, the school will be enjoying 60 years of existence and an output of some 2000-plus surveying graduates.

In designing its first papers it would be interesting to consider how Prof Mackie and others believed they might prepare students for the future. What technical knowledge did they consider important, and what personal attributes?

As new technology is introduced, it is important that surveyors, and students training as such, have the ability to adapt and learn new skills in the use of these tools. They should also hold a critical mind and understand the potential strengths and weaknesses of this new technology.

This is only possible when possessing a certain degree of advanced maths and science knowledge, combined with critical thinking and an ability to problem-solve.

To instil critical thinking and lifelong learning in graduates is a significant part of the University of Otago's *Teaching and Learning Plan (2013-2020)*.

A number of other important attributes such as communication, interdisciplinary skills and teamwork all serve to enhance and prepare students for future changes in their surveying and spatial professional lives. A willingness to continue to learn new skills and dedicate time to training and future study will continue and grow in importance.

Tertiary providers of surveying in New Zealand enjoy very generous support with the provision of modern surveying hardware and software.

Students in our university and polytechnics have access, on the most part, to modern equipment and computer software.

However, there are still a number of core skills needed to be taught that provide students with the advanced maths and surveying science knowledge necessary to learn and adapt to new technology – and to test and analyse that spatial data produced is accurate and fit for purpose.

Graduates will quickly adapt to the use of the latest equipment even if they haven't experienced it in their tertiary study, but understanding the underlying measurement principles, the potential sources of errors, the weaknesses are critical. Being forced to measure survey lines as surveyor and assistant on a mid-winter afternoon in Dunedin will also undoubtedly test their teamwork.

So how does a relatively small, but critical industry such as ours prepare for the future?

Diversity in membership, and a commitment to involvement in industry bodies that provide opportunities for training and professional development are important starting points. Sharing knowledge, adapting and building on a broad range of skills might hopefully still see some of us surveying as long as our esteemed colleagues mentioned above. ●

The peg may have changed, but the surveyor is still at the centre of monumenting and spatially defining property.

Positioning & Measurement and Engineering Surveying Workshop

Full house at the Ellerslie Events Centre

Hairy Maclary the robotic scanning station dog, the latest in drone technology and state-of-the-art survey and scanning equipment were just some of items on display for people attending the April workshop held in Auckland. Hosted by the Positioning & Measurement and Engineering Streams, this annual event is a unique opportunity for engineering, surveying and spatial professionals to get together in one venue to discuss projects, technolo-

gies and common issues.

With over 100 attendees the audience weren't disappointed. A wide variety of topics were covered including amongst others; precision measurement services being provided to the energy sector, the importance of setting up-front the site coordinates

and 84 Recruitment. Glenn Stone, Managing Director of GS Insurance Partners provided some cautionary



Hairy Maclary the robotic dog

in land developments, autonomous surveys and robotics in action, Auckland City Rail link, mapping of shallow water and shorelines and an update on the S+SNZ certification project. Even hairy Maclary shimmied down the aisle at one stage.

The day was well supported by equipment and service suppliers to the sector - Allterra, Global Survey, Synergy Positioning Systems, Position Partners, Road Science, Ferntech and 12d along with S+SNZ Diamond partners GSI Partners



Glenn Stone handing a spot prize to John Mill from McConnell Dowell

(and scary) case studies on the ease in which digital breaches and hacks can have a negative impact on your business and Mark Fisher, Managing Director of 84Recruitment provided a some insights and tips on keeping your staff in these tough employment times.

Mike Cutfield, Engineering Stream Chair and one of the event organisers was thrilled with the turn-out. He sees a real need for creating this kind of opportunity where professionals from different survey and spatial disciplines who wouldn't normally get together can do so and have some meaningful and useful discussions. ●

HYDROGRAPHIC STREAM NEWS

Declan Stubbing (Discovery Marine Ltd) was invited to speak at the recent S+SNZ Engineering, Positioning and Measurement workshop in Auckland. The presentation focused on the use of vessel-mounted laser scanning as a tool for mapping shorelines of rivers, lakes and coastline.

When combined with multibeam echosounder data, the resulting point clouds provide a valuable dataset for design or monitoring purposes. The technical event was attended by more than 100 S+SNZ members from all over New Zealand.

Stream members also attended the SSSI Hydrographic Commission webinar on the Hydrographic Industry Partnership Program (HIPP) run by the Australian Hydrographic Office.

It was an excellent webinar which provided good insight into how the HIPP is running, how the client relationship is developing towards working with the contractors, and the role of the client rep.

It was also interesting to learn how the contractors have been finding their way into the world of nautical charting surveys, with interesting but common issues encountered for all involved, for example, tides and current observations being damaged or sometimes lost to the sea, and how vessel selection has been the key to success.

The HIPP has also enabled a large amount of innovation, particularly around near real-time web-based interfaces for client interaction of the data. It's definitely a very exciting time to be in the hydrographic industry.

Nearer to home, the NZ Branch of the Australasian Hydrographic Society is preparing for their AGM and Seminar to be held on July 7 at Toitū Te Whenua LINZ, Wellington.

The day begins with an informal breakfast at the James Cook Grand Chancellor Hotel followed by a field visit to CentrePort and an afternoon of presentations.

These include the RNZN talking about its recent Antarctic survey experience and the introduction of new capability, including the HMNZS Manawanui's multibeam systems; Industry presentations from DML and NIWA; and presenta-

tions from students from our national universities. This will be followed by an informal dinner.

Please email Maurice Perwick (maurice.w.perwick@gmail.com) to register to attend the day.

And finally, as everyone knows – or they do now – June 21 is World Hydrography Day and this year the theme is *One hundred years of international cooperation in hydrography*.

The theme is designed to showcase progress in knowledge and technology over the past 100 years, while celebrating the groundbreaking work which was done during this period.

The goal is to highlight the past, present and future of hydrography by showing the important work of early hydrographers, progress in technology, and state-of-the-art technology.

This year, LINZ will be hosting an event to celebrate the MFAT NZ Aid-funded project, Pacific Regional Navigation Initiative (PRNI). It is hoped some of the countries involved in PRNI will be able to attend in one shape or form.

Stuart Caie, Hydro Stream

ROLL OUT OF HIGH-RESOLUTION ELEVATION MAPPING BEGINS

The first tranche of mapping data from the Provincial Growth Fund (PGF)-LiDAR project is now available to the public from Toitū Te Whenua Land Information New Zealand.

LiDAR data, which creates 3D baseline elevation information, will deliver multiple uses over the coming decades to councils and regional industries.

"This mapping information will greatly assist the likes of farmers, by providing detailed slope information to protect waterways, or councils addressing coastal inundation," Damien O'Connor said.

The PGF-LiDAR project commenced in 2018 after the Government made co-funding from Kānoa - Regional Economic Development & Investment Unit (previously known as the Provincial Development Unit) available over five years to support regions across New Zealand to obtain a baseline elevation dataset.

Ten regions sought funding from this initiative to carry out the data mapping, with the West Coast being the first region where this data has become available. Current LiDAR data coverage across the country sits at 20 percent and is set to increase to 80 percent once the project is complete.

"This resource will enable the West Coast to plan for a more resilient and safer future. With highly accurate terrain maps there will be improved modelling and that is of



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immense benefit to our communities, particularly in the hazard space.

"The West Coast environment is a highly dynamic one. Heavy rain events bring erosion, which lifts river beds. You only need to look at Waiho River at Franz Josef, which shrugged off its bridge in 2019.

"Having LiDAR eventually available across New Zealand will ensure future development occurs in more appropriate locations," Damien O'Connor said.

The initiative is being managed by Toitū Te Whenua Land Information New Zealand on behalf of the Ministry of Business, Innovation and Employment's Kānoa – Regional Economic Development & Investment Unit.

This first dataset covers the Westport area of the West Coast, with more data expected to be released across the regions participating in the PGF-LiDAR project as the data becomes available.

Hon. Damien O'Connor

STUDYING GIS BROCHURE

What is the Studying GIS brochure? This informational brochure is aimed at senior secondary students considering tertiary studies and early stage tertiary students.

It asks the rhetorical question; "Are your studies getting you to the right place?" and goes on to suggest that adding Geographic Information Science (GIS) papers to a tertiary qualification can reveal a whole world of possibilities.

It is used mainly by New Zealand universities and polytechnic institutions for events such as careers or open days.

The brochure showcases profiles of young tertiary graduates who have studied GIS together with a wide variety of major degree options, for example: Geography, Geology, Computer Science, Economics, Environmental Science.

Work roles of profiled graduates are given together with brief quotes of why they see value in GIS studies.

GIS papers are taught across New Zealand in tertiary institutions from Whangarei to Invercargill.

The brochure has a QR code and URL for a full list of GIS courses, GIS lecturer/tutor contact details and qualifications (including GIS major degree options) – www.linz.govt.nz/studying-gis.

The webpage also contains two digital versions of the brochure as well as more GIS student/graduate profiles.

The brochure is produced as a work item of the cross-sector Geospatial Capability Committee that contains representatives from central and local government, tertiary,



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LocationTech, the Emerging Spatial Professionals Group, Te Kahui Manu Hokai/Māori GIS Association as well as Survey and Spatial New Zealand – www.linz.govt.nz/gcc.

The brochure is now being updated before a reprint funded by Toitū Te Whenua LINZ. If you would like copies of the updated brochure to help interest students in tertiary GIS studies, please contact growgisnz@linz.govt.nz.

*Geoff O'Malley, Principal Adviser
Geospatial Capability Building,*

*Toitū Te Whenua Land Information New Zealand,
and Jasmin Callosa-Tarr, Spatial Stream Lead,
Survey and Spatial New Zealand*

(continued from page 14)

preschool children – only a problem when you think your kids are the cutest things out!

Beyond The Boundaries was born out of the realisation that as a solo female land surveying business owner I had to be vulnerable and open to new ways of thinking and working in order to succeed in business. Our main focus is being creative when it comes to solving a landowners dilemmas – our most common client are the ones that have been told “no it’s not possible.” Creative solutions and awesome communication are always at the forefront of all our interactions, both in house during our stand-up meetings and externally with all our clients.

The core business of cadastral surveying has remained strong throughout the 16 years GeoSync has been operating but in addition we now have a thriving UAV and GIS department, as well as a Planning sector to support the Cadastral team. It was at a surveying conference in Invercargill, with a boffin from America as a guest speaker who said, “in order to remain valid into the future you have to be creative every day.”

What I have realised is that you don’t necessarily have to invent anything new – you just have to continue to do your core business well with the highest integrity as well as remain open enough that when opportunities arise you are ready to jump.

It may seem mad, but GeoSync

has never advertised for a single position – all of our staff have either called up out of the blue – some from the other side of the world – or seen the GeoSync flag on the street and walked up the four flights of stairs to ask for a job. And out of that randomness we have grown a team of highly creative, intelligent, and fun-loving individuals. The entire team have an incredible can-do attitude and with all of the latest technology and internal support systems that have been setup over the years GeoSync is totally ready for anything the future will throw us. So, my advice to anyone with a view to the future in this industry – the most important skills are – stay open minded – creative – and communicative. ● (return to start)

(continued from page 24)

Winchester is critical of the extreme wealth and power provided by the private ownership of land. He demonstrates how wealth and socioeconomic status is linked directly to land ownership.

In the USA, he notes: “...the disparity between the amount of land owned today by Blacks and by whites – the average Black household holding assets of no more than 8 percent of those owned by the median white household, land being a central component of those assets – is an enduring legacy that contributes to the country’s racial disharmony”. I suspect a similar situation exists in New Zealand.

He is admiring of the relationship that indigenous peoples have towards land being either not owned or communally held. And he concludes that: “If properly and fairly apportioned, land can be the key to so many

possibilities, all of them for the general benefit of those of us who live and work and have our being upon it.”

He promotes a more equitable distribution of land, the return of land to those from whom it has been stolen, the establishment of land trusts, conservation covenants and retention of wilderness.

One of the basic premises of why land is valued so highly has been that it is a limited but secure and consistent resource – that it is about the only thing that can’t fly away.

But the book starts with a caveat that, with climate change and sea level rise, that assumption must change.

Winchester therefore questions: “Might the very fact of land’s newly realised impermanence not suggest to some that this could be the time to consider what has for so very long been well beyond consideration – the notion of sharing land rather than merely owning it outright?” ●

(return to start)

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