

Ontario Professional Surveyor



on the cover ...
The Missinaibi River

also in this issue ...
Know your History – Part 10
Risk Management Principles
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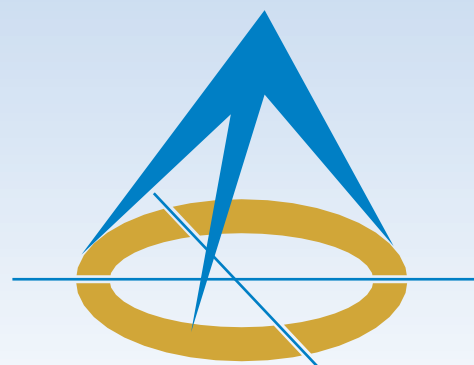
ON THE COVER ...

The Missinaibi River, photo credit Ontario Parks. Many land surveyors have travelled the Missinaibi River, including Phillip Turnor who was a Hudson's Bay Company surveyor and cartographer. In Tom Bunker's article "Exploration to the Kwataboahagan River" on page 12, he writes about an exploration route survey that he worked on in 1975 from Smoky Falls to Jaab Lake. The survey crew stayed in a camp near where they crossed the Missinaibi River. In 2004, it was designated as a Canadian Heritage River. See the Sites to See on page 13.

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President's Page

By Gavin Lawrence, O.L.S., C.L.S., MBA



Now that the balmy days of summer are somewhat behind us, we can start looking forward to cooler days and the beautiful fall colours. Unfortunately, at this time, we are not seeing an end to the COVID-19 pandemic, but rather strategies to living with it are becoming more popular as restrictions diminish and vaccination rates climb. Please continue to listen to public health advice and adhere to their guidelines as we enter our fourth wave.

Over the last few months, I have been busy with operational duties, and there haven't been any online AGMs for our fellow associations since my last article. However, the President's Forum did discuss and take care of administrative type items that needed attention. Otherwise, the President's Forum continues to be a space for collaboration and a valuable sounding board.

As you know, our Act now falls under a new Ministry. Executive Director, Brian Maloney and I sent an introductory letter requesting a meeting with the Honorable Minister Greg Rickford, who is now responsible for the Ministry of Northern Development, Mines, Natural Resources and Forestry. A few days ago, we met with staff from the Minister's office. We conveyed to them how important surveyors are to the economic growth and success of Ontario and emphasized the good work we are doing as a responsible and proactive self-regulating body. We also focused on the work we are doing to modernize and future-proof the *Surveyors Act* and discussed the perhaps precarious position created by York University's decision to pause the enrollment of students into their Geomatics program. This is not ideal as the industry lacks a steady supply of qualified students needed to fill the current and near-term industry needs. In the coming weeks we plan to provide the Minister's office with more information on these topics. According to the AOLS Staffing Needs Survey, there is an immediate need for nearly 70 surveyors and possibly over 200 in the next 5 years. Company owners also believe about three times as many technical staff will be needed.

Soon Brian and I will be meeting virtually with the Dean and Assistant Dean of the Lassonde School of Engineering at York University to better gauge the current situation and the future existence of their Geomatics program. Once again, we will be using the results from the recent Staffing Needs Survey to make them aware of the demand for surveyors and technical staff and to highlight the importance of keeping their program going. Even though a significant amount of work is being done to support the TOLD (Towards an Online Degree) project, it remains in its infancy and will not satisfy the current and

medium-term industry needs, which means the York University program is still critical for the education of potential surveyors.

Your continued consideration and help in completing association questionnaires is appreciated and important, because the results support and drive critical decisions. The Fair Fees for Field Notes and Strategic Planning Membership questionnaires were also recently distributed, and we are looking forward to reviewing the collated results to gain a better perspective of what is happening within the industry. All of these questionnaires provide you with a voice and we want to hear from you, so I kindly ask that you take time to carefully complete them.

The appointment of Paul Wyman as our next Survey Review Department Manager is fabulous news. He is a well-rounded surveyor with a wealth of experience and knowledge. On the other side, it is with a heavy heart that we say farewell to Tom Packowski, the current manager, who has devotedly served us and implemented crucial improvements. Both Tom and Paul are consummate educators and they are well suited for this position. Please join me in warmly welcoming Paul and wishing Tom well as he tackles new adventures.

Planning for the next AGM has started in earnest by contemplating the theme and the agenda, along with a few potential offerings. We are all looking forward to some sense of normalcy as we plan to reconnect with old friends, make new ones, and celebrate our newly minted surveyors. As governments carefully lessen social restrictions, it is impossible to predict how the pandemic will eventually influence our upcoming AGM with any certainty. Therefore, I plan to share more details on this topic in the winter issue of the OPS magazine.

The Regional Groups are planning their fall meetings, which will give you an opportunity to gain CPD points, give you an opportunity to be heard, and gauge the local pulse.

Council last met in July and had earlier decided to forego the usual two-day summer meeting. We plan to meet in-person at our September strategic planning session, which will be held in Kingston. On a personal note, I have been working from home for more than a year and a half, so I am looking forward to seeing fellow Councillors again and meeting new ones in person. Last year's virtual session was satisfactory and productive. This session will be more personable and provide a more wholesome gathering.

All of the key players within the AOLS continue to drive us forward as we make plans to ensure public protection remains paramount into the future. These plans will also set the governance tone and make the AOLS more resilient. As we continue to plan and make good progress on a number of fronts, it reminds me of a quote by Benjamin Franklin who said, "If you fail to plan, you plan to fail".



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Executive Director's Notes

By Brian Maloney



How will technology impact a professional surveying regulator?

While considering potential changes to the *Surveyors Act*, I have been reading about and considering the changes that technology is likely to make to the surveying profession and consequentially the needs for evolving regulation. While I admit that it is not possible to predict the future, there are certainly many trends that point to directions that are likely to influence where we end up.

Surveyors have a broad set of skills and service many societal needs beyond the obvious real-estate transactions and supporting construction. We are part of a much larger geospatial community that is part of a larger I&IT community. As a result, changes in these broader areas will significantly influence how we work and what we are involved in. A thesis by Brian John Coutts presented to the University of Otago concluded that the role of the surveyor will not change as a result of technology but how we perform that role will. Since I became a surveyor, the technology and processes for conducting a survey have changed significantly, despite the fact that the products remain very near the same. I expect an increasing level of change, not only on equipment and processes, but also in the products and services we provide.

My interest in this topic is primarily about how a regulator of professional surveyors should be responding. However, the impact on the profession needs to be understood before we can think about impacts to the regulator.

Although I have considered a number of technological advances, I am only addressing broad trends in this article. I have broken them into the following categories: Data Collection, Computing and Communication Technology, and Applications of Geospatial Technology. These are not clear-cut categories, and it could be argued that some of the technologies fit in other areas and certainly cross boundaries. This article provides a very high-level summary only.

Data Collection

Much of the past efforts of surveyors related to data collection happened because we possessed the technology and knowledge to measure and record objects with accuracy. We had little competition. That has changed dramatically over the last few decades, with black box technology available to anyone with moderate knowledge and the money to acquire it. While surveyors still provide data collection services, their value comes from value added services such as increased quality assurance, knowledge of boundary law and assessment of evidence, or the ability to manage the property development set of rules and

processes. The advent of LiDAR, Robotic Total Stations, UAVs, and GNSS have all increased our efficiencies and accuracy (in some cases), but they have also made it easier for others to compete in the positioning market. Other existing and future space-based sensors (e.g., MAXAR, RADARSAT Constellation Mission, High Altitude Pseudo Satellites (HAPS)) are and will also be providing useful data. While the technology increases efficiency, it also requires an understanding of the limitations and accuracies associated with it.

Computing and Communication Technology

The changes in computing and communication technology are having a profound impact on all professions and surveying is no exception. As 5G rolls out and is bundled with cloud computing, edge computing and potentially quantum computing, surveyors can work from anywhere. Limits in processing and sharing huge amounts of data will significantly change how we collect data and make decisions using it. The desire for hard copy plans will eventually diminish in favour of digital twins and the exchange of information products in real time over the semantic web. Transactions will increasingly be moved from person to person, to computer to computer. The Internet of Things will continue to grow with an increasing number of connections and sensors working in real time, all with positions associated with them. Enhanced Digital Rights Management systems and distributed ledgers (e.g., blockchain) will allow surveyors to think about how they charge for products and services and potentially allow short-term licenses (e.g., a survey file that expires after a set period). Artificial Intelligence and machine learning software already allow image classification and object extraction, however, that is expected to improve along with expanding amounts of sensor data available, thereby allowing additional automated decision-making that is only reviewed for quality. Virtual reality and augmented reality will allow new products to be delivered that may eliminate the need for stake outs and increase safety by allowing boundaries and underground utilities to be seen in real-time. Clearly these new technologies will have to be understood to take advantage of them properly and appropriately.

Applications of Geospatial Technology

Geospatial technology continues to become more pervasive in usage without most of the public even thinking about it. Most individuals are using it in some fashion ranging from locating their pets, finding the nearest restaurant, or even having a robot vacuum their house. As autonomous

vehicles become mainstream, more construction practices are performed without physical layout, increased spatial information is relied upon for asset management, and as digital twins emerge, the reliance on increasingly comprehensive and accurate geospatial data will grow. While many of today's applications of geospatial data can operate with little concern about referencing systems, that will not be the case as accuracy requirements increase.

Societal Changes

Technological advancement is impacting society in a variety of ways. There is an increasing belief that individuals can source necessary knowledge without involving professionals and many will expect to get that information for little or no cost. Most people are carrying powerful sensors in their pockets (smartphones) that allow them not

only to access information but also to be information providers (knowingly or unknowingly). Technology is crossing professions and breaking down traditional barriers between professions. Clients are expecting to get service in short order, whether they are ordering products through Amazon, or purchasing services online. They are rating their service providers on social media and negatively impacting those providers that are not meeting their expectations. These are just some of the changes that are impacting the expectations of professionals, including land surveyors, and they will definitely impact what and how we need to regulate.

In my next article I will provide some resulting considerations for regulating professional surveying into the future.



NEWS FROM 1043

Changes to the Register

MEMBERS DECEASED

Peter J. Williams	1211	Aug. 6, 2021
William James Bowman	1278	Aug. 2, 2021

RETIREMENT

Ian D. Smith	CR125	Sept. 1, 2021
Colin Vanderwoerd	2066	Aug. 31, 2021
Andrew Bounsall	1861	July 19, 2021
Paul Torrance	1340	June 30, 2021

REINSTATEMENT

Jamie Leslie	1940	Sept. 1, 2021
Paul Wyman	1344	Aug. 25, 2021

COFAS RELINQUISHED

Simon Kasprzak Land Surveying
Barry's Bay, Ontario
July 6, 2021

Surveyors in Transit

Grant Bennett is now with **Stantec Geomatics Inc.** in Ottawa.

City of Brantford is now located at 58 Dalhousie St., PO BOX 818, Brantford, ON, N3T 5R7.

Topotec Inc. is now located at 108 Steeles Avenue East, Markham, ON, L3T 1A4.

Hopkins Chitty Land Surveyors Inc. now has a branch office located at P.O. Box 485, 33 Perth Street, Brockville, ON, K6V 5V7.

Simon Kasprzak is now with **Adam Kasprzak Surveying Ltd.** in Pembroke, ON.

Robert Fligg is now the Managing OLS at **Raikes Geomatics Inc.** in Bracebridge, ON.

THE AOLS IS PLEASED TO ANNOUNCE THAT THE FOLLOWING ONTARIO LAND SURVEYORS WERE SWORN IN:

Sasan Ansariramandi	2103	July 15, 2021	Humair Mallik	2111	July 15, 2021
Mohamed Aroos Abdul Ali	2104	July 15, 2021	Jonathan McArthur	2112	July 15, 2021
Junnel Bravo	2105	July 15, 2021	John Monahan	2113	July 15, 2021
Amanda Bulua	2106	July 15, 2021	Stuart Moore	2114	July 15, 2021
Phil deJong	2107	July 15, 2021	Jeffrey Pengelly	2115	July 15, 2021
Bennett Faulhammer	2108	July 15, 2021	Alycia Robinson	2116	July 15, 2021
Daniel Gautron	2109	July 15, 2021	Mathew Thomas	2117	July 15, 2021
Kosala Gunathillake	2110	July 15, 2021	Anna Tsvetanova	2118	July 15, 2021

Risk Management Principles for Asset Management

By Dr. Robert Radovanovic, P.Eng, ALS, CLS, ENV Sp

Author's note – this article is part of a series highlighting the practice of Infrastructure Asset Management from a geomatics context. The goal of this series is to illustrate how many concepts inherent in cadastral surveying (and the broader geomatics industry) are integral to the asset management practices used to maintain community infrastructure. In this article, we examine the concept of *risk management*, which is integral to both maintaining assets as well as successfully delivering projects of any kind.

A key aspect of effective asset management is ensuring that an organization's assets will function properly in the future, and that they will remain relevant in the face of changing service demands. For example, a municipality may build a road today, but it must ensure that the road will be able to handle traffic flows ten years from now, that there are appropriate alternatives if a flood washes it out suddenly, and that it will be properly configured to handle the types of vehicles that we can foresee in the future (e.g., busses, mass transit, scooters, bicycles, etc.). If the municipality doesn't account for these factors, then service delivery will be significantly impacted when anything apart from the status quo occurs.

Although we can't accurately predict the future with certainty, we can make educated guesses about what might happen and the consequences of those events. By thinking about all the various outcomes that can occur when providing a service (and coming up with plans to deal with them), those outcomes are no longer "surprises" and their impacts on our service delivery are minimized.

Being *responsible* for service delivery means that an organization needs to manage risk so that it can best ensure that end-users aren't adversely affected under different scenarios. Ultimately, this is just good business practice, since disrupted customers are not happy customers, and unhappy customers tend to look for alternatives.

However, if something does seriously go wrong, then proper (and documented) risk management measures can show that the organization demonstrated *due diligence* in terms of assessing how delivery could potentially be disrupted and established appropriate mitigation plans.

Fortunately, surveyors are very experienced in managing and dealing with risk. "Reliability" and "redundancy" are everyday concepts when we're discussing measurement - and we all know that it's a good idea to carry spare batteries when we're

running RTK far away from the truck. The best field surveyors start the day thinking about what can go wrong with a job, and have Plan "B's", "C's" and "D's" ready for when Murphy's infamous law starts making itself known. The process of *risk management* is really about taking a process that many do on an instinctual level and applying numerical and procedural rigor around it.

Risk Management

ISO 31000 is an international standard that outlines a systematic approach to managing risk. It defines risk as the "effect of uncertainty on objectives." It is interesting to note that the standard is careful to highlight that the impacts of unintentional events are not necessarily negative – so risks can create opportunities as well as threats.

More specifically, ISO 31000 (2018), defines risk through four components, namely:

Risk sources: an "element which alone or in combination has the potential to give rise to risk".

Events: an "occurrence or change of a particular set of circumstances" including the non-occurrence of an expected event.

Consequences: an "outcome of an event affecting objectives" which can be positive or negative.

Likelihoods: the "chance of something happening".

Since you can never completely prevent a given occurrence from happening, the overall goal of risk management is therefore to *control* (as opposed to eliminate) the level of risk. As well, risk management seeks to quantify the impacts of potential risk outcomes, so that the cost-benefit ratio of various risk mitigation approaches can be evaluated. The overall risk management process can be described by the flowchart in the figure at left.

Risk Sources Identification

The first step of the risk management process is simply identifying risk sources that could affect your ability to

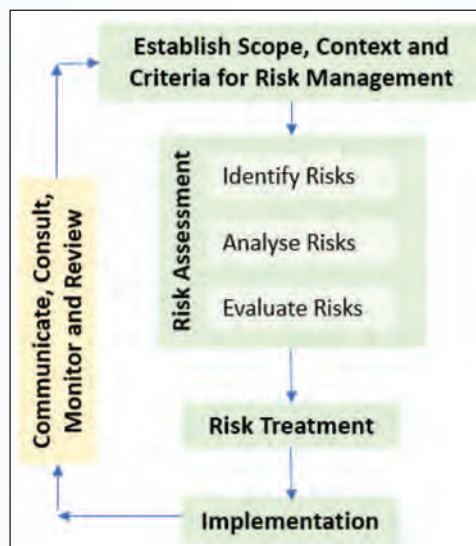


Figure 1. Risk Management Process (per ISO 31000)

provide a service. In surveying, a risk to successfully completing RTK surveys might be a broken cable or heavy tree cover over a point, while risks to providing adequate traffic capacity may be degradation to road surfaces or unexpected increases in car usage.

However, at the initial stage of risk identification/brainstorming, it's important to balance thinking broadly with thinking practically. There are many potential risk sources, and one would like to include a wide consideration, but risks such as "a meteor hits the earth preventing us from surveying or driving" delve into the un-constructive.

For this reason, it's generally preferred to use a 'risk spectrum approach' (International Infrastructure Management Manual (IIMM), 2020) where the potential risks are first assessed from high-level categories and then drilled down into sub-categories and, eventually, specific considerations. This tends to ensure sufficient risks from across the operational spectrum are considered. It can also help an organization think about risks from an "internal" and "external" point of view (Natural Sciences and Engineering Research Council (NSERC), 2006).

For example, in the case of a business providing cable-internet delivery, risks might be broken out as:

External Risks

Natural Events

Wildfire destroys hydro poles carrying cables

Indirect 3rd party

Power outage disrupts data centre
Increase in home-office work leads to increased demand for bandwidth

Direct 3rd party

Thieves steal copper cabling
Hackers infiltrate data centre

Internal Risks

Asset Failure

Copper data lines corrode due to age
Equipment failure after 100 000 hours

Personnel / Management Risk

Retirement of experienced operations personnel

Financial Risk

Delays in collections results in cash flow issues

Many of these risks would not look out of place in evaluating a long-term surveying project!

Risk Impacts

When evaluating risk, it is important to evaluate the severity of the impact of the risk. Typically, these consequences can be categorized as:

- Cost-related (economic loss to the organization due to loss of asset, loss of revenue, increase in cost to operate, fines, etc.)

- Environmental (damage to ecosystems, contamination, pollution)
- Social (loss of life, injury, reputation, trust)
- Service Delivery-related (inability to deliver services at agreed upon levels)

While some consequences have easily definable financial values (e.g., cost to replace a broken RTK cable is 'x', down time due to cable replacement is an additional 'y' per hour times 'z' hours), many risk consequences have difficult to quantify values (in particular when dealing with environmental or social impacts). For this reason, it is common to instead evaluate risk severity on a sliding scale of categories (e.g., 1-5, A-D, etc.), where the scale is established (and periodically reviewed) via a risk management policy that considers the strategic priorities of the organization.

Different classes of risk (e.g., environmental, service, financial) are provided different guidelines for ranking (e.g., a "2/5" for financial impact is provided a different description than a "2/5" for injury impact). This scale then guides risk assessors in quantifying different impacts in a consistent fashion. A sample risk severity rating scheme is shown in Figure 2 based on the IIMM, Institute of Public Works Engineering Australasia, (IPWEA, 2020). Obviously, there is no single rating scheme that will apply to all organizations or asset/service types and engagement with relevant stakeholders is critical in establishing these guidelines.

Sample Risk Severity Rating (based on IIMM, 2020)				
Score	Business Costs*	Service Outage†	Environment	Safety
1	< \$ 2 000	< 5% of customers experience outage < 1 hr.	Reversible impact within 1 week	No lost time
2	< \$ 20 000	< 5% of customers experience outage > 1 hr	Impact reversible w/i 3 mo. Possible prosecution.	Lost time. Minor medical.
3	< \$ 100 000	> 5% of customers experience outage < 1 hr	Impact reversible w/i 1 yr. Prosecution likely.	Lost time. Hospital.
4	< \$ 2 million	> 5% of customers experience outage > 1 hr, < 1 day	Impact reversible w/i 5 yr. Prosecution expected.	Loss of life
5	> \$ 2 million	> 5% of customers experience outage > 1 day	Impact not reversible. Long term studies required. Prosecution likely.	Multiple loss of life

* includes direct and 3rd party costs
† Service outage defined as > 10% outside of CLOS target

Figure 2. Sample Risk Severity Rating Scheme (based on IPWEA, 2020)

Risk Probability and Criticality

Equally important in the evaluation of risk is not just how bad the outcome of an occurrence is, but the likelihood that it will actually occur. Overall, the criticality of a risk can be expressed as

$$Criticality (risk) = Severity * Likelihood$$

cont'd on page 8

Similar to risk severity, likelihoods are often difficult to express in definitive terms (e.g., “there is a 22% probability that this event will occur, but a 37% probability that this alternative event will occur, etc.”) and so likelihoods tend to be evaluated via a similar, sliding-scale approach. Referring to the IIMM, a typical series of likelihood classifiers is shown in Figure 3.

Value	Likelihood Descriptor	Likely time to occurrence	Prob. of occurring in 1 yr
1 (A)	Rare	> 20 years	0.02
2 (B)	Unlikely	Within 10-20 years	0.05
3 (C)	Possible	Within 6-10 years	0.1
4 (D)	Moderate	Within 3-5 years	0.3
5 (E)	Likely	Within 2 years	0.7
6 (F)	Almost Certain	Within 1 year	0.9

Figure 3. Sample Probability Descriptors (IPWEA, 2020)

Broadly speaking both risk probability and severity information can be gleaned from a number of sources including:

- almanacs of natural events (historical temperature, precipitation, etc.)
- manufacturer information and specifications (mean time to failure, recommended service intervals, etc.)
- internal experience from operators (preferably documented through a performance monitoring plan but subjective expert opinion is valuable as well)
- studies and reports of equivalent assets

Once risk sources, consequences and severities are evaluated, they are aggregated into a *risk register*. The risk register allows the prioritization of all the risks by their criticality and allows a framework for isolating the significant risks and establishing subsequent mitigation strategies.

Risk Evaluation and Treatment

Not all risks need to be mitigated. Some risks may have vanishingly small likelihoods that there is no point in dealing with them. Others may have consequences with very low severities that make simply dealing with the consequence the most economic option. Still other may have no practical means of reducing likelihood or severity (e.g.,

“a meteor hits the earth”).

Overall, there are four main ways to deal with risk. They can be categorized as (NSERC, 2006):

- *Accept* – accept the risk and impacts as they occur
- *Avoid* - ceasing the activity subject to the risk or removing the asset. This will typically have significant impacts of being able provide the service.
- *Transfer* – insuring against impacts or sharing the risk among multiple parties
- *Mitigate* – implement actions to reduce the consequence or likelihood of the risk. These actions may take the form of actions such as:
 - Regular monitoring of condition to better understand the risk probability
 - Increasing preventative maintenance to improve asset condition
 - Altering operational processes to reduce wear on assets or to minimize consequences of risk
 - Influencing demand for the service to reduce the impact of failure
 - Investing in redundant assets and spares or establishing alternate service provision sources
 - Creating response plans to deal with risks when they occur (managed failures)

The decision on which course of action to take with a given risk source depends on the overall criticality of the risk, the effectiveness of the action on reducing the risk (i.e., the *residual risk*), and the cost / effort of the action.

For the purpose of identifying thresholds where the “accept” course of action is acceptable, an organization’s risk management plan will usually identify a criticality threshold below which risks are not considered. As an example, a risk management plan may specify that any risks above a “high” threshold must be assessed and mitigated until they become a “medium” risk as per Figure 4.

Beyond a simple assessment of “accept / don’t accept”, the risk management policy may dictate different levels of intervention for different risk levels (e.g., acceptance of low risks, monitoring of medium risks, treatment for high risk,

	Insignificant	Minor	Moderate	Major	Significant
Almost Certain	Medium	High	High	Very High	Very High
Likely	Medium	Medium	High	Very High	Very High
Possible	Low	Medium	High	High	Very High
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Medium	Medium	High

Figure 4. Sample Criticality Ranking Matrix (Municipal Finance Officers’ Association (MFOA), 2018)

cont’d on page 10



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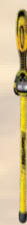
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avoidance of very high risk, etc.). These policy aspects serve to guide decision making with regards to appropriate approaches to dealing with risks.

In the case of our hypothetical cable-internet provision business, a sample risk register may look similar to that in Figure 5. The risk register identifies the intervention threshold for the risks that need to be accommodated and identifies which mitigation approaches are most cost effective.

Risk Register – Home Cable Internet Provision (LH – likelihood, S – severity, C – Criticality)						
Intervention Threshold – C > 10						
Risk ID	Risk Type	Risk	Impact	LH * S = C (1-5)	Potential Mitigation	Residual LH * S = C
1	Nat. Event	Wildfire	Hydro poles carrying cables destroyed, cables damaged, connectivity lost to neighbourhood	3 * 2 = 6	Bury cables (may lead to increased corrosion and necessitates new easements)	3 * 1 = 3
2	Indirect 3 rd Party	Power outage at data centre	Data centre goes down, service provision lost city-wide temporarily	5 * 4 = 20	Install backup power supplies (leads to additional assets to manage)	5 * 1 = 5
3	Indirect 3 rd Party	Increase in home-office work	Increased bandwidth requirements leading to network congestion.	4 * 4 = 16	Add additional cables (increases cost and surplus capacity)	2 * 4 = 8
					Throttle per-house capacity but reduce pricing to offset drop in service quality	4 * 4 = 16
4	Asset Internal	Buried Cable Corrosion	In-ground corrosion reduces signal quality, reducing bandwidth along line segment	4 * 2 = 8	Use different cable materials (increases cost of cable)	2 * 2 = 4
					Put cables on poles (see Risk # 1)	2 * 2 = 4
5	Personnel Internal	Retirement of key data centre operations personnel	Inability to operate data centre in the event something goes wrong, leading to increase of other risks	3 * 4 = 12	Implement mentoring program to ensure succession plans	2 * 3 = 6
					Implement knowledge base documentation on critical process	3 * 2 = 6

Figure 5. Typical sample risk register

In the example above, it is worth noting that some mitigation approaches do not affect the likelihood of a risk source occurring (e.g., burying cables does not impact the likelihood of a wildfire happening or damaging poles) but do impact the severity (buried cables aren't affected by burnt poles). Other mitigations affect probability but not severity (i.e., increasing inspection frequency so that failures can be better predicted).

Additionally, some risks may have multiple potential mitigation approaches (such as opting to increase network capacity or accepting a decrease in service quality) and some mitigation approaches may result in the same criticality but have different costs or downstream impacts.

The final stages of the risk management process are to evaluate the costs (or efforts) of various mitigation measures, and to determine relative cost-benefit ratios given their impact on the residual remaining risk. Once a subset of appropriate mitigation measures are identified, they can

then be implemented and their impacts over time monitored.

Continuous Improvement

Establishing a risk management plan is not simply a “set it and forget it” exercise. Over time, new risk sources emerge that were never contemplated (e.g., new technologies, government regulations, etc.) and the probabilities or severities of certain events may change. For example, increasing population growth in flood-prone areas may alter the risk profile for stormwater management as extreme weather events increase in certain regions. As a result, risk management plans should be reviewed on a 3 to 5-year cycle, or as significant developments become apparent. Continuous improvement and performance monitoring is a critical feature of a properly implemented ISO 31000 system.

Conclusion

Managing risk is an activity most of us do unconsciously “off the side of our desk.” We instinctually weigh balances of probabilities and outcomes, and put in place back-up plans for when things go wrong in our projects. However, humans are notoriously prone to issues such as confirmation bias, under-estimation of future risk, and doubling down on sunk costs.

While the impacts of this “risk blindness” may be small when evaluating whether you should be taking a total station with you or just relying on the RTK to work, they become very relevant when dealing with a major surveying project or managing complex networks of infrastructure assets. In such cases, formalized risk management processes like ISO 31000 make sure that you're truly “covering off all the angles” and ensuring that when Murphy's law

does pop up, that you likely already have a plan in place to deal with it.



With over 20 years of experience in land surveying, advanced positioning technologies, and 3D scanning, **Dr. Radovanovic** is actively involved in educational initiatives in the land surveying and infrastructure asset management professions. He is the Calgary Engineering Branch Manager with McElhanney Ltd., as well as an Adjunct Associate Professor in the Department of Geomatics Engineering at the University of Calgary. He can be reached via email at rradovanovic@mcelhanney.com

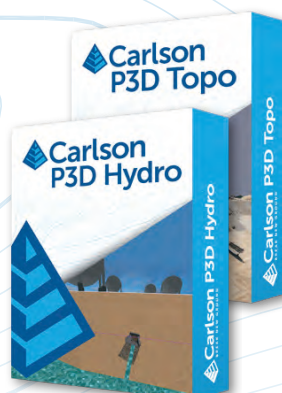
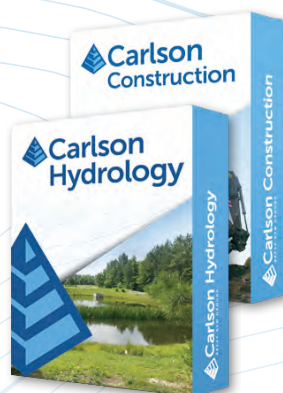
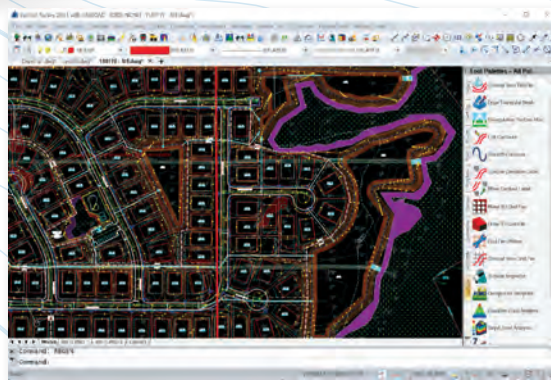
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Know your History — Part 10

By Tom Bunker, O.L.S., C.L.S., P.Eng., C.P.A. (Ret)

The following article is Part 10 in a series of historical articles by Tom Bunker.

Exploration to the Kwataboahegan River

Ontario contains 1,068,580 square kilometres of land and waterⁱ and about 80%ⁱⁱ of that lies in Northern Ontario, being the portion north of Lake Nipissing and the French River and westerly beyond Lakes Huron and Superior. A large portion of Northern Ontario is geologically defined as Canadian Shield and a substantial source of non-fuel minerals, forestry resources and potential agricultural lands. With climate change projections the latter use may become more productive and significant in the Provincial economy.

At the northern edge of the shield we find significant waterfalls where major rivers cascade from the rocky lands to the geological Hudson Platform. The Hudson Bay and James Bay lowlands rise not much more than 150 metres above sea level. This wetland area of about 320,000 square kilometresⁱⁱⁱ rims the shore of the Bays and is the second largest wetland in the world^{iv}. Access to this area of the Province is a challenge even during winter and such access will be exacerbated by climate changes.

European exploration began with earnest in northern Canada, at the time Rupert's Land, in 1670 with the establishment of Moose Factory as a trading post of the Hudson Bay Company near the mouth of the Moose River. There wasn't much resource exploitation except for the fur trade

and even by 1876 Ontario did not extend to tide water at James Bay.

Into the twentieth century the only commercial developments in the area were hydro-electric projects on the major rivers in the 1930's and the construction of the Ontario Northland Railway from Cochrane to Moosonee completed in 1932.

In January 1975, T. E. Rody Limited was awarded a Provincial contract to provide horizontal and vertical control in support of resource exploration activity (Cochrane file 2894). The exploration's objective was to investigate the potential for any viable mineral or fossil fuel assets in a selected area of the lowland.

An "ice road" was to be cut through the wilderness to provide access for seismic work and exploratory drilling into underlying bedrock.



Portion of Dominion of Canada map^v



The expected exploration route would start from a point west of Smoky Falls and proceed in a direction toward Jaab Lake.

Smoky Falls is a hydro-electric generation site on the Mattagami River commissioned in 1931 and at the time^{vi}

was operated by Spruce Falls Power and Paper Company to provide power to their Kapuskasing paper mill. A few operations people lived on site and it was accessible year-round by a gravel road west from Fraserdale located at an Ontario Hydro (OPG) power dam on the Abitibi River. Our initial crew was housed at Smoky Falls.

The terrain of the whole project would be considered flat, with the only exception the deep gullies eroded by the major rivers: the Opasatika, Missinaibi and Kwataboahagan. The vegetation is primarily stunted black spruce and tamarack trees on deep and often floating peat muskeg with larger white spruce near the well drained river valleys. The soil underlying the muskeg is primarily marine deposits of clay^{vii}.



The railway at Moosonee disappears to the south at the flat horizon – typical terrain – photo taken summer 1969

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During our field effort of January 25 to March 11, 1975 the day time temperatures ranged between -35°C and -5°C.

Labelle Construction from Cochrane was granted the contract to create the “road” through the muskeg using a bulldozer with a tree cutting blade to cut off the scrub trees and to grade the surface flat. Once the trees and snow were flattened it froze solid enough to permit heavy vehicles to pass.

The terms of our survey contract required us to mark chainage stations every 200 feet (contract was pre- metric

cont'd on page 14

Sites to See

The Missinaibi River – A Canadian Heritage River

<https://chrs.ca/en/rivers/missinaibi-river>

For 200 years, the Missinaibi was one of Canada’s most important fur trade canoe routes in the 18th and 19th centuries, connecting Moose Factory to Michipicoten on Lake Superior. Trading posts were built by the competing Hudson’s Bay and North West companies at several locations, including New Brunswick Houses, Missinaibi Houses, and Wapiscogamy House. These trading post sites comprise just a few of the almost 50 important archaeological sites spanning human history along the river.

As the fur trade declined, the railway brought settlers and non-Indigenous hunters and trappers, as well as prospectors and miners. Lumbering was closely linked with the installation of the railway and forestry is still one of the main employers for people in the region today. In many ways, the history of the Missinaibi is a smaller-scale reflection of the history of Canada. Protection of the values of the Missinaibi began in the 1960s and continues today.

conversion in Ontario), to set scribed wooden mile posts along the route, to plant recoverable monumentation, to determine horizontal position to legal survey standards and to establish periodic permanent benchmarks for use by the other exploration professionals. We anticipated the survey would cover between 60 and 85 miles, depending on the effect of weather on the swamps and the requirement for final returns delivery by March 31.

The contractor started his work in early January and set up an alignment based on a scaled map position and compass direction. I travelled with a crew from Timmins and arrived at Smoky Falls mid-afternoon on Saturday, January 25. We located the Kipling Township boundary that afternoon for the required boundary tie points. The road clearing had proceeded almost 30 miles and the exploration crews needed reference points. The crew immediately started the work of chaining and setting plus-station markers and wooden mile posts beginning at the Kipling boundary. The two-man crew dragged their gear along with a toboggan on the flattened road while I left 4X4 posts and bundles of 4 ft long wooden stakes about every odometer mile. In many places the frozen muskeg was cut with a chain saw and the 10 ft long wooden posts were manually pushed down into the swamps. We similarly used 10 ft long 3/4" round iron bars easily driven in as monumentation in muskeg areas.

I attended to the contractor's camp and carried out a solar observation (by altitude method), calculating the results at the site to confirm the direction the contractor was running.

I located and flagged the McCausland/Hambly boundary and was able to visibly spot the 7th Baseline that had been run in 1930^{viii} across wet muskeg. The original blazes on 4"

diameter trees not much taller than 10 feet had never grown over in 45 years.

I located the geodetic benchmark at the Harmon Generating Station down-stream of Smoky Falls in preparation for the vertical control survey. By our first week at the site the crew had chained and set monuments on the first 31 miles of road.

The flat water soaked peat muskeg and scrub trees rendered most of the boreal lowlands inaccessible except in winter months. Unfortunately I didn't take my camera.



Don Johnston NC/Alamy Stock Photo

Some area Township outline surveys had been conducted, notably Kipling, McCausland and Hambly which themselves had been based on earlier base line and meridian surveys. Our field ties to these prior surveys would provide geographic location in a pre-GPS era.



Map reproduced from page 160, *They Left Their Mark*, John L. Ladell, Dundurn Press, Toronto, 1993

While I was away at the AOLS Convention the following week, other crews arrived from Cochrane to continue work on the road chainage, begin the road traverse and start the vertical control. Our vertical objective was to obtain engineering standard results. We proposed that using a one-direction run of observations with Second Order methods (Invar rods and rod turning plates, micrometer and three wire observations) and gross error checks using vertical observations from our Wild T2 traverse would give us the results required. The firm had been using the T2 and an HP3800 EDM (range 9900+/- ft) on highway control contracts. While the terrain often allowed sight lines of more than 3 miles, we decided to limit our traverse legs to one mile in length. Distances were measured forward and back and T2 directions observed in three sets with start direction spread 120° around the horizontal circle. A check on final azimuth values was created by astronomical observations every 10 stations or 10 miles, whichever was shortest.

By February 24 the road had been pushed as far as the Kwataboahagan River and it had been decided this would be the contract terminus. We

had previously installed a trailer camp at the Missinaibi River crossing for our accommodation of two crews that rotated about every 10 days.

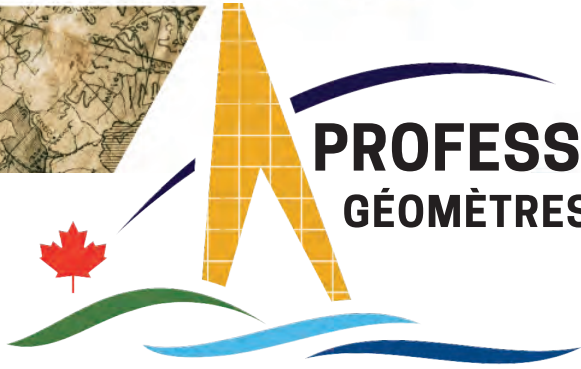
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My crew was last on site and monumented the end of the project and ran the horizontal traverse back toward the work already completed, tying in drill holes and seismic craters, mile posts and reference monumentation along the way until we connected with earlier work.

We were working near our camp on Sunday, March 9 so decided to have lunch there. We were surprised by a knock on the door and found two men with a car outside. They wanted to know how far this “road” went as they were planning snowmobile excursions from Smooth Rock Falls to Moosonee!

The field component was finished by March 11 with 71 miles + 4,250 ft of survey completed. My Timmins office computed the results to be drafted on existing map sheets with results shipped out on March 28.

Operational Challenges

We operated from our Missinaibi camp in the wilderness about 40 miles from the closest occupied site. We had vehicle transportation, including a snowmachine, but no communication (phone, radio, etc) link to the outside world.

The seismic crew had worked their way back from the north end and found it easier to create their explosive site in the middle of the road rather than to the side. Avoiding the resulting craters made our access now more challenging.

On February 26 it was snowing so hard we could no longer survey by noon. In the open black spruce swamps the snow drifted as high as the hood on my three-quarter ton van and it popped the fan belt on each snow drift impact. We had to stop in the blizzard and re-install the belt each time but did make it back to camp before dark.

We found that the 90° eyepiece prism needed to effectively observe Polaris at Latitude 50°N was too inconvenient at -30°C at night. Instead, we opted for solar observations by time, using a Roelofs Prism for direct observation of the sun and a shortwave receiver for time signal and stopwatch for accurate time. On one of the last outings, the sun’s image didn’t appear correct and I discovered one of the internal semi-circular prisms had become detached. After a few failed attempts at repair I found that table syrup was sticky enough to hold the prism in place. It wasn’t a very elegant or accurate solution, but the systematic error that was created was resolved by double facing and our results were proven when calculated on-site.

The HP3800 was reasonably new technology and it suffered in operation when the exterior battery pack became very cold. We found a solution by putting it into a backpack with a blanket and hot pad, with only the connecting cord exposed.

The road wound its way down each side of the river valleys and any exposed dirt became slick mud in the sunshine overlying frozen clay. On one trip we needed to exchange my rental four-wheel drive with the outgoing crew’s van as the van couldn’t get up the hill at the Opatatika River crossing. The crew left without advising us we were dangerously low of gasoline and our generator ran

out at 3:30 am. Power was needed for the oil-burner to heat the camp. The following morning we were out of camp with the van before 6 am and arrived at the driller’s camp beyond the Opatatika River with an empty fuel drum to get gas just as they were having breakfast.

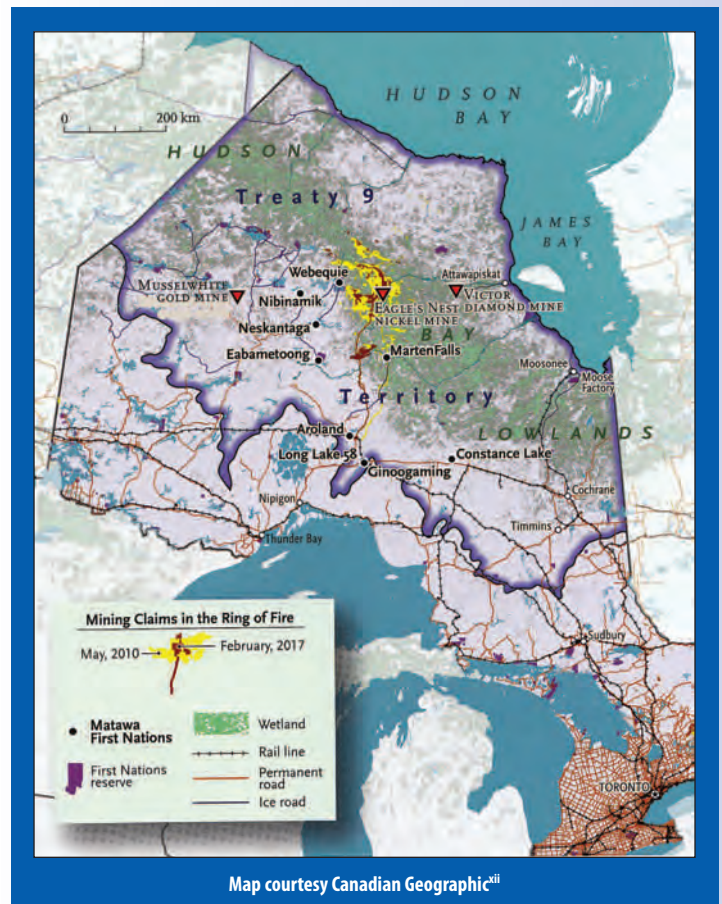
During our completion of final reports we were asked if it would be possible to generate road profile sheets. While this had not been anticipated at inception of the work we responded in the affirmative. We had captured 3-wire data while levelling to evaluate BS/FS length differentials so could create profile data sheets with elevations generated at each turning point about every 400 feet along the entire route.

Epilogue

Northern Ontario has been home to First Nations long before the Hudson Bay traders visited the area in the 1600’s. The area is currently home to 34 individual First Nations with Reserves established under Treaty 9 (1905/06 and 1929/30)^{ix}. First Nations have traditionally utilized their territory on a renewable basis as part of their social beliefs. Any resource development requires consultation to address concerns of the affected Indigenous communities^x.

After a negotiated agreement with the Moose Cree First Nation^{xi}, upgrades to Smoky Falls and associated powerhouses were completed in 2014 to increase the clean-energy output from 54 MW to 268 MW.

Further north of Smoky Falls, exploration by De Beers’ led to the 1987 discovery of diamond bearing kimberlite pipes about 90 kilometres west of Attawapiskat (Lat 53°N)



on James Bay. The Victor Mine was developed in 2006 under an Impact Benefit Agreement negotiated with the Attawapiskat First Nation. The open pit mine required a \$1 Billion investment for a mine with an estimated operating life (post construction) of about 7 years, closing in 2019.

About another 180 km further west of the Victor Mine lies a huge mineral deposit that was discovered after exploration began in 2003. The “Ring of Fire” deposits include chromium, copper, nickel, platinum, vanadium and gold. Access during exploration was solely by air strip on frozen lakes with winter roads over “string bogs”. The closest

Webequie and Martin Falls First Nations objected that there was no prior consultation for this work on their traditional territory.

There are nine First Nations, collectively the Matawa First Nations, potentially affected by this resource development over an estimated 5,000 sq. km as well as access corridors for a railway connection near Nakina and a year-round road to Pickle Lake.

Work on the multi-billion dollar project has stalled after the Province pulled away from negotiations with the collective Matawa First Nations in 2019.



ⁱ Page 41, Canadian Oxford World Atlas, 4th Edition, Oxford University Press, Toronto, 1998
ⁱⁱ My estimate from the map on Atlas pages 40 - 41
ⁱⁱⁱ <https://uwaterloo.ca/wetlands-hydrology/research/james-bay-lowland-ontario-canada>
^{iv} ibid
^v Modern School Geography and Atlas, Fifth Edition, James Campbell and Son, Toronto, 1876
^{vi} Smoky Falls is now part of a four plant series operated by Ontario Power Generation since 1991, Wikipedia
^{vii} Engineering Problems in Supplying Municipal Services to Moosonee; University of Toronto, Undergraduate Engineering Thesis: Tom Bunker, 1970.
^{viii} Page 247, They Left Their Mark, John L. Ladell, Dundurn Press, 1993
^{ix} See pages 46 – 52, Vol. Indigenous Canada; Indigenous Peoples Atlas of Canada, The Royal Canadian Geographical Society, 2018
^x Constitution Act, 1982
^{xi} Moose Cree First Nation Ratifies Amisk-Oo-Skow Comprehensive Agreement
<https://web.archive.org/web/20120825141308/http://www.opg.com/news/releases/090520MooseCreeFirstNation.pdf>
^{xii} Map credit Chris Brackley, Canadian Geographic, March/April, 2017
<https://www.canadiangeographic.ca/article/whats-stake-ontarios-ring-fire>

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Survey Review Department Forum



By Tom Packowski, O.L.S., Manager Survey Review Department,
Chair Continuing Education Committee

Are Field Notes at Risk of becoming a Lost Art?

Over the course of my tenure as Manager of the Survey Review Department, I have written at least two articles on field notes in the Ontario Professional Surveyor and hosted one webinar on the topic. Field notes are a vital component of a professional surveyor's practice, yet they seem to be at risk of becoming a lost art in this age of electronic data acquisition. What follows is a summation of my previous articles as well as my own years of experience on this subject. As usual let's begin with what the legislation has to say on the subject.

The *Surveys Act* at Section 4 (2) states: Every surveyor shall make and preserve exact and regular survey records and shall index all such survey records and shall exhibit or give copies of the same to any surveyor for a reasonable charge.

Field notes – O. Reg 216/10, Section 15

15. For each survey, field notes shall be prepared in the field and shall contain a clear, accurate and detailed account of everything found, observed and done in the field in the course of and relevant to the survey.

What information is available to you, the practitioner, to assist you in providing training to your staff? In addition to the information in the OPS magazine, the following documents are available on the AOLS website: Log into the home page > Splash Page > Member Tools > SRD > see PDFs on the left side of the page.

1. The Interpretive Guide and Supplement to the Performance Standards for the Practice of Cadastral Surveying (Ontario Regulation 216/10).
2. Guideline for the Preparation of Field Notes.
3. Field Notes and Field Procedures.
4. Guidelines for use of Total Station and Radial Methods for Legal Surveys.

It is suggested you print these documents and provide copies to your field staff. Periodically review sample field notes prepared by your field staff with them to ascertain whether the notes demonstrate that:

When undertaking a survey, a surveyor shall carry out a thorough field investigation for the best available evidence of all lines, boundaries and corners of the land under survey. O. Reg. 216/10, 8(b).

Are the field notes neat and include all administrative

details? O. Reg. 216/10, s. 15

Do the notes show all evidence including evidence that appears to be contradictory?

- i. Is the extent of the field research evident from the field notes?
- ii. Have all lines, boundaries and corners been examined for evidence?
- iii. Can evidence be identified as to age, type, condition and origin?
- iv. Are all found monuments identified by a company id or a number?
- v. Is the condition of the found monument identified as well?

Fences and their relationship to the boundary must be shown on field notes and plans (O. Reg. 216/10, s. 24 (1)(a) ii and (b). (Note: Features such as fences, retaining walls, hedges, posts which appear to limit or demarcate properties must be shown in relation to the boundaries.) Field notes and plans shall show any visible encroachments from the land being surveyed onto adjacent lands and from adjacent lands onto the lands being surveyed (O. Reg. 216/10, s. 24 (1)(a) iii. (Note: Field notes shall show overhanging eaves, encroaching structures, fences, driveways, planters, walks, utility pedestals and lines, pole anchors and the like.)

Are all monuments that are set independently verified to confirm that they were set in the proper location? This is most evident in 'total station' applications using radial stake out. Often the field notes do not show what checks have been made to confirm that the coded point numbers for the occupy, backsight and foresight points are correct. The regulations require that "all measurements shall be verified by mathematical closure or independent measurement". (O. Reg. 216/10, s. 12).

All field notes made for the various types of surveys should be set out in a logical format which will lead any reader through the progress of the work in the same manner as the actual field work was completed.

The Survey Review Department (SRD) has recommended that each page of field notes should be formatted with prompts to include all the administrative details of the survey as outlined in the Guideline for the Preparation of Field Notes as approved by Council in July, 2007, (e.g.

name and address of survey organization; company file number; names and duties of field party; date(s) of field activity; weather conditions; geographic location of survey; page number and number of pages; north point; survey equipment used, including an identified method for differentiating between GPS measured points and Total Station measured points; units of measure; coordinate framework being used). It is further suggested that field notes should also contain the following where a Total Station is used: traverse points and traverse lines with closed traverse loops where appropriate or an obvious check on hanging traverse points; methodology and progression; redundant measurements, including independent measurements to points established; names of relevant streets as posted; legible printing. Also, it is highly recommended that the field crew take pictures of the site and include them as part of the field note package.

In the field notes, if the term ‘Measured’ is actually a calculated value (i.e., an inverse between two points) then it should be shown as ‘Calculated’.

As mentioned above, the origin of monuments that were found should be identified in the field notes along with the condition of monuments found to confirm that they don’t appear disturbed. Monuments found, and monuments set, together with their associated point numbers should be illustrated in the field notes as well as the extent of the field

investigation for physical evidence, including where monuments were looked for but not found. This information in the field notes would better support the method used to re-establish existing limits and/or corners.

As well as showing occupational features that exist along a boundary, the field notes should indicate those boundaries or portions thereof where none exist (i.e., no fence). Again, this information is critical to the method of survey and priority of evidence.

Field notes should include the raw data file as part of the field note package. A coordinate list should also be included that provides a list of point numbers, their coordinates, and a description of what the point represents. The raw data file should be related to the field note sketch so that, between the two, the definition of the methodology, progression and redundant measurements can be captured (i.e., set up, backsight, foresight, point details, GPS details, etc.) The field note sketch should further relate to the methodology and progression of the survey by showing the traverse lines/network and by more frequent use of terms such as, set, measured, calculated, held, accepted, etc. This information can either be provided directly on the field note sketch, or on a calculation sketch (which should then be part of the field note package). In this manner, the method of establishing boundaries would be better illustrated, particularly when summarized further in an

cont’d on page 20



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accompanying report. The raw data file should also be cross-referenced on the field note sketch.

The creation of field notes is a regulatory requirement and is not to be taken lightly. Constant on-the-job training on field note preparation is necessary to obtain a true knowledge of how they must be prepared. Field Notes that are “messy”, incomplete, difficult to read, and without the required checks, lead to frustration and wasted time spent attempting to decipher what was actually done in the field. This often leads to return trips to the site to verify data, or, to incorrect decisions and missing information on the plan.

Field notes should be prepared with sufficient care and clarity so that you would feel comfortable explaining your opinion on a boundary to a professional colleague or in Court.

It was noted above that the raw data file should be part of the field notes. Although a coordinate printout that provides a list of point numbers, their coordinates and a description of what the point represents is good information, it is not the raw data file.

Preprinted field notes are recognized as an efficient way to display information, however, it is suggested that they do not preprint anything that is required to be verified in the field (i.e., measurements, type of structures, street name, etc.).

All measurements should be specifically defined as being set, measured, or calculated to help define the method and progression of the survey.

The field notes should illustrate the point numbers for all features measured so that, when coupled with the raw data (which should be formatted to illustrate all measurements, point numbers and items measured to), they will capture all the evidence, structures, boundary features and other items displayed on the plan.

The following is a summation of the above as well as frequent omissions and deficiencies we see during our Comprehensive Reviews at the Survey Review Department.

- The origin of monuments that were found should be identified in the field notes.
- Where a monument known to have existed is looked for but not found, the field notes should so indicate.
- The field notes should state the condition of monuments found to confirm that they don't appear disturbed.
- Let me re-state. In addition to showing occupational features that fall along a boundary, the field notes should indicate boundaries or portions thereof where there are none (i.e., no fence).
- The coordinate framework being used and the sources of coordinates for points used to integrate the survey and the measurements made to them should be part of the field note package. As well, the combined scale factor should be noted in the field notes.

- All details shown on a plan should appear on the field notes.
- All items measured in the field should be indicated on the field notes with the associated point numbers.
- The field notes should not contain information that was clearly the result of office calculations. The field notes should only be a reflection of the actual work done in the field. Instead, the calculation results should be done on a calculation sheet, (which could be an enlarged copy of the field notes). This calculation sheet should be part of the field note package.
- The field note package should contain elevation notes to support the elevations shown on the plan.
- The Surveyor's Certificate should indicate that the field work is current to the date that the plan was certified. To reduce liability, if there is a substantial delay between the completion of the field work and plan certification, it is suggested that a supplementary field check should be made closer to when the plan is certified. The notes from the field check should be included with the field note package.
- The field notes should provide an obvious indication as to how measurements are independently verified. As well, to support compliance with Section 5 of O. Reg. 216/10, the file should include closures for field traverses and documentation of adjustments as well as a report of all check measurement comparisons. Some check measurements may include hand taped measurements around building walls (to compare with inverse calculations between corner points) and from building corners to corner monuments, as well as hand taped or resection measurements between monuments set to provide an excellent independent measurement check. Other checks may include observations to the same building corner from different traverse points.
- Other than the above, other typical omissions are: overhead utility wires; outlining why a monument of substantial compliance (i.e., SSIB, Plastic Bars) had to be used to replace a required monument (i.e., SIB); not following the rules for monumentation; not measuring the eaves of buildings that are close to a boundary; not showing all features along or close to a boundary (i.e., fences, hedges, tree rows, edges of driveways/sidewalks).

Let me repeat that it is very important that the field crew take pictures of the site and include them as part of the field note package.

And lastly, a reminder: it is not up to the field crew to decide what should be picked up and what should not be picked up. They are your eyes in the field. They should note everything observed (or not observed) and it should then be up to the surveyor to decide what goes on the plan.



Registrar's Review



By Kevin Wahba, B.Eng., LL.B., O.L.S., Barrister & Solicitor

Over the past year there have been changes within the policies and practices of several of the statutory committees that allow the Association of Ontario Land Surveyors (AOLS) to execute its objectives. Additionally, several policies are being contemplated for the coming year which will help the Association adapt to the evolving needs of a self-governing profession. This article is intended to keep the members, who may have not had an opportunity to be closely involved with these committees, informed about these changes.

As of November of 2019, the Academic and Experience Requirements Committee (AERC) implemented a plan check exam as an additional component of the professional licensing exams. Previously, a plan check question was incorporated into the professional written exam. The professional exam for cadastral applicants now comprises three separate modules, a plan check exam, a written exam, and an oral exam. Since November of 2020, the exams have been offered through an online, remote delivery service.

Keeping on the topic of exams, recently the AERC passed a policy motion to now allow appeals to the professional oral exam. AERC has also been moving forward to further align with the Canadian Board of Examiners for Professional Surveyors' (CBEPS) academic requirements, and academic evaluation procedures. This work, although still ongoing, has allowed the AOLS to begin to further flesh out academic requirements that are applicable to the surveying profession in Ontario, in the modern era. The AERC have also identified future projects which intend to improve the articling experience for both the student and the articling surveyor, as well as increase the transparency of procedures and decisions made by the Committee.

The Complaints Committee recently published an updated procedural manual. The manual can be found on the AOLS website. A number of the items addressed in the manual include general procedures for the withdrawal of a complaint, complaints involving ongoing litigation, complaints against former members, as well as several administrative revisions to the samples listed in the manual's appendices. The Committee is considering the treatment of complaints involving primarily fee related concerns and the potential overlap with the Fees Mediation Committee.

The Fees Mediation Committee also published a formal procedural manual which is found on the AOLS website. The manual addresses procedural issues such as how a complaint is filed and processed, the role of the Registrar as the Committee's administrative officer, and how a complaint may proceed by Mediation and Arbitration. The manual also contains many sample documents distributed by the Committee during the complaint process.

The Registration Committee is one which receives several requests from members for a variety of situations. The Committee is currently working towards policies related to the issuance of Certificates of Authorization and the approval of requests for one member to operate two or more offices. A manual is currently being developed for the Committee.

Across all of the Committees that I have been involved with during my time here, it is apparent that the primary goals of these statutory committees are to function in a transparent, consistent and reliable way. As policies and procedures are updated in response to evolving technology, practice and legislation, we hope to keep the membership and the general public informed and involved with the changes.



AOLS Strategic Plan (2021-2024)

By Brian Maloney, Executive Director

For approximately the last decade, Council has been using strategic planning methodologies to establish directions. This allows them to prioritize activities to help them focus on the most important items. Normally Council has a larger session involving members outside of Council to establish a new plan every five years. During the intervening years the plan is reviewed and tailored by Council as required. This was the case for this current plan.

Although the Vision and Associated Objectives for 2024 were not changed substantially, the immediate Mission (2021-2022) and Objectives (2022) were adjusted along with the corresponding Action Plans. Significant changes were made to review potential changes to the *Surveyors Act*

placing the Association in a proactive position to respond to increasing demands for changes to how professionals are governed and help us address the continuing changing technologies and uses related to surveying. Two other notable changes were made: establishing a mentoring program and developing a social media promotional campaign targeted at students. We are also responding to the changing availability of university programs.

A copy of the Placemat (2021-2024), which describes the high-level directions for the Association, is on the next page. This was shared with all AOLS staff and Committee/Task Force Chairs to ensure we are heading in the same direction.



Vision 2024

We are a trusted, forward-looking, ethical, highly engaged, diverse and inclusive association of licensed surveying professionals protecting and serving the public interest, working collaboratively with other Associations across Canada to:

1. Regulate the activities of our membership through an evidence-based, risk management approach
2. Encourage and accommodate the introduction of innovative surveying products and services
3. Maintain and enforce contemporary standards and practices, including effective, transparent peer review processes
4. Provide access to relevant professional education, technical and business support and services based on the need
5. Work with educational institutions and others to attract a diverse community of new members to our profession portraying surveying as a compelling career and lifestyle

As a result, the Association and its members are valued for their contribution to the social and economic development of the Province and Canada as a whole.

Mission 2021-2022

Further the future relevance and effectiveness of the Association for Ontario citizens, businesses, institutions, and our members

1. Developing a risk-based management framework for all activities of the Association
2. Continuing to expand our efforts to develop and train new talent for the profession including online degree options
3. Identifying and securing agreement to required changes in legislation / regulations that will sustain the relevance of the profession in the future
4. Developing and implementing a strategy to increase awareness within government and among the general public of the services surveyors create for society, and the attractiveness of the profession as a career
5. Furthering the development of a fully converted, indexed, image-based survey records system
6. Ensuring we are an inclusive, bias free regulator
7. Facilitating a strong continuing educational program with a focus on technological change

Education

1. Continue to support the Toward an On-Line Degree program (TOLD)
2. Determine the fate of the Geomatics Engineering Program at York and take appropriate action
3. Collaborate with CBEPS to develop a parallel academic evaluation for domestic and international students
4. Refine and clarify the Continuing Education Requirements of members particularly related to external training
5. Inventory and publish external training opportunities for members
6. Establish a voluntary mentoring program
7. Arrange for training related to technology and emerging trends, if not available elsewhere
8. Support the development of technical training in colleges
9. Provide sample products (e.g. field notes, plans) to the membership

Key Priorities & Increased Public & Government Awareness

1. Implement recommendations from the Psychometric Analysis in response the recommendations of the Office of the Fairness Commissioner
2. Post the requirements of a land survey and samples of different types of surveys on the website
3. Support the continuation of viable surveyor offices in Ontario Government, reinforce the importance of the surveying profession in government through regular meetings with key Ministry staff and Government Officials
4. Develop a social media promotional campaign targeted at students
5. Meet with key government officials to ensure their understanding of the contributions and challenges of the surveying profession



Associated Objectives 2024

1. Provincial Survey records Index system in place and populated
2. Risk management framework providing focus for all activities of the association and governance reviewed and strengthened
3. One license model for all members of the profession, and increased # of articling students
4. Strong education partnerships in place with selected universities and colleges and an online degree program available
5. Total membership compliant with CPD and engaged in Association activities
6. Reduced number of substantive complaints
7. Numerous joint initiatives underway with other Associations to increase efficiency/effectiveness
8. Technology is implemented and used to effectively run the Association and support its members
9. The Association has no unnecessary barriers to entry and is a model of inclusivity

Objectives 2022

1. Risk management framework further developed and introduced to two statutory committees
2. At least 25 new qualified surveyors
3. A strategy for University education developed
4. Promote the profession by: participating in at least one virtual career day
5. Promote the profession by: developing a social media promotional campaign targeted at students (note: TikTok, hashtag, Instagram etc.)
6. Concepts for revised forward-looking Surveyors Act shared with members in 2021
7. Establish a voluntary mentoring program

& Action Plans

Risk Management

1. Refine and share dashboard information with Council, Committees and the membership to inform policy and directions
2. Complete further risk management assessments with two committees
3. Consider increased support for key committees to ensure effectiveness
4. Consider mental health of members and how the AOLS should respond
5. Complete and respond to our self-requested external regulatory review
6. In the event that University Programs are not available consider alternate methods of recruiting surveyors

Legislation and Regulations

1. Create recommendations for redefining the area of exclusive practice of licensed members under the Surveyors Act
2. Develop alternative proposed processes for Complaints and Discipline
3. Develop a potential model for voluntary boundary mediation between members
4. Develop alternatives for the structure of Council and statutory committees (including cooperation with other Canadian Survey Associations)
5. Develop alternatives for approvals (regulations, by-laws, interpretive guides, policies, etc.)
6. Consider the changing environment on rules surrounding surveying business operations
7. Further discussions with other Canadian surveying regulators on opportunities for further collaboration on key regulatory activities

Insurers Beware: The Perils of Limitation of Liability Clauses in Subrogated Claims

This article originally appeared in an RMC Newsletter published by the Risk Management Counsel of Canada. It is reprinted with permission.

An insurer's right of subrogation is one of the cornerstones of a contract of insurance. Once the insurer has indemnified the insured, the right of subrogation allows the insurer to "step into the shoes of the insured" and claim against the relevant third party in order to recoup some or all of the indemnity payments made. However, before proceeding with litigation that can be expensive, an important consideration is to determine the potential for recovery from the defendant. While the most obvious challenge could be an impecunious defendant, an often over-looked issue would be where an insured has negotiated a reduction in its rights. Where an insured has contractually agreed to restrict or limit the extent to which a third party is liable to the insured, then the subrogating insurer is similarly bound by that limitation. Such clauses, known as "limitation of liability clauses" have become increasingly common in recent years and can be an unwelcome surprise to the subrogating party.

Limitation of Liability Clauses

Canadian courts have allowed parties to negotiate to limit liability for claims arising in either contract or tort through appropriately drafted exclusion or limitation of liability clauses.ⁱ A limitation of liability clause serves to limit the amount and types of compensation one party can recover from the other party. It caps or narrows the losses to be pursued by one party, and correspondingly reduces the risk to the other party. These types of clauses are seen in professional service agreements to limit the exposure of, for example, home inspectors, engineers, accountants, etc. to the value of the fees paid for services rendered or to the value of set amounts of professional liability insurance. These types of clauses are also seen in supplier contracts for products to cover any latent defects. A limitation of liability clause may also restrict a party's exposure to damages caused by negligent acts, or work to exclude liability for certain types of damages, such as consequential damages or business interruption losses.

For subrogating insurers, while investigating a file for its potential for recovery, it is essential to recognize such a contractual provision between the insured and any third party at the investigative stage. The first stage of inquiry would be to determine if the limitation of liability clause is drafted such that it will be enforced. If so, then it may be

efficient to either forgo subrogation or focus efforts of recovery towards third parties that are not bound by such clauses. However, in certain cases, as described in further detail below, courts may refuse to apply the limitation of liability clause. In many instances, it may be valuable to seek a legal opinion on the validity of such clauses. Where the facts are favourable, judicial intervention might also be sought to render such clauses unenforceable.

Enforceability of Limitation of Liability Clauses

Limitation of liability clauses have gained prominence since the 2010 decision of the Supreme Court of Canada in *Tercon Contractors Ltd. v. British Columbia (Transportation and Highways)* ("*Tercon*")ⁱⁱ, which established that limitation of liability or exclusion of liability clauses would be presumptively enforceable.

For a proper analysis to determine whether a limitation of liability clause would be enforceable, Justice Binnie set out a three part test:

- 1. As a matter of ordinary contractual interpretation, does the exclusion clause apply to the circumstances established in the evidence?**
- 2. If so, was the exclusion clause unconscionable at the time the contract was made?**

The Supreme Court of Canada stated that unconscionability involves two elements: inequality in bargaining power and a resulting improvident bargain that unduly advantages the stronger party or unduly disadvantages the weaker party.ⁱⁱⁱ

- 3. If not, should the Court decline to enforce the clause because of an overriding policy concern?**

Generally, where a party seeking to rely on an exclusion clause either knew it was putting the public in danger by providing a substandard product or service, or was reckless as to whether it was doing so, a limitation of liability clause is not enforced on grounds of public policy.

Enforcement of a Limitation of Liability Clause

As explored below, limitation of liability clauses have generally been enforced.

For example, where a security company is guilty of negligence in failing to report an alarm^{iv} or is in breach of its

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contract in negligently failing to properly protect the plaintiff against burglary during a temporary installation^v, or a monitoring service neglected to report a burglary to the police^{vi}, courts have held a limitation of liability clause to be not unconscionable, and denied or reduced damages accordingly.

In the pre-*Tercon* case of *Fraser Jewellers (1982) Ltd. v. Dominion Electric Protection Co. (Fraser)*,^{vii} the security company failed to respond when it received a signal of ongoing burglary at the plaintiff's jewellery store. The contract contained a clause limiting the defendant's liability for any loss, damage or injury due to a failure of service or equipment. The trial judge refused to give effect to the exclusion clause in the contract, holding that the failure to respond promptly to the holdup alarm signal constituted a fundamental breach of the agreement and that the clause, in any event, was unconscionable. However, on appeal, this decision was overturned.

The Ontario Court of Appeal found that there was no fundamental breach of the contract. While the appeal judge agreed that there may have been unequal bargaining power, there was no abuse of bargaining power. It was held that in the absence of fraud or misrepresentation, a person is bound by an agreement to which he has put his signature whether he has read its contents or not. Further, the court stated that whether the breach was fundamental or not, an exclusionary clause of the kind should be enforced according to its true meaning. Relief should be granted only if the clause, seen in the light of the entire agreement, could be said to be unconscionable, or unfair or unreasonable.

Post-*Tercon*, fundamental breach is no longer a tool to avoid exclusion and limitation clauses. The court is instead required to use its discretion to interpret clauses in a manner that leads to a fair result. Courts can always decide to decline to enforce a limitation of liability clause if there is a compelling public policy rationale to do so.

In a commercial setting it is expected that a party who executes a document will exercise reasonable care before doing so, and parties who are careless enough to execute a document without reviewing it may do so at their peril. In *Suhaag Jewellers Ltd. v The Alarm Factory Inc.*,^{viii} the facts were similar to those in *Fraser*. After a burglary took place at its jewellery store, the plaintiff sought damages from the alarm company. The contract between the parties included an exclusion clause that precluded the plaintiff from bringing the proceeding. The plaintiff claimed that he had not read or understood the terms of the contract. The court noted that the plaintiff had occasion to read the terms, and gave effect to the exclusion clause and concluded that it was not unconscionable.

A well drafted, unambiguous clause will generally be enforced. In *Biancaniello v. DMCT LLP*^{ix}, the Court of Appeal considered a broadly worded exclusion clause included in a release signed to settle litigation between the parties. The litigation arose due to unpaid fees by a client to the accounting firm. Some years after the release was

signed, a claim unanticipated at the time the settlement agreement was signed came to light. The issue was whether the release applied to the new claim. The Court of Appeal noted that the language used was unambiguous and encompassed all claims, and gave effect to the limitation of liability clause.

Similarly, in *Lippa v. Colletta*^x, a court rejected a plaintiff's attempts to avoid application of the limitation of liability set out in a home inspection agreement (which intended to limit the inspector's liability for unreported defects). While the court was sympathetic to the plaintiff's position, the court noted that it was impossible to ignore the clear wording of the exclusion clause included in the agreement.

Further, a failure to bring an exclusionary clause to the attention of the plaintiff will not necessarily render such a clause invalid or unenforceable. In the Alberta case of *Bragg Creek Community Association v. Tyco Integrated Fire & Security Canada, Inc.*^{xi}, the plaintiff claimed against the defendant in relation to a water loss after one of the fire suppression pipes in the ceiling burst, causing loss and damage to the auditorium and meeting rooms at a community centre. The contract contained a limitation of liability clause that would limit the amount of the damages to the amount paid for the inspection of the fire suppression system.

The signatory to the contract was an experienced facility director with the plaintiff. While the evidence suggested it was unlikely that the limitation of liability was brought to the plaintiff representative's attention, the court also noted that a notification of those clauses within the Terms and Conditions was provided in bold, capital letters just above the signature block of the agreement. The Court held that the agreement was between sophisticated commercial parties and was signed by a suitably trained employee who could have sought further clarification, but chose not to do so. Accordingly, the plaintiff was bound by the exclusion clause and its claim against the defendant was limited to the amount paid to defendant for the inspection services provided.

Recently, in the Saskatchewan case of *Smith v. Hawryliw*^{xii}, a home inspector sought to limit its liability to the amount of fee charged for the inspection in accordance with his agreement with the plaintiff. The reading of the provision was unambiguous and the Court found that the exclusion clause did apply based on the principles in *Tercon*. The Court also found that the clause was not unconscionable due to the defendant's failure to bring the exclusion clause to the plaintiff's attention or to canvas her knowledge of the terms of the agreement. Finally, relying on *Tercon*, the court concluded that there was no public policy rationale that negated the public interest of supporting freedom of contract.

While the status quo might suggest that limitation of

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liability clauses are enforced, there has nevertheless been development in the case law. Exceptions are being created. For example, in certain situations, courts have been reducing the contractual protections available to professionals under the limitation of liability clauses. These inquiries are based on the test set out in *Tercon*.

Unenforceable Clauses

In the 2014 decision of *Creston Moly Corp v. Sattva Capital Corp.*^{xiii}, the Supreme Court of Canada affirmed that the goal of contractual interpretation is to ascertain the intention of the parties at the time when the contract was executed. The Supreme Court also, however, added a new element to this exercise, requiring the trial judge to consider the “factual matrix” surrounding the formation of the contract.

The factual matrix is comprised of “objective evidence of the background facts at the time of the execution of the contract, that is, knowledge that was or reasonably ought to have been within the knowledge of both parties...”^{xiv} A trial judge should consider the factual matrix when interpreting a contract to ensure consistency between the written words of the contract and the intentions of the parties, even when there is no apparent ambiguity in the written contract.

The intention of the parties is to be determined on an objective basis of what a contract would mean to a reasonable person. Accordingly, trial judges moving forward will have a greater discretion to determine the true meaning of the contracts before them in the context of the relationship between the parties and the facts that existed at the time the parties signed the agreement.

Where a court is not satisfied that the exclusion clause applied to the circumstances established in the evidence, such a clause is not held to be valid. In the British Columbia decision of *Peter v. Soares*^v, the plaintiff, Mr. Peters, filled out and signed a membership agreement to a Brazilian Martial Arts Club. The provisions of the membership agreement referred to waiver of claims against the club relating to all claims, liability, injury and damages. On a later date, Mr. Peters got injured in a competition and sued the defendant club. The defendant sought to rely on the exclusion clause. The Court found that there was no evidence that the competition was in Mr. Peters’ contemplation at the time he signed the membership agreement, and so there was no factual basis on which Mr. Peters could have contemplated that the waiver provisions of the membership agreement would apply to the competition. The Court also engaged in the *Tercon* test and stated that the first *Tercon* inquiry [i.e. whether the clause applied to the circumstances] is answered in the negative. The membership agreement waiver did not relate to Mr. Peters’ claim regarding the injuries he allegedly sustained in the competition and so could not exclude Mr. Peters’ claim.

A party to a contract will not be permitted to engage in unconscionable conduct secure in the knowledge that no liability can be imposed upon it because of an exclusionary

clause. In *Plas-Tex Canada Ltd. v Dow Chemical of Canada Ltd.*,^{xvi} Dow knowingly supplied defective plastic resin to a pipeline fabricator, choosing to rely on a contractual limitation clause rather than disclosing the defect. This, it was held, created significant risk to public health and property. Accordingly, the court held that the exclusion clause was not enforceable.

In another 2014 decision of *Bhasin v. Hrynew*, the Supreme Court created a general duty of honest contractual performance, which requires the parties to be honest with each other in relation to the performance of their contractual obligations.^{xvii} According to *Bhasin*, parties must not lie or otherwise knowingly mislead each other about matters directly linked to the performance of the contract. The Court ruled that the duty of honest performance “operates irrespective of the intentions of the parties, and is to this extent analogous to equitable doctrines which impose limits on the freedom of contract, such as the doctrine of unconscionability”.

Where a contractor or a service professional makes a misrepresentation about the work carried out, the application of a limitation clause is not allowed. In *Swift v. Tomecek Roney Little & Associates Ltd.*^{xviii}, the plaintiffs jointly purchased land on Vancouver Island, on which to build a large custom home. Mr. Swift signed the architect’s agreement containing a limitation of liability clause which also extended to the architect’s sub-consultants. The engineer, a sub-consultant of the architect made a mistake that resulted in damages. The engineer represented that the mistake had been corrected, when it had not been. The trial judge held that the limitation clause applied to the plaintiff’s claims, including the negligent misrepresentation claim against the engineer.

The Alberta Court of Appeal, however, reversed the decision of the trial judge. While the court agreed that the limitation clause protected the architect and its sub-consultant, it held that the negligent misrepresentations made by the engineer during the project were not subject to the limitation clause. Consequently, the engineer’s liability was not limited. This case arguably carves out an exception in the contractual protection available to design consultants by way of a limitation of liability clause.

In short, the Supreme Court of Canada seems to have given more tools to judges in the analysis of limitation of liability clauses. The factual matrix approach may assist parties in obtaining relief from overly harsh contract provisions in certain agreements. An inquiry into the behaviours and conduct of the parties may further curb the so-called freedom of contract between parties. While this may also make trial decisions less predictable in cases involving contract interpretation in the future, it will open up opportunities for subrogating insurers to bring claims that they may have previously thought barred. When faced with a limitation of liability clause, a legal opinion on the enforceability of such a provision may open doors for a subrogated

claim that may previously have seemed questionable.

Conclusion

Limitation of liability clauses have generally been enforced, especially when a clearly worded exclusion has been drafted into the agreement, and entered into by parties with equal bargaining power. However, where there is an imbalance in bargaining power (unsophisticated parties or contracts of adhesion), or a scenario where a sophisticated party may be abusing their power, some courts have refused to give effect to the limitation clauses.

For subrogating insurers, the devil is in the details. It is essential to conduct thorough investigations early on, review any contracts to identify limitation of liability provisions, and to determine, by way of direct evidence from the insured, if there are any factors present that may aid in vitiating such a clause. Unwelcome surprises can be avoided.



The Risk Management Counsel of Canada (RMC) is a national association of independent law firms offering a comprehensive range of legal services to the insurance industry, risk retention groups and self-insureds. A copy of this article can be found on RMC's website at <https://www.rmc-agr.com/publication/insurers-beware-the-perils-of-limitation-of-liability-clauses-in-subrogated-claims/>

ⁱ *Edgeworth Construction Ltd. v. N.D. Lea & Associates Ltd.*, 1993

CanLII 67 (SCC)

ⁱⁱ *Tercon Contractors Ltd. v. British Columbia (Transportation and Highways)*, 2010 SCC 4

ⁱⁱⁱ *Uber Technologies Inc. v. Heller*, 2020 SCC 16 at para 65

^{iv} *D. Thomas Furs Ltd. v. Wackenhut of Canada Ltd.*, [1989] O.J. No. 1758 (Dist. Ct.)

^v *Marmac Credit Jewellers Ltd. v. Dominion Electric Protection Co.* [1978], 3 B.L.R. 144 (Ont. H.C.J.)

^{vi} *Loeb Inc. v. Bomar Security & Investigations Ltd.*, [1993] O.J. No. 109 (Gen. Div.)

^{vii} *Fraser Jewellers (1982) Ltd. v. Dominion Electric Protection Co.* 1997 CarswellOnt 1894, [1997] O.J. No. 2359, (ON CA)

^{viii} *Suhaag Jewellers Ltd. v. Alarm Factory Inc.*, 2015 ONSC 3542, 2015 CarswellOnt 8530 (Ont. S.C.J.)

^{ix} *Biancaniello v. DMCT LLP*, 2017 ONCA 386, 2017 CarswellOnt 6974, (Ont. C.A.)

^x *Lippa v. Colletta*, 2017 ONSC 1122, 2017 CarswellOnt 2382 (Ont. S.C.J.)

^{xi} *Bragg Creek Community Association v. Tyco Integrated Fire & Security Canada, Inc.*, 2019 ABQB 226, 2019 CarswellAlta 628 (Atla QB)

^{xii} *Smith v. Hawryliw*, 2020 SKQB 169, 2020 CarswellSask 320 (Sask QB)

^{xiii} *Creston Moly Corp v. Sattva Capital Corp.*, 2014 SCC 53, 2014 CarswellBC 2267

^{xiv} *Ibid.* at para. 58

^{xv} *Peters v. Soares*, 2019 CarswellBC 319, 2019 BCSC 189 (BC SC)

^{xvi} *Plas-Tex Canada Ltd. v. Dow Chemical of Canada Ltd.*, 2004 ABCA 309, 2004 CarswellAlta 1290 (Atla CA)

^{xvii} *Bhasin v. Hrynew*, 2014 SCC 71 (CanLII) at para. 93.

^{xviii} *Swift v. Eleven Eleven Architecture Inc.*, 2014 ABCA 49, 2014 CarswellAlta 153 (Atla CA)



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Everything's coming up Millhouse: Island 27 in the Otonabee River

By Dr. Brian Ballantyne, O.L.S. (Hon), A.L.S. (Hon)

Abstract

A headland can morph into an island, title to which can be millhoused. Also, damming might be so gradual as to cause erosion in law. Wait ... what?

Coming up Millhouse

It was the worst of days and the best of days for Millhouse. At first, he was dismayed that his pants were too short: "Oh, I hate these flood-pants." Things changed, however, when his house was flooded, and he discovered the merits of truncated trousers: "Hey, they're working. My feet are soaked but my cuffs are bone dry. Everything's coming up Millhouse."¹

This is an allegory for what happened on the Otonabee River in Smith Township between 1818 and 1868, as captured in an August 24, 2021, decision of the Court of Appeal.² The most significant finding is that the decision was a win for three First Nations – Curve Lake, Hiawatha, and Mississaugas of Scugog – in their claim³ to an island in Lake Katchewanooka in the Otonabee River (see Figure 1). Flooding of the upland riparian parcel benefitted the First Nations – They millhoused the island.

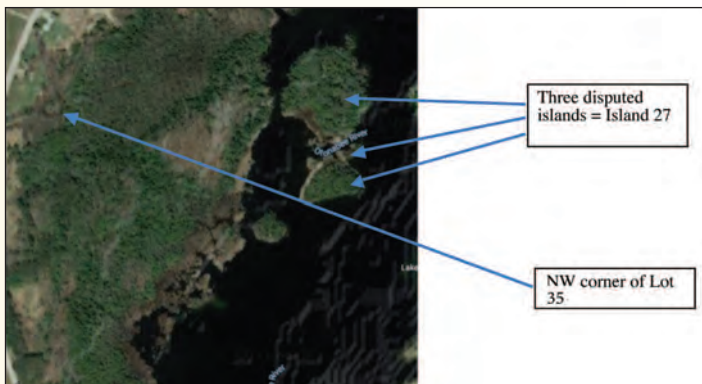


Figure 1 - The three disputed islands in the Otonabee River (Google Maps - 2021).

Sadly, millhousing is not the focus of this article.⁴ Regulated watercourses – regulated by dams and weirs to maintain water levels or flows⁵– bedevil with the distinctions between the effects of artificial structures and natural forces, between gradual and sudden changes to the water's edge, and between water's edge at time of survey and time of patent. This case clarifies these distinctions brilliantly; describes the reality of islands, sometimes formed when a headland detaches from the upland owing to higher waters;

and sows doubt into the doctrine of accretion.

Application⁶

The estate of William Herold⁷ applied for three things, the significant request was to quiet title to Lot 35, Concession 11, Smith Township, so as to include Island 27.⁸ Island 27 consists now of three islands – essentially Parts 7, 8 and 9 and the nearby riverbed, lying some 20 m east of the water's edge of the Lot 35 upland⁹ (see Figure 2 – Plan 45R-15645).

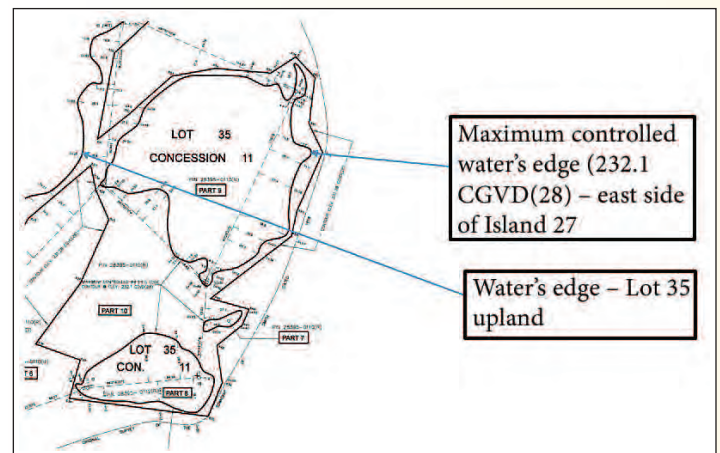


Figure 2 - Island 27 = Parts 7, 8 & 9, and the intervening riverbed (extract from Plan 45R-15645 – 2013).

The application judge acknowledged that "the title ... has been plagued since 1868 by uncertainty" about whether Lot 35 included Island 27.¹⁰ The Herold Estate retained OLS 1; the First Nations retained OLS 2 – both did much research. The application judge found their reports to "be instructive and make for interesting reading."¹¹

Both OLSs agreed that the south part of Smith Township was surveyed by Deputy Surveyor Wilmot in 1818, bounded on the east by the Otonabee River. Wilmot did not traverse the river; he merely sketched the location of the water's edge, as reflected in the title of the Township plan – "concession lines surveyed but the waters are not traversed only sketched." On August 22, 1818, Wilmot surveyed the Concession 11/12 road along the north boundary of Lot 35 easterly to the river a distance of 24.88 ch. For the first 19.5 ch the ground was high; for the final 5.38 ch he traversed "lowland, ash and elm, to an ash tree marked and blazed ... on the shore of the river." A headland protruded from Lot 35 into the river in 1818 (see Figure 3).¹²

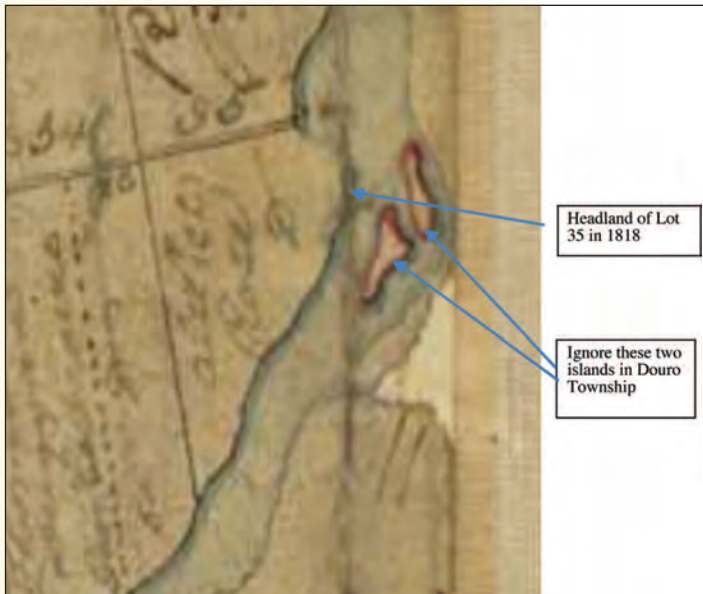


Figure 3 – Extract from Smith Township plan, showing Lot 35 headland (1819).

Both OLSs agreed that Lot 35 was patented in 1868, and that much stuff happened in the 50-year gap between survey and patent. When Lot 35 was patented, the headland had ceased to be. In its place was an island – Island 27, which continues to exist in the same location (albeit as three smaller islands). The river was regulated by dams constructed at Lakefield in three phases: circa 1830 for saw and grist mills, circa 1840-1860 for the floating of logs, circa 1885 for Trent Canal navigation. Island 27 had come into being by 1855, when Haslett surveyed the islands in the Otonabee River (see Figure 4 – Plan 3080 CLSR-ON).¹³ Both OLSs agreed that the 5.38 ch of lowlands had been flooded after 1818 and before 1855, and that the distance of 5.38 ch corresponds well to the current distance from the water’s edge of the Lot 35 upland to the east edge of Island 27.

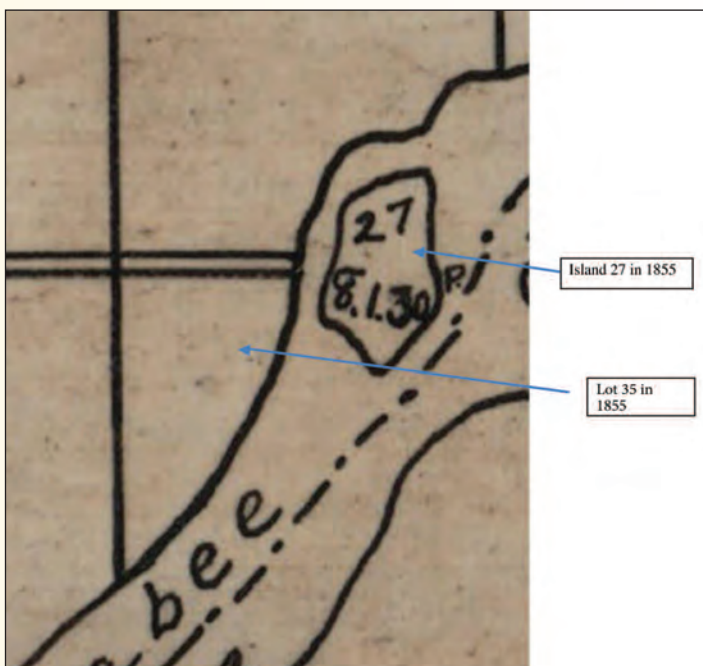


Figure 4 – Extract from Haslett’s plan of islands in the Otonabee River (1856 – Plan 3080 CLSR).

The effect of the raised waters on Lot 35 was significant. By 1940, the area of the Lot 35 upland (i.e. excluding the islands) was some 12 ac, according to topographical mapping (see Figure 5).¹⁴

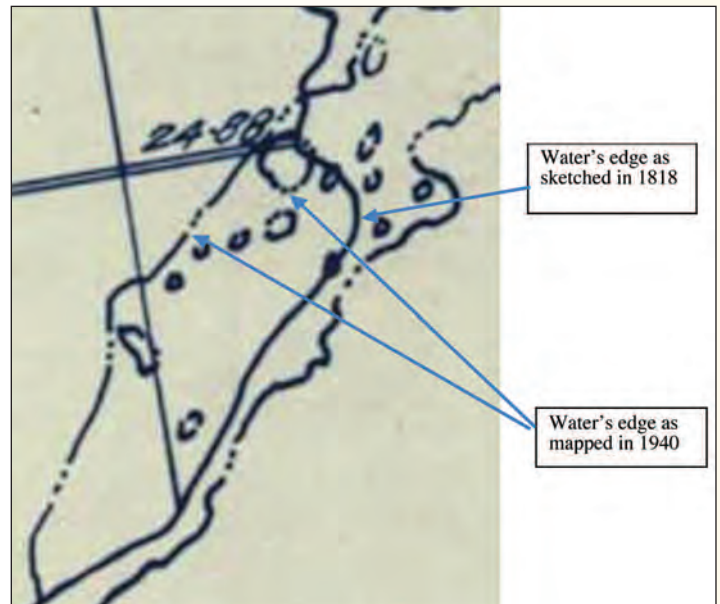


Figure 5 - Extract from Ontario Lands & Forests plan, showing effect of higher waters (1940).

OLS 1 concluded that the waters of the river had been raised some 2.5 ft by the 1830s and suggested a contour to represent the water level in 1818. OLS 2 rendered no conclusion about the effect of damming nor about the elevation logic of OLS 1, noting that there was no evidence as to the elevation of the water in 1818 (date of Township survey), in 1855 (date of island survey) or in 1868 (date of patent). Both agreed that there was no evidence of gradual erosion creating Island 27 from the Lot 35 headland. Finally, both agreed that re-establishing the 1818 contours in the narrow channel between the Lot 35 upland and Island 27 should be approached with caution.¹⁵

So, with such agreement between the two OLSs – that an island existed in fact in 1868 at the time of patent – surely there was no dispute? Right? Hah. OLS 1 boldly concluded that Island 27 was included in the 1868 grant as part of Lot 35; that the land acquired by the patentee included Island 27. OLS 2 concluded that it is likely that the lands now existing as the three subject islands (i.e. Island 27) were part of the lands included in Lot 35 at the time of the 1818 survey.

The application judge accepted the two OLSs opinions, that “the islands in the lake adjacent to the subject property were actually higher elevations on the lot [35] prior to the flooding”¹⁶ and addressed three issues.¹⁷ Let’s focus on the first issue: Did the 1868 patent include Island 27?¹⁸ The application judge answered: Yes, the 1868 patent included Island 27, because the riparian boundary of Lot 35 was fixed in place when the waters were raised by the Lakefield dam in the 1830s. This meant that Lot 35 now consisted of three parts:

cont’d on page 32

- Much upland, west of the current water's edge.
- Island 27:
 - Parts 7, 8 & 9.
 - Some inundated land – ostensibly riverbed.

The decision hinged on the effects of artificial flooding, on the *Surveys Act*, on the *Beds of Navigable Waters Act*, and on the intention of the parties. First, the flooding of the river “for clear, unobstructed and reasonably deep waters to support the commercial and private traffic” was a “lengthy and gradual process” that created Island 27.¹⁹ Second, the riparian boundary of Lot 35 as surveyed in 1818 was “true and unalterable”, pursuant to s.9 of the *Surveys Act*. That is, the boundary of Lot 35 was based on the water's edge “prior to the Crown grant and subsequent flooding.”²⁰ The application judge relied on *That fuzzy shadowland* monograph, published by Natural Resources Canada in 2016, for the principle that the date of survey was critical.²¹ Third, the application judge dismissed the *Beds of Navigable Waters Act* as irrelevant, because it was not enacted until 1911.²² Finally, the application judge held that it was mere “speculation” to suggest that the patentee intended to receive only to the water's edge in 1868. That is, if the Crown did not intend to grant Island 27 in 1868, then it would have excluded Island 27 from the parcel described in the patent.²³

The application judge doubled down on the principle set out in *That fuzzy shadowland*²⁴ that:

When water levels are quickly raised through a process that is not gradual, then the boundary of the property in question is fixed in location at the time of encroachment.²⁵ That principle is set out in an article²⁶ produced and published by no less an authority than Natural Resources Canada.²⁷

Sadly, *That fuzzy shadowland* sets out no such principle.²⁸ Nevertheless, the application judge ordered that title to Island 27 be vested in the Herold Estate.

Appeal

The Respondents – the three First Nations and Canada – appealed. Boundary issues are mixed questions of fact (what existed in 1818 and 1855/68) and law (boundary principles from the courts), which are normally accorded deference upon appeal. However, the Court of Appeal (CA) showed no deference to the application judge because he had made three “extricable errors of law,”²⁹ that included misusing *That fuzzy shadowland*. Germane to this article is that he misapplied the “legal principle about the effect of sudden changes in water levels between different owners.”³⁰ Thus, the CA affirmed the appeal, and held that Island 27 was excluded from the 1868 patent and did not vest in the Herold Estate.

There was little quibbling about the facts; all parties agreed that:

- Lot 35 was described by reference to Lot 35, Concession 11, Smith Township.
- The Township plan of 1818 showed Lot 35 as a

riparian parcel bounded by the river.

- Island 27 was beyond the water's edge and “not connected” to Lot 35 upland in 1868.

The CA dissected the “three legal principles” identified by the application judge:

- The Bed of Navigable Waters Principle.
- The Ambulatory Principle.
- The Flooding Principle.

Recall that the application judge rejected the *Beds of Navigable Waters Act*, because it was enacted 43 years after the patent. The CA held that the basis for rejection was wrong – the Act applies retrospectively to patents issued before 1911. However, this error was immaterial, because the Act and thus the principle do not apply to Island 27, which was always above water and never part of the bed.³¹

Recall, also, that the application judge referred to the principle that a riparian boundary has the potential to shift in location, if the shift is gradual. Thus, a riparian parcel can lose through erosion and gain through accretion. The CA noted that this Ambulatory Principle is set out in *That fuzzy shadowland* (page 31)³² and that the application judge had applied the principle to Lot 35 as of 1818 – the date of survey. This led to the crux of the biscuit,³³ which was the application judge's use of the Flooding Principle, whereby the boundaries of a parcel are fixed in location if the encroachment of water is sudden. The CA noted that the Flooding Principle set out in *That fuzzy shadowland* (page 39)³⁴ had been incorrectly applied by the application judge to Lot 35 as of the 1830s – the date of flooding.³⁵

The first error in applying the Flooding Principle was that it was unsupported by the facts. On the one hand, the application judge found that the rise in water levels was “a lengthy and gradual process” that began in the 1830s and culminated in the 1880s. On the other hand, he referred to *That fuzzy shadowland*, which sets out that the Flooding Principle only applies “through a process that is not gradual” (page 44).³⁶ This inconsistency was described by the CA as a “discrepancy” – applying the Flooding Principle (which relies on a non-gradual change) when the application judge “found the opposite,”³⁷ that the raising of the waters was gradual.

The Herold Estate tried to buttress the application judge's use of the Flooding Principle by arguing that water levels had been artificially raised. The CA scoffed, noting that the only criterion is rate of change, not the cause of the change.³⁸ *That fuzzy shadowland* (page 29) was relied on for this criterion.³⁹ To sum up this error, the CA held that “on the factual findings of the application judge, the Flooding Principle was not applicable. It was thus an error of law for him to apply it.”⁴⁰

The second error was to apply the Flooding Principle to a time before the Crown patent. The CA noted that, although the application judge relied on *That fuzzy shadowland*, the monograph says exactly the opposite – that the Flooding Principle only applies after the time of patent, and that “the

time of survey pales into insignificance” (page 5).⁴¹ In other words, the CA was critical of the application judge for twisting the boundary principle from *That fuzzy shadowland* into its opposite.

Bonus principle

The CA clarified that extrinsic evidence can be used to resolve a latent ambiguity in a parcel description, and that a latent ambiguity exists when the description is applied to the land that “raises an issue about the location of a boundary.”⁴² Island 27 did not exist when surveyed in 1818 but it did exist when patented in 1868. Thus, its existence raised an issue about the boundary of what was conveyed in 1868.

Conclusion

Writ small, the case tells us that headlands can morph into islands, that Island 27 was excluded from the 1868 patent and did not vest in the Herold Estate, and that OLS research was invaluable.

Writ larger, the case reinforces the riparian boundary principles that:

- Boundaries are fixed in place if the encroachment (or retreat) of water is sudden.
- Such encroachment (or retreat) is only relevant to fixing boundaries after the date of patent.
- The rate and direction of change of the water’s edge between survey and patent is irrelevant.
- Boundaries can shift gradually, owing to the unintentional effect of an artificial structure.
- Ontario legislation vesting navigable beds in the Crown applies to patents before 1911.
- Extrinsic evidence can be used to resolve a latent ambiguity in a parcel description, as when the description raises an issue about the location of a boundary.

Writ largest, the case suggests that damming of the waters of the Otonabee River (perhaps the entire Trent Canal) can be a gradual process, meaning that upland riparian parcels have the potential to erode in law. Certainly, this was the finding of the application judge and the argument of the First Nations,⁴³ a finding/argument that was not questioned by the Court of Appeal.⁴⁴



Dr. Brian Ballantyne, OLS (Hon), ALS (Hon) is intrigued by boundary principles: <https://boundaryintelligence.ca/> He can be reached at brian_ballantyne@hotmail.com

¹ *The Simpsons*. Season 10 – Episode 19. December 20, 1998.

² *Herold Estate v Canada (Attorney General)*, 2021 ONCA 579. The appeal period to the Supreme Court of Canada has not yet expired. If leave to appeal is sought, and if leave to appeal is granted, and if the appeal is successful, then I will write a follow-up article.

³ Much of the dispute dealt with the effects of Treaty 20 (1818), Treaty 78 (1856), and Crown Resolution (1893) that retained islands for First Nations’ use: A fascinating issue, worthy of its own article.

⁴ This article has been critiqued by five surveyors. They are responsible for any errors. Probably.

⁵ For upstream navigation or downstream flood control, or for downstream power generation.

⁶ *Herold v Attorney General of Canada*, et al, 2020 ONSC 1202.

⁷ Deceased.

⁸ The two other requests were to discharge from title three 1893 resolutions in favour of the First Nations, and to convert the PINs to land titles absolute.

⁹ “Lot 35 upland” is shorthand to describe that part of Lot 35 now west of the river (i.e. not covered by water) and excluding any islands (e.g. Island 27).

¹⁰ ONSC. Para 3. This uncertainty persisted despite the analysis by Pierce OLS in 1936, who observed that the easterly part of the Lot 35 (as surveyed in 1818) was covered by water through which tree stumps protruded, and that two small islands existed where a headland had existed in 1818.

¹¹ ONSC. Para 2.

¹² Two islands were shown across the mid-point of the river in Douro Township to the east; ignore them.

¹³ Everybody agreed that Island 27 was shown too far north by Haslett in 1855, probably because he did not re-establish the Concession 11/12 road. Nothing hinged on that error.

¹⁴ Such areas are approximate, in the absence of a shoreline traverse in 1818.

¹⁵ There was other stuff on which the OLSs (including OLS 3, retained by Canada and OLS 4, who prepared the R-plan) opined, such as that:

- The wetland along the shore was not patented, resulting in a parcel size of a mere 21 ac.
- A neck of land continued to join Island 27 to the upland, relying on an assumed contour.
- The river (as part of the Trent Canal system) had not been retained by Canada at Confederation.
- Haslett erred by misinterpreting his instructions in 1855, because Island 27 was part of Lot 35.

The court thought the channel contour and Confederation issues were “interesting.” ONSC. Para 12 & 13

¹⁶ ONSC. Para 11

¹⁷ ONSC. Para 21. The other two issues are fascinating; such analysis waits for another day.

¹⁸ Weirdly, the Applicant argued that the island was formed by flooding in the 1870s, after the 1868 patent, contrary to the findings of its expert – OLS 1 – that the island existed by 1855.

¹⁹ ONSC. Para 24.

²⁰ Spoiler alert: Island 27 was not caused by flooding subsequent (i.e. after) to the patent.

²¹ Para 29. Ballantyne. *Water boundaries on Canada lands: That fuzzy shadowland*. NRCan. 73 pp. 2016. Admittedly, a brilliant compendium – trenchant and irreverent, insightful without being pedantic. Nevertheless, such reliance was wrong; the principle says the opposite – the patent date is critical.

²² ONSC. Para 32. Foreshadowing: The correct decision, for the wrong reason.

²³ ONSC. Para 34.

²⁴ Again, a stellar publication.

²⁵ Again, flooding after – not before – the patent is determinative.

²⁶ Not an article – a monograph.

²⁷ ONSC. Para 37.

²⁸ The application judge completely roached the principle. Apparently.

²⁹ The other two errors of law are worthy of examination. Elsewhere.

³⁰ ONCA. Para 5 & 37.

³¹ ONCA. Para 60.

³² ONCA. Para 61.

³³ Zappa. “The crux of the biscuit is the apostrophe.” *Stinkfoot song – Apostrophe* album. 1976.

³⁴ ONCA. Para 61.

³⁵ ONCA. Para 63.

³⁶ ONCA. Para 69.

³⁷ ONCA. Para 70 & 71.

³⁸ ONCA. Para 73.

³⁹ Yet again.

⁴⁰ ONCA. Para 74.

⁴¹ ONCA. Para 76.

⁴² ONCA. Para 40-55, with an emphasis on para 48-49.

⁴³ Weirdly argued. Its expert – OLS 2 – concluded that there is no evidence of erosion creating Island 27 and that it is more likely that flooding caused by downstream damming created Island 27.

⁴⁴ This principle must be further examined, because downstream dams typically raise upstream waters suddenly, not gradually – *Gall v Rogers*, 1993 CanLII 5446 (ON SC).

Moving towards an online degree in surveying/geomatics in Canada

By Marie C. Robidoux, C.L.S., Registrar, Canadian Board of Examiners for Professional Surveyors

The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

Introduction

The Canadian Board of Examiners for Professional Surveyors¹ (CBEPS) is engaged with its members – 10 of 11 Canadian self-regulating land surveying associations, except for Québec – in moving its examinations towards an online degree in surveying/geomatics.

This project is funded by the Government of Canada's Foreign Credential Recognition Program, and the Association of Canada Lands Surveyors is providing CBEPS with administrative support during the project.

The project's objectives are to academically prepare future generations of surveying and geomatics professionals where they live, build upon technologies to strengthen Canadian society and develop our future workforce.

Canadian Board of Examiners for Professional Surveyors (CBEPS)

CBEPS is an organization created by Canadian land surveying associations to harmonize the technical components required to become a Canadian licensed land surveyor across the country.

All land surveying associations under the common law system are members of CBEPS and have total control on the Canadian technical requirements for their land surveyors/geomatics professionals. CBEPS establishes, assesses, and certifies the academic qualifications of individuals who apply to become land surveyors and/or geomatics professionals in Canada, except for Québec as it has a civil code system.

CBEPS created a National Syllabus complete with study guides and learning outcomes to assist candidates in preparing for the examinations which occur twice yearly in a number of locations in Canada.

The current National Syllabus' main components are anywhere from 10 to 20 years old.

Therefore, the CBEPS National Syllabus is being modernized to account for new approaches and technologies. This will go hand in hand with a Canadian online surveying/geomatics degree.

At the same time the current accreditation of academic institutions and course exemptions must also be modernized to reflect the new National Syllabus.

Project Description

The project is divided into 3 phases:

1. Modernize the CBEPS National Syllabus to meet changing societal needs and priorities, and adapt it to a future driven by technological change;
2. Update the CBEPS Accreditation and Exemptions Process;
3. Develop a clear path to an online Canadian surveying/geomatics engineering degree.

1. Modernize the CBEPS National Syllabus to meet changing societal needs and priorities, and adapt it to a future driven by technological change

The National Syllabus Team is composed of representatives from several educational institutions, both universities and colleges, from all land surveyors' associations, and a representative from an industry association.

More than ever, the intersection between subjects is causing duplication of learning outcomes between not necessarily similar subjects. The modernizing effort will also examine the redundancy in subjects caused by their intersection.

The current syllabus does not address either the expanded role of the profession in areas such as land management, project management, new technologies and new uses of new and old technologies.

Currently the National Syllabus is composed of 12 compulsory core subjects and 5 elective subjects as follows:

Core Requirements:

- C1 Mathematics
- C2 Least Squares Estimation & Data Analysis
- C3 Advanced Surveying
- C4 Coordinate Systems & Map Projections
- C5 Geospatial Information Systems
- C6 Geodetic Positioning
- C7 Remote Sensing & Photogrammetry
- C8 Cadastral Studies
- C9 Survey Law
- C10 Land Use Planning & Economics of Land Development
- C11 Business Practices & the Profession
- C12 Hydrography

Elective Requirements:

- E1 Spatial Databases & Land Information Systems
- E2 Advanced Hydrography
- E3 Environmental Management
- E4 Advanced Remote Sensing
- E5 Advanced Photogrammetry

The core and elective requirements are supported by detailed learning outcomes and study guides².

All institutions that are accredited cover all of the CBEPS subjects' learning outcomes through one or more courses. A candidate graduating from an accredited program, upon presentation of his/her transcripts, automatically qualifies for the certificate of completion.

For institutions that do not have full accreditation but have course exemptions, a candidate must submit a transcript identifying the subject they wish to be exempted from to be granted the exemption.

Educational institutions in Canada have been moving towards “attributes” and “competencies” for some years as they follow educational requirements in their province as well as for engineering program certification.

Proposed Syllabus

The new proposed syllabus will have a different format that will emphasize and group items under a larger umbrella.

For example, one of the syllabus subjects called “Modelling & Analysis” may include items such as modeling and prediction; estimation and approximation; filtering; and statistical data analysis. This would be a departure from having this subject focusing only on least squares estimation and data analysis without learning how and where it can be used.

In doing this thorough review of its National Syllabus, CBEPS wants to move from a prescriptive content to a more flexible competency and learning outcomes type of syllabus to keep pace with the Canadian academic institutions and other accreditation entities.

The syllabus work was tackled by a group of 25 people with a mix of academics and land surveyors. A small task force was formed to bring to the whole group a list of proposed components for a new syllabus. This was discussed, debated and modified until the group was satisfied and could approve in principle a list of 8 proposed components for the new CBEPS syllabus. This list was also approved in principle by a majority of the land surveying associations. Following approval in principle of the proposed syllabus components, smaller clusters composed of a combination of academics and land surveyors were formed to work on each component in more detail.

A collaborative and consensus-building approach was taken to engage representatives from academia and industry to:

- Determine relevant content for current and future land surveyors
- Develop draft competency-based learning outcomes

The final list of proposed components is:

- C1 – Mathematics and Sciences
- C2 – Modeling and Analysis
- C3 – Geodesy
- C4 – Surveying
- C5 – Remote Sensing
- C6 – Geospatial Information Systems
- C7 – Law, Tenure, Boundaries, Cadastres and Planning
- C8 – Professional Practice

The clusters' work was carried out between May 10 and June 11, 2021. The following Competency Summary Map Template was used for each component and an experienced facilitator worked with each cluster.

COMPONENT 1: Specific Cluster to be discussed				
LEARNING OBJECTIVES				
• High-level learning objectives for the cluster				
Key Principles	Motivation	Knowledge (must know)	Critical Thinking (must be able to think through)	Competency/Learning Outcomes
Topic	Reasoning for why the topic is of relevance to surveyors (what's in it for them?)	"Must know" content to be covered to achieve competency-based learning outcome	Critical thinking required to ensure knowledge results in learners being able to apply knowledge in a working environment rather than learn to pass an exam	Measurable, action-based learning outcomes that result in a learner being successful in the workplace

The final draft of proposed components for the new CBEPS syllabus are now with the surveying associations for their review and comment. CBEPS is hopeful that the new National Syllabus may be available to all interested academic institutions across the country in 2022 so they can examine its content.

2. Update CBEPS Accreditation and Exemptions Process

The current process is out of date and academic institutions have been requesting a modernization of the process that can provide them with more flexibility than what is currently available.

In 2019, the exemption process received an update where institutions requesting accreditation of a syllabus subject, besides the course(s) content, are also required to list the graduate attributes that are addressed in the courses that

cont'd on page 36

cover the syllabus item. Then they describe where and how they are covered in each course.

The attributes are:

- Investigation and critical thinking
- Problem solving, creative thinking and design
- Communication (ability to communicate complex land surveying and survey engineering concepts)
- Individual and teamwork skills
- Project management
- Professionalism, ethics and equity
- Awareness of the impact of surveying and associated development on society and on the environment
- Commitment to lifelong learning

Proposed Process

The new process will require providing flexibility to educational institutions while not compromising the new syllabus currently in development.

The current process is heavily tilted towards meeting the learning outcomes in each syllabus subject, i.e., content oriented, whereas the proposed process will rely more on competencies, expectations and learning outcomes.

The expectation is that the new process will enable educational institutions to provide all the essential learning required by the syllabus as identified by competencies, attributes or other mechanisms and to then focus their program on their specific expertise or the “nice to have” areas where they shine. Each institution in Canada generally has a different focus for their “nice to have” or specialized areas.

Such an environment would also allow the institutions to put their funding to work in a more balanced way instead of just trying to match course contents to a syllabus.

3. Develop a clear path to an online Canadian surveying/geomatics engineering degree

The last phase is concerned with developing a clear path to a Canadian online degree in surveying/geomatics engineering.

The end result is not to end up with an online degree ready to roll out but to pave the way for such a degree. Working with educational institutions, land surveying associations and industry, we hope to achieve this in the not-so-distant future.

Once the groundwork of a modern syllabus and flexible accreditation and course exemption processes are finalized, and they have received approval from the stakeholders, the group will turn its attention to the question “how can we make this online degree happen?”


There are already numerous ideas to bring us there, including having each institution provide different modules which could be based on their specific expertise. Another idea to consider is that each institution provides their own degree as long as a candidate has not taken more than a



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certain percentage of courses at another institution or other university, which is the current process.

The main difficulty with this phase of the project is centered around what the institution will find palatable and how provincial governments will react.

This is also why the ultimate goal of this project is not to end up with an online degree but with a reasonable and achievable map of the process.

Conclusion

CBEPS anticipates that the whole process’s renewals and a detailed, clear map towards an online degree in surveying/geomatics engineering will be a game changer for Canada. It will open up the profession to internationally trained professionals like never before and at the same time make it possible for numerous Canadians to enter the industry while learning from their home location.

The hope is that many more candidates will join the ranks of the many Canadian surveying firms and assure the industry’s future.

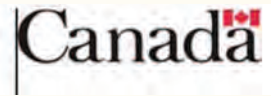


Marie C. Robidoux, C.L.S. received her early education in Quebec and graduated in law from Université Laval. After moving to Alberta, she received a Surveying Technology Diploma from NAIT in Edmonton. In 1993 she was commissioned as a Canada Lands Surveyor and moved to Yellowknife, Northwest Territories in 1994 to work for the Surveyor General

Branch. In 2000 Marie moved to Calgary and worked in various industries as a CLS and Indigenous relations advisor.

Marie currently works as the Registrar for the Association of Canada Lands Surveyors (ACLS) as well as the Registrar for the Canadian Board of Examiners for Professional Surveyors (CBEPS).

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¹ <https://cbeps-cceag.ca/>

² <https://cbeps-cceag.ca/resources/learning-outcomes-and-study-guides/>

Sites to See

GIS Day – November 17, 2021

<https://www.gisday.com>

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Using Digital Terrain Models (DTM's) in Remotely Piloted Aircraft System (RPAS) OPERATIONS

By Thomas Hoppe, B.Tech., O.L.S.

In 2020, I had been contracted to provide aerial orthophotos for pre-construction assessment for the Trans Mountain Pipeline from just north of Kamloops, BC to Merritt, BC. The terrain is somewhat mountainous, though to be fair, I am biased after living in the foothills of the Rocky Mountains with peaks as high as 10,000ft or 3,000m, so when I see a mountain with a peak of 5,500ft, it's just a long haul of getting my gear and backside up there if I have to walk. The vegetation consists primarily of sage brush and rocks. If you didn't know better, you would think you were in Arizona during the summer months. When you get to higher altitudes and different soil conditions, you'll encounter fir and lodge pole pine forests but not necessarily dense such as you would encounter in say Algonquin Park. It's actually quite pretty though I could do without the rattlesnakes.

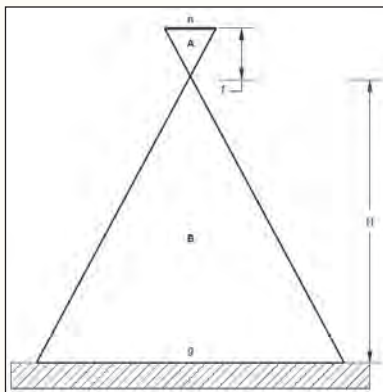


When flying drones and building orthophoto mosaics, one of the requirements for this process to work properly is to maintain a decent photo scale. When referring to photo scale, just remember:

Large Scale = Zoomed In (high detail)

Small Scale = Zoomed Out (less detail)

Scale of Photograph = Altitude AGL / Focal Length



In high altitude aerial photography, the terrain relief in the flatlands of the prairies or South-Central Ontario for that matter isn't a problem. When you get urban areas with large multi-storey buildings, we need to deal with vertical displacement. Get to rolling hills

and mountainous regions, we need to start taking consistent photo scale into consideration. Consistent scale will allow us to create ortho mosaics that are consistent and correct. It also aids the photogrammetric software in being able to producing ortho imagery.

When we take into account the use of drones, the first thing we realize is that we're flying low to the ground – no more than 122m or 400ft – and typically, I like to fly between 45m and 90m for the best

resolution and precision. Even minor relief in the terrain starts to become an issue – think a quarry with multiple benches. How do we resolve this dilemma then?

The solution is quite easy in theory, just fly at a constant altitude above ground (AGL). Easier said than done, and there are some idiosyncrasies to handle. Firstly, your flight management software needs to be able to “fly the terrain”, that is, it needs a DTM model to adjust the altitude of the drone with respect to the surface. In this way, you can theoretically maintain the same altitude above the ground while flying your mission and thus maintain a consistent photo scale.

Here are the issues you will face:

- DTM does not reflect changes to the terrain – old DTM, new surface in the mine/quarry/subdivision
- DTM is of low resolution* and large tiles

**NOTE: The base DTM provided in many advanced flight management systems is free and is the SRTM which stands for the Shuttle Radar Topography Mission (SRTM) Digital Terrain Elevation Data. The resolution or accuracy of this data is approximately 16m at 90% RMSE.*

- DTM does *not* deal with what sits on the terrain – structures and vegetation
- Altitude restrictions
- Starting altitude

One of the first surprises I encountered in the very first

mission was the multiple restrictions. I flew within 1,400m of the threshold of runway 27 of Kamloops Regional Airport. This means that I was flying in controlled airspace and in close proximity to actual low altitude operations that consisted not only of general aviation, but scheduled commercial flights. My desire to fly at an altitude of 60m AGL became a restriction on my operations as that is what I asked for. In the excitement of conducting the flight and my own laziness, I elected to start at the bottom of the "hill".



The drone is designed to use the starting altitude as "0" and go from there. With the altitude restrictions programmed in, that meant that from the bottom of the hill, I could only climb to 60m, which was quite the surprise when my drone approached the rock face and got up close and personal with it. It was then that I realized that the altitude restriction was more of a priority than the terrain to follow. Realizing my error, I slugged up the 140m slope (which was at 30°+) and started at the top and worked downward. Now my altitude restriction wasn't being an

impediment, and the drone then flew the mission descending as it went.

The second issue faced was in the use of the standard SRTM DTM – the tiles are big at 30m so the altitude changes are somewhat abrupt and disconcerting. During one of my flights, the DTM directed my drone to fly upslope at an altitude of 1m AGL, then zoom straight up 60m! So much for my photo scale. Note the power pole at the bottom

right of the image on page 40 for scale.

As luck would have it, the client provided access to the new high resolution DTM created during the project engineering design. My flight management software allowed me to import my own custom DTM and from there, the work flowed much more smoothly without the drama.

The conclusion I can draw from my experience is that:

- Use a drone flight management app that allows for

cont'd on page 40

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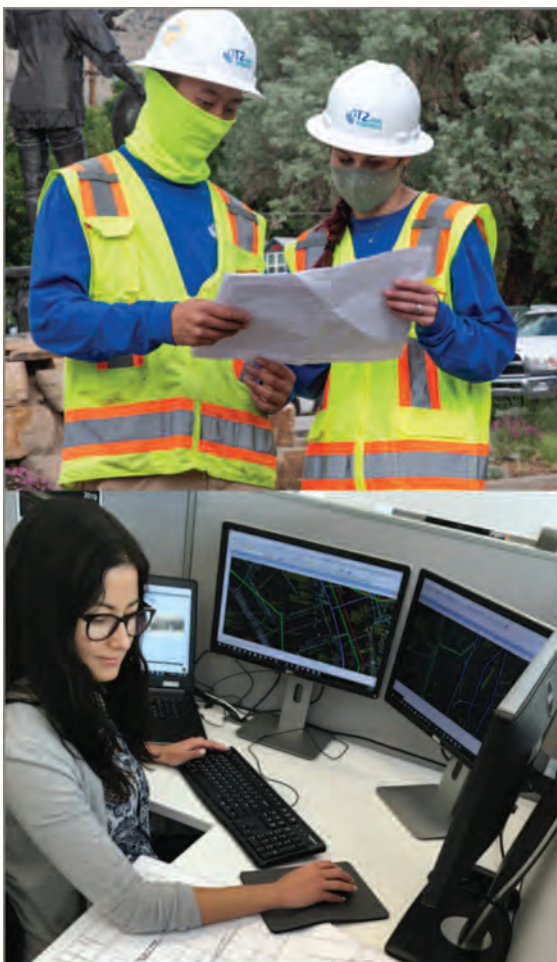
- the use of a DTM – and preferably a custom DTM
- Fly downhill if you have a large relief
 - If you're flying a quarry/mine – fly each bench independently from different starting points
 - Always remember your altitude restrictions and the impact on the terrain
 - Don't be lazy, climb that hill/mountain – you could use the exercise



Thomas Hoppe is the Owner/Manager of 43 Degrees North Enterprises Ltd. He has been employed in the Geomatics industry since 1986 with international and unique positioning technology experience. He began his surveying career in Ontario, Canada, and has lived and worked in several locations throughout North America holding multiple roles from Professional Surveyor, Geomatics Business Development, Manager Aerial Survey Operation, RPAS Pilot – Operations Manager, GNSS/UAV

Equipment Sales and GNSS/UAV Technical Support, UAV Ground School/Flight Instructor, Transport Canada Authorized Flight Reviewer (RPAS), Technical Trainer and National GNSS Training Manager.

Thomas' home base is in Lake Country BC (Kelowna) where he currently provides RPAS aerial surveys, contract RPAS pilot services, RPAS data processing and aerial survey support services throughout Canada. He can be reached at thoppe@43north.ca for further information.



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EDUCATIONAL FOUNDATION NEWS

Congratulations to our Award Winners!

York University – Lassonde School of Engineering – Timothy Kehoe and Alexander McGillis are the recipients of the 3rd Year Highest Aggregate GPA Awards (Fall 2020/Winter 2021), which are awarded to two Geomatics students who have successfully completed 102 credits and achieved the best grade point averages from the core curriculum in their third year of study.

AOLS Donation from the 2021 AGM

This year the AGM was held virtually, which meant that there couldn't be a Welcoming Party and the Exhibitors' Draw, which is one of the most important events for the Educational Foundation. However, to help make up for this missed fundraising opportunity, the AOLS donated \$3000 from the proceeds of the

AGM. The Board of Directors would like to thank the AOLS for this generous donation.

November 1st – “Invest in our Future” and join or renew your Membership

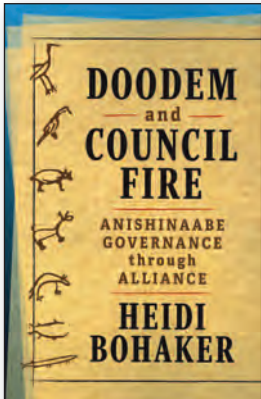
Over this past year, the Educational Foundation has awarded a total of \$42,740 out of its allotted \$51,500 to many post-secondary students enrolled in surveying and geomatics courses at several colleges and universities. Since 1975, the number of award winners who have become Ontario Land Surveyors has increased to 104 and 16 of our current articling students have received awards. To continue to offer these awards we need your support. Please *Invest in our Future* and consider making a donation to the Educational Foundation. For information visit the Educational Foundation page on the AOLS website <https://www.aols.org/about/educational-foundation>

The Educational Foundation would like to recognize with thanks a donation made in the memory of Jim Bowman.

BOOK REVIEWS

Doodem and Council Fire Anishinaabe Governance through Alliance

By Heidi Bohaker



Published by University of
Toronto Press
ISBN 978-1-4426-1543-4

While Canada's constitution protects Indigenous treaty rights, Canadians know much less about the legal traditions of Indigenous nations and the ways in which these different traditions informed treaties made between Indigenous peoples and the Crown. *Doodem and Council Fire: Anishinaabe Governance through Alliance* is a ground-breaking exploration of one Indigenous legal tradition. In it, the author explains how a uniquely Anishinaabe category of kinship, the *doodem*, structured governance and law as practiced in formal councils (referred to metaphorically as fires) through the practice of alliance formation. Such alliances created relationships of interdependence, which were renewed through the exchange of gifts in council.

The records of early Canadian treaties, Bohaker

argues, are to be found in the records of gifts exchanged to create these alliances between council fires; the Anishinaabe treated the French, and later the British, as if their governments were council fires also. In return, colonial officials adhered to Indigenous law when they entered into treaties. Bohaker weaves together a voluminous amount of research from both Anishinaabe and European sources, including archival documents and material culture from institutions in Canada, Britain and France, to describe the continuities and changes in Anishinaabe governance and law until settler colonial law (the Indian Act) replaced traditional governance with elected band councils.

Information taken from The Osgoode Society for Canadian Legal History.

The Politics of the Canoe

Edited by Bruce Erickson and Sarah Wylie Krotz

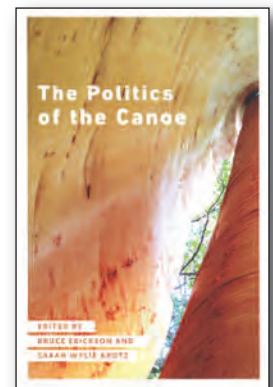
Popularly thought of as a recreational vehicle and one of the key ingredients of an ideal wilderness getaway, the canoe is also a political vessel. A potent symbol and practice of Indigenous cultures and traditions, the canoe has also been adopted to assert conservation ideals, feminist empowerment, citizenship practices, and multicultural goals. Documenting many of these various uses, this book asserts that the canoe is not merely a matter of leisure and pleasure; it is folded into many facets of our political life.

Taking a critical stance on the canoe, *The Politics of the Canoe* expands and enlarges the stories that we tell about the canoe's relationship to colonialism, nationalism, environmentalism, and resource politics. To think

about the canoe as a political vessel is to recognize how intertwined canoes are in the public life, governance, authority, social conditions, and ideologies of particular cultures, nations and states.

Almost everywhere we turn, and any way we look at it, the canoe both affects and is affected by complex political and cultural histories. Across Canada and the United States, canoeing cultures have been born of activism and resistance as much as of adherence to the mythologies of wilderness and nation building. The essays in this volume show that canoes can enhance how we engage with and interpret not only our physical environments, but also our histories and present-day societies.

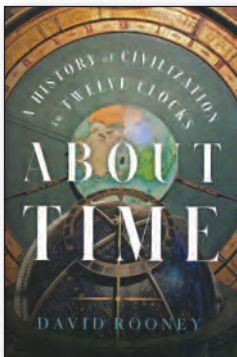
Information taken from the back cover.



Published by University of
Manitoba Press
ISBN 978-0-88755-909-9

About Time A History of Civilization in Twelve Clocks

By David Rooney



Published by W. W. Norton
& Company
ISBN 978-0-393-86793-0

For thousands of years, people of all cultures have made and used clocks: city sundials in ancient Rome, medieval water clocks in imperial China, hourglasses fomenting revolution in the Middle Ages, the Stock Exchange clock of Amsterdam in 1611, Enlightenment observatories in India, high-precision clocks circling the Earth on a fleet of GPS satellites that have been launched since 1978. Clocks have helped us navigate the world and build empires, and have even taken us to the brink of destruction. Elites have used them to wield power, make money, govern citizens, and control lives – and sometimes the people have used them to fight back.

Through the stories of twelve clocks, *About Time* brings pivotal moments from the past vividly to life. Historian and lifelong clock enthusiast David Rooney takes us from the unveiling of al-Jazari's castle clock in 1206, in present-day Turkey; to the Cape of Good Hope observatory at the southern tip of Africa, where nineteenth-century British government astronomers moved the gears of empire with a time ball and a gun; to the burial of a plutonium clock now sealed beneath a public park in Osaka, where it will keep time for 5,000 years.

Information taken from inside the front cover.

The Last Word

By W. Bruce Clark, Surveyor General



I am delighted to say a few words of introduction as your new Surveyor General. In May 2020, I returned to Ontario and joined the Office of the Surveyor General (OSG) after 14 years practicing land surveying in Alberta. During that time, I obtained my ALS, while maintaining my OLS (I am a 30-year veteran) and returned “home” regularly to attend most AOLS AGM’s - if only as an excuse to lace up skates with Pat Hills and the gang.

Joining the Ontario Public Service, after a career largely in the private sector, I recognized a need for a refresher on Ontario legislation, MNRF (now MNDMNR) policy and current survey practices. I also realized how little I knew about the management of Ontario’s vast Crown Lands, the preparation of descriptive Regulation plans, and providing expert advice to Crown Land Patent Registry, MNDMNR district offices and to the Legal Services Branch when a boundary becomes the issue of a dispute. These are all now part of my daily responsibility.

Perry Molloy was persuaded to delay his retirement to show me the ropes, and Sue MacGregor allowed me to shadow her for months, taking the time to pass along her knowledge and experience. I have been greatly assisted by the team of dedicated professionals I inherited within OSG; I have been impressed by their professionalism and commitment to service since day one, especially considering all they have had to deal with in the past 18 months.

Delegated with oversight of the *Surveyors Act* and the *Surveys Act*, I sit as the minister’s representative on AOLS Council. I have long admired the working relationship between the membership, Council and the

Surveyor General. I marveled at Sue’s ability to always put protection of the public first, to convey complicated technical information to a general audience and deliver hard messages to the membership as required. She is a tough act to follow.

While negotiating new directions within a newly amalgamated ministry our goals will be to continue our pursuit of operational excellence and to streamline several long-standing processes to move towards a more digital workplace. We will finish scanning our massive collection of nearly 125,000 historic records and put them online.

OSG has seen the retirement of several long-term colleagues and this trend will continue for the foreseeable future. We have been successful in recently hiring land surveyors from outside the ministry and the province! – but the difficulty in attracting and training professional staff in a competitive market remains. The demographic makeup of the AOLS requires a significant influx of new surveyors and it is vitally important that professionals remain in the public service to provide direction and guidance to Government.

I look forward to working with the membership and Council on several initiatives, from attracting students to Geomatics education to overcoming professional governance challenges. As we go forward, please don’t hesitate to reach out to me or the rest of the OSG team. We are all in this together and it’s going to be an interesting journey!



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Editor & Publication Manager:

Maureen Mountjoy, O.L.S., O.L.I.P.

Production Manager:

Lori Veljkovic

Advertising Manager:

Maureen Mountjoy, O.L.S., O.L.I.P.

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