

Ontario Professional Surveyor



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The Mattawa River

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Know your History – Part 12 –
Surveyors, First Nations and
Reconciliation; Part 1: History
Together, We can Reduce the Errors
made by Surveyors – Risk
Management Advice

plus our regular features

Educational Foundation
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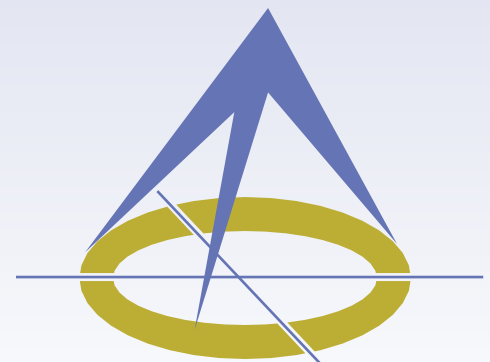
ON THE COVER ...

The Mattawa River, photo credit Ontario Parks. The Mattawa River, located in Samuel de Champlain Provincial Park, is associated with First Nations history, with the exploration of Canada, and the fur trade. For the First Nations, as well as the French who came to the region in the 1600s, this waterway was a vital link from the St. Lawrence Valley to the upper Great Lakes. Tom Bunker’s article on page 6 makes reference to the North West Company, which was based in Montreal. Every spring flotillas of huge voyageur canoes travelled along the river loaded with trade goods to service their trading posts all across Canada. The Mattawa River was designated as a Heritage River in 1988. Its place in Canada’s history is commemorated by provincial and national historic site plaques in the town of Mattawa.

*Professional
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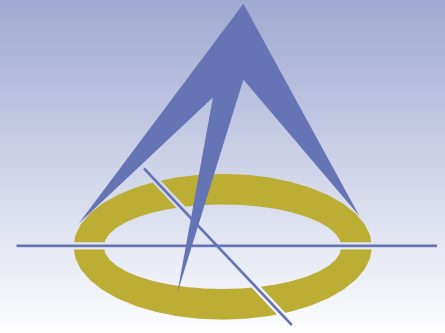
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President's Page

By V. Andrew Shelp, O.L.S.



I was speaking with the Executive Director of the Alberta Land Surveyors' Association (ALSA), and after congratulating me on my presidency, he went on to describe the nature of the articles penned by the presidents in *their* quarterly. It went something like this... the first article thanks those who made their presidency possible; the second one talks about the problems in the association; the third one outlines how they are trying to solve the problems; and the fourth one stresses how quickly the year has gone by. Since my first article bucked the trend, I thought I would continue to be different. So here goes...

When we last spoke, I was entering into Day 2 of the BCLS AGM, and I was expressing my feelings of being at an in-person AGM. The remaining two days solidified my initial thoughts... that the in-person experience far exceeds anything that is possible in the sterile digital environment. Next stop, Jasper, Alberta and the ALSA.

For those who have never been to Jasper, you should go. It's just like you would imagine. Surrounded by snow-covered peaks and a beautiful glacier-fed lake, it truly is a postcard in person.

The first day of the AGM was professional development day and started in the same manner as the BCLS AGM. The first speaker was a woman presenting about DEII (diversity, equality, inclusivity and—a new one for me—Indigeneity). She was well spoken and started by telling her own story about her experiences with discrimination. It centered around her, as an executive in a private company, sitting in a board room with six others, all of whom were men. One man turned to her and said: "I can't work with you because you are a woman." Shocked, she asked the man to repeat what he had just said, and he did. Still in wonderment, she again asked him to confirm his statement and, once again, he did. This bothered her immensely, but what shocked her the most was the fact that none of her associates came to her defence as the situation was unfolding. As she exited the room, two of her colleagues approached her to apologize to her for how she had been treated. She thanked them, but still wondered about the support she *didn't* get during the meeting and, subsequently, she quit from the firm the next day. I thought about what I would have done if I had been in the room that day. I convinced myself that I would have said something to right the injustice and the ill treatment she had

received. I believed that I would have done the right thing.

Her presentation continued with the subject moving towards unconscious bias and was followed by a question-and-answer session. An older man with a long beard and cane walked up to the microphone and addressed the concept of unconscious bias. He said that many of these things were cultural and passed down from parents to children. That sounded about right, I thought. But then he continued, and what he said made me stop in my tracks and cringe (and for those who know me, this takes a lot!). He talked about how, when he was young, black licorice candies were referred to in a completely racialized and unacceptable term. He referred to them *as they were known at the time* several times during his discussion and saw nothing wrong with what he was saying. The presenter remained calm and engaged the man in conversation... not so shocking, given her professionalism. But what *did* shock me, however, was that given her own story about being discriminated against in a public forum, *she* never stood up for the people in the room who may have been offended by the word the man kept using. I was equally shocked when no one in the meeting said anything to the man to inform him that what he was saying was not appropriate, and that he should stop, or leave the room. The more I thought about it, the more the shock turned inward. Why didn't I stand up and say something to enlighten the man? I could say that it was because I didn't know anyone. I could argue that it was not my AGM. I could also excuse myself because I was there in an observational capacity only. All just excuses. I was disappointed in myself. If there is anyone reading this now who may have been there and been offended, I apologize for not doing the right thing.

The remainder of the meeting and the President's Forum were like those I experienced in BC, with lots of in-person, lively conversation, and topical discussions (on lack of educational institutions, the introduction of professional governance acts, the separation of regulatory and membership functions presently performed by the association, etc.).

Next stop... the Professional Engineers Ontario (PEO) virtual AGM. This group, like the two previous associations, are grappling with the same issues of self-governance, regulatory and membership services, and diversity, equity and inclusion (DEI) concerns. The PEO has an initiative called 30 by 30. They are hoping to increase the number of newly licensed engineers who are women to 30 percent by 2030.

cont'd on page 4

Executive Director's Notes

By Brian Maloney



Just as my deadline for this article was approaching, I lived through the severe storm that barreled across the province on the May long weekend. What was supposed to be a relaxing weekend with my family turned into a lot of worry and the start of weeks of clean up. About 20 mature trees were blown over, 6 of which ended up on our house. Fortunately, no one was injured, and houses can be repaired. I am normally self-sufficient, and I pride myself on being able to complete most of my own work and not rely on others. Unfortunately, this tree removal was beyond my abilities and required equipment that we don't have and could not rent. As we waited for help, I wondered if this is not the same type of situation for surveyors' clients.

We were frustrated at the lack of return calls and the inability to get help. One company that promised to come by never did and then wouldn't return calls or texts. When we ultimately got a call from the organization dealing with our insurance claim, they were prioritizing the work but did get a company to come out based on the risk of further damage or injury. The company that showed up had the right equipment, which was impressive, and the right knowledge and skill. They told us about the challenges for equipment access, removing the trees safely and the impact it would have on our property. They worked quickly and skillfully and did a great job of removing the trees without causing further damage to our house (I can't say the same for the yard).

So why am I telling you this? I suspect many of our clients feel a bit like I did when they are trying to get surveying services that they don't have the knowledge, skills, and equipment to perform themselves. Like me they are looking for help and are focused on their own needs and their outcomes. I was looking for a timely return of my call, an understanding of my needs, an understanding of the urgency, honesty about their ability to complete the required work safely within a reasonable time frame, and an estimate of the cost. When they got to the site, I wanted them to show respect for my property (i.e., attempt to limit the damage or impact), a sense that they knew what they were doing and could explain the challenges, process and risks associated

with their service and what the outcome might look like. I expected them to work carefully and diligently and complete the work as discussed. In the end they did this, and I ended up asking for a quote on additional work that will be required and will not be covered by insurance.

I suspect most surveying companies take a similar approach and provide adequate communications throughout the project from the original call, through the work process, to the review of and reporting on the products, and finally to the explanation of the costs shown on the invoice. Unfortunately, I know from the phone calls we receive at the AOLS office, this is not always the case. Failure to properly communicate or perform the work in a diligent fashion impacts your company's reputation and the reputation of our entire profession. While I recognize that surveying companies are as busy as they have ever been and can't keep up with work, that doesn't prevent them from taking a few minutes to explain the situation, discuss alternatives and timelines. A few minutes of conversation can go a long way in easing a member of the public's concerns and building an understanding of the challenges for your services and products. It can help them understand the complexity of the work and help dispel the myth that we "just measure between the pegs". It strengthens your reputation and the reputation of surveyors.

I would urge you to discuss these matters with your staff, who are your envoys during the performance of the survey. Well trained staff, who can respectfully explain what they are about to do, work diligently and with care, and leave the property in the condition they said it would be in, help make the client feel that they are getting value for the fees that you are charging them. In the end it boils down to putting yourself in the client's shoes. They are interested in their needs and hopefully you can make them feel that they have received good professional services for good value and leave them understanding a little more about the complexities of surveying and the value of our profession.



President's Page (cont'd from page 2)

Let's hope they are successful in their pursuit.

I guess the message of this article is that DEII is a major concern for us as an association, and for us as a community. While we may not be guilty of the sins of our ancestors, we should recognize the issues and be sensitive to those who have been mistreated.

If you *see* something, *say* something! You never know who may be in the room and who might be offended by what you or somebody else has said or done. Take your opportunity and do the right thing.



Know your History — Part 12

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

The following article is Part 12 in a series of historical articles by Tom Bunker.

Surveyors, First Nations and Reconciliation; Part 1: History

In this era of reconciliation, if we want to move beyond the empty rhetoric of “improved relations between Canadians and Indigenous peoples,” we’re going to need to have some tough conversations about land, territory, and who can access it.¹

Since “first contact,” surveyors, initially as explorers and mapmakers, have been on the land and engaged with First Nations peoples. Over my nearly 50 years as a surveyor, I have acted as a consultant to Canada and to First Nations Councils and administrators and have been engaged with First Nations individuals as clients, contractors, co-workers, employees, and fishing friends, from Rama in the south to Moose Factory in the north, Lac Seul in the northwest and places between.



July 1 weekend 1969, when I was invited by the Hunter family to go trout fishing in a creek on the south shore of James Bay, east of the Moose River.

I have observed that each community is composed of a variety of individual personalities and opinions, not unlike the many non-Indigenous places I called home. They can have, however, a strong resistance to outsider influences.

Records acknowledgement

It must be acknowledged at the outset that the non-Indigenous understanding of the history of colonialism is based on the diaries, letters, reports, instructions, grants, and other documents archived by Europeans while Indigenous historical views were shared and maintained orally. A bias must be recognized even in records made of Indigenous concerns, comments, and agreements that were documented by colonists through language interpreters.

Background

The Americas were incidentally “discovered” by European explorers during their quest to find a more economical route to China. By the mid-1500s, the Spanish had established colonies in the Caribbean and in Central and South America by brutal conquest of the Indigenous people they encountered. Samuel de Champlain sailed with the Spanish to the Caribbean island of La Désirade and others

and then to Mexico in 1599ⁱⁱ and was disturbed by the Spanish treatment of both Indigenous and African slaves.

In the 17th century, European merchants were granted exclusive trading monopolies to “the new world” by their kings, who were generally supported at court by land-holding noblemen and a lesser investor/merchant class, and they ruled over a non-influential peasant worker society.

English explorers were established along the Atlantic coast of North America at Jamestown, Virginia in 1607, and the Dutch were in the New York area by 1614. The Dutch West India Company purchased Manhattan Island from the local Indigenous peoples in 1626. French King Henry IV had authorized Pierre Dugua sieur de Mons to explore the area now known as the Bay of Fundy, with Champlain as lieutenant, in 1604.ⁱⁱⁱ Settlement was based on trade in furs and other resources that could be acquired from the aboriginal population. The small number of trader colonists were not a physical threat to the larger native population. Nonetheless, the British and Dutch traders established themselves by purchasing land for their base settlements.

Without regard for any First Nation, on the basis of *terra nullius*, King Charles II granted a trading monopoly (and the land?)^{iv} of the drainage basin of Hudson Bay to “the Governor and Company of Adventurers of England trading into Hudson Bay” in 1670 (The Hudson’s Bay Company).

Quebec and French Canada

Samuel de Champlain (1567–1635)

Samuel de Champlain is the first relevant surveyor and mapmaker in Canada, beginning with a few weak attempts at settlement in Acadia. He eventually established permanent settlements after exploring at Tadoussac (1603) and Quebec (1608) in the St. Lawrence Valley. While the French claimed the land of New France *by discovery*, his philosophy was one of co-existence with the people of the watershed whenever he could obtain alliances. In 1609,^v he joined with the Montagnais, Algonquin and Huron to make an attack on their Mohawk enemies near Lake Champlain, with his objective to discourage Mohawk attacks in the St. Lawrence Valley.

Champlain made an investigation up the Ottawa River valley in 1613 where he famously lost his astrolabe, which wasn’t found until 1867. In 1615, he made an excursion up the Ottawa River, crossing through Lake Nipissing and Georgian Bay before returning through the Severn River system. He participated with the Huron and Algonquin

nations in an attack on their Onondaga Iroquois enemy south of Lake Ontario, where Champlain was seriously wounded. He recovered during the winter of 1615–16 in Huronia before returning to Quebec. Throughout his time in New France, he encouraged young Frenchmen to live with the First Nations to learn their customs and languages, notably Étienne Brûlé and Nicolas Marsolet, and took a few Indigenous men to France to show them French culture before returning them to their homeland. It wasn't until his settlements were well populated that Champlain began to allocate property to individuals under the French Seigneurial system in 1627.^{vi}



Since its installation in 1925, this monument in Orillia has been subject to criticism. While attempting to show Champlain as a leader of European settlement in Ontario, it places him in a superior position to the First Nations figures below while, according to his own records, Champlain recognized the Huron as leaders in their own territories and fostered mutual respect.

Champlain's reports suggest that the various First Nations groups he encountered were loosely allied to others with similar languages. In governance they operated on a consensus basis, although some individuals might not go along with the consensus opinion, and that they may have had different leaders (chiefs/sachems) for different activities. Most of the groups moved with the seasons of hunting and gathering while some were more settled, especially the Huron, with large villages and tracts of cultivated land.

The earliest reported farm lot survey near the Great Lakes occurred in 1749 by the Frenchman Gaspard Chaussegros de Léry on the easterly bank of the Detroit River at Petite Côte.^{vii}

British North America

The British expelled Dutch control of New Holland in 1664 and thereby consolidated control of most of the Atlantic shore. They continued the practice where Indigenous lands were bought directly by individual settlers.

By a deed signed in July 1701, the Five Nations of the Iroquois Confederacy surrendered a huge tract of land to the British Crown.^{viii} While the described lands included some north of Lake Ontario acquired by earlier Iroquois conquest, it was also acknowledged therein that these lands had been taken in the 1680s by other Nations. Almost at the same

time, an Iroquois Peace Treaty was signed with the French at Montreal.^{ix}

France and England were often at war. The British obtained control of Acadia (Nova Scotia/New Brunswick) through a treaty with the French in 1713.^x

The French and Indian War (in Europe the Seven Years War, 1754–1763) was waged between the British and their Iroquois allies of New England against the French and their First Nations allies in the St. Lawrence region, with the British finally taking control of North American lands by the Treaty of Paris (1763). To better establish administrative control of the territory, King George III issued a Royal Proclamation^{xi} on 7 October 1763 recognizing the boundaries of the Government of Quebec and the limits between the New England colonies and the “lands Reserved to the Indians.” This document has been recognized as the foundation of First Nations land rights^{xii} acknowledgement in Canada.

The proclamation forbade transactions of Reserved Lands except through the government and a Department of Indian Affairs was created with Sir William Johnson (1715–1774)^{xiii} as superintendent.

Johnson had lived on a large estate in the area of New York State that was Mohawk Territory. He learned Mohawk culture and language and had several children with Mohawk women, notably Molly Brant, an older sister of Joseph Brant. Johnson was a significant military leader with Mohawk chief Hendrick Theyanoguin in the Seven Years War. Note the placement of the two figures on the New York statue erected in 1903^{xiv} compared to the Champlain monument at Orillia.



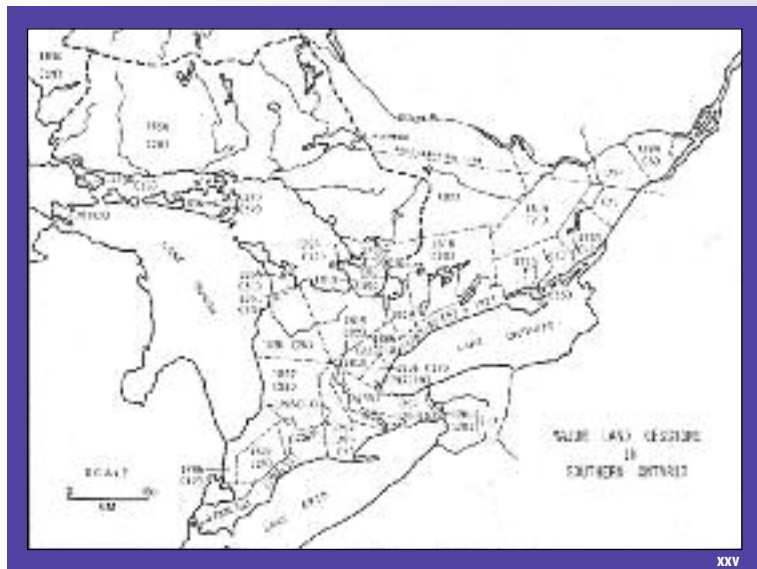
In 1764, Johnson arranged for a land “purchase” from the Seneca along the Niagara River to control communication and transport, but it did not allow for settlement (see Niagara Purchase, 1781^{xv}).

After William Johnson's death, his nephew, Colonel Guy Johnson (1740–1788), became Superintendent General and Inspector General of Indian affairs,^{xvi} followed by William's son Sir John Johnson (1741–1830).^{xvii} The Johnson family and the Brants all played a significant role in the settlement of “Canada” after the American Revolution (1775–1781) when the defeat of the British resulted in about 30,000 Loyalist emigrants from New England, including Iroquois allies.^{xviii}

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The first land surveys for British settlement were in Quebec, under Governor Murray and Surveyor-General Samuel Holland and his deputy, John Collins, both surveyors appointed in 1764.^{xix} Private lands were purchased from First Nations near the Detroit River with reference to surveys made by J. Porlier Benac in 1780, although in breach of the Proclamation.^{xx}

Frederick Haldimand was appointed Governor of Quebec in 1778, and during the American Revolution he needed to support troops in the Niagara area. In 1781, Col. Guy Johnson arranged the purchase of a strip along the Niagara River from the Mississauga, who were now in possession (see also prior Seneca purchase) specifically for settlement. The tract was posted by military surveyors^{xxi} with the settlement marked out by Allan McDonell.



Loyalist Settlement in Canada

Most of the emigrants from New England did not want to settle in the former French territory of Quebec. Governor Haldimand set out to arrange purchases of land near the Bay of Quinte, on Lake Ontario, for both British settlers and Mohawk allies.

These purchases (or treaties?) were fraught with problems,^{xxii} namely:

- Poor record-keeping: e.g., there is no original copy of the Crawford Purchase agreement (1783) if indeed it ever existed.
- First Nations Chiefs attended and signed agreements but might not have had any interest as the agreed land was part of another Nations territory.
- Misunderstanding of actual lay of the land and extent of lands in the agreement – early agreements made reference to topographic features whose positions were not accurately known until after survey (see 1792 correction of the Between the Lakes Treaty of 1784). The Crawford Purchase was for a tract described as deep from the water “so far as a man can travel in a day.”
- Misunderstanding due to the quality of language translations.
- First Nations had no societal concept of “ownership of land” and accordingly no words for grant or cessation of ownership,^{xxiii} while recognizing Nations territories for the resources to sustain their livelihood.

The purchase of lands continued but attitudes toward the First Nations changed after the War of 1812. That conflict was, in part, the result of First Nations in America trying to retain control of their territory and to resist westerly expansion of the American colonies.^{xxiv} The war was settled by the Treaty of Ghent without First Nations participation although the British proposed a First Nations buffer state between Canada and America, a proposal not accepted by the American side. With ever-increasing numbers of colonists arriving from Europe, the First Nations were seen as an impediment to agricultural and industrial development.

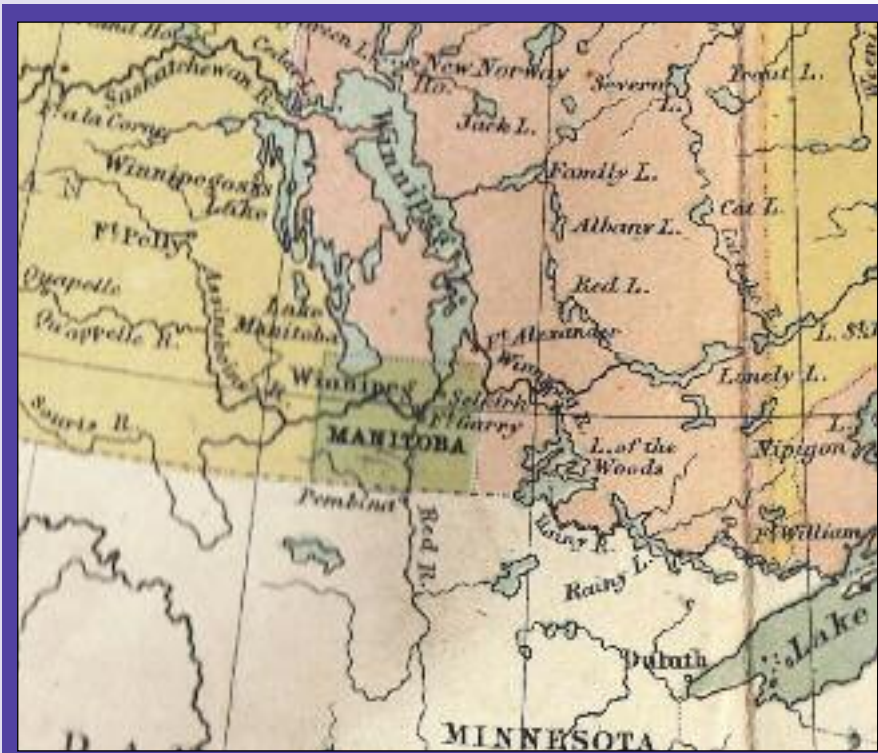
As lands were surveyed into townships and settlers were established in them, pressure continued for colonist access to arable land and forestry and mineral resources, until Canada West (southern Ontario) was covered by purchases or treaties by 1850. After 1870, “the northwest” became part of Canada and many of the issues noted above caused ongoing First Nations land claims that continue to this day across Canada.^{xxvi}

The northwest and the Hudson’s Bay Company (the Company)

The Company had jurisdiction over a large portion of North American territory, exceeding 1.5 million square miles,^{xxvii} about 40% of modern Canada. The Company was primarily focused on the northern part of its territory but was increasingly challenged in trading by the North West Company, which was headquartered at Montreal. To determine the location of trading routes, trading posts, and forts, the Company engaged surveyor Philip Turnor (1751–1799)^{xxviii} in 1778. He went on to train David Thompson (1770–1857)^{xxix} and Peter Fidler (1769–1822)^{xxx} in 1789–90. Thompson and Fidler both married First Nations women and raised families while exploring and mapping the northwest. Turnor retired to England in 1792 to reunite with the English wife he had married at Battersea in 1788, although he apparently fathered four children with a native wife while living in Canada.

The Company merged with the North West Company in 1821 and a new charter was granted, extending the “powers” granted in 1670 and granting a trading licence over all of British North America. The licence was later extended until 1858. Vancouver Island and the British Columbia territory was under colonial rule through the Company, and from 1850 the Company’s chief factor and later governor James Douglas purchased land for settlement on behalf of the Company.^{xxxi} The Company Charter was extinguished in 1858 and the British Government took direct rule.

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The *Rupert's Land Act* of 1868 allowed the surrender of the Company land to the British Crown, which then transferred it to Canada on May 15, 1870. The Company was entitled to

compensation in the sum of £300,000, 1/20th of all the land in a prescribed “fertile belt,” land around its posts, and the right to continuing trade without further tax or tariffs.^{xxxii}

The *Manitoba Act* was negotiated between Canada and the resident Métis and was enacted on the same day in 1870. The Act created a small province and allowed for the allocation of about 1,400,000 acres for the existing Métis settlers.^{xxxiii}

Because the land had not yet been divided by survey, paper “scrip” was issued to be exchanged for 160 acres of land when made available. Many of the scrip changed hands before land was claimed and the allocation of land to Métis was frustrated. In 1872, the *Dominion Lands Act*, which dealt with terms of settlement and amendments in 1874 and 1879, expanded the township survey arrangement, the training required to become a Dominion Land Surveyor, and the method to allocate the portion of land to the Hudson's Bay Company.

The various stages had been set for surveyors to get their hands dirty and feet wet dividing up the countryside for development.



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- ii Chapter 5, *A Spy in New Spain*; Champlain's Dream, David Hackett Fischer, Vintage Canada, 2009
- iii Chapter 8, *ibid*
- iv <https://www.hbcheritage.ca/things/artifacts/the-charter-and-text>
- v Chapter 12, *Champlain's Dream*, David Hackett Fischer, Vintage Canada, 2009
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- vii Page 48, *They Left Their Mark*; John L. Ladell, Dundurn Press, 1993
- viii Albany Transfer of July 1701; often referred to as Nanfan Treaty
- ix <https://www.thecanadianencyclopedia.ca/en/article/peace-of-montreal-1701>
- x Treaty of Utrecht: History of Treaty Making [ap_htmc_treatliv_1314921040169_eng.pdf](https://www.ainc-inac.gc.ca/ap_htmc_treatliv_1314921040169_eng.pdf); www.ainc-inac.gc.ca
- xi <https://caid.ca/RoyalPro010208.pdf>
- xii “upon any Lands whatever, which, not having been ceded to, or purchased by Us as aforesaid, are reserved to the said Indians, or any of them”
- xiii https://en.wikipedia.org/wiki/Sir_William_Johnson,_1st_Baronet
- xiv Battle of Lake George Historical Marker; <https://www.hmdb.org/m.asp?m=9410>
- xv Page 14, *Indian Lands Surrenders in Ontario, 1763–1867*, R. J. Surtees, 1983, *Indian Affairs and Northern Development*; https://www.publications.gc.ca/collections/collection_2017/aanc-inac/R5-350-1983-eng.pdf
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- xxii See details in *Indian Lands Surrenders in Ontario, 1763 – 1867*, R. J. Surtees, 1983
- xxiii The Interpretation Problems; page 23, *The True Spirit and Original Intent of Treaty Seven*, McGill-Queen's University Press, 1996
- xxiv Tecumseh, His Confederacy and the Road to War; In Defence of their Homelands - Canada.ca
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- xxxiii *Modern School Geography and Atlas*, James Campbell and Son, Toronto, 1876

Geomorphology on the Waterfront: The Law Struggles to Keep Up

By Izaak de Rijcke, O.L.S., L.L.M. and Colin Rennie, PhD., P.Eng., FCSCE

We live in an era in which the human impact on the natural environment is unprecedented. Regimes designed to control water for a wide range of purposes exist everywhere to the point that it is not a question of whether or not a body of water is impacted by human activity but rather a matter of the degree to which impact is occurring. In this environment, an understanding of water boundaries and how these are impacted by changes in both geomorphology and flow regulation, becomes even more pressing. Natural processes of erosion and deposition result in river channel realignment over time, but riparian property boundaries change only if bank line changes are deemed to be slow and imperceptible. Water boundaries and their retracement in situations of controlled regulated waterways depend on the specific language in the Crown Patent and subsequent conveyances and their timing relative to licences of occupation by which water levels can be changed. During our joint presentation at the Association of Ontario Land Surveyors' Annual General Meeting in March 2022, these issues were discussed in detail including two recent case law examples. Herein is an abridged overview of the issues that were provided.

River Channel Change

The position of a river in the landscape will change over time due to natural processes of bank erosion and accretion. This is recognized in water law with the principle that a riparian property boundary will adjust over time to track the position of the river bank, but only if the process is "slow and imperceptible." Otherwise, a riparian boundary will remain unchanged despite the river realignment. This qualitative criterion is open to interpretation. Rivers vary widely in morphology, with channel size determined largely by flow discharge, and channel type by valley slope, sediment size and

supply, and riparian vegetation (Church 1992; Millar 2000). Rivers in mountainous areas with low sediment supply tend to be straight with rock steps; these step-pool channels are relatively stable, but can be washed out catastrophically every few decades during infrequent debris torrent events. Channel avulsion is common during these events in which the river channel completely realigns instantaneously along a new path. These realignments are clearly not slow and imperceptible. As valley slope decreases and sediment supply increases, wandering gravel-bed rivers occur. Bank erosion is common in these rivers, and greater sediment supply or reduced riparian vegetation leads to unstable braided channels, with even more prominent bank erosion.

Finally, rivers in lowland areas tend to meander in plan-form, with outer bank erosion and inner bank deposition at meander bends (Figure 1). If sediment supply is low, this process can be slow, although the outer bank erosion may still be perceptible in the form of oversteepened outer banks (Parsapour-Moghaddam and Rennie 2018). It is also worth noting that due to their glacial history, many rivers in Canada are semi-alluvial, with bedrock bed and banks, and thus are relatively stable (Ferguson and Rennie 2017).



Figure 1. Outer bank recession, Watts Creek, Kanata, ON. Is this erosion natural, slow and imperceptible?

cont'd on page 14

Based on the wide variation in river channel types and their rates of bank erosion, the determination as to the degree to which river channel realignment is slow and imperceptible is context dependent and subjective. This is further complicated by the fact that bank erosion is often controlled artificially with revetment such as riprap, groynes, and dikes, and these structures can influence upstream and downstream river processes (Kiss *et al.* 2008).

The principle of riparian property line adjustment applies to slow and imperceptible natural accretion or erosion, but the courts have also recognized cases in which gradual accretion or erosion was influenced by river structures placed elsewhere in the river on different properties. It should also be recognized that not all waterfront property owners hold riparian rights: this depends upon the language in the legal documents associated with the property. A surveyed boundary along the water is a fixed property line in terms of character, but can nonetheless meander. In these cases, it can be challenging to identify the original river or lake bank line at the time when the patent, title, or deed was written. This may be accomplished by means of historical air photo analysis. Numerical morphodynamic river models have also been developed to predict river channel change over time (Khosronejad *et al.* 2007).

Flow Regulation

Whether to provide irrigation, prevent flooding, harness hydroelectric power, create transport routes or secure and distribute water for consumption, flow is regulated in many rivers throughout the world by means of dams and weirs, with resulting backwater leading to artificial reservoirs. The water level in these reservoirs is usually controlled within a specified range established through devices such as an easement or licence of occupation, which have important consequences for water boundary law. How do artificial controls of waterways impact our understanding of water boundary retracement?

The retracement of water boundaries is a two-step process which involves first looking at the correct features on the ground that established the original boundary and then the retracement of that boundary today. In doing so, land surveyors must look at both the legal and technical components of their work. For the legal component the surveyor considers the nature and intent of original grants and subsequent conveyances to determine the intent of the grantor and the nature of what they sought to accomplish. This may of course be easier said than done where there is ambiguity in crown patents or conveyancing documents as seen in the ever-growing body of common law concerning water boundaries in Ontario. The technical component requires the surveyor to perform the necessary surveys and measurements in order to capture the spatial extent of the

boundaries of that grant (that is to say the legal interest) as it exists on the ground. Our focus in this paper is on both components, but in the context of an ambulatory water boundary feature. The critical pieces of a water boundary retracement puzzle include the Crown Patent and subsequent conveyances for the parcel in question. By looking at the language, the relative timing and the status of the water level at the time these documents were given effect, the surveyor gets a clearer picture of the status of the water boundary for the purpose of a retracement exercise.

Controlled water levels will often involve an authorized flooding of an upland owner's parcel to the extent permitted by, say, a licence of occupation. A licence of occupation may define a topographic contour line, based on a permitted rise in elevation of a body of water. In considering what this means in terms of ownership along the shoreline, it is important to remember that a licence of occupation does not create an estate in land and does not create a parcel with incidents of riparian ownership. Also important to consider is the fluidity of the landscape. The contour line may change over time as a result of changes in the topography of the shoreline. This is particularly interesting given that such changes in topography may be a direct result of the presence of water at elevations above the natural elevation permitted by the licence of occupation. While such changes may be physically occurring, erosion only has the effect of changing a legal boundary (moving a natural boundary) if the upland parcel is riparian and the process of erosion is slow and imperceptible.

The status of the upland property ownership as riparian depends on whether the boundary of the parcel was in fact at the water's edge *on the day of granting the patent*. For an upland parcel that is otherwise separated from the water's edge to be riparian it would require that the water was raised to the maximum elevation (i.e. the contour line) on the day of the patent and therefore the water's edge would have been coextensive with the boundary of excluded lands under the patent described. If the water was at a lower elevation at that time (i.e. below the contour line), there would have been a gap of dry land separating the private owner's land under patent (limited by the contour elevation line) and the actual water's edge (which is lower than the highest potential elevation). The legal boundary would therefore not necessarily be to the water's edge and would not be a riparian boundary, meaning that it would be fixed in position and may not ambulate as a result of erosion or accretion. Again, whether this occurred in respect of a specific property needs to be researched and evaluated carefully on a property-by-property basis. Such an inquiry would require an understanding of the boundaries of the upland parcels and the extent of any flooding at the time of the crown patent (at, above or below the contour line?).

As noted above, there is a physical movement of soil and fill as a natural consequence of the raising and lowering of water level over time. This is a consideration for the retracement exercise that looks at where the water's edge was at the time of the patent. As such, the present intersection of a water elevation plane with the topography along the shoreline is likely *not* the best evidence of the contour line which served as the legal boundary at time of the patent. It is certainly a challenging task for the land surveyor to essentially travel back in time to determine the elevation at the time of the crown patent. Challenging, but not impossible, as noted above.

Key Considerations for Retracement

In addressing a retracement question related to a water-front boundary, it is important for the land surveyor to be cognizant of the fact that the existing water's edge may not be the best evidence of the boundary. Understanding the timing of how an artificial control regime was applied relative to the surveying, patenting and conveyancing dates is important, it gives information to create the context around which the patent and subsequent conveyances were created.

In trying to reconstruct the history of a changing water-front, the surveyor should look for information in

vegetation, slope, substrate and other shoreline attributes that one may consider outside the surveyor's traditional purview but can provide important information in addition to that which can be gleaned through the tools of monumentation and measurement.



Izaak de Rijcke works in private law practice on complex title and boundary problems. He has taught at Osgoode Hall Law School, while an adjunct professor there. He now delivers two survey law courses through the College of Extended Learning at the University of New Brunswick, while also licensed and practising as an OLS. He is working on a 2nd edition of his book, *Principles of Boundary Law in Canada*, in his spare time.

Colin Rennie is a Professor of Civil Engineering at the University of Ottawa, where he recently served a six-year term as department chair. His expertise is in river engineering, with particular emphasis on channel morphodynamics. He has published over a hundred journal articles, with papers in top journals including *Nature*. He is a Fellow of CSCE, an Associate Editor of the *Journal of Hydraulic Engineering (ASCE)*, and serves on technical committees with CSCE, ASCE, and IAHR.

Build a ‘Surveyor’

By Bill Webb, O.L.S.

“I’ve seen workers carrying those sticks around, but never knew what they were doing.”

“I always thought they were using a camera on that tripod thingy.”

Several times a year, I present an Introductory Survey Course through the “Build This City” workforce development training program in Sault Ste. Marie, and it never ceases to amaze me to receive these types of responses from participants when I inquire as to whether any of them have ever had personal experience with surveying. It seems the work of our industry is still a very well-kept secret to the general public.

First, some background. The Build This City program (<https://btc.saultcareercentre.ca/>) is funded in part by the Government of Canada as well as the Government of Ontario in partnership with Employment Ontario and is implemented by the Sault Community Career Centre and the Sault Ste. Marie Construction Association. The key role of the program is to provide eight weeks of free technical skills training, along with work placement and financial support, for eligible candidates who are 18 years of age or older, a resident of Ontario (legally entitled to work in Canada), and not attending school full-time. It also provides a means for employers to take an active role in recruitment and receive financial support for staff mentors involved in providing the training.

The participants, in my experience, come from a variety of backgrounds, with ages ranging from 18 to 60 years. All have either not yet found a career or, for one reason or another, have been forced to change their career path. This program is very appealing as candidates can be retrained into a new industry rather quickly (aside from formal education), and they can learn about a new industry to see if they have the interest necessary to pursue the required formal education. The number of participants is usually small (6-12 participants on average), however each class runs for a full day so they have a great opportunity to learn the basics of the industry and whether it might be a good fit for them. One thing all participants have in common is their eagerness to learn something new, which is undoubtedly driven by their current state of employment. It is evident from all participants that they appreciate the opportunity to learn a new skill that might lead into a new career.

I typically start in the classroom with basic instructions on Levelling, the equipment being used, and how and why it is performed, followed up with real-world examples. The class is interactive, and each participant has an



opportunity to set up and use the instrument, record data, hold the levelling rod, take measurements, and process the data that has been measured in the fieldwork portion of the class. Depending on time and the aptitude of the class, I also introduce the use/setup of total stations and sometimes even GNSS equipment as well, which is often the icing on the cake for the participants, as they all have it in their cars and already know how it works, right? Sarcasm aside, the amazing part of the day is when you see the satisfaction on their faces after they have taken measurements in the field, processed the data, and then used them to complete a fictitious project – remembering that at the beginning of the day they were calling the instrument a camera!

The most recent course that I presented on April 29 was especially encouraging, as 50 percent of the class were female and they were very engaged and eager to learn about our industry. A typical class might have only one or two women, so I was pleasantly surprised to see such a good representation.

Unfortunately, I do not yet have any information on the participants who attended the course and whether they have since pursued surveying or a related industry, however the way I see it, there are three main possible outcomes from the implementation of this program First, awareness – the program definitely raises awareness of our industry at a personal level of what we do and why we do it. Second, recruitment of technical staff – we all know that our industry is currently overwhelmed with a heavy workload along with a constant challenge to recruit and retain qualified, capable technical staff; this program offers an opportunity to tap into a potential workforce that is hungry for work but generally unaware of our existence. And third, “building new surveyors” – it is quite possible for this program to spark interest in an individual to pursue becoming a professional surveyor, given the opportunity.

There are several committees within our Association that are actively involved in recruitment, and they are doing excellent work, however recruitment into our industry is not simply the responsibility of our peers in these committees, it is the responsibility of each licensed member. If you live in Ontario, if you have a career/employment centre in your community, if you have a local



construction association, then my challenge to you is this – make contact with them and inquire about this program in your community and see how you can get involved. If you do not have this program where you live, let’s get one going. A few participants in each concentrated class conducted several times a year in multiple communities *will* have an impact, so together let’s create a “Build a Surveyor” program!



NEWS FROM 1043

Changes to the Register

MEMBERS DECEASED

Joseph Ronald Eade	878	May 4, 2021
Peter J. Homer	1750	April 15, 2022
Douglas Bruce	1230	April 21, 2022
Kenneth M. Wiseman	783	May 10, 2022

RETIREMENT/RESIGNATIONS

Robert Murdoch	CR136	Jan. 1, 2022
Anthony G. Smith	1600	April 30, 2022
David R. Watt	CR152	May 20, 2022
Robert J. Jordan	1626	June 15, 2022

COFA RELINQUISHED

P.A. Blackburn Limited
North Bay, ON
December 31, 2021

F.S. Surveying Inc.,
Richmond Hill, ON
April 25, 2022

Donald Roberts Surveying Ltd.
Toronto, ON
June 10, 2022

COFA REVISED

Was: D.S. Urso Surveying Ltd.
Now: Monument-Urso Surveying Ltd.
April 14, 2022

Was: Young & Young Surveying Inc. (a subsidiary of Mauro Group Inc.)
Now: Mauro Group Inc.
April 7, 2022

COFA APPROVED

Brooks Lise Surveying Ltd.
Woodstock, ON
May 10, 2022

Surveyors in Transit

The notes and records of **P.A. Blackburn Limited** are now with **Callon Dietz Incorporated Ontario Land Surveyors** in North Bay, ON.

Aroos Ali is now with **J.D. Barnes Limited** in Markham, ON.

Mojtaba Tavallaee is now with **MTE Ontario Land Surveyors Ltd.** in Burlington, ON.

The Toronto office of **Tulloch Geomatics Inc.** has moved to 219 Dufferin St., Suite 206B, Toronto, ON, M6K 3J1.

Michael Masciotra is now with **Tulloch Geomatics Inc.** in Toronto, ON.

Tom Cortens is now with **Tulloch Geomatics Inc.** in Sudbury, ON.

The Maple office of **Pearson & Pearson Surveying Ltd** has moved to 10211 Keele St., Unit 16, Maple, ON, L6A 4R7.

Steve Czajka is no longer with the **City of Mississauga**, he is now with **TELUS** in Toronto, ON.

Arie Lise is now the Managing OLS of **Brooks Lise Surveying Ltd.** located at 514 Princess St., Suite 120, Woodstock, ON, N4S 4G9. Phone: 519-539-8089.

George N. Bracken is now the Managing OLS of **Callon Dietz Incorporated Ontario Land Surveyors** in Carleton Place, ON.

Robert Hawkins is no longer with **Maughan Surveyors (a division of IBW Surveyors Ltd.)**.

Sophie Rose Côté is now the Managing OLS at **Maughan Surveyors (a division of IBW Surveyors Ltd.)** in Parry Sound, ON.

Phillip Robbins is now with **Rodney Geyer, Ontario Land Surveyor Inc.** in Alliston, ON.

Robert Wannack is now with **IN Surveying Ltd.** in Brockville, ON.

The Etobicoke office of **Krcmar Surveyors Ltd.** has closed and the staff have relocated to the main office in Thornhill, ON.

Peter N. Aubrey is now with **E.J. Williams Surveying Limited** in Huntsville, ON.

News from our Members

Vladimir Krcmar, president and founder of Krcmar Surveyors Ltd., is pleased to announce and welcome his granddaughter, Victoria Donko, as the newest Ontario Land Surveyor to the Krcmar Surveying family. Having successfully passed her November 2021 professional examinations, Victoria was officially sworn in on January 26, 2022, via an online Zoom meeting. Victoria joins Vladimir, Saša, Maja, and Tom in their family surveying business in Thornhill.



*Congratulations Victoria.
Your grandfather is very proud of your achievements.*

Together, We can Reduce the Errors made by Surveyors - Risk Management Advice

By Mark Sampson, BBA, FCIP

I had the pleasure of making a presentation during the online AOLS Annual General Meeting this past March. The theme of the meeting was “Ubuntu” or “Togetherness”. From an insurance perspective, we are all “together” ... collectively sharing the good or bad results of the professional liability insurance program. The fewer errors that surveyors collectively make, the better the insurance outcomes will be, and that results in a lower premium charged by the insurance company.

One way to manage your risk is to prevent professionally related errors from happening. During the Plenary Session on Wednesday, March 2, I co-presented a seminar which provided a high-level breakdown of the type and nature of claims that surveyors have experienced in Ontario over the past 4 years. In addition, we outlined lessons learned from common losses and provided some suggestions on best practices to implement in your firm in order to avoid experiencing similar losses.

The co-presenters were members of the AOLS Insurance Advisory Committee: Brian Maloney, O.L.S., Executive Director, Joseph Young, O.L.S., Dan Dzaldov, O.L.S., Alister Sankey O.L.S. and John Breese from Maltman Adjusters.

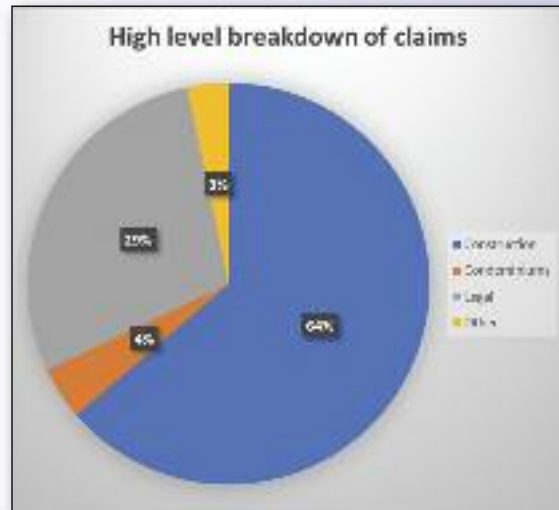
For those surveyors who did not have a chance to attend the seminar, here is a summary of our presentation.

High Level Breakdown of Insurance Claims

- 2017 – January 2022



Construction errors represent 64% of all claims reported during this time period. Legal/Cadastral represent 29% of reported errors. A further breakdown of construction vs. legal is as follows:



The definitions are as follows:

Office Error Calculation – this was used when it was clear that the error flowed from a calculation error in the office

Office Error Check – this was used where it was obvious that the error should have been caught by a check but was

cont'd on page 22

not used when it was a calculation error (e.g. wrong lot number on plan, wrong unit number on condo plan)

Office Error Search – this was used where there was a lack of information that would have been available with a reasonable search (e.g. title search, municipal by-law search)

Field Error – this was used where there was admission that the error was in the field (even though it should have been caught by a check)

Communication – used where internal and/or external communications caused the error (e.g. wrong version used)

No observable error - there was no clear error by the surveyor

Other – errors not covered above

Unknown – the surveyor did not provide enough information to derive a source of error

Common Errors: Layout of Structures

Laying out structures is a common area where we see surveyors making errors that result in losses. Here is a claim scenario and more importantly, suggestions on how to avoid making a similar error.

Claim Scenario

The land surveyor was retained to provide construction layout services with respect to an industrial building. An office calculation error occurred with respect to the location of the gridlines. The baseline reference points used for the insertion and rotation of the digital CAD files, i.e., site plan, structural plan and architectural floor plan, were inadvertently shifted, relative to the calculated boundary limits for the project.

The resulting shift caused the points in the CAD files to move relative to the insured's reference points. As a result, the interior grid lines were shifted by a very significant amount.

What Happened?

The land surveyor analyzed the layout data, noticed the discrepancy with the boundary reference points (GPS, offset site), and determined the points did not match the initial GPS points, set with the initial traverse. When the surveyor created the upload files for layout, they incorporated the files to create the upload files. The surveyor inputted the calculated boundary, then the GPS and traverse points, architectural site plan (imported, shifted and rotated), then the separate model file for the gridlines (calculated independently, then shifted and rotated into place). Once they fit properly, the surveyor merged the files and extracted the points.

The surveyor determined that the traverse (GPS) control points were inadvertently shifted relative to the calculated boundary points during the process of rotation of the other models or possibly during the merging of the file.

The Outcome

There is a significant exposure to liability as there is a possibility that all of the structures will need to be relocated

to avoid conflict with underground services.

Lessons Learned

- Any layout work/calculations completed in the office must be checked by a second set of eyes prior to being given to the field crew.
- Review your internal procedures with respect to importing and rotating external CAD files for use in calculating sites for layout.
- You must have independent and redundant checks for all imported and rotated external CAD files.

Best Practices Suggestion

- Field work check followed by an Office check
 - Completing redundant field checks including hand measuring with a tape (if possible), taking check measurements with an instrument on redundant set points.
 - Completing office checks as soon as possible and reporting any issues to the client.
 - Advising the client not to use set points until the office check is complete and layout verified (this may be difficult to enforce).
 - Keep a duplicate copy of any paperwork (cut/fill sheets, etc.) given to client on site.
- Use of a “Checklist” as a quality assurance and error prevention procedure.
 - Checklists cannot replace common sense, but they will help compensate limited memory and attention.
- Try not to give out GPS coordinates to contractors unless it is a proper control job.
- Provide layout of building corners, gridlines etc. as agreed with offsets and let the contractor come up with the coordinates.
- Follow up layout with a field copy of the point plan without anything dimensioned other than what you staked. Do not provide a layout sheet that will be fully dimensioned that will be used by them to construct as you just took on the architect's liability. Only provide dimensions for offsets so they clearly know what was staked.
- Do not agree to use a CAD file that contains everything the architect had for the building on layers and xreferenced files that you need to manipulate to get to the grids or otherwise that you need.
 - If this is not possible, you need strong version controls (project management) and written client documentation/confirmation.
 - You may want to ask the architect/consultant to review your final computation.



Mark Sampson, BBA, FCIP is the Senior Vice President of Arthur J. Gallagher Canada Limited.

Sites to See

Flood Hazard Identification and Mapping Program (FHIMP)

<https://bit.ly/3NgTGQM>

Flood hazard maps are essential to understanding a community's risk to flooding. In Canada, many flood maps are not always available or up to date. High quality flood mapping that is current and accessible will help governments, communities, and individuals understand flood hazards and implement effective mitigation strategies to reduce the impacts of flooding.

The Government of Canada is investing in its *Flood Hazard Identification and Mapping Program* (FHIMP) to help Canadians better plan and prepare for future floods. In partnership with provincial and territorial governments, the FHIMP aims to complete flood hazard maps of higher risk areas in Canada and make this flood hazard information accessible.

These maps will inform decision-making in support of flood mitigation, adaptation to a changing climate, resilience building, and protection of lives and properties.

Federal Airborne LiDAR Data Acquisition Guideline and the USGS LiDAR Base Specification

By Susan Muleme Kasumba - Business Development Manager, Airborne Imaging

This article is a summary of the Webinar presented to members of BeSpatial Ontario, a not-for-profit organization of geospatial professionals (<https://www.bespatialontario.ca/>), on June 9th 2022. It is intended to outline and compare the key elements of the Federal Airborne LiDAR Data Acquisition Guideline and the USGS LiDAR Base Specification documents. We compiled the most pertinent information out of each 80-page document that we felt folks would be interested in knowing. The topics discussed in the webinar included:

- An introduction to each document
- Summary of point densities, accuracies and reference system
- LiDAR Acquisition
- LiDAR validation and ground control check points
- Hydro-flattening and hydro-enforcement
- Point cloud classes
- Deliverables

Introduction to the Federal Guideline and USGS Specification

Natural Resources Canada first formally created LiDAR guidelines in 2017. The document was created with consultation from several Canadian LiDAR companies and the creator of the USGS LiDAR Base Specification, H. Karl Heidemann. The document was updated in 2018 to version 2.0, and most recently updated in 2020 to version 3.0 https://ftp.maps.canada.ca/pub/nrcan_rncan/publications/ST_Publications_PublicationsST/327/327418/gid_327418.pdf. The USGS LiDAR Base specification was first created in 2010, updated several times, most recently in April 2022 <https://www.usgs.gov/ngp-standards-and-specifications/lidar-base-specification-online>.

The Federal Guideline describes Canadian Quality Level 1 (CQL1). This is the minimum requirement for airborne LiDAR data acquisition in Canada, as well as to support the Government of Canada's National Elevation Data Strategy. The strategy has created specifications for LiDAR data that enable various stakeholders to participate in delivering products that are consistent and standardized across the

country. The document includes 5 appendices that further add specifications and guidelines for LiDAR collection for Forestry, Flood Mapping, High Relief Terrain, Urban Infrastructure Mapping and Airborne Topo-bathymetric LiDAR. By following either of these documents, procurers of LiDAR can be assured that the data meets a standard.

The USGS Specification describes LiDAR data based on 4 Quality Levels: QL0, QL1, QL2 and QL3. These specifications are used for the National interagency 3D Elevation Program (3DEP). Stakeholders from all levels of government and private companies were consulted in the development of this specification. For the purposes of our discussion, we included QL0-QL2.

Summary of point density, accuracy and reference system

Requirements	CQL1	Flood Mapping Risk - High	USGS QL0	USGS QL1	USGS QL2
Aggregate Nominal Pulse Density [ANPD]	≥ 2 pulses/m ²	4-10 pulses/m ²	≥ 8.0 pulses/m ²	≥ 8.0 pulses/m ²	≥ 2.0 pulses/m ²
Aggregate Nominal Pulse Spacing [ANPS]	≤ 0.75 m	N/A	≤ 0.35m	≤ 0.35m	≤ 0.71m
RVA - RMSE	≤ 10.0 cm	5.0-7.5cm	≤ 5.0 cm	≤ 10.0 cm	≤ 10 cm
RVA - 95% confidence level	≤ 13.6 cm	10-15cm	≤ 6.8 cm	≤ 19.6 cm	≤ 19.6 cm
RVA - 95th percentile	≤ 30 cm	N/A	≤ 15.0 cm	≤ 30.0 cm	≤ 30.0 cm
Horizontal Accuracy - RMSE	≤ 35 cm	N/A		See notes below	
Horizontal Accuracy - 95%	60.0 cm	N/A			

Figure 1 Summary and comparison of documents

We have summarized the requirements of the Federal Guideline and USGS Specification in Figure 1.

For the USGS Specification, a requirement for horizontal accuracy reporting was added, however there is no statement of a required horizontal accuracy. The horizontal accuracy value is usually contract specific and depends on the end client. The USGS provides the calculation to assess horizontal accuracy based on ASPRS guidelines. Horizontal accuracy is calculated using the GNSS positional error, IMU error, and flight altitude.

The horizontal datum for both specifications is NAD83 CSRS (in Canada). The epoch is dependant on the region or province, however for Ontario it is 2010. The vertical datum is CGVD2013 (in Canada) for both specifications. To note, historic mapping is typically registered to CGVD28. Data

will not line up when overlaid if delivered in different datums. Some of Airborne's clients have requested delivery in both datums to mitigate problems related to multiple datums. The investment is not cost prohibitive, depending on the over all project budget.

LiDAR Acquisition

The Federal Guideline has more acquisition recommendations than the USGS Specification.

- Both documents require a 100m buffer to be added to project areas as part of the flight plan
- The Federal Guideline requires a minimum swath overlap of 15%, but includes higher overlap recommendations based on the use of the data (i.e., 50% minimum overlap for urban mapping)
- The Federal Guideline recommends a scan angle range between $\pm 20^\circ$ - $\pm 25^\circ$
- The USGS Specification removed flight line overlap and scan angle limits in the 2014 update.

LiDAR Validation - Ground Control Check Points

LiDAR validation ground control checkpoints are divided into two classes; non-vegetated vertical accuracy (NVA), traditionally referred to as hard surface checkpoints, and vegetated

Land cover class or description	Current reporting group
Clear or open, bare earth, low grass; for example, sand, rock, dirt, plowed fields, lawns, golf courses	NVA
Urban areas; for example asphalt, concrete, tall, dense man-made structures	NVA
Tall grass, tall weeds, and crops; for example, hay, corn, and wheat fields	VVA
Brush lands and short trees; for example, chaparrals, mesquite	VVA
Forested areas, fully covered by trees; for example, hardwoods, conifers, mixed forests	VVA

Figure 3 Land cover classes; USGS Base LiDAR Specification 2021; Table 3

variety of ground cover if found within the project area. Figure 3, Land cover classes, describes the land cover feature distribution for NVA and VVA surveys.

Hydro-Flattening and Hydro-Enforcement

Hydro-flattening is the process of modifying the LiDAR derived Digital Elevation Model (DEM) so that hydrographic features such as streams, rivers and waterbodies are level from bank to bank. Hydro-enforcement ensures that water flows downstream in the DEM. These treatments are given to streams and rivers that are at least 30m wide, and water bodies that have at least 8000m².

The process involves creating breaklines along hydro-

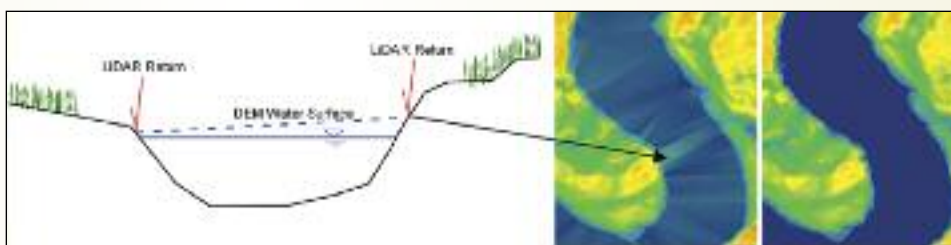


Figure 4 Hydro-flattening- courtesy 4DM Inc.

Project Area (Square Kilometers)	Vertical Accuracy Testing of Elevation Data sets		
	Number of Static 3D Checkpoints in NVA	Number of Static 3D Checkpoints in VVA	Total Number of Static 3D Checkpoints
<500	20	5	25
501-750	20	10	30
751-1000	25	15	40
1001-1250	30	20	50
1251-1500	35	25	60
1501-1750	40	30	70
1751-2000	45	35	80
2001-2250	50	40	90
2251-2500	55	45	100

Figure 2

http://www.asprs.org/a/society/divisions/pad/Accuracy/Draft_ASPRS_Accuracy_Standards_for_Digital_Geospatial_Data_PE&RS.pdf

vertical accuracy (VVA) checkpoints. The check-point distribution follows the USGS/ASPRS guidelines based on the size of the project area.

NVA check-point locations are typically based on easily accessible sites on major roads. When Airborne is completing projects that meet either specification, we request from our surveyor that these points be surveyed at least two metres away from breaklines, sloping ground, or overhanging trees/bush. VVA check points are collected in a

graphic features that meet the minimum requirement for inclusion. The breaklines are then used to create the Triangular Irregular Network (TIN), and a new DEM is generated. The Federal Guideline calls for the delivery of a hydro-flattened 1m grid DEM to be created if the LiDAR data is to be used for flood mapping. The USGS specification calls for a 1m grid hydro-flattened DEM to be delivered with all projects along with the breaklines used to create the DEM.

Point Cloud Classes

The point cloud classes for both documents are essentially the same with the exception of ignored ground, snow and temporal exclusion.

Code	Federal Guideline	USGS Specification
1	Processed, but unclassified	Processed, but unclassified
2	Ground	Bare earth
7	Low points (noise)	Low noise
9	Water	Water
17	Bridge decks	Bridge deck
18	High noise	High noise
20	Ignored ground (typically hydro-flattened DEM not delivered typically breakline proximity)	Ignored ground (typically breakline proximity)
21		Snow (if present and identifiable)
22		Temporal exclusion (typically unprocessed areas (wetland forests)

Figure 5 Minimum LiDAR data classification scheme

cont'd on page 26

Federal Guideline	USGS Specification
- Point cloud; classified data in Las v1.4	- Classified point cloud in LAS v1.4
- Index file; date, naming convention, project name and location	- Bare-earth surface hydro-flattened raster DEM
- Raw data; not required for delivery unless client requested	- Breaklines used in hydro-flattening
- Metadata; XML format using ISO 19115:2003	- FGDC Metadata

Figure 6 Summary of LiDAR deliverables

Deliverables


Both documents provide a list of minimal deliverables, along with details about what is needed for each product.

The Federal Guideline details how reports are to be delivered and specific information that must be included. The USGS Specification lists similar requirements for the

Project Reporting
- Project Planning; methodology, instruments and data collection
- Progress Reports; schedule, %status of collection/ completion, issues or delays if applicable
- Deliverables; field notes for surveying, flight logs, data QA report, deliverable report
- Data Inventory list; Inventory and dictionary describing all data and documentation
Field Data
- Survey control; active/passive station, control points, photos of control and map of base
- Flight information; flight trajectory SDEI, shapefiles with trajectory orientation, time & date
- In situ validation; check point measurements, GNSS field and control data, photographs, maps
- Metadata; XML format using ISO 19115:2003
Data Validation
- Spatial distribution/regularity; results from checking distribution
- Relative accuracy; inter and intra swath comparison
- Pulse density; grid and histogram calculated from pulse density grid data voids; from data void check
- Pulse classification; summary from classification results
- Positional accuracy; RMSE, V&A and horizontal accuracy result

Figure 7 Project Reporting deliverables

same information, however it is included in the Metadata deliverables.

In summary, both the documents allow users to receive LiDAR data that meets a variety of needs. Both documents are updated on a regular basis following real world project results. The key benefit of following a guideline or specification, is that users do not have to guess what to request from vendors. The decision about which specification to follow should depend on the final use of the data. 

Susan Muleme Kasumba is a graduate of Sir Sanford Fleming's GIS/Cartography program and attended the University of Guelph. She has over 20 years of experience in the mapping industry. Susan joined Airborne Imaging in 2011 and is currently Manager of Business Development. Susan has been a member of BeSpatial since 2017 and has held the board positions of Eastern Section Director and President. She is currently the Director of Strategy and Outreach. Susan lives and works in Ottawa. Susan can be reached by email at susank@airborneimaginginc.com

Registrar's Review

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



My time acting as Registrar has been an interesting experience. As I write my last article for the Ontario Professional Surveyor magazine, I reflect on the unique experiences this position has provided to me. The most positive thing that I can express about this position is the people. The staff at the Association welcomed me into this position from my first day on the job. They are not only diligent in their work, but a pleasure to work with. The Association also has a great roster of volunteers who participate on many committees. I have always been overly impressed with the effort and passion exhibited by our committee members.

Many people may consider the position of Registrar as adversarial. While this is true in part, the role also brings fulfillment. The surveyors who I have sworn in over the years will always be the highlight of my time at the Association, and I feel honored to have participated in many students' journeys towards licensure. Of course, there have been difficult circumstances that arise. Disciplinary actions, refusals to grant Certificates of Authorization to members who feel honestly that they would be able to carry that responsibility and dealing with members of the public who may not be satisfied with any recommended approach or outcome are a few of the less appealing tasks that come to mind. However, the opportunity to effect change in a profession so significant to our economy overshadows the negativity that from time to time accompanies the role.

Considering I likely have many years remaining in my professional career, the decision to leave the role of Registrar was a difficult one. To say I will miss the people

and the position would be an understatement. I have experienced pride and fulfillment in many of the things that I have done during my time at the Association. I have learned to handle a leadership role, and to act in the public interest at a high level. The role is unique in the sense that you do not act with the intention of increasing profitability, or to establish connections for monetary gain. Rather, the role requires that one act for the assurance that our profession provides a high level of quality of work to the public. As a self-governing profession, the Association plays a unique role through the training and overall supervision of our membership. There is little in the way of political influence, which allows for a more independent approach to regulation.

Although many may not realize, the Association puts in a great deal of work to balance its regulatory role to ensure that the public is protected, while making best efforts to avoid overregulating the profession. This is a difficult task. At my last Council meeting, there were in depth discussions of the future of our profession and the issues that need to be addressed in the short term. It is clear that the Association, like many other self-governing professions, has a lot of work ahead of it. I have done my best to assist with the governance of our incredible profession, and as I leave the role I am grateful to have participated in helping to keep our profession moving forward, and wish to thank everyone I have worked with and their wonderful contributions to my role as Registrar, and land surveying as a whole.



Sites to See

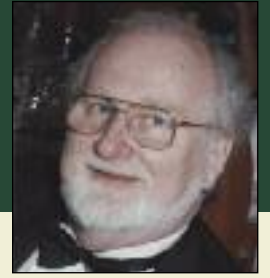
The Geographical Names Board of Canada (GNBC) Celebrates 125 Years

<https://bit.ly/3lgLvbc>

Canada's national coordinating body for geographical names is celebrating its 125th anniversary in 2022. Since 1897, the board has worked to establish standards and practices for the naming of Canada's places and features, and its members have approved over 350,000 official names across our vast geography.

Geographical names surround us and capture the cultural and historical narrative of Canada from past to present. They are especially significant in preserving Indigenous cultures and languages. The policies and procedures of the GNBC have evolved throughout its history, from the early days of explorers recording handwritten names on paper maps, to present day digital communication and interactive maps.

Survey Review Department Forum



By Paul Wyman, O.L.S., Manager Survey Review Department

The SRD Report: “Whatcha talkin’ ‘bout Willis”¹

Plan Titles

“...Then you should say what you mean,” the March Hare went on.

“I do,” Alice hastily replied; “at least – at least I mean what I say – that’s the same thing, you know.”

“Not the same thing a bit!” said the Hatter. “You might just as well say that “I see what I eat” is the same thing as “I eat what I see!”²

In a similar vein, someone once said, “Words are free. It’s how you use them that may cost you.”

Semantics, always the difficulty of choosing words that best convey our meaning so that the reader is best informed. I recently dealt with a member of the public who was concerned that the service rendered was not as expected or desired because the plan title used the phrase “Topographic Sketch.”

I appreciate that there has been considerable discussion within AOLS about the use of various terms – in particular the use of the words “sketch” and “survey.”

The latest AOLS Policy on Sketches (Bulletin 2021-1) suggests the use of the word “sketch” for topographic information. Subsection 1) d of the bulletin provides:

1) Sketches should indicate in their title block the purpose of the sketch, for example, but not limited to:

d) Sketch showing Topographic Information,

Section 16 of O. Reg. 216/10, pursuant to the *Surveyors Act*, provides:

16. The word “survey” and its equivalent in any other language shall not be used in the title of any plan unless the plan has been prepared from a survey of land made for the purpose of establishing, locating, defining or describing any line, boundary, or corner of a parcel of land, or land covered with water.

The surveyor is prohibited from using the more customary term “Topographic Survey” and is perhaps encouraged to use the term “Topographic Sketch.” Unfortunately, the common meaning of the word “sketch” is:

- as a noun – “a rough or unfinished drawing or painting, often made to assist in making a more finished picture” or “a short humorous play or performance, consisting typically of one scene in a comedy program.”
- as a verb – “to make a rough drawing of ...”

With regard to the particular inquiry, I believe that the “topographic sketch” produced by the survey firm was based

on an actual field survey to the standard customary for this type of work. The plan also stated that the property boundaries had not been determined or monumented. The use of the phrase “topographic sketch” and the disclaimer resulted in the client believing that the service provided may have been approximate or incomplete.

I am not suggesting that we should revisit any of these regulations and guidelines to find better words. In all likelihood, we would only work ourselves into a different corner. Personally, I prefer the use of the phrase “Topographic Plan” vs “Topographic Sketch” but, in either case, I believe that the deliverable, either in hard copy or digital, would benefit from notes on the face of the plan that explicitly indicate the origin of the information. For instance, topographic information may be data that is obtained by an actual field survey; it may be information collected from other sources such as the local municipality (i.e., sewer inverts, pipe sizes, etc.); or it might even be proposed from a “lot grading plan” that is to be used for final property grading.

As with all our services, a reporting letter accompanying the deliverable is required. It provides the client with specifics about the project and helps build confidence that their needs have been met. As a reminder, Section 4 of O. Reg. 216/10 – Performance Standards for the Practice of Professional Land Surveying provides:

Report after completion

4. (1) Upon completing a project, a professional member shall provide a project report to the client.
- (2) The report shall include, if applicable,
 - (a) the objectives, scope, area and date of the project;
 - (b) the data sources and dates of acquisition for the project;
 - (c) the names and versions of pertinent software for the project;
 - (d) deviations from the initial project scope;
 - (e) a declaration of compliance with all applicable Acts, regulations under them and practice standards;
 - (f) statements of ownership and authorship of all deliverables for the project, including computer software developed within the scope of the project;
 - (g) an explanation of the limitations of data received, manipulated and delivered under the project;
 - (h) a description of field procedures for the project;
 - (i) a statement describing the project, map projection,

zone, datum, and if applicable, adjustment epoch; and

(j) documentation of all project milestones and quality assurance activities.

(3) Except if an Act or a regulation under an Act requires otherwise, if the professional member is a licensed member performing a cadastral survey, the declaration of compliance mentioned in clause (2) (e) shall be signed and dated by the licensed member and shall be in Form 1.

SRD “Point” Scores

While on the topic of better communication, I would like to take this opportunity to review the SRD Comprehensive Review “point scoring” system.

The SRD Comprehensive Review is a detailed look at several survey projects for a survey firm – usually a minimum of four and a maximum of ten projects. We try to select plans from all the surveyors who have signed plans for that firm in the past year. The project is reviewed against the requirements as set out in the legislation, regulations, and the AOLS Practice Standards and Guidelines.

As part of that process, any aspect of a project that is found to be deficient is rated on a scale of one to ten – one being very minor and ten very serious. A project that has a total score of over twenty-five points might be viewed as substandard. A comprehensive review where the average score for all projects exceeds twenty-five points might be referred to the AOLS Registrar for their consideration. This is pursuant to Subsection 40 (8) of O. Reg. 1026, which provides:

40. (8) The member or members appointed by the Council shall report to the Registrar any instances of non-compliance with the Code of Ethics, the Standards of Practice or any regulations under this or any other Act governing surveying standards.

I have been asked if such a process can be fair and free of bias. To be perfectly candid, no point award system can be 100% free of bias. The umpire calling strikes and balls, the judges rating gymnasts or ice dancers will all have some aspect of bias. The SRD does go to considerable effort to eliminate and reduce the effect of bias.

Firstly, all consultants are appointed by AOLS Council and are selected from members who have years of varied experience in our profession. Consultants undergo training and their first reviews are scrutinized by a senior consultant.

All comprehensive reviews are assigned two consultants.

The primary reviewer undertakes the review, authors the draft report, and scores (rates) any deficiencies. The second consultant then reviews the draft review with an eye to any errors and valuation consistency with our evaluation and scoring. The draft report is then sent to the survey firm under review and an office visit is scheduled. This affords an opportunity for the survey firm to also evaluate the review and scoring and to request changes. The draft report and scoring are often amended as a result of this office visit.

Should a comprehensive review evaluation still exceed an average of twenty-five points per project, the consultant will then refer the review to me as manager of the SRD. Together, we will decide if it should be referred to the AOLS Registrar. In the past, notice of this referral was sent by the consultant to the firm. We have altered this process, and the Registrar will notify the firm if the Registrar believes it is necessary. For reviews that have excessive scores, there is not much discussion or deliberation on my part to refer it. For reviews that are marginally poor, I tend to look at the nature of the deficiencies. Are there significant issues that could result in measurement errors or incorrect boundary determination, or is there an accumulation of many more minor issues? Please keep in mind that even an accumulation of less significant issues reflects either a carelessness or ignorance (or both) of regulation and may need to be addressed.

Please note that deciding if a project is deficient with respect to a regulation or guideline is generally not difficult. If your project plan does not show a comparison with an underlying survey dimension when it should, then there is no question of a deficiency. If the difference would not affect the survey, then it will likely score low. If the difference was two metres of distance and it appears that something may be seriously wrong, then it will score high. There will be some judgment exercised in the valuation.

As I noted in my report at this year’s Annual General Meeting, please take the time to provide all the relevant data for each Comprehensive Review. The consultant can base their review only on the material provided. If materials are not provided, the reviewer can only assume it does not exist or was not used for the project. As a result, the draft report and the valuation scores will reflect these deficiencies.

I can say with confidence and some pride that AOLS SRD Comprehensive Reviews are undertaken professionally, fairly, and with considerable effort.



¹ *Diff’rent Strokes* (TV series 1978–1986)

² *Alice in Wonderland* by Lewis Carroll

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

Jennifer Elizabeth Humber	2125	April 13, 2022
Jonathan Edward Anderson	2126	April 26, 2022

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EDUCATIONAL FOUNDATION NEWS

Congratulations to our 2021/2022 Award Winners!

York University – Lassonde School of Engineering – Timothy Kehoe is the recipient of the *Hubert J. Reinthaler Award* for 2021. This award, which was initiated by Fred Schaeffer in 2003, is presented to one of the AOLS Aggregate GPA Geomatics Engineering Award winners who achieves high academic standing and displays evident characteristics of enthusiasm, leadership, and professionalism. **Erin Corrado** and **Jared Yen** received awards for achieving the highest grades in *LE/ESSE 4670 Survey Law* and demonstrating a strong interest in cadastral surveys during the course.

University of Waterloo – A Geomatics Excellence Award was presented to **Harry Cheung** based on academic excellence as a full-time undergraduate student enrolled in year three of the Geomatics program in the Faculty of Environment.

Loyalist College – The Eastern Regional Group Achievement Award, which recognizes a graduating student in the Survey Engineering Technician Program for achievement in Survey Drafting, was presented to **Karter Paul Kelly**. The *Eastern Regional Group Leadership Award*, which recognizes a

graduating student in the Survey Engineering Technician program for achievement in several Geomatics courses and overall leadership qualities was shared this year by **Karter Paul Kelly** and **Matthew Kinsinger**. The awards are co-sponsored by the *Eastern Regional Group*.

Fleming College – Kira-Marie Lazda received the *AOLS Educational Foundation GIS Award*, which is presented to a student in the GIS Applications Specialist Program who exemplifies leadership in project management. **Amanda Hunter** received the *Kawartha-Haliburton Surveyors Scholastic Award*, this year named in memory of Eric Ansell. This award, which is co-sponsored by the *Kawartha-Haliburton Regional Group*, is presented to a student in the GIS Applications Specialist program who excelled in their assignments at Survey Camp and exemplified leadership.

AOLS Donation from the 2022 AGM

The Board of Directors would like to thank the AOLS for donating \$3000 to replace the funds that would have been raised during the Welcoming Party if the AGM had been held in person.

BOOK REVIEWS

Sextant

A Young Man's Daring Sea Voyage and the Men Who Mapped the World's Oceans

By David Barrie



Published by William Morrow, an imprint of HarperCollins Publishers
ISBN 978-0-06-227935-4

In the tradition of Dava Sobel's *Longitude* comes this dramatic tale of invention and discovery—an eloquent elegy to one of the most important navigational instruments ever created, and to the daring mariners who used it to explore, conquer, and map the world.

Since its invention in 1759, a mariner's most prized possession has been the sextant. A navigation tool that measures the angle between a celestial object and the horizon, the sextant allowed sailors to pinpoint their exact location at sea.

David Barrie chronicles the sextant's development and shows how it not only saved the lives of navigators in

wild and dangerous seas, but played a pivotal role in their ability to map the globe. He synthesizes centuries of seafaring history and the daring sailors who have become legend, including James Cook, Matthew Flinders, Robert Fitz-Roy, Frank Worsley of the *Endurance*, and Joshua Slocum, the redoubtable old “lunarian” and first single-handed-round-the-world yachtsman. He also recounts his own maiden voyage, and insights gleaned from his experiences as a practiced seaman and navigator.

Information taken from the publisher.

Latitude

The Astonishing Adventure that Shaped the World

By Nicholas Crane

An almost forgotten moment in history, a tale of our times, this is the true story of the mission to discover the shape of the Earth.

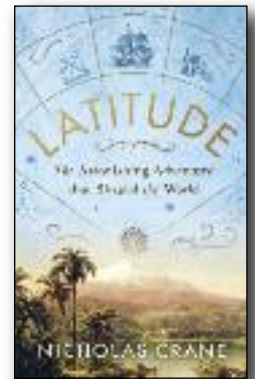
They knew the world wasn't a sphere. Either it stretched at the poles or it bulged at the equator. But which? They needed to know because accurate maps saved lives at sea and made money on land. But measuring the Earth was so difficult that most thought it impossible.

The world's first international team of scientists was sent to a continent of unmapped rainforests and ice-shrouded volcanoes where they attempted to measure the

length on the ground of one degree of latitude. Beset by egos and disease, storms and earthquakes, mutiny and murder, they struggled for ten years to reach the single figure they sought.

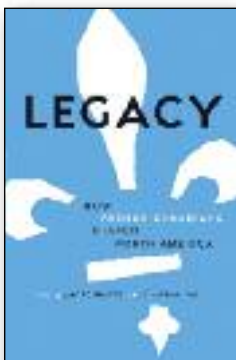
Latitude is an epic story of survival and science set in mountain camps and remote observatories. It is also a story of exploration in which an unruly gaggle of misfits made breakthroughs in rubber and platinum, gravity and fogbows, quinine and Inca archaeology. A breathtaking tale of courage in adversity, it is celebrated today as the first modern exploring expedition.

Information taken from inside the front cover.



Published by Michael Joseph part of Penguin Random House

ISBN: 978-0-241-47834-9



Published by Signal, an imprint of McClelland & Stewart, a division of Penguin Random House Canada Limited

ISBN 978-0-7710-7240-6

Traces of the French-Canadian role in North American history can be found in all regions of the continent. More often than not, we are unaware of or indifferent to these signs. Yet the descendants of the French travelled farther than one would expect and explored the land and a wide variety of fields of human activity such as science, arts, and economy. Through their audacity, their courage, and their determination, they shaped Canada – and to a smaller but still significant extent – the United States.

Legacy is the story of thirteen French-Canadian

Legacy

How French Canadians Shaped North America

Edited by André Pratte and Jonathan Kay

pioneers, from the era of Nouvelle-France up to the twentieth century. Through the lives of these extraordinary persons, the authors reflect on the French-Canadian legacy, convinced that Canada would not be what it is today were it not for these French-speaking Canadians who explored the land, hung on to their culture while respecting that of others, longed for peace, fought bravely, and stood up for a brand of humanism that helped shape the country we live in today.

Information taken from the back cover.

The Last Word

My Last Word as the Editor of the OPS

By Maureen V. Mountjoy, O.L.S.

I am not retiring yet, but as part of the AOLS succession planning process, I will be handing over my duties as the Editor of the Ontario Professional Surveyor (OPS) magazine to AOLS Communications Specialist, Dave Whitton starting with the upcoming fall issue. I can't believe that it has been almost 22 years that I have been responsible for publishing the magazine. It has been such a pleasure working with Lori Veljkovic, who has been our Production Manager since 2005. I want to thank Lori for being such a valuable member of my team and for doing such a great job to make the magazine look so good.

When I think about some of my favourite issues, two come to mind; the special Fall 2005 issue highlighting the 125th anniversary of the Association of Manitoba Land Surveyors and the recent special Winter 2022 issue commemorating the late David W. Lambden. A favourite article that stands out for me is one that I wrote for the Fall 2014 issue, which described how Canadian General Andrew McNaughton's tactical use of artillery intelligence and aerial mapping was widely acknowledged to be instrumental in the Canadian Corps' victory at Vimy Ridge in 1917. Charles Wilkins, author of our AOLS book

Great Lengths, read my article and thought it was important enough to expand it to a full chapter and include in the book.

As a book lover, one of my own objectives was to find three survey-related books for every issue to feature in the Book Reviews. I have review copies of almost every one of the books and my office looks like a library.

Becoming the editor was daunting at first, but as time went on, I embraced the challenge and sought out original content that would showcase the knowledge and expertise of our members and keep everyone abreast of the technical advancements in our surveying industry. I would like to thank all of the authors who contributed articles and the advertisers for their continued support.

I hope you all have enjoyed reading the OPS magazine during my time as the editor as much as I have enjoyed putting it together.



Published by:

The Association of Ontario Land Surveyors
(Established 1892)
1043 McNicoll Avenue
Toronto, Ontario, Canada M1W 3W6
Phone: 416-491-9020 FAX: 416-491-2576
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Unless otherwise stated, material which originates from our membership may be re-printed with acknowledgment.

Printed by Colour Systems Incorporated
Original graphics design by Uniq Graphics and Design, Toronto, Ontario
Computer implementation by nu Vision Images Inc., Toronto, Ontario

Views and opinions in editorials and articles are not official expressions of the Association's policies unless so stated. The Ontario Professional Surveyor Magazine and its publisher accept no responsibility for these views and opinions.

Advertising Rates:

	1 time	4 times
1st Cover	Not Sold	Not Sold
2nd and 3rd Cover	Not Sold	\$715
4th Cover	Not Sold	\$825
Full page 4 Colour	\$705	\$660
1/2 page B&W	\$280	\$245
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1/4 page B&W	\$190	\$165
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Typed page: 48 picas wide by 63 picas deep
Bleed size: 8.75 wide by 11.25 deep
Non-bleed image area of a single page should be 7.5 x 10
D.P.S.: 17.25 wide x 11.25 deep with bleed
D.P.S.: 16 wide by 10 deep without bleed

Digital File Requirements:

Supplied files should be "Press Quality" PDFs with trim and bleed marks included and with all fonts applied in the ad embedded.

Note: The "Marks Offset" should be set to the same value as bleed (for example .125") to avoid marks protruding into bleed area and thereby reducing bleed. Four Colour images should be in CMYK mode with a resolution of 300ppi.

Colour profile included in the file should be GRaCoL_2006_Coated with Relative Colorimetric Intent.

Circulation (This Printing)

Ont. Land Surveyors & Associates	778
Other Professional Affiliations	239
Advertisers	15

The *Ontario Professional Surveyor* Magazine is published quarterly as a medium of communication between the Association and its members. Readers are invited to comment and express their opinions on relevant subjects.

The *Ontario Professional Surveyor* Magazine is distributed to all members of the Association.

Subscription Rates to others: \$40.00 per year or \$10.00 per copy. All rates to us - no provision for commissions or discounts.

Canadian Publication Sales Agreement
40064685
Postage paid Mississauga / Gateway

**Published Quarterly:
next publication deadline:
August 15, 2022**

**ALL PRICES LISTED ARE SUBJECT TO
13% H.S.T.**