



*The Boundary Point* is published by Four Point Learning as a free monthly e-newsletter, providing case comments of decisions involving some issue or aspect of property title and boundary law of interest to land surveyors and lawyers. The goal is to keep you aware of decisions recently released by the courts in Canada that may impact your work.

In this issue we comment on a startling decision from the Alberta Court of Appeal: *Kon Construction Ltd. v Terranova Developments Ltd.*<sup>1</sup> It is startling, because it suggests that raw survey data is amenable to understanding and insight by a court, without much further explanation. The software algorithms are trusted for what they purport to do. This issue is especially important for surveyors and engineers; the processes of how a boundary retracement and spatial information may rely on field data which has been acquired electronically through a total station is used by a court is explored and clarified. In *Kon*, a distinction is introduced between the need for expert testimony on questions of interpreting evidence and the acceptance, without any expert testimony at all, of data which results from the collection of spatial information on the ground.

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## Field Data from Total Stations: When is Interpretation Needed?

**Key Words:** *total station, expert witness, interpretation, data, field notes*

As a general proposition, surveyors and engineers work in an increasingly automated environment in which data acquired in the field is converted through application software which uses algorithms in order convert raw data into information which can be used in a trusted and meaningful manner. The intersection between technology<sup>2</sup> which, with increasing sophistication, is accepted in our society as reliable and trustworthy, and the subjective interpretation and assessment of evidence which takes special skill and training, is becoming increasingly blurred.

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<sup>1</sup> *Kon Construction Ltd. v Terranova Developments Ltd.*, 2015 ABCA 249 (CanLII), <http://canlii.ca/t/gk9g3> In this issue, the appellate decision and trial proceeding will be collectively referred to as “*Kon*”.

<sup>2</sup> Examples of technology which has attained a level of legal trust include speed measuring devices (also known as “radar traps”) and breathalyzers. As discussed further below, these are examples which apply in the context of criminal law and have particular public protection policy objectives. Their use, and the admissibility of measurements taken as evidence in court are still based on a minimum threshold of calibration and training of the operator.

The appellate decision in *Kon Construction Ltd. v Terranova Developments Ltd.*, is therefore both timely and welcome in shedding more light on what one might expect when seeking to use measurement data which has been downloaded from a total station *and then subjected to further analysis and intervention by a user*, in a court setting. In fact the appellate decision in *Kon* follows the Supreme Court of Canada decision in *White Burgess Langille Inman v Abbott and Haliburton Co.*<sup>3</sup>, but *White Burgess* followed the trial decision in *Kon*. This gives rise to an opportunity to consider the application of the underlying legal principles in more detail, but it also makes the process of understanding the principles themselves more complex. At a very basic level, the decision invites all professionals to think about the nature of what makes their knowledge and skill so specialized and needing to be explained in a court setting: is it that the science is incredibly complex? Or is there an element of human interpretation of the data which is the application of the expertise?

*Kon* was decided after a lengthy trial<sup>4</sup> in 2014.<sup>5</sup> As plaintiff, Kon Construction Ltd. sought damages of almost \$100,000.00 for Terranova's breach of contract in unpaid invoices for regrading a site in Edmonton for subsequent development as a subdivision.



Figure 1: The 11-acre site<sup>6</sup> in northwest Edmonton today does not reflect the massive amount of earth moving and grading to what was once bucolic prairie before development occurred 10 years earlier.

The site, as depicted above in Figure 1, shows the appearance today after completion of the subdivision. However, the dispute in *Kon* spilled over into many other issues as Terranova

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<sup>3</sup> *White Burgess Langille Inman v. Abbott and Haliburton Co.*, 2015 SCC 23 (CanLII), <http://canlii.ca/t/ghd4f>

<sup>4</sup> At the outset, the estimated length of trial was 12 days but ultimately used 19 days.

<sup>5</sup> *Kon Construction Ltd v Terranova Developments Ltd*, 2014 ABQB 256 (CanLII), <http://canlii.ca/t/g6pwf>

<sup>6</sup> Image from Bing Maps at <https://www.bing.com/maps/> All rights reserved.

issued a counterclaim and Scheffer Andrew Ltd.<sup>7</sup>, a firm of engineers offering consulting work to land developers, was also added as a party. The issue which is of interest to readers is the use (or non-use, depending on how it is viewed) made by the trial judge of certain engineering survey data available from the extensive work done during the course of construction. Terranova called an expert witness at trial for the purpose of explaining the duty of care owed by a professional engineer and counsel provided that witness with the documentation to be considered. The trial judge summarized the documentation as:

Surveys and drawings were taken and produced by SAL regularly throughout Kon's work on Site. [The expert] never requested computer stored information, including surveys. [The expert] complained of the lack of records kept. There are many surveys, and calculations related to those surveys, daily time records, survey books, some truck load reports – there were many methods of record keeping to confirm what was being done on the Site. But he did not request computer generated surveys and other computer generated material relevant to the records and calculations. He was asked to base his opinion on the information provided to him. [The expert] was not given complete information on this important point.<sup>8</sup>

The benefit of the expert's testimony was therefore very scoped and the trial judge concluded that the report and expert opinion were of limited use. Some of the facts which the expert had relied on were not established during trial and, "the report is to a large extent based on the instruction letter and provided by counsel for Terranova which does not set out the conflicting evidence".<sup>9</sup> However, a key issue at trial was the extent to which Kon Construction had actually moved the dirt on the site as it had contracted to do. The court concluded that it had, relying on evidence from the surveys which were reconciled with the work that Kon did and billed.

On appeal, this issue became central. Some of the evidence relied on at trial included printouts from total station<sup>10</sup> data collectors which Terranova argued were expert evidence, and could not be introduced through a lay witness. In addition, Terranova argued that these exhibits were inadmissible hearsay. In analyzing these grounds, the appellate court noted,

The two arguments overlap to some extent, and raise a number of sub-issues:

- a) The admissibility of records automatically collected and stored in electronic form.

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<sup>7</sup> Herein referred to as "SAL"

<sup>8</sup> *Kon* trial decision, at para. 164

<sup>9</sup> *Ibid.*, at para. 166

<sup>10</sup> A total station is described in *Wikipedia* as, "an electronic/optical instrument used in modern surveying and building construction. The total station is an electronic theodolite (transit) integrated with an electronic distance meter (EDM) to read slope distances from the instrument to a particular point." From: [https://en.wikipedia.org/wiki/Total\\_station](https://en.wikipedia.org/wiki/Total_station)

- b) The interaction of the admissibility of electronic records, and ‘expert’ evidence about the meaning of those records.
- c) The admissibility of evidence from witnesses with expertise, who are not necessarily ‘expert witnesses’.
- d) How the exclusion of hearsay evidence affects the admissibility of electronic records and the opinions of experts.<sup>11</sup>

In embarking on a consideration of these issues, the court sagely observed,

The electronic age has affected many aspects of society and business, and has had a particular impact on record creation and management. Information gathering is increasingly automated, and record keeping is now commonly done in electronic format. This appeal requires an examination of the effect of electronic record management on the laws of evidence, which were formulated on different assumptions about how records are kept. The laws of evidence must adapt to accommodate the current reality of record management...

New technology is always a bit mysterious, particularly where it lacks transparency. The rules of evidence have always been designed to screen out unreliable information, and the courts look skeptically on untested forms of information, particularly in criminal cases. The technical rules of evidence should not, however, be used to screen out information that is inherently reliable. Information gathered by electronic equipment is routinely relied on by the average citizen and the courts because of the indices of reliability just noted.<sup>12</sup> The information may not be perfect, infallible, or accurate to a certainty, but it is sufficiently reliable to be used in court. The admissibility of evidence does not depend on proof to a certainty of exact accuracy; flawed evidence is routinely admitted, and its weight is assessed by the trier of fact.<sup>13</sup>

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<sup>11</sup> *Kon* appeal decision, at para. 12

<sup>12</sup> The indices of reliability referred to in this quoted paragraph from the appellate decision in *Kon* are listed at para. 17 of the decision as:

1. The equipment and software are designed by experts in accordance with scientific and engineering knowledge; at a theoretical level, they should produce accurate results.
2. The prototype equipment is tested against known samples to ensure that it does provide accurate results.
3. The field equipment is mass-produced in accordance with the precise design and specifications of the prototype, and each piece is usually tested before it leaves the factory.
4. Those who use the equipment follow established standards for maintenance, calibration and operation.
5. The equipment and the data are then used on a day-to-day basis, and are shown by experience to be reliable.

Once this threshold of reliability is met, the party tendering the evidence does not have to re-prove the underlying technology in every case, citing: *R. v A.K.*, 2004 ABQB 875 (CanLII).

<sup>13</sup> *Ibid.*, at paras. 13 and 18

For engineers and surveyors this may bring relief: the raw data can be relied on and a court may trust what is produced as a result. However, as always, the relief may be short lived. It appears that the electronic evidence in *Kon* was not scrutinized at a deeper level to ascertain whether or not it had been modified. Engineers and surveyors know that a data collector used to collect raw information in the field with a total station will invariably require some “grooming” in order to adjust for redundancies and to ensure that the level of uncertainty in the data itself, is within tolerances for error and still acceptable. How this is generally done is part of the special knowledge and expertise of the engineer and surveyor: it may require human intervention. But what degree of human intervention will be allowed before the dataset itself becomes “an opinion”? The appellate decision explained the acceptability of internalized software processes which are trusted, even though they may appear to involve an element of “judgment” and stated:

There is undoubtedly a point where a computer program is sufficiently idiosyncratic, sophisticated, and judgmental that the information it generates crosses over into the area of “opinion”. Such computer programs might “require specialized knowledge”, or even rise to the level of “novel or contested science”. That is not, however, true with all computer programs. Some of them are so generic and routine that they fall into the same category (for the purposes of the laws of evidence) as automated equipment like watches, laser speed-measuring devices, photocopiers and breathalyzers. All of those types of equipment have formulas programmed into them, which are as much a part of the equipment as their mechanical circuitry... Relying on output from equipment which has computer programs and formulas embedded in it does not invariably rise to the level of “expert opinion evidence”.<sup>14</sup>

Nonetheless, total stations and the use of field information stored in data collectors cannot be used blindly. Even the operating manual of some common total station products give guidance on the need for human involvement and the exercise of judgment in regards to the reliability of the data collected.<sup>15</sup> Another commentator on the *Kon* appellate decision has noted:

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<sup>14</sup> *Ibid.*, at para. 22

<sup>15</sup> For example, consider the software application which was available during the time when the *Kon* work was taking place. Extracts from user manuals for total station software demonstrate opportunities for post-field collection data processing, including the deletion of some data points, tweaking the underlying co-ordinate framework and scale factor and generally, manually override much of what the program produces. For example, this extract appears from a total station user manual which was current when the field work in *Kon* was acquired and processed:

Since an adjustment can be made multiple times with Survey Controller software, only one adjustment is used in the solution of these points. There can be multiple traverses in a job file that adjust other points. The points that are adjusted by a traverse adjustment are in a “fixed” state. They will not be recomputed by a change to the coordinates of the starting or ending points unless you perform a least squares network adjustment (select **Survey > Adjust Network**).

The line where information generated by software crosses into the realm of expert opinion is drawn on a case-by-case basis, and in the Court's words "[t]here is no automatic or universal rule that computer-generated reports are inadmissible hearsay, or only admissible through expert evidence"<sup>16</sup>

Indeed, there is also a line between accepting mechanically generated data and then testing, through cross-examination, whether the operator knew what was being done. This is not a line to be crossed in each instance but certainly in *Kon*, the appeal may have had a different outcome if there had been conflicting evidence about the representation of that data: Was it altered after collection? What did the data processing algorithm actually do? What were the statistical attributes of the final result?

The surveyors working at the site testified about the calculations as being not much more than a "subtraction" of terrain models. There is a difference between the admissibility of such data and the calculations made by the software and being able to effectively challenge it as inherently unreliable if in fact that is possible by having an expert of one's own who has concluded that the data does not support the "black and white" conclusions reached by the software.

In some respects, the appellate decision in *Kon* reminds us of what can happen when technical and scientific data is tendered in evidence in a court: the evidence may or may not be "opinion" evidence. If it is not opinion evidence, then it is admissible, subject to the usual tests and rules. If it is opinion evidence, then it is hearsay and inadmissible, unless it falls under one of the exceptions – such as it being expert evidence. *Kon* seem more like a case that struggles with the first test: is the data even admissible or is it, by its very character and nature, something that requires interpretation? If the latter, then it probably needs to be tendered through an expert. The appellate decision in *Kon* ultimately holds that the data at issue was admissible because it is trusted and from a standard source which surveyors use all the time. The need for an expert never arose at trial because it was not characterized as opinion evidence to begin with. Future litigation may hold otherwise if a court is presented with evidence of the frailties and potential sources of untrustworthiness of data from a total station.<sup>17</sup>

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From: *Importing Total Station Data*, © Trimble Navigation Limited, 2005-2010. All rights reserved.

<sup>16</sup> Fluker, S., *Some Observations about Evidence in the Electronic Age*, ABlawg, July 29, 2015: <http://canliiconnects.org/en/commentaries/37712> citing *Kon* appeal decision, at para. 25

<sup>17</sup> In some respects the data set collected by a total station and the subsequent software processing is relatively "simple" compared to what may be presented as potential evidence in the near future in the form of an orthophoto map that is produced from a data set collected by an Unmanned Aerial Vehicle (UAV).

## FYI

There are many resources available on the [Four Point Learning](#) site. These include self-study courses, webinars and reading resources – all of which qualify for *formal activity* AOLS CPD hours.<sup>18</sup> These resources are configured to be flexible with your schedule, range from only a few hours of CPD to a whole year’s quota, and are expanding in number as more opportunities are added. Only a select few and immediately upcoming CPD opportunities are detailed below.

### Third Annual Boundary Law Conference

This year’s conference theme is: *Enhancing Parcel Title by Re-Thinking Parcel Boundary*. This one day [event](#) (November 16, 2015) engages in critical thinking about boundaries and how we conceptualize them. Traditional assumptions about the nature of boundaries are revisited and new mindsets are introduced so as to better align with what the courts do and conclude. A draft agenda is in preparation and *early bird* registration is now open.

### Administrative Law for Regulated Professionals: A Primer for Members and Statutory Committees

This [seminar](#)<sup>19</sup> relates the various acts, principles, structures and processes of Administrative Law to AOLS members’ practice as well as to the workings of AOLS council and committees. This full-day in-person event will take place on **Tuesday, October 27<sup>th</sup>** at the [Delta Hotel, Markham](#).

### Survey Law 1 – York University course ESSE 4660

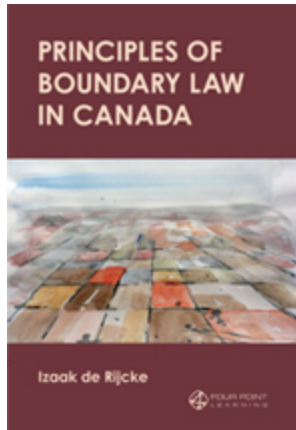
[Survey Law 1](#) provides a foundation for professional surveyors to integrate legal principles, legislation and regulations within the overall framework of property boundary surveys in Ontario. This university-accredited course will be taught twice-weekly by Izaak de Rijcke using a “blended delivery” approach (whereby lectures can be attended either in person or remotely via Internet access) starting **Wednesday, September 9<sup>th</sup>**.

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<sup>18</sup> Please note that the designation of CPD hours is based on the estimated length of time for the completion of the event. The criteria used are those set out in GeoEd’s [Registered Provider Guide](#) for Professional Surveyors in Canada. Other professions may qualify under different criteria. References to AOLS are to its Continuing Education Committee. Elsewhere in Canada, please confirm your eligibility for claiming CPD hours.

<sup>19</sup> The seminar qualifies for 12 *Formal Activity* AOLS CPD credits.

## COMING SOON: *Principles of Boundary Law in Canada*



This comprehensive treatment of the principles of boundary law lies at the intersection of law and land surveying. Although the [textbook](#) has its foundation in the law of real property in Canadian common law jurisdictions, it is intended as a resource which bridges two professions. For real estate lawyers, it connects legal principles to the science of surveying and demonstrates how surveyors' understanding of the parcel on the ground has helped shape efficient systems for property demarcation, conveyancing and land registration. For land surveyors, it provides a structure and outlines best practices to follow in the analysis of boundary retracement problems through the application of legal principles. This textbook is not meant to be used as a “how to” guide for the answering of specific questions about boundary problems. Rather, it is intended to serve as a reference tool to support the formation of professional opinions by clarifying the framework for evaluating boundary and survey evidence.

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ISSN: 2291-1588