



# **ACLS PRACTICE MANUAL**

**A professional guide for Canada Lands Surveyors**

**The Association of Canada Lands Surveyors**

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# **Part 1: PROFESSIONAL PRACTICE**

## **INTRODUCTION**

### **1.1 Terms of Reference**

The Association of Canada Lands Surveyors (ACLS) is a self-governing professional association established by the authority of the Act respecting Canada Lands Surveyors (46-47 Elizabeth II, Chapter 14), and by the Canada Lands Surveyors Regulations and General Bylaws. The purpose of this practice manual is to further the objects of the association as detailed in Section 6 of the Act as follows:

- (a) to establish and maintain standards of qualifications for Canada Lands Surveyors;
- (b) to regulate Canada Lands Surveyors;
- (c) to establish and maintain standards of conduct, knowledge and skill among members of the Association and permit holders;
- (d) to govern the activities of members of the Association and permit holders;
- (e) to cooperate with other organizations for the advancement of surveying; and
- (f) to perform the duties and exercise the powers that are imposed or conferred on the Association by this Act.

Furthermore, Section 42 of the Act imposes a standard of conduct as follows:

A member of the Association who directs the provision of surveying services is in all respects liable for maintaining the standards of conduct and competence in respect of the provision of those services.

### **1.2 Aid to Members**

This manual is intended to be an aid to the members of the association in helping to define a level of professionalism expected of all Canada Lands Surveyors. It is to be considered a working document in so much as it will require ongoing adjustment to keep it current, useful and effective. Members are encouraged to recommend changes where necessary.

### **1.3 Not Standards of ACLS**

This manual is not to be considered a “Manual of Standards” per se, but rather a mix of standards and recommendations for good practice. (See amendments for 2006)

### **1.4 Contributions**

ACLS gratefully acknowledges the contributions of the Surveyor General Branch and of sister associations throughout Canada. Much of the material has been copied, whole or in part, from other similar manuals of recommended practice. In the same spirit of sharing, ACLS encourages reproduction and claims no copyright to the information in this manual.

### **1.5 National Standards for the Survey of Canada Lands**

The National Standards for the Survey of Canada Lands takes priority over this ACLS Practice Manual in all matters pertaining to surveys prepared under the direction of the Surveyor General. Any disagreement between the two manuals shall be ruled in favour of the former. (See Part 9)

### **1.6 Definitions**

**Accuracy:**

The degree of conformity or closeness of a measurement to the true value. (Mikhail & Gracie, Analysis and Adjustment of Survey Measurement). (See precision).

**Act:**

The “Act” means the Canada Lands Surveyors Act.

**Administrative Plan:**

A plan created for administrative purposes and prepared under Section 31 of the Canada Lands Surveys Act.

**Air Space Parcel Survey:**

a survey that describes a volume of space. Examples include underground tunnels, bridges, and overhead walkways. Air space parcel boundaries are independent of physical structures, and are defined by planes or curved surfaces that have three-dimensional coordinates.

**Artificial boundary:**

A boundary defined by a straight line, a circular curve of known radius or, in rare cases, a spiral curve.

**Association:**

The Association of Canada Lands Surveyors.

**Bed:**

The bed of a body of water is the land covered so long by water to wrest it from vegetation, or as to mark a distinct character upon the vegetation where it extends into the water or upon the soil itself.

**Boundary:**

A natural or artificial line on the surface of the earth, below the surface of the earth, in airspace or in or on any structure, the purpose of which is to indicate the extent of a legal interest in land, land under water, water, airspace or natural resources, or in a structure. (see artificial, jurisdictional and natural boundaries)

**Building Unit Survey:**

a survey that defines an area enclosed by features such as walls, floors, and ceilings within a building. Areas or facilities of common use are often included in the survey. These surveys are generally used for leasing apartments in a building on First Nation Lands and are similar to building unit condominiums. Building unit surveys may also define parking areas, decks, patios, and other exclusive-use areas allocated to particular building units.

**Cadastral surveying:**

Surveying in relation to:

(a) the identification, establishment, documentation or description of a boundary or the position of anything relative to a boundary; or

(b) the generation, manipulation, adjustment, custody, storage, retrieval or display of spatial information that defines a boundary.

**Calculated bearing or distance:**

A bearing or distance derived by computation rather than by measurement.

**Canada Land:**

Lands within the meaning of subsection 24(1) of the Canada Lands Surveys Act.

**Canada Lands Surveyor's Real Property Report:**

The plan and report prepared in respect of the survey performed for the purpose of identifying, locating, and illustrating the location of all *permanent* structures relative to the boundaries of the parcel of land.

**Canada Lands Surveyor:**

A person who holds a commission under the Canada Lands Surveyors Act.

**Closed Traverse:**

A traverse which begins and ends at the same point (closed loop), or begins and ends at points whose relative positions have been determined by other surveys.



**Commission:**

A commission granted under section 49 of the Canada Lands Surveyors Act or deemed to have been granted under that section by section 48.

**Compiled plan:**

A plan made under the direction of the Surveyor General, compiled from existing survey information.

**Council:**

The Council of the Association.

**Cursory Review:**

A review of the returns of a survey carried out by SGB as part of its responsibility to manage the survey systems on Canada Lands.

**Direct supervision:**

Means that survey operations have been carried out under the CLS' supervision and direction in such a manner that he/she is certain of their correct execution.

**Disturbed monument:**

A monument that has somehow been moved other than by an authorized surveyor in the exercise of a professional duty, and that can be proven beyond doubt to have been moved from its original position.

**Entity:**

A corporation, partnership or unincorporated organization or association, but does not include a department or agency of the government of Canada or of a province.

**Encroachment:**

The unauthorised extension of the boundaries of land. *Osborne's Concise Law Dictionary* or,

Undue or unlawful trespass on the privileges, jurisdiction ..., of another. *The New Webster Encyclopedic Dictionary of the English Language*.

**Field Notes (official):**

Any field notes recorded in the Canada Lands Surveys Records.

**Field records:**

The records made in the field during the course of the survey.

**Geo-referencing:**

Determining the coordinates for a monument or point with respect to the NAD83 (CSRS) or alternative horizontal datum sanctioned in the specific survey instructions.

**Geo-referenced control:**

A point, which can be a monument, that has been geopoint (GCP) referenced to an absolute accuracy of 0.10 m or better at a 95% confidence level.

**Geo-referenced monument:**

A monument that has been geo-referenced to an absolute accuracy of 0.10 m or better.

**Incompetence:**

Means a lack of knowledge, skill or judgment or a disregard for the public interest of such a nature or to such an extent as to demonstrate that the member of the Association, Canada Lands Surveyor or permit holder is unable to meet the requirements of the profession or to conduct surveys in accordance with the Act or any other Act respecting surveying or any regulations made there under.

**Independent check:**

A process by which a measurement or calculated value is confirmed using a different set up, a different procedure, a different origin or different data.

**Legal survey:**

A survey made by a licensed surveyor to define boundaries of parcels of land suitable for the transfer of rights. It includes the preparation of field notes and plans and any examination, approval or confirmation that may be required. (see also surveying)

**Letter of Authority:**

A surveyor requesting specific survey instructions shall supply SGB with a letter of authorization. When working on First Nation lands, the surveyor must obtain permission to enter the reserve prior to commencing the survey. Prior to doing a survey in the Territories, the surveyor must first obtain the necessary authorities and planning approvals. Depending on the type of survey and status of land, this may consist of an authority/approval to survey a new crown land disposition issued by a territorial or federal lands department, a subdivision approval of crown or titled land issued by a territorial or municipal planning authority, or an approval to survey a disposition of settlement land issued by an Aboriginal government.

**Lost monument:**

A lost monument is one whose position can be re-established only by measurements from some other monument or monuments to which it had previously been connected by survey.

**Jurisdictional boundary:**

A boundary dividing the area of authority between two governments or two levels of government. Examples are: international boundary, Inter-provincial and municipal boundaries, the boundaries of an Indian Reserve or National Park.

**Licence:**

In order to practice cadastral surveying on Canada Lands or private lands in a territory an individual must have a Canada Lands Surveyors Commission, be a member in good standing of the Association and must obtain an ACLS licence.

**Marker post:**

A wooden, metal, plastic or similar type post placed near monuments or on boundaries, used to protect and help locate monuments and boundaries. (see reference post)

**Middle thread:**

The middle thread of a stream (*ad medium filum aquae*) is the line midway between the banks.

**Minister:**

The Minister of Natural Resources.

**Monument:**

A general term for some device, object or thing marking a surveyed boundary of land. (See disturbed, lost, obliterated and witness monuments)

**Natural boundary:**

A boundary defined by a natural feature such as the bank of a body of water or the middle thread of a stream. This can also include the line between two watersheds as is the case between the Yukon and Northwest Territories.

**Obliterated monument:**

A monument which can be restored with confidence from traces remaining on the ground of the original monument or from other physical evidence of the position of the original monument. (See restore)

**Official plan:**

A plan of surveyed Canada Lands confirmed by the Surveyor General under Section 29 of the Canada Lands Surveys Act.

**Offset:**

The direction and distance of a single straight line from a point fixed by survey to another nearby point. Usually the offset is at right angle to the boundary or traverse line.

**Ordinary high water mark:**

The limit or edge of the bed of a body of water. In the case of non-tidal waters it may be called the “bank”. (see bank)

**Permit:**

An entity that intends to provide cadastral surveying services on Canada Lands or private lands in a territory must obtain an ACLS Permit.

**Monument on line:**

Where an artificial boundary terminates at a natural boundary, a “monument on line” may be placed on the artificial boundary at a distance from the natural boundary which would make it reasonably safe from destruction. (see witness monument)

**Practice:**

A Permit holder, a sole practitioner or a government office authorized under the Act to provide legal surveying services.

**Precision:**

The degree of closeness or conformity of repeated measurements of the same quantity to each other. (Mikhail & Gracie, Analysis and Adjustment of Survey Measurements). (see accuracy).

**Re-establish:**

To determine the position of a lost monument.

**Redundant measurement:**

An additional measurement used to confirm the results.

**Reference post:**

A post placed near a monument or control survey marker which may be used to re-establish the position of the monument or to confirm the stability of the monument or control survey marker.

**Registration plan:**

A term discontinued in 2014. Registration plans were formerly defined in the Interdepartmental Agreement with the Department of Indian Affairs and Northern Development respecting land transactions on First Nation Reserves. Plans for this purpose are now prepared under Section 31 of the Canada Lands Surveys Act (see Chapter 2: Survey Plans in the National Standards).

**Regulations:**

Regulations refer to regulations made pursuant to section 62 of the Canada Lands Surveyors Act.

**Restore:**

To refurbish an obliterated monument to its original or near original condition. The field notes must explain what was done to restore a monument.

**Resurvey:**

A survey under Section 33 of the Canada Lands Surveys Act of a previously surveyed boundary made for the purpose of correcting errors, re-establishing lost monuments, or placing additional monuments on the boundary.

**Retracement survey:**

A survey of a previously surveyed boundary in order to determine the directions and distances between the monuments marking it.

**Review:**

A general review of a practice carried out by the Practice Review Department pursuant to the Practice Review Department Manual of Administrative Procedures.

**SGB:**

Surveyor General Branch, Natural Resources Canada (NR Can)

**Surveying:**

The determination of the form of the earth or the position of natural or artificial things, boundaries or points on, above or under the surface of the earth or the collection, storage, management, integration, analysis or representation of spatial and spatially related information pertaining to the earth or the interpreting of or reporting or advising on that information. (See also legal surveying)

**Surveyor General:**

The Surveyor General within the meaning of subsection 2(1) of the Canada Lands Surveys Act.

**Survey Instructions:**

Details on procedures for surveys of Canada Lands issued by the Surveyor General pursuant to sections 24 and 36 of the Canada Lands Surveys Act. They are issued in two forms: general survey instructions which are of the National Standards for Surveys of Canada Lands, and specific survey instructions which are issued for particular projects. They may also be in the form of a letter of authority.

**Witness monument:**

A monument placed on the boundary of a parcel, which witnesses the position of a point that cannot be monumented. The point is defined by the distance and direction from the witness monument. A point can have only one witness monument defining its position.

## 1.7 Legislation

The Canada Lands Surveyor's profession is governed by the following:

- **The Act respecting Canada Lands Surveyors** (46-47 Elizabeth II, Chapter 14): which governs Canada Lands Surveyors and the Association.
- **The Canada Lands Surveys Act** (Chapter L-6): which governs the way surveys are performed on Canada Lands.
- **Canada Lands Surveyors Regulations** pursuant to the Act respecting Canada Lands Surveyors.
- **The Association of Canada Lands Surveyors General Bylaws** dealing with matters necessary to carry on the business and activities of the Association.
- Other Legislation referred to in the National Standards for the Survey of Canada Lands. It is posted on the internet at [www.sgb.nrcan.gc.ca](http://www.sgb.nrcan.gc.ca) and [www.myclss.ca](http://www.myclss.ca).
- Natural Resources Canada, SGB "**National Standards for the Survey of Canada Lands**", which sets comprehensive standards for surveys that lead to official registration in the Canada Lands Survey Records (CLSR). It is posted on the internet at [www.sgb.nrcan.gc.ca](http://www.sgb.nrcan.gc.ca) and [www.myclss.ca](http://www.myclss.ca) .

## 1.8 Code of Ethics

The official Canada Lands Surveyors Code of Ethics is enumerated in Section 3 of the CLS Regulations and is as follows:

- (1) Members shall abide by the code of ethics set out in subsections (2) – (7).
- (2) Members shall serve the public to the best of their knowledge and ability and with accuracy and efficiency for the development and peaceful enjoyment of Canada's lands and natural resources.
- (3) Members shall be honest and trustworthy and shall, in particular,
  - (a) maintain confidentiality with respect to client or employer affairs during the term of their contract or employment and after their contract or employment has been terminated;
  - (b) certify work that was performed only by the member or under the member's supervision; and
  - (c) enter into fee-splitting arrangements only with the knowledge and consent of their client.

- (4) Members shall be vigilant upholders of the law relating to their profession and shall refrain from, in particular,
  - (a) entering into an arrangement that would allow the unauthorized practice of their profession; and
  - (b) knowingly or willingly becoming accessories to a failure to report any illegal practice of their profession to the Council of the Association.
- (5) Members shall avoid any appearance of Professional impropriety and shall, in particular,
  - (a) declare to their clients or employers any conflict of interest that impairs the quality of their services;
  - (b) ensure, to the best of their ability that their names are not used in association with persons or enterprises of dubious or doubtful ethics; and
  - (c) accept no compensation from more than one source for the same service without the consent of all parties involved.
- (6) Members shall charge and accept only fair and reasonable compensation for their services and shall, in particular,
  - (a) make their claims for compensation commensurate with the professional and technical complexity of their services, their level of responsibility and their professional liability; and
  - (b) make details relevant to their claims for compensation available to their client on request.
- (7) Members shall maintain their competence, integrity and respect for their profession in their relations with colleagues, clients, employers or employees and the public and shall, in particular,
  - (a) assume professional responsibility for authorized works carried out by their non-professional employees;
  - (b) cultivate into their employees the utmost integrity and a clear understanding of the professional obligations of surveyors to the public;
  - (c) provide their employees with good working conditions and reasonable remuneration;
  - (d) continually advance their skills and knowledge through study and educational programs;

- (e) refrain from public criticism of the conduct or practice of colleagues;
- (f) report any perceived misconduct or incompetence of members to the Council of the Association;
- (g) keep adequate records of their work such that its Quality can be judged by their peers;
- (h) refrain from accepting assignments beyond their competence or beyond the resources available to them; and
- (i) limit their advertising to a level that provides adequate information and avoids misleading and self-laudatory language.

## **1.9 Professional Misconduct**

In respect of a member of the Association, Canada Lands Surveyor or permit holder, as the case may be, professional misconduct means any of the following:

- (a) receiving a conviction in a court of competent jurisdiction of an offence relating to surveying;
- (b) contravening the Act, these Regulations or the by-laws, or any other Act or regulations relating to surveying;
- (c) failing to comply with the code of ethics of the Association;
- (d) signing a certificate, report or plan that is not prepared or completed by the member of the Association or Canada Lands Surveyor or under the supervision of the member or Canada Lands Surveyor;
- (e) failing to assume responsibility for all phases of survey work carried out under the supervision of the member of the Association or Canada Lands Surveyor;
- (f) failing to engage employees that are competent by virtue of education or training, or both, to perform the duties assigned to them;
- (g) knowingly allowing or encouraging employees who are not Canada Lands Surveyors to engage in activities that reasonably would be regarded as those of a Canada Lands Surveyor;
- (h) failing to regard as confidential any information, however obtained, about the affairs of an employer's clients or failing to continue to regard the information as confidential after the termination of the relationship with the employer;



- (i) failing to disclose to a client or employer a conflict of interest;
- (j) charging a fee for services not performed or knowingly submitting a false or misleading estimate, account or charge for services;
- (k) advertising in a manner that is contrary to the by-laws;
- (l) making a false or malicious statement or publication that injures the professional reputation, the prospects or surveying business of another member of the Association, Canada Lands Surveyor or permit holder;
- (m) soliciting or accepting any work when the member of the Association, Canada Lands Surveyor or permit holder knows or has reason to believe that another member of the Association, Canada Lands Surveyor or permit holder is engaged for the same purpose by the same client;
- (n) offering a remuneration or an inducement to secure employment or a contract for services;
- (o) undertaking work that the member of the Association, Canada Lands Surveyor or permit holder is not competent to perform by virtue of training and experience or that is beyond the resources of that member, Canada Lands Surveyor or permit holder to complete in the time agreed on with the client;
- (p) failing to cooperate with the Association with respect to a claim made under a professional liability insurance policy;
- (q) failing to cooperate with the Association in a review of the surveying activities of a member of the Association;
- (r) authorizing a non-member to act in a manner that would lead the public to believe that the non-member was licensed in accordance with the Act and these Regulations;
- (s) engaging in conduct relevant to surveying that, having regard to all the circumstances, would reasonably be regarded by members of the Association as dishonourable or unprofessional;
- (t) failing to remedy poor, incorrect or incomplete work after acknowledging that a deficiency exists;
- (u) failing, in respect of a permit holder, to immediately notify the Registrar when there is no longer a member of the Association available to supervise services offered by the permit holder which must be supervised by such a member;
- (v) failing, in respect of a permit holder, to ensure that work is carried out under the supervision of a member of the Association; and

(w) authorizing, permitting, counselling, abetting, assisting, aiding or acquiescing in any act or omission referred to in paragraphs (b) to (v).

## **ASSOCIATION ADMINISTRATION**

### **1.10 Council**

The affairs of the Association are managed by a Council, which consists of six members elected annually (President, Vice-president, Past President and three councillors), the Surveyor General for Canada Lands, and two persons who are not members and who are appointed by the Minister of Natural Resources Canada. The powers and duties of council are detailed in the by-laws of the association. The by-laws can be viewed on the Association's web site [www.acls-aatc.ca](http://www.acls-aatc.ca)

### **1.11 Committees**

The council of the association is aided by the following standing committees:

Executive: President, Vice-president, past-president and Surveyor General

Finance

Insurance

Nominating

Board of Examiners

Complaints

Discipline

Offshore

Bylaws and Legislation

Continuing Professional Development

Practice Review

Aboriginal Liaison

Public Awareness

Standards of Practice

Conference

## **1.12 Vision Statement**

ACLS will be a leader and valued partner in advancing the survey profession in Canada.

## **1.13 Licence and Permit**

In order to practice cadastral surveying on Canada Lands or private lands in a territory, an individual must have a Canada Lands Surveyors Commission, be a member in good standing of the Association and must obtain an ACLS licence.

And, similarly, an entity that intends to provide cadastral surveying services on Canada Lands or private lands in a territory must obtain an ACLS Permit. An entity is a corporation, partnership or unincorporated organization or association, but does not include a department or agency of the government of Canada or a province.

The requirements for an entity to obtain a permit are as follows:

- a principal function of the entity is surveying
- the entity has within its management at least one licence holder who ensures that the entity complies with the Association's standards of conduct, knowledge and skill in its surveying activities
- the entity has professional liability insurance coverage at least equivalent to that required by licensed members and
- the name of the entity is not misleading, self-laudatory or inappropriate with regard to protection of the public and the integrity of the profession

## **1.14 Seals**

Seals come in two forms: digital and crimping. All original plans and paper copies shall bear the member's seal. Digital seals are preferred for original mylar plans.

Any member authorized to practice in accordance with Section 1.13 may purchase a seal from the ACLS office by completing the appropriate order form found on the ACLS web site [www.acls-aatc.ca](http://www.acls-aatc.ca). Authorized members may produce their own digital seals providing they conform to the approved design.

## **1.15 Survey Monuments**

Monuments are obtained from the member's standard supplier rather than from the Association. The supplier(s) do not collect the monument assessment fee as stated in the Bylaws.

## **1.16 Plan and Monument Fees**

The assessment of plan and monument fees forms part of the submission of a plan to Surveyor General Branch, Natural Resources Canada (NRCan). myclss. The subsequent invoice that is created in myclss is forwarded by NRCan to ACLS. Effective January 1, 2016, the member will be invoiced \$80.00 per plan plus \$12.00 for each new monument placed in the course of the survey. The assessment of plan and monument fees must be completed even if no new monuments have been placed.

**Notes:**

1. The monument fee applies only to “monuments placed”. It does not apply to restored or re-established monuments.
2. The term “monument” refers to all of the posts placed for a given monument. It included the primary post plus any ancillary monumentation such as reference or witness posts placed for the same monument. i.e. Primary monument plus witness or reference posts = One monument.
3. The assessment of plan and monument fees must be completed for each plan to which a new CLSR number will be assigned. Some projects may have more than one plan and some plans may have more than one sheet. The rule is:  
each prospective CLSR number = one plan fee.

## **PRACTICE REVIEW**

### **1.17 Introduction**

Individual reviews will be carried out on all practices. For the purpose of practice review, “Practice” is defined as a Permit holder, a sole practitioner or a government office authorized under the Act to provide legal surveying services.

### **1.18 Process**

The Practice Review Process is detailed in the ACLS Practice Review Department Manual of Administrative Procedures. [www.acls-aatc.ca/en/node/260](http://www.acls-aatc.ca/en/node/260)

### **1.19 Purpose**

The purpose of Practice Review is to ensure compliance with the Act and Regulations and to provide practice assistance and continuing education to members of the Association.

### **1.20 Practice Review Committee**

A Practice Review Committee is established by council to provide advice to the practice review manager and to serve as ombudsman to any member who has concerns about the practice review process.

### **1.21 Duty to Cooperate**

It is the duty of all members to cooperate with the Practice Review Department. Failure to cooperate may constitute a breach of the Act resulting in a charge of misconduct.

## **PROFESSIONAL LIABILITY INSURANCE**

### **1.22 Compulsory**

(Act) 56. (1) Subject to subsection (2) and the regulations, every member of the Association who engages in surveying must be insured against professional liability.

### **1.23 Exception**

(2) Subsection (1) does not apply in respect of a member of the Association who is employed by Her Majesty in right of Canada or a province or by an agent of Her Majesty in either of those rights.

### **1.24 Limit**

Section 29 of the regulations require a minimum coverage of professional liability insurance of \$250,000 per occurrence with a minimum total of \$500,000 for all occurrences in each policy year. Insurance companies suggest \$1,000,000 per occurrence with a total of \$2,000,000 for all occurrences in each policy year. Many larger contracts require Error and Omissions coverage considerably higher than the minimum requirements of Section 29. It is recommended that you review your insurance policy when accepting larger contracts to ensure you have sufficient coverage to meet the clients' requirements.

The ACLS offers a list and description of different insurance, intended to raise the awareness of the ACLS members on insurance issues. This list can be found on the ACLS web site [www.acls-aatc.ca](http://www.acls-aatc.ca).

### **1.25 Notice of Claim**

Each member is to inform the registrar immediately on notice of a claim or an impending claim.

### **1.26 Cancellation**

The association shall be given 10 days notice before a policy of professional liability insurance is cancelled.

### **1.27 Proof of Insurance**

Every member shall provide the Registrar with a copy of his/her professional liability insurance policy and notify the registrar of any changes to it.

## **COPYRIGHT**

(See Appendix 1 for additional copyright information)

### **1.28 Application of Copyright Law**

The application of copyright law with respect to survey products is not clear. "It appears indisputable that the Copyright Act vests ownership of artistic works such as plans of survey in the first author (the surveyor) unless an agreement of contrary effect has been executed by the surveyor". (Allred – Appendix 2)

Having said that, many survey products become public record once they are recorded or filed in a public registry. Other products become part of a data base and are no longer distinguishable in their own right. In such cases, the surveyor relinquishes the protection

offered by the Copyright Act and use of the universal copyright symbol is not recommended.

Most other products prepared for a client would necessarily imply a licence to use the products for the purpose intended. However, this implied licence would not necessarily extend to unauthorized alterations or reproductions of the work. The Association of Canada Lands Surveyors follows the lead of the other survey associations in recommending use of the universal copyright symbol together with the surveyor's name followed by the year. In addition, all plans, not intended for registration, should contain this statement located beneath the universal copyright symbol:

No person may copy, reproduce, distribute or alter this plan in whole or in part without written permission of John Doe, CLS.

## **CERTIFICATION OF DOCUMENTS**

### **1.29 Legislation**

Section 37 of the CLS Regulations states the following:

*Every member of the Association who holds a licence shall certify their documents and drawings by means of*

- (a) a statement of responsibility in accordance with section 38; and*
- (b) the authorized seal referred to in section 36.*

### **1.30 Statement of Responsibility**

(Section 38 of the CLS Regulations)

- (1) A statement of responsibility shall be in the form "**certified correct**", signed and dated by the member of the Association, if the survey and all associated work, documents and drawings to which the statement applies
  - (a) were made by or under the direct supervision of that member;*
  - (b) were made in accordance with the instructions, requirements and standards applicable to the purposes for which they were made;*
  - (c) were made in accordance with the instructions of the client; and*
  - (d) are correct and true to the best of the member's knowledge and belief.**
- (2) A statement of responsibility that is not in the form "certified correct" shall specifically identify those responsibilities referred to in paragraphs (1)(a) to (d) that*

*are accepted by the member of the Association and be signed and dated by the member.*

The use of the ‘certified correct’ statement, as per Section 38(1) of the CLS Regulations, has been widely embraced by members of the Association when certifying plans of survey. There are, however, times when this statement may not be applicable to the document being prepared. As per Section 38(2) of the CLS Regulations, the surveyor has the option of identifying which responsibilities he/she does want to accept when signing a particular document.

A surveyor will have to assess any plans or document he/she signs for the statement of responsibility he/she feels applies but should be aware that by using a statement of responsibility that is not in the form ‘certified correct’ but rather made up of Section 38(1)(a) to (d) or an elaboration thereof, a surveyor is able to limit his/her responsibility for the work being done. The surveyor should state what he/she is certifying in positive terms. By adding only a signature to a document as a way of limiting responsibility, the surveyor should be aware that he/she could be seen instead as accepting unlimited responsibility.

A surveyor may also wish to add some disclaimer statements to a document to limit his/her responsibility. For instance, the following example statements, or variations thereof, may be added to a plan that is prepared from various sources.

- *The information shown on this plan has been prepared using (insert list of sources). No fieldwork was performed to verify the monuments, measurements, topographic features, or potential boundary encroachments.*
- *New unsurveyed boundaries calculated from (insert list of sources) are shown thus: “calc”. The dimensions of calculated boundaries may change upon survey.*

(See amendments for 2006)

Members may also use an oath in the following form:

I \_\_\_\_\_, Canada Lands Surveyor, solemnly swear that I have in my own proper person, according to law and the instructions of the Surveyor General of Canada Lands, faithfully and correctly executed the survey shown by this plan and field notes, and that the said plan and field notes are correct and true to the best of my knowledge and belief, so help me God.

Sworn before me at \_\_\_\_\_

On this \_\_\_\_ day of \_\_\_\_\_

\_\_\_\_\_  
CLS

\_\_\_\_\_  
Signed

Justice of the Peace or

Notary Public or  
Commissioner of Oaths or  
Canada Lands Surveyor

### **1.31a) Documents Requiring Certification**

Not all documents require a seal and/or certification. In practice, every member shall certify and seal the primary documents representing their work. This would include field notes, plans and survey reports intended for registration or recording in a public registry such as the Canada Lands Survey Records. Aerial photographs, maps or other information sources that have the position of natural boundaries marked on them in accordance with Chapter D1, Section 79b of the General Instructions for the surveys of Canada Lands, e-edition must be signed and dated by the surveyor, but not necessarily certified. It is not normally necessary to seal the supporting documentation which accompanies a primary document.

Certification is also required for Surveyor's Real Property Reports.

### **1.31b) Date of Certification**

There are two relevant dates to any project, the first being the date of "completion" of a survey, and the second, the date of certification of the provisional and/or final document or plan.

Professional surveying projects generally include the following components: research of technical and/or historical records; the measurement of physical conditions; computations and analysis; a document of findings in textual and/or graphic presentation. Our definitions of "surveying" and "cadastral surveying" suggest that not all components are integral to each and every project. A construction survey may not require research of historical title records while an analysis and report on the nature of a body of water may not require its physical measurement.

The date when a "survey" is complete is the date when sufficient effort has been expended to enable the surveyor to present a provisional or final document of his/her opinion, in accordance with the relevant standards and regulations, including Instructions issued by the Surveyor General. Should further effort be involved that results in an amended opinion or document, then the completion date would be so advanced.

The date when the document is issued is the date it should be certified. Normally, the surveyor dates his/her certification according to the date the document is actually signed, i.e. when ink hits the paper. It is to the surveyor's discretion whether to use a new date whenever the same document is re-issued or whether to advance the date to the new issue date. Any issuance of an updated or otherwise altered document requires a certification at the date of re-issuance.

### **1.31c) Signatures on documents**

A personal signature is a uniquely individual sign of authenticity. When using hardcopy media, a signature is almost always in ink and sometimes accompanied by an embossed



seal attesting to its originality. A digital or electronic seal is recommended for plans and documents issued in electronic format. The signature of a professional person often carries with it the full weight of his/her professional responsibilities and the liabilities associated with them. Unauthorized use or reproduction of a person's signature can have dire consequences and is strictly prohibited by law. There are two major concerns regarding signatures on plans and documents in a digital environment.

First, is the possibility of someone other than the professional having access to his/her signature and using it to certify documents without authorization. An example of this is having a signature scanned or digitized and filed in a location that is accessible to others. Strict attention must be placed on security of such files.

Second, is the possibility of a document being altered without authorization by a third party while still bearing the original signature of the professional. Issuing a signed letter in a word document attached to an email is a prime example as it can be easily changed or altered by anyone who has access to the letter. A person should never issue a letter, plan or document that can be opened and altered but rather, make a copy, sign it, and scan it into a PDF or some other "read only" format before introducing it to the digital environment.

## **OFFICES**

### **1.32 Legal Address**

The licensed CLS or permit holder who is offering surveying services to the public shall have a legal address and access to adequate office space and equipment to conduct a proper survey operation. There should also be systems in place to ensure proper record keeping, administration and quality control.

### **1.33 Records**

The office manager should maintain a file on each employee with particular emphasis on the individual's training, experience and continuing professional development.

### **1.34 Office Records**

Each Canada Lands Surveyor shall maintain an orderly system of record keeping that will allow ready access or retrieval of all survey information on file. Particular care must be taken to provide safe storage of archived records.

### **1.35 Archiving Files**

When archiving digital files, consideration must be given to the hardware and software necessary for its retrieval. Archived digital files may have to be reformatted to be compatible with new office systems.

### **1.36 Computer Back-up**

As a protection against vandalism, fire or computer failures, daily back-up routines of all current files should be performed by all firms with provision for off-site or fire-proof storage of backed-up files.

### **1.37 Advertising**

Licensed Canada Lands Surveyors and Permit holders should limit their advertising to a level that provides adequate information and avoids misleading and self-laudatory language (Code of ethics). The advertising should not harm the integrity and honour of the profession. It is good practice to display identification signage on vehicles used in field operations.

## **DEALING WITH THE PUBLIC**

### **1.38 Right to Enter**

Section 43 of the Act states:

*A licence holder or anyone acting under the direction of a licence holder may, for the purpose of cadastral surveying, enter, pass over and measure the land of any person but shall take all reasonable precautions to avoid causing damage in so doing.*

### **1.39 Good Practice**

It is considered good practice for land surveyors and their staff to:

- 1) Make a reasonable effort to advise property owners when surveying on private property. Use of a calling card is recommended.
- 2) Explain the need to search and dig for evidence and take appropriate steps to repair any damage upon completion.
- 3) Make every attempt to respect the wishes of property owners who are concerned about the cutting and blazing of lines.
- 4) Surveyors and their staff should maintain a neat appearance and avoid any actions or language that may reflect poorly on the profession.
- 5) Surveyors should always present themselves in an appropriate professional manner whether working in the field or attending to other professional duties.

## **CONTRACTS AND SUB-CONTRACTING**

### **1.40 Contracts**

When entering a contractual arrangement, the licensed CLS or entity should be guided by the Code of Ethics and all applicable laws. This includes:

- avoiding the appearance of professional impropriety;

- preserving the confidences of his/her client, and regard as privileged the information he/she may obtain regarding the affairs of his/her client;
- exercising unbiased independent professional judgment on behalf of his/her client and represent his/her client completely; and by
- assessing and receiving fair and just compensation from his/her client, commensurate with the technical complexity, level of responsibility and liability potential for the services performed.
- Indemnity Clauses – the surveyor must exercise caution in dealing with indemnity clauses. Any assumed liability must fall within the surveyor’s liability insurance coverage. If in doubt about the wording of an indemnity or “save harmless” clause in a contract, the surveyor should seek advice before entering into the contract.

For a comprehensive guide to preparing contracts, consult the document entitled “Contracting Survey Services” dated 2003, published by the Canadian Council of Land Surveyors (CCLS) which is available on the Professional Surveyors Canada Web site at: <https://www.psc-gpc.ca/wp-content/uploads/2016/09/CONTRACTING-FOR-SURVEYING-SERVICES-MANUAL-RevJan-15.pdf>

#### **1.41 Estimates**

An estimate should only be prepared after the Canada Lands Surveyor has identified the particular product or service that the client requires and has had the opportunity to conduct sufficient research to prepare an informed estimate.

In any estimate or quotation given to a prospective client, the surveyor should clearly outline the work covered by the estimate and indicate any conditions that could contribute to additional costs. Care must be taken to avoid quoting a fixed fee for an unknown quantity of work unless the fee includes all contingencies.

The surveyor should complete the work for the agreed amount.

#### **1.42 Technical Services Sub-contracting**

A Canada Lands Surveyor:

- 1) may engage the services of a person or persons, not in his/her direct employ, (referred to here as the subcontractor), to perform technical functions on his/her behalf. These technical functions do not include or encompass client liaison or new business development.
- 2) shall assume full responsibility for the actions and conduct of the subcontractor during the term of the engagement as though he/she were in the land surveyor’s direct employ. The land surveyor will issue all work instructions to, and receive the completed work from the subcontractor in person.
- 3) shall not remunerate any of his/her technical assistants or the subcontractor for services based on a proportion of the entire fee which he/she charges a client for

the whole service, nor a fixed fee which may encourage inferior methods or time-reducing procedures at cross purposes with adopted survey standards.

### **1.43 Direct Supervision**

Direct supervision means that survey operations have been carried out under the CLS' supervision and direction in such a manner that he/she is certain of their correct execution.

This implies the CLS has some personal knowledge to that effect. It follows that a CLS must assume a personal role in the execution of each survey. At a minimum the CLS should:

- Review the research upon which the survey was based.
- Review the field notes.
- Personally inspect the plan of survey.

### **1.44 Occupational Health and Safety**

Each licensed ACLS and Permit holder should comply with any laws applying to occupational health and safety in the workplace. This may include:

- Preparation of a safety manual
- Training and certification of employees in first aid, WHMIS, traffic control, power saws etc.
- Creating office policies
- Holding safety meetings

## **Part 2: PRINCIPLES OF BOUNDARY SURVEYS**

### **2.1 Research Sources**

All documentary evidence related to the land under survey and the adjacent lands should be obtained prior to undertaking a survey. Failure to carry out proper research constitutes a serious breach of the surveyor's Professional responsibility. Sources of documentary evidence may include among other things:

- i) Canada Lands Surveys Records  
<http://www.nrcan.gc.ca/earth-sciences/geomatics/canada-lands-surveys/10780>
- ii) Land Titles Office or Registry office
- iii) Mining Recorder's Office
- iv) Indigenous and Northern Affairs Canada (INAC) – Land Administration Division  
<https://www.aadnc-aandc.gc.ca/eng/1100100027883/1100100027887>
- v) Government of NWT (GNWT) – Municipal and Community Affairs (MACA) – Land Administration Division.
- vi) Government of Nunavut – Community Government and Transportation – Community Planning & Lands Directorate.
- vii) Government of Yukon – Energy, Mines and Resources – Land Branch
- viii) The surveyor's own files
- ix) The files of other licensed surveyors
- x) Municipal government records
- xi) Aboriginal government records
- xii) Other probable sources of pertinent material such as federal and provincial/territorial government records.

### **2.2 Case Law Precedents**

All of the physical evidence must be appraised in accordance with legal principles of law. The surveyor should be guided by the same precepts and rules that courts of law would apply. Decisions made in the field may be examined in court at a later date, and the surveyor may be required to appear and explain or justify those decisions.

### **2.3 Original Surveys**

An original survey is the first survey of a boundary. In conducting an original survey, the surveyor must ensure that the boundaries are well marked on the ground, and that the nature and position of the monuments marking the boundary are accurately recorded. The boundaries defined by the original survey are usually the boundaries by which a parcel is first granted, bought, sold or otherwise dealt with and those boundaries are the boundaries of the parcel for all future owners.

## **2.4 Physical Evidence**

In all surveys, other than original surveys, the surveyor must make an exhaustive search for original monuments, ancillary monumentation and if necessary, physical evidence such as post holes, blazes and cut lines marking a boundary. Only by finding original monumentation, or actual physical evidence of the original monumentation, can boundaries of a parcel be identified conclusively. The surveyor shall never abandon a search for evidence until convinced that no other surveyor could subsequently find better evidence.

## **2.5 Hierarchy of Evidence**

Numerous court judgements have supported the following order of importance of evidence in redefining boundaries:

- a) Evidence of natural boundaries
- b) Evidence of original monuments
- c) Evidence of possession which can reasonably be related back to the time of the original survey.
- d) Measurements quoted by the original surveyor on a plan or in field notes.

## **2.6 Rights of Adjoining Property Owners**

The surveyor must bear in mind that the boundary does not only mark the limits of one parcel, but the dividing line between two or more parcels. In any search for evidence, the surveyor must consider the rights of all owners, and include in the search evidence created in surveys of adjacent properties

When cutting and blazing boundaries take all reasonable precautions to avoid causing damage to private property. Every effort must be made to inform each owner affected and to respect any concerns they may have.

## **2.7 Original Position**

Even after a monument is found, the surveyor should not assume that it is the original monument, or that it is in the position in which it was originally placed. Sufficient collaborative evidence must always be collected and recorded in the field records to support the acceptance of a monument and its position.

## **2.8 Measurements and Coordinates**

Legal principle requires that actual physical evidence of the original monument shall govern its position. That does not imply that original survey dimensions or coordinates should be ignored. Measurements and coordinates provide an indication of the position of a monument, and in some cases, may be the best evidence of the original monument location. See Section 2.16

## **2.9 Identifying Natural Boundaries**

In surveying natural boundaries of Canada Lands, a surveyor must be guided by the legislation, legal principles, and jurisprudence in force in the province or territory where the survey takes place. The following general principles should be considered in defining natural boundaries:

- a) A natural boundary of Canada Lands, at any instant, is the identifiable natural feature as it exists at that instant, and its position changes with the natural movements of the feature provided the movements are gradual and imperceptible from moment to moment.
- b) A natural boundary of Canada Lands fronting on a body of water is the natural feature identified in the original survey on which the official plan is based, subject to the following conditions:
  - i) If the body of water is a stream that is neither tidal nor navigable, then the boundaries will normally be the middle thread of the stream, notwithstanding that the bank or high water mark was identified in the original survey. If erosion of, or accretion to, the bank occurs due to natural causes, then the middle thread will advance or retreat, with the change in the bank. This general rule will not apply where there is a statute to the contrary, or where there is a specific and clear contrary intent in the original description of the land. A contrary intent is not to be assumed from the fact that the lands are shown on a plan by measurement and colour to exclude the bed.
  - ii) If the body of water is the sea, a tidal stream, a navigable stream or lake, and erosion occurs due to natural causes, then the land covered by water will normally form part of the bed of the body of water.
  - iii) If the body of water is the sea, a tidal stream, or a navigable stream or lake, and accretion occurs due to natural causes, then the additional land will normally form part of the Canada Lands.

## **2.10 Settled Possession**

In surveys of occupied parcels, the surveyor must be very cautious about doing anything which would upset the established limits of occupation, or lead to a dispute. Settled possession which can be reasonably related back to the time of the original survey may provide the courts with satisfactory evidence of the original boundary.

## **2.11 Disputed Boundary**

In cases of a disputed boundary, the surveyor can only advise those affected by the boundary and provide an opinion of the correct position of the boundary. Care must be taken not to perform any act which might have the effect of prejudicing the case of any party.

## **2.12 Confirmation by Surveyor General**

Boundaries of Canada Lands defined by monuments placed in surveys made under the Canada Lands Surveys Act become the true boundaries of those lands:

- a) On confirmation of the Surveyor General (or a person designated by the Surveyor General to confirm such plans) for plans confirmed under Part II of the Act or;
- b) On filing of the plan in the land titles office for plans confirmed under Part III of the Act.

## **2.13 Rectification of Errors**

An error in a survey, or a failure to find original evidence, should not result in a loss of land to an owner. If an error is discovered, or if original evidence is found after a plan has been confirmed, then a resurvey correcting the work or incorporating the additional evidence may be required to rectify any problems caused by the previous survey.

## **2.14 Affidavits**

When evidence respecting the location of a boundary is taken from any person, the surveyor should record the evidence in the field notes, read it over to the person who has given the evidence and take the affidavit of such person as to the truth of the statements contained therein.

According to the Lawyer's Encyclopaedia published by Prentice-Hall, a typical affidavit will contain a statement such as: John Doe, being duly sworn, says that he has read the foregoing evidence; that the same is true to his own knowledge, except as to those matters stated to be alleged upon information and belief, and as to those matters, he believes it to be true.

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_

\_\_\_\_\_  
CLS

## **2.15 Prorating (From Survey Law in Canada, Carswell Company Ltd. 1989)**

In general terms, prorating can be defined as the orderly proportionment of a difference between a plan distance and a measured distance. It is commonly used to allow for the orderly adjustment of small differences between undisputed corners when intermediate boundaries lie between those undisputed corners.

Keep in mind however, prorating has a lower preference in the hierarchy of evidence and should only be used when all evidence of a higher nature has been diligently and fully searched for but not found. (Additional information on prorating can be found in the BCLS Manual of Standard Practice)



## 2.16 Coordinates as Evidence

The introduction of integrated survey areas in Canada has led to much discussion as to the present and future role of integrated survey coordinates in re-establishment of missing property corners. It is probably safe to say that the traditional order of evidence still applies in integrated survey areas but coordinates must be considered when the original monument is missing. Coordinates should only be used in the absence of better evidence.

Additional information on Coordinate Based Cadastral Systems can be found in the following references:

- 1) 1999 paper entitled “Coordinates in Context: technical, social and legal Implications of using Coordinates only to define Boundaries” by Dr. Brian Ballantyne, NRCan LSD publication.
- 2) 2002 paper entitled “Integrated Land Surveys” by Dr. Brian Ballantyne., NRCan LSD publication.
- 3) 2003 paper entitled “CCOG Resolution F02-12 National Standards for Integrated Surveys Status Report” NRCan LSD publication.
- 4) 2002 paper entitled “Coordinate Based Cadastre Test Project Summary Report” published by the Alberta Land Surveyors Association  
[http://www.alsa.ab.ca/Portals/0/PDF/Member\\_Resources/ALS\\_News/0209.pdf](http://www.alsa.ab.ca/Portals/0/PDF/Member_Resources/ALS_News/0209.pdf)

## 2.17 Compiled Plans

The National Standards for the Survey of Canada Lands define a compiled plan as “A plan compiled from existing survey information”. This definition applies to official plans prepared under Section 29 and administrative plans prepared under sec.31. For official plans prepared under Section 29, it must have been fully monumented by previous surveys.

A compiled plan may be prepared to create a new parcel, to eliminate a parcel remainder, to consolidate existing parcels or to create one plan for an area from several plans where the numbers of plans and the changes to boundaries and parcels result in confusion or uncertainty.

Compiled official plans must satisfy all of the following requirements.

- Specific Instructions must be issued for a compiled plan
- The plan must be based on field notes, plans recorded in the CLSR or plans recorded in provincial land titles or land registry offices.
- Boundaries shown on a compiled plan may be created from existing survey information or by computing the bearing and distance between monuments.
- For a complete list of requirements, refer to the National standards for the Survey of Canada Lands.chapter 2.1 , 2.2 and 2.7

In addition to the above requirements, the following guidelines should be considered when compiling plans from information other than the surveyor's own field notes.

- There should be sufficient survey fabric that can be used to define the boundaries of the new parcel. The surveyor should review existing surveys in the area and possibly do some field work to determine if there is sufficient survey fabric in the area that can be used to define the boundaries on the ground.
- The surveyor must be confident that the existing plans and documents used to compile a plan are current, reliable and of a sufficient standard to provide certainty of the new boundaries.
- Consideration should be given to a site inspection or field survey if there is any question as to the reliability of the plans and documents being relied upon. If no site visits are executed, the surveyor must consult the orthophotos in the area of the new parcel to ensure there is no potential conflict with the boundaries.
- The proposed land use or the transaction intended may dictate that survey be considered.
- A compiled plan should not be prepared if encroachments are suspected; OR, before compilation, clients and/or others having vested interests are made fully aware that encroachments are probable.
- When compiling natural boundaries, care must be taken to ensure they have not changed. A new survey may be required if the natural boundary has changed significantly. The surveyor should consult with the SGB on how to deal with any changes to the natural boundaries.

## **Part 3: SURVEYS CARRIED OUT UNDER THE DIRECTION OF THE SURVEYOR GENERAL**

### **3.1 Surveyor General**

The Surveyor General also provides advice on matters related to surveys of Canada Lands; writes and/or reviews legal land descriptions of Canada Lands; and manages surveying and mapping programs for other federal government departments responsible for administering Canada Lands.

### **3.2 Management of surveys**

The Surveyor General manages legal surveys by:

- a) issuing instructions, issuing lot numbers, examining and recording plans of surveys of Canada Lands;
- b) initiating surveys of Canada Lands to maintain boundaries and survey frameworks; and

- c) carrying out, by staff or through contracting, surveys and mapping of Canada Lands, or lands to become Canada Lands, at the request of other federal government departments;
- d) maintaining custody of the original plans, journals, field notes, and other hardcopy and digital material generated in connection with the surveys.

### **3.3 Other Responsibilities of the Surveyor General**

The Surveyor General also provides advice on matters related to surveys of Canada Lands; writes and/or reviews legal land descriptions of Canada Lands; and manages surveying and mapping programs for other federal government departments responsible for administering Canada Lands.

### **3.4 Specific Survey Instructions Required**

#### **General**

Any surveyor engaged to undertake a legal survey or prepare a plan of Canada Lands must carry out the work in accordance with the instructions of the Surveyor General of Canada Lands. For every survey on Canada Lands the Canada Lands Surveyor must open a survey project in MyCLSS. MyCLSS is the website application to initiate survey projects and to request Specific Survey Instructions.

#### **Specific Survey Instructions not required**

For legal surveys carried out under the legislation listed below, general instructions are contained in The National Standards for the Survey of Canada Lands, no further instruction is required.

- a) Canada Oil and Gas Land Regulations;
- b) Condominium Act (NT);
- c) Condominium Act (NU);
- d) Indian Oil and Gas Regulations;

#### **Specific Survey Instruction Required**

For legal surveys, other than those made under the legislation identified above, specific survey instructions are required and may be obtained by visiting the “MyCLSS” website. (see 3.6)

Specific survey instructions are also required for control surveys in coordinated survey areas.

For most survey activities on Canada Lands, specific survey instructions can be requested, even if they are not required.

### **3.5 Field Notes of Monuments Restored or Re-established**

In some situations, a surveyor may restore or re-establish a monument as part of a Surveyor's Real Property Report or some other survey that is not being executed under the direction of the Surveyor General. In these situations, the surveyor shall file a report of the monument restoration or re-establishment in accordance with the general instructions contained in Part D of the General Instructions for the Surveys of Canada Lands, E -edition. The report may be filed in plan or book form. Alternatively, in the case of a monument replacement, it should be shown on a SGB, Natural Resources Canada (NR Can) LS56 form.

### **3.6 MyCLSS**

[www.myclass.ca](http://www.myclass.ca)

MyCLSS is a collaborative site between the Association of Canada Lands Surveyors (ACLS) and the Surveyor General Branch (SGB) to allow surveyors to:

- Initiate a project
- Request survey instructions
- Use online tools to help the surveyor in the production of official plans
- Monitor project status until completion
- Request amendments to survey instructions
- Pay the required fees to the ACLS

#### **Help Section:**

- MyCLSS user guide
- MyCLSS General overview of the application
- MyCLSS overview of the Critical Issues and Amend Checklist Functionalities
- Requirements to setup your system in order to use MyCLSS
- Known issues and fixes
- MyCLSS Webinar

MyCLSS also provides surveyors quick reference to relevant survey information to assist them through the survey process.

#### **Research**

- Survey Plan Search
- Survey Project Search
- Map Browser
- Land Titles Offices
- Yukon Lands
- Indian Land Registry
- Standards (General Instructions, ACLS Practice Manual)
- Canada Lands Overlay on Google Earth
- Legislation / Justice Canada
- Legislation / CanL11

- Parks Canada

### **Authorizations**

- Before Field Work
  - Obtain permission to do a survey
  - Request Survey Instructions
  - Survey Sketch
  - Land Status Report
- After Field Work
  - Approval Form
  - Land Titles Office Forms (Nunavut)

### **Data and Tools**

- Canada Lands Digital Cadastral Data
- Geobase
- Geobase/Canadian Administrative Boundaries
- Geogatis
- Online Geodetic Tools (PPP)
- Canadian Spatial Reference System (CSRS)
- Canada Oil and Gas Grid Areas Outline Applications

### **Plan Check**

- Survey Document Checklist (Critical Error List)

### **Recording**

- Recording
- E Recording

### **Log In**

Prior to opening a project or requesting instructions a member has to be registered with MyCLSS by obtaining a password from the ACLS office.

## **Part 4: FIELD PRACTICES AND GENERAL REQUIREMENTS**

### **4.1 General Principles**

This manual is mainly concerned with field procedures insomuch as it pertains to general principles of care and control. It is assumed the surveyor is trained and skilled in the use of all his/her equipment whether it is a total station, GPS or some other technology. Regardless of the choice of equipment, the general principles of surveying remain the same.

Field practices should provide:

- The detection of gross errors and blunders.
- The minimizing of systematic and random errors.
- Independent checks on all measurements.
- The creation of a complete record of the field activity.
- Sufficient redundant measurements.

### **4.2 GPS Survey Methodology**

Users should follow the recommendations set out in the manufacturer's documentation. It is the responsibility of the land surveyor to assess which survey methods and procedures are to be applied to a cadastral survey project. All GPS data and results should be carefully scrutinised; the surveyor is reminded that ambiguities may not always resolve correctly. The surveyor must perform adequate quality control and assurance to ensure that accuracy standards and survey requirements are met.

The following additional information is available from the Geodetic Survey Division website ([www.geod.nrcan.gc.ca](http://www.geod.nrcan.gc.ca)):

- "Guidelines and Specifications for GPS Surveys, Release 2.1", December 1992  
<http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/publications/pdf/guidelinesspecifications.pdf>
- "Guidelines for the NAD83 Integration of Local GPS Surveys, Version 1.0", January 1998  
4.3 *Direct Measurements*

The preferred method of placing monuments and of determining the length and direction of boundaries is by direct measurement along the boundary.

### **4.3 Direct Measurements**

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#### **4.4 Indirect Measurements**

Indirect measurements, such as radial ties or positions obtained by GPS, may be used to place monuments or to determine the length and direction of existing boundaries provided they are verified by an independent method, for example:

- a) incorporating the monuments in a closed traverse;
- b) comparing with measurements of the same boundary shown on a prior official plan;  
or
- c) making additional radial ties from another control survey marker or traverse point incorporated in the control network.

#### **4.5 Closed Traverses**

Survey traverses shall be closed by: making a loop closing on itself; closing on official control survey markers; or closing on connected monuments shown on official plans.

#### **4.6 Monumentation Placement Guidelines**

- a) In addition to the monumentation requirements specified in the National Standards for the Survey of Canada Lands, the surveyor should follow the guidelines outlined in this section when placing monuments.
- b) The surveyor shall consider the following principle objectives when placing monuments:
  - **SAFETY:** no monument should be placed such that it is likely to strike a buried utility or that it is likely to protrude from the ground surface in a fashion that creates a hazard to pedestrian or vehicular traffic;
  - **PERMANENCE and RELIABILITY:** every monument should be placed in stable soil or rock and under conditions such that it is likely to remain undisturbed;
  - **USEFULLNESS:** sufficient monuments on each individual project should be placed to adequately identify property boundaries and corners or survey reference systems. Ancillary line blazes, reference stakes and posts should be employed.
  - **IDENTIFICATION:** each monument should be clearly visible or identified by a suitable marker to advise the public of its general location and purpose.
- c) Set CLS standard posts, CLS standard rock posts and other capped monuments flush with the ground. Other types of monuments should protrude just enough to allow markings to be read, and not more than that prescribed by provincial practice, i.e. 5 to 10 cm above the surface of the ground. If the monument is placed in areas where it is subject to disturbance by manmade activity, it should be set flush with or close to surface of the ground.
- d) If it is necessary to place a monument in a traveled road or trail, cultivated field or other location where it could be a hazard, then countersink the monument sufficiently to avoid injury or damage.

- e) If a monument has been driven to refusal to a depth of at least 30 cm but protrudes more than 10 cm above the surface of the ground, secure and protect its position by building a mound of earth or rocks around the protruding monument.
- f) It is good practice to avoid placing witness monuments, particularly in urban areas where they may be mistakenly used by the public as marking the lot corner. Make every effort to monument the lot corner. If it is not possible to monument the lot corner, witness monuments should be placed far enough from the corner so they are less likely to be mistakenly used as the lot corner.

## **UNITS AND REFERENCING SYSTEMS**

### **4.7 Bearings and Angular Units**

Bearings may in order of preference be controlled by or be derived from:

- a) Coordinated Control Monuments in a Coordinated Survey Area;
- b) Canadian Spatial Reference System or federal or provincial control survey markers;
- c) GPS baselines;
- d) astronomic observations for azimuth providing that the accuracy requirements for legal surveys are attained; or
- d) monuments established in a previous legal survey for which the plan is recorded in the CLSR. The distance between boundary monuments selected should be sufficient to enable legal survey accuracy standards to be met, and over 100 m, if possible.

Angles and bearings shall be expressed in degrees, minutes and seconds. Note: Chapter 2, Section 2.4, Subsection 21 of the National Standards for the Survey of Canada Lands requires that bearings are to be expressed as full circle bearings.

### **4.8 Meridian**

If a meridian to which bearings are to be referred to is not specified in the specific survey instructions for the survey, refer bearings to one of the following meridians:

- a) the customary meridian in the area of the survey;
- b) if the survey is located within a recognized coordinate system to the central meridian of the coordinate system; or

if one of the above two methods is not applicable, then to the meridian through a point, preferably monumented, central to the survey.

## **ACCURACY**

(Sections 4.9 through 4.13 apply to cadastral surveys)



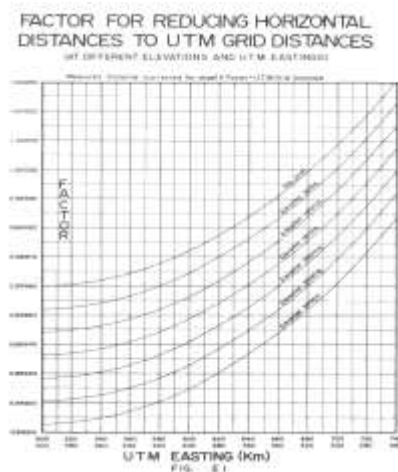
## 4.9 Geo-referencing

Geo-referencing to NAD 83 CSRS (The Canadian Spatial Reference System) is often required when working on Canada Lands. GPS uses the Global Navigational Satellite System (GNSS) to determine relative positions on the ground that can be related to NAD 83 CSRS by using NRCan's web based Precise Point Positioning (PPP) service. When referencing the survey to a provincial or local control monument(s), the coordinate values and orthometric height(s) for the monument(s) should be included in a table of main monuments on the face of the plan. It is important to state whether the values shown for the control monument(s) are "observed" or "as published". If different, both values should be shown in the table.

### Scale Factor

Since the measurements shown on the plan are horizontal ground measurements, a combined scale factor must be used to reduce the distances to sea level and to the projection plane before calculating grid coordinates. The table of coordinates for main monuments on the plan should include the combined scale factor of each point or, if the survey is relatively small, a combined scale factor for the entire plan can be mentioned in the legend of the plan. If the scale factor is not known it can be approximated using the chart entitled "Factor for Reducing Horizontal Distances to UTM Grid Distances" found in Chapter E2 of NRCan Oil and Gas Survey Instructions

[http://cls.nrcan.gc.ca/standards-normes/images/d7-e1\\_e.jpg](http://cls.nrcan.gc.ca/standards-normes/images/d7-e1_e.jpg)



## 4.10 Accuracy Standards

The surveyor shall use methods, procedures and equipment that will meet the accuracy standard and be satisfied that the survey will meet the standard. Any one station of the survey must meet the standard relative to all other stations.

## 4.11 Angular Misclosure

The maximum allowable angular misclosure is 20 times the square root of n seconds (n=number of angles measured in the traverse loop or between lines of bearing control).

## 4.12 Overall Accuracy

The minimum accuracy standard for legal surveys is defined by the ellipse showing the 95% confidence region for the positioning of one station relative to another. The semi-major axis of this ellipse in centimetres ( $r$ ) with respect to another station must be less than or equal to  $C(d+0.25)$  where:

- C =an assigned value depending on the accuracy requirement; and
- d =the distance in kilometres to any station.

## 4.13 Value of C

### Surveys involving own work

For surveys involving the surveyor's own work, C is assigned the value 8. The following table illustrates how various distances affect the semi-major axis of the 95% confidence region of one station with respect to another, parts per million (ppm) and the accuracy ratio for  $r = 8(d+0.25)$ :

<i>d (km)</i>	<i>r (cm)</i>	<i>ppm</i>	<i>ratio</i>
0.01	2.1	2100	1/480
0.03	2.2	733	1/1360
0.10	2.8	280	1/3570
0.50	6.0	120	1/8033
1.00	10.0	100	1/10000

### For surveys involving previous work

For surveys using the surveyor's own measurements combined with previous surveyors' measurements, C is assigned the value 15. The following table illustrates how various distances affect the semi-major axis of the 95% confidence region of one station with respect to another, parts per million (ppm) and the accuracy ratio for  $r = 15(d+0.25)$ :

<i>d (km)</i>	<i>r (cm)</i>	<i>ppm</i>	<i>ratio</i>
0.01	3.9	3900	1/260
0.03	4.2	1400	1/710
0.10	5.3	530	1/1890
0.50	11.3	225	1/4420
1.00	18.8	190	1/5320

## 4.14 Confidence region

See Appendix E4 of the General Instructions for the Surveys of Canada Lands, e-edition (<http://clss.nrcan.gc.ca/standards-normes/e4-v1-eng.php>) for additional information regarding the concept of confidence region for legal surveys and the application of this standard for legal surveys.

## EQUIPMENT

### 4.15 General

- Equipment used should be in adjustment and tested regularly for calibration.

- EDM equipment should be tested on a baseline or returned to the manufacturer/dealer for testing and calibration.
- GPS equipment should be tested on a validation network or returned to the manufacturer/dealer for testing and calibration.
- Prism pole circular bubbles should be checked frequently and adjusted if necessary.
- Optical plumbs in instruments and tribrachs should be checked frequently.
- Horizontal and vertical angle readings should be checked frequently.
- Spirit levels should be peg tested as necessary.
- All equipment should be serviced and maintained regularly.

#### **4.16 Adjustment and Testing of Measuring Equipment**

All equipment used in the survey must be in adjustment, in calibration and standardized. The surveyor must keep records of calibration and standardization results and carry out sufficient analysis of the data to prove that the equipment is operating to the manufacturer's specifications. One method of testing measuring equipment is the use of a Precise Calibration Base Line, another would be to send the equipment for calibration by the manufacturer.

As the instrument and reflector combinations may change from project to project undetected errors may be introduced into the measurements unless frequent testing and calibration is conducted. A precise calibration base line is an easy way to determine and monitor the precision of the EDM system. By measuring different combinations of lengths of lines on the base line and comparing these values to the adopted values, the scale of correction to be applied to all measurements can be determined for each instrument-reflector combination.

If there is not a Precise Calibration Base Line located in your area of operation a base line could be constructed for your own use. In setting up a precise calibration base line the following conditions should be met:

1. It must be physically stable.
2. The adopted values for distances between piers must be determined to a precision greater than that of the instruments to be calibrated.
3. It must be located in a place where the piers are unlikely to be disturbed.
4. The base line must be easily accessible.
5. It must not pose a hazard to users or the general public.

When using the base line the following considerations should be made:

1. Make measurements using the same instrument-reflector combination that is usually used.
2. Compare lines of different lengths covering the full range of the instrument.
3. Make measurements under normal weather conditions.
4. Calibrate after instrument maintenance and repair.
5. Calibrate when instrument-reflector combinations change.
6. Document each calibration and maintain a history so that changes over time can be detected.

7. Implement a regular calibration program, typically at the beginning and end of projects.

Records of calibration and standardization results and copies of any analysis carried out must be retained so that, if requested, they can be reviewed by both the ACLS and SGB.

#### **4.17 Testing GPS Equipment**

Indirect positioning systems, such as the Global Positioning System (GPS), must be tested on a control network, or returned to the manufacturer/dealer for testing and calibration.

A GPS Validation Network can be used to evaluate the results obtained using a specific combination of GPS equipment, software, and observation procedures. The accuracies attainable from different observation procedures and equipment can also be determined using a validation network.

A GPS validation network is typically comprised of between 5 and 10 forced centering piers. The network design should provide GPS baselines of varying lengths, usually ranging between 1 and 100 kilometers. The design and location of the pillars should take the following into consideration:

1. Forced centering is used to eliminate centering error.
2. The piers should be located where they are easily accessible, unlikely to be disturbed, and don't pose a hazard to the user or general public.
3. The site should be generally clear of obstructions above 10 degrees.
4. The piers should be constructed with stability and longevity in mind.

The concept behind the validation survey is to evaluate the entire GPS “*survey system*” that is being used on survey projects, and to determine with confidence whether or not it produces reliable results that meet the accuracy requirements and generates the final products expected. The survey system includes the equipment and all procedures used for data collection as well as equipment, software and procedures used for data processing and output of final results.

Records of calibration and standardization results and copies of any analysis carried out must be retained so that, if requested, they can be reviewed by both the ACLS and SGB.

## **FIELD RECORDS**

### **4.18 Field Records**

Field records are the records made in the field during the course of the survey.

Field records are everything found, observed and done, including:

- a) the description and the location of the project;
- b) the names and duties of persons in the field party;

- c) the type and identification of survey equipment used;
- d) the date of observations;
- e) each quantitative observation or measurement;
- f) a complete description of every monument found, restored or placed, including markings and ancillary monumentation;
- g) searches made for monuments and other physical evidence;
- h) if applicable, reasons why monuments cannot be placed where specified in the instructions;
- i) the methods used to re-establish lost monuments;
- j) searches made for documentary or verbal evidence;
- k) Data added to field notes on a date other than that recorded on the page should be so identified;
- l) A field report should include:
  - record of all oral evidence;
  - any discrepancy or assessment of conflicting evidence.

Field record entries must not be erased or obliterated. Stroke out incorrect entries in such a way that they remain legible but are obviously discarded.

#### **4.19 Additional Field Records**

Depending on the project and the equipment used, field records and sketches may also contain:

- 1.a)
    - north arrow
    - weather conditions
    - offset lines and traverse lines identified;
    - names and widths of streets;
    - annotation of instrument stations, interline points, points of intersection, site stations etc;
    - whether angles and distances or coordinates have been set or measured;
    - reference to records of field calculations;
    - the point numbers which relate to the measurements in the schedule of measurements or stored in the data collector;
    - direct check measurements.
  - b) a record of corrective instructions, if any, to be applied to the data stored in the data collector;
  - c) a schedule of measurements; and
  - d) a reference to the computer file where the data captured in the field is stored
2. A record of the mode of operation when using GPS. Antenna height measurements and their verification should be recorded.
  3. A record of the relationship of the “control points” to the actual job.

4. The control station name and inscription, the position of the control stations (*coordinates, elevations etc*), datum and map projection should be provided. For “project control” the geodetic control to which it was tied into should be indicated. In addition, any transformations applied to the GPS derived positions should be provided.

#### **4.20 Retain Original Notes**

The field records shall be held by the surveyor and, even though official field notes have been filed in the CLSR, a surveyor may still be required to submit the field records or copies of the field records. Where it is deemed necessary to redraw the field records, the original field records should be retained and attached to the copies.

#### **4.21 Data Collectors**

Where field data is recorded by an automated or semi-automated data-logging device, including voice recordings, this data should be verified and transcribed onto a permanent visually readable format attached to the field notes when the data is incorporated into a final survey.

## **DATA RECORDING AND STORAGE**

#### **4.22 Raw Data**

Raw observational data should be archived. It is equivalent to the surveyor’s field book and should be retained. A permanent copy of the following shall be kept as part of the data/survey records:

- field notes;
- an edited abstract of field data (computer printout) in a readable format;
- a point plan which would:
  - i) identify point numbers and what they represent;
  - ii) indicate the accepted evidence and the relationship of all evidence to the final boundary
- a coordinate list of all points prior to and after they have been averaged.

#### **4.23 GPS Project Records**

GPS project records may include:

- the date;
- the project operators and processors;
- observations schema with start and end times;
- measurement rate, observation types and elevation mask;
- system make, model, serial numbers, and firmware for all receivers, antennas and recording devices, and any software (including version) used, processing controls and methods and analysis files, differences between any repeat measurements or derived position, and adjusted value (average);

- sketch and any values necessary to relate the measured antenna height to the vertical;
- distance from the station marker to the antenna phase centre;
- verification of control;
- summary of any receiver, operator, tracking or processing problems.

## **SURVEYOR’S REAL PROPERTY REPORTS**

### **4.24 Surveyor’s Real Property Reports within the Provinces**

Where a Provincial Land Surveying Association has adopted standards for the preparation of Surveyor’s Real Property Reports, otherwise known as Building Location Certificates or Surveyor’s Certificates; then the provincial standards should be considered as a minimum requirement when carrying out this type of work on Canada Lands within a Province.

### **4.25 Surveyor’s Real Property Reports in the Yukon, Northwest Territories and Nunavut**

#### **4.26 Definitions**

“**Surveyor’s Real Property Reports**” means the plan and report prepared in respect of the survey performed for the purpose of identifying, locating, and illustrating the location of all **permanent** structures relative to the boundaries of the parcel of land.

“Permanent structures” **may** include:

- (i) All buildings and projections there from, including eaves, steps, landings and the foundations of all buildings under construction.
- (ii) All permanent sheds.
- (iii) Retaining walls and fences that appear to define property lines or that extend beyond the limits of the parcel or into the parcel from adjacent parcels.
- (iv) Utility poles and pedestals on the subject parcel.
- (v) Decks, patios, balconies or stairways.

#### **4.27 Survey Requirements**

When conducting a survey for a Surveyor’s Real Property Report, a surveyor shall:

- (i) Perform sufficient research to identify the parcel boundaries and all easements and rights of way that affect the extent of title.
- (ii) Locate and confirm sufficient monuments related to the land under survey to determine the parcel boundaries.
- (iii) Locate the main external walls of visible permanent structures on the parcel relative to the boundaries thereof, whether entirely or partially within the parcel, together with any visible portions of the structure which may extend beyond the parcel boundaries.

- (iv) Locate visible permanent structures that extend into the parcel from adjacent parcels.

The location of additional structures may be necessary to satisfy specific requirements (e.g., zoning, mortgage etc.). Whether such additional structures are of interest to the client should be determined in consultation with each individual client.

The level of work required to carry out a Surveyor's Real Property Report may vary depending on the value and location of improvements on a property as well as the value of the property itself. A client usually requests a Surveyor's Real Property Report to minimize financial risks. The property values and risks involved should be taken into consideration when preparing a Surveyor's Real Property Report or when providing an estimate of cost.

#### **4.28 Plans**

When preparing a plan for a Surveyor's Real Property Report, the surveyor shall:

- (i) Indicate the legal description, municipality and if available, the municipal address.
- (ii) Show the parcel designations for adjoining lands.
- (iii) Illustrate all visible permanent structures with their dimensions and offset distances from the boundaries of the subject parcel.
- (iv) Indicate the type and stage of building construction.
- (v) Identify the surface that the building ties are measured from (e.g., concrete foundation, siding, etc.)
- (vi) Identify visible permanent structures that extend beyond the limits of the parcel or extend into the parcel from adjacent parcels. It is suggested that the word "encroachment" not be used since by definition, encroachment implies an unlawful act, the determination of which would be beyond the scope of the survey.
- (vii) Indicate the length and bearing of each boundary of the parcel.
- (viii) Identify all easements and/or rights of way which affect the parcel.
- (ix) Certify the plan by date, signature and seal.
- (x) Show a north arrow and the scale of the plan.
- (xi) State the units of measurement.
- (xii) Include the statement: "This Surveyor's Real Property Report was prepared for (name of client) and is not valid unless it is a sealed original copy issued by the surveyor."

#### **4.29 Updating Surveyor's Real Property Reports**

All Surveyor's Real Property Reports issued shall be up-to-date and cannot be considered up-to-date unless:

1. A new field inspection has been done and it is determined that no changes have taken place that would necessitate a change in the plan.
2. A statement has been added to the Surveyor's Real Property Report stating that a site inspection has been made prior to issuance.



### **4.30 Reports**

A report shall accompany the Surveyor's Real Property Report if considered necessary. The report may be included on the plan or prepared separately. If separate, the plan and report shall cross reference each other.

## **SKETCHES**

### **4.31 Cautionary Notes**

Sketches can be any graphic illustrations prepared for a client other than legal survey plans and Surveyor's Real Property Reports. Sketches need not be certified.

The great concern with sketches is that they may be mistaken by the public (and the courts) as being legal survey documents. Therefore, sketches should not be prepared on pre-printed forms used for plans of survey, which contain legends, certificates, etc. When preparing sketches, great care must be taken to ensure they are not subject to misinterpretation.

Sketches should clearly indicate in their title blocks the purpose of the sketch, e.g., building permit application, severance application etc.

The following caution note should appear prominently on the sketch:

#### **CAUTION**

"This is not a plan of survey and shall not be used except for the purpose indicated in the title block".

Furthermore;

A sketch should indicate the exact source of the dimensions shown on the sketch and note if they are not obtained from survey.

A sketch should include a note indicating that the sketch is protected by copyright.

A sketch should not be signed unless required by an approving agency.

## **CONSTRUCTION SURVEYS**

### **4.32 Good Practice**

When performing construction layout surveys the following applies:

- 1) Field and office copies of the complete set of construction drawings, "Approved for Construction" should be obtained before commencing any site layout.

- 2) The construction drawings should be reviewed and any discrepancies or ambiguities clarified prior to the site layout. No assumptions should be made as to any position on the plans.
- 3) The layout should be pre-computed and sufficient checks performed to ensure it is consistent with the original construction drawings.
- 4) Sufficient research shall be carried out to ensure the project surveyor has all information available to define the site boundaries. A survey methodology, which will produce the required accuracy, should be used.
- 5) Horizontal and vertical control to be used for the project shall be verified prior to commencement of any site layout.
- 6) The project surveyor shall verify who is responsible for locating underground facilities within the construction area.
- 7) If any changes in the location or dimensions of the facilities are requested, the revisions should be in writing and signed by an authorized person. This would include any positioning determined by site conditions.
- 8) Independent check-ties shall be made on all facilities laid out to ensure any layout inconsistencies are rectified prior to construction.

In no instance should the surveyor allow construction to begin where the layout has not been verified.

## **Part 5: HYDROGRAPHY**

### **5.1 Standards**

Standards for Hydrographic Surveys are set by the Canadian Hydrographic Service, Department of Fisheries and Oceans.

These standards are outlined in a manual entitled “Standards for Hydrographic Surveys” second edition, August 1998 and posted on the Fisheries and Oceans Canada website <http://www.charts.gc.ca/data-gestion/standards-normes/intro-eng.asp>

## **Part 6: PHOTOGRAMMETRY**

### **6.1 General**

Aerial or terrestrial photographs can be utilized to make measurements by photogrammetric measuring and calculating techniques. The basics of photogrammetry are explained at the following website: <http://www.geodetic.com/Whatis.htm> .

The typical photogrammetric product is a map in either a paper or digital form, the latter being very useful for applications such as Geographic Information Systems (GIS). Aerial photography can also be used in either a quantitative or qualitative manner to assist in the determination of natural boundaries and assisting the surveyor in boundary and corner recovery (Brown et al 1994). Recently photogrammetric methods have been used to map the natural boundaries of large land claims in Canada's northern territories.

### **6.2 Photogrammetric Mapping**

Photogrammetric measurements from aerial photographs are conventionally made utilizing analytical stereo plotting machines having optical systems that allow the resolution of targeted or well defined points down to the micrometre ( $1 \times 10^{-6}$  metres) level. The actual reliability of the measurement depends on the object or target size and how well it is defined and other miscellaneous error sources. A reasonable estimate for the overall uncertainty in a target measurement on a photograph is about 10 micrometres (1 standard deviation). The typical photogrammetric measurements are the x and y photo coordinates for a selected point or target.

Today, more and more mapping firms are using digital photogrammetry. Digital photogrammetry uses scanned images of aerial photographs, computers with sophisticated mapping software, and a stereo viewing device for the operator. In digital photogrammetry, scanner errors are introduced into the mapping. The scanner used must be calibrated and the image must be scanned to a suitable resolution.

Measurements are subject to uncertainties from many error sources, both random and systematic. Uncertainty in measurements should be reflected by an accuracy statement attached to measurement values. Guidelines governing such statements are nicely covered at the NIST website: <http://physics.nist.gov/Pubs/guidelines/contents.html> .

Typically, measurements are made for pass and tie points between adjacent photographs and adjacent rows of photographs to facilitate a least squares adjustment (aerotriangulation) along with values for surveyed control point coordinates (sometimes including camera locations determined by GPS) are used to solve for the position and orientation of the individual photographs. Individual pairs of photos are then set up in stereoplotting machines for compilation of detailed mapping points and/or contours (Wolf & Dewitt 2000).

### **6.3 Potential Accuracy of Photogrammetric mapping**

As a guide to the surveyor the following estimates of 95% confidence mapping accuracies in metres from the photogrammetric mapping process are suggested:

Horizontal Accuracy for detail  $\approx$  Reciprocal Photo Scale times 150ppm

Vertical Accuracy for spot elevations  $\approx$  1.5 times the Horizontal Accuracy

Contours  $\approx$  2 times the horizontal accuracy

Map Scale produced  $<$  10 times the photo scale (preferably 5 or 6 times)

*Example:* with 1/10,000 scale photography the surveyor might expect points with a horizontal accuracy of  $10000 \times 150 \times 10^{-6} = 1.5\text{m}$  and vertical accuracy of 2m or so. Reliable contours of 3m could be developed for a map of scale no larger than 1/1000 and more preferably about 1/2000 scale.

### **6.4 Photogrammetric Control**

In order to obtain the expected accuracies from aerial mapping adequate ground control points established throughout the mapped area are required. Horizontal control around the perimeter and a well distributed number of vertical control points throughout the area are required. Guidelines for this are given in the references (Wolf & Dewitt 2000, A.S.P.R.S 2004) and as well, advice should be taken from the photogrammetric firm doing the mapping. A general rule of thumb is that control points should be established to a magnitude better than expected from the photography. For example if horizontal mapping accuracies of the order of 1.5m are expected then the horizontal control points should be established to an accuracy of 0.15m or better. Vertical control points should have an accuracy of 0.2m or better to establish vertical mapping accuracies of 2m. All such ground control should be marked by artificial targets of suitable size and layout (section 6.5). The control should extend beyond the limits of the desired mapping area but still show up on the photographs.

The aerial photography supplier may be able to provide coordinates for picture centres obtained with GPS equipment. Such GPS derived coordinates must be in the same coordinate system as the ground control points. A typical accuracy (95% confidence) on GPS determined photo centres is of the order of 0.1m horizontally and 0.15m vertically.

### **6.5 Targets**

Artificial targets should be centred on the ground control and constructed with materials providing a good contrast to the surrounding ground surface. Typically a central target circle of diameter equivalent to 30 to 100 micrometres at photo scale is centred over the control point. Three to four arms of the same width as the target and length of about five times the width are placed to enhance the visibility of the target. The references give recommendations as to size, shape and contrast (Wolf & Dewitt 2000, A.S.P.R.S 2004).

### **6.6 Quality Control**

The surveyor should establish additional control points throughout the mapped area for quality control purposes particularly in the vicinity of boundaries that are to be

established utilizing the mapping. Points chosen should be typical of the type of detail that the surveyor is having mapped for his/her purposes. These points should have the same level of coordinate accuracy as other control points. The coordinate values should not be used as part of the mapping control and should be made known to the photogrammetrist doing the mapping. Instead they should be used to check on values determined photogrammetrically to confirm that the accuracies indicated in section 6.3 are valid and represent the accuracy of the points determined photogrammetrically.

## **6.7 Ground Verification**

One key requirement of photogrammetric mapped water boundaries is the ground verification. The CLS must verify the boundaries on the ground (see applicable Section in the Manual of Instructions). The best method to verify longer natural boundaries is by viewing them from the air from a helicopter. Many colour pictures should be taken so that the CLS may refer to them back in the office and file them with the survey report. It is essential for the CLS to:

- Determine if a water boundary makes a suitable natural boundary. A small creek may look suitable in a photo due to the vegetation, but may be near impossible to locate on the ground with any degree of certainty. The ground verification is always the final tool that is used to determine if a poorly defined creek should be replaced with a monumented artificial boundary.
- Determine interpretation uncertainty where there are flat marshy areas and sandbars. Colour photos taken from a helicopter tell the story in these cases, not the 1:50000 scale aerial photo.
- Verify if any accretion or erosion has occurred since the original mapping of an existing boundary. This may be indicated in the aerial photos, but it is the ground verification that is the final determination.
- Determine islands and navigable channels to see where the parcel boundary should be mapped. It is sometimes difficult to distinguish these in the aerial photos where there may be a small neck of vegetation that connects what appears to be an island to the mainland.
- Check to ensure that the Photogrammetrist used the correct feature to map the natural boundary. Beaches above the OHWM and marshy areas are commonly mapped incorrectly by the photogrammetrist.
- Check the photogrammetric mapping against some ground ties to ensure the mapping has no shift blunders and it is of sufficient accuracy. This can easily be done where an artificial boundary intersects a natural boundary.
- Do preliminary photogrammetric mapping of natural boundary before the CLS verifies the boundary in the field. The photogrammetrist can identify uncertain areas for the CLS to pay particular attention, and the CLS will have a coordinated digital boundary of the field that can be checked. If an orthophoto is also prepared, the CLS has a digital picture of the mapped boundary to check in the field; otherwise use prints of the aerial photos.
- Constantly consult with the Photogrammetrist to ensure that it is well understood of what and how the natural boundary is being mapped. The field CLS is supervising the mapping of the natural boundary similar to what they would supervise on any other part of the survey. There may be cases where the Photogrammetrist is a licensed CLS

who certifies the location of the boundary. In this case, the CLS Photogrammetrist should be making the ground verification because it is arguably the most important component of the mapping.

## **6.8 Recommended websites for additional information.**

Washington State Dept. of Transportation

<http://www.wsdot.wa.gov/mapsdata/Photogrammetry/default.htm>

Remote sensing tutorials

<http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/satellite-imagery-products/educational-resources/9309>

Geographic information system overview (USGS)

[http://erg.usgs.gov/isb/pubs/gis\\_poster/](http://erg.usgs.gov/isb/pubs/gis_poster/)

## **References:**

Brown, C. M., Robillard, W. G. and Wilson, D. A., Evidence and procedures for boundary location, 3<sup>rd</sup> Ed., 1994, Wiley-Interscience.

Mikhail, E.M., Bethel, J.S. and McGlone, J.C., Introduction to Modern Photogrammetry, 2001, John Wiley & Sons, Inc.

Wolf, P.R. and Dewitt, B.A., Elements of Photogrammetry with Applications in GIS, 3<sup>rd</sup> Ed., 2000, McGraw-Hill.

A.S.P.R.S., Manual of Photogrammetry, Chris McGlone, Editor; Edward Mikhail & Jim Bethel, Associate Editors, Fifth Edition, 2004.

## **Part 7: PROPERTY RIGHTS SYSTEMS**

(This section is yet to be developed)

### **7.1 “Canada’s Offshore: Jurisdiction Rights and Management 3rd edition”**

The authors of the book are: Bruce Calderbank, Alec MacLeod, David Gray and Ted McDorman. The book can be purchased through the ACLS office or you can visit the ACLS website to view the colour version. The book is also being translated into French.

(See amendments 2006)

## **Part 8: SURVEYOR GENERAL BRANCH**

### **8.1 SGB, Natural Resources Canada (NRCan)**

The Surveyor General Branch has five corporate offices (Head offices) and ten regional offices across Canada. A complete list of locations is posted on the internet at <http://www.nrcan.gc.ca/earth-sciences/geomatics/canada-lands-surveys/surveyor-general/11070>. Contact persons, addresses, phone numbers and e-mail address can be found at this site.

#### **Head Office:**

**Surveyor General Branch  
Natural Resources Canada**  
Suite 605, 9700 Jasper Avenue  
Edmonton, Alberta T5J 4C3  
Telephone: 780-495-2519  
Fax: 780-495-4052

**Western Canada Division**  
Natural Resources Canada  
Suite 605, 9700 Jasper Avenue  
Edmonton, Alberta T5J 4C3  
Telephone: 780-495-6175  
Fax: 780-495-2725

**Eastern Canada Division**  
Natural Resources Canada  
588 Booth Street, 2nd Floor  
Ottawa, Ontario K1A 0Y7  
Telephone: 613-995-4570  
Fax: 613-947-1388

**Canadian Geodetic Survey**  
Natural Resources Canada  
588 Booth Street, 2th Floor  
Ottawa, Ontario K1A 0Y7  
Telephone: 613-793-2102  
Fax: 613-996-9843

**International Boundary Commission - Canada Section**  
588 Booth Street, 2th Floor  
Ottawa, Ontario K1A 0Y7  
Telephone: 613-297-3030  
Fax: 613-947-1388

**Regional Offices:**

**Alberta Regional Office**

Natural Resources Canada  
Suite 605, 9700 Jasper Avenue  
Edmonton, Alberta T5J 4C3  
Telephone: 780-495-6176  
Fax: 780-495-4052

**Atlantic Regional Office**

Natural Resources Canada  
136 Victoria Street, East  
Amherst, Nova Scotia B4H 1Y1  
Telephone: 902-661-6766  
Fax: 902-661-6769

**British Columbia Regional Office**

Natural Resources Canada  
1501-1138 Melville Street  
Vancouver, British Columbia V6E 4S3  
Telephone: 604-666-3517  
Fax: 604-666-0522

**Manitoba Regional Office**

Natural Resources Canada  
250 - 365 Hargrave Street  
Winnipeg, Manitoba R3B 2K3  
Telephone: 204-983-3793  
Fax: 204-983-0157

**Northwest Territories Regional Office**

Natural Resources Canada  
2<sup>nd</sup> Floor, Greenstone Building  
P.O. Box 668  
Room 230, 5101 50th Avenue  
Yellowknife, NT X1A 2N5  
Telephone: 867-445-2784  
Fax: 867-766-8533

**Nunavut Regional Office**

Natural Resources Canada  
Governor Building #1093, Room 100  
P.O. Box 2380



Iqaluit, Nunavut X0A 0H0  
Telephone (toll-free):  
1-866-975-4633  
Fax: 867-975-6624

**Ontario Regional Office**  
Natural Resources Canada  
606 - 55 St. Clair Avenue East  
Toronto, Ontario M4T 1M2  
Telephone: 416-973-1006  
Fax: 416-973-1004

**Quebec Regional Office**  
Natural Resources Canada  
Jacques-Cartier Complex  
320 St-Joseph Street, East, Room 203  
Quebec, Quebec G1K 8G5  
Telephone: 418-648-7681  
Fax: 418-648-5728

**Saskatchewan Regional Office**  
Natural Resources Canada  
100 Central Park Place  
2208 Scarth Street  
Regina, Saskatchewan S4P 2J6  
Telephone: 306-780-5402  
Fax: 306-780-5191

**Yukon Regional Office**  
Natural Resources Canada  
225 - 300 Main Street  
Whitehorse, YT Y1A 2B5  
Telephone: 867-667-3957  
Fax: 867-393-6709

## **8.2 National Standards for the Surveys of Canada Lands**

The complete version of this manual can be found at the following web location: The English version can be found at: <http://clss.nrcan.gc.ca/surveystandards-normesdarpentage/index-eng.php> and the French version at: <http://clss.nrcan.gc.ca/surveystandards-normesdarpentage/index-fra.php>

# **Part 9: GENERAL STANDARDS FOR FIRMS QMS: QUALITY MANAGEMENT SYSTEM**

## **9.1 Introduction**

Notwithstanding the following recommendations, each member must ensure compliance with the current Code of Ethics of the Association of Canada Lands Surveyors and the relevant statutes and regulations governing the survey of Canada Lands which take precedence over any of the following recommendations.

These recommendations form part of the suggested standards of practice of the profession with which a firm should comply in establishing a quality management system applicable to all projects. It is recognized that no rule of general application can be phrased to suit all circumstances or combination of circumstances that may arise, nor is there a substitute for the exercise of professional judgment in the determination of what constitutes good practice in a particular case. Recommendations need not be applied to insignificant matters; significance is a matter of professional judgment in the particular circumstance.

Recommendations are intended to apply to all firms that employ members of the Association.

## **9.2 General Standards - Quality Management for Firms**

### **9.2.1 Introduction**

The firm should establish a quality management system designed to provide it with reasonable assurance that the firm and its personnel comply with professional standards and regulatory and legal requirements, and that reports issued by the firm or the member are appropriate in the circumstances.

The firm's quality management system should include policies and procedures addressing each of the following elements:

- a) leadership responsibility for quality within the firm;
- b) ethical requirements;
- c) independence
- d) acceptable and continuation of client relationships;
- e) human resources;
- f) project performance;
- g) project documentation; and
- h) monitoring and review.

The firm's policies and procedures should be documented and communicated to the firm's personnel.

### **9.2.2 Small Firms**

The recommendations describe responsibilities for several different roles and functions within a firm, including overall quality management. It may be necessary for one person to perform more than one of these functions.

### 9.2.3 Definitions

- (a) **Applicable Ethical Requirements** – the rules of professional conduct/code of ethics
- (b) **Project** – a member is engaged to issue a written communication (in textual, graphic or digital form) expressing a conclusion concerning a subject matter for which the accountable member is responsible.
- (c) **Project Team** – the person or persons who perform the project, including any sub-consultants.
- (d) **Competencies** – the knowledge, skills and abilities of a project team or individual.
- (e) **Project documentation** – the record of work performed, results obtained, and conclusions the member reached.
- (f) **Firm** – a sole practitioner, partnership or professional corporation engaged in professional surveying.
- (g) **Inspection** – procedures designed to provide evidence of compliance by the project team with a firm’s quality control policies and procedures.
- (h) **Monitoring** – a process comprising an ongoing consideration and evaluation of the quality control policies and procedures established by a firm, including periodic inspection of a selection of completed projects.
- (i) **Personnel** – members and other staff, including sub-consultants, who act as part of the project team.
- (j) **Practitioner** – the member who has overall responsibility for performance of the project and the issuance of the report.
- (k) **Professional Standards** – standards for performance of project set out in the Association’s Practice Manual.
- (l) **Reasonable Assurance** – in the context of this Standard, a very high, but not absolute, level of assurance.

### 9.2.4 Leadership responsibility for Quality Management

The firm should establish policies and procedures designed to promote an internal culture based on recognition that quality management is essential to all aspects of the work. Such policies and procedures should require the firm’s chief executive officer (or equivalent) to assume ultimate responsibility for the firm’s quality management system. Any person assigned operational responsibility for the firm’s quality management system should have sufficient and appropriate experience and ability and the necessary authority to assume that responsibility.

### 9.2.5 Ethical Requirements

The firm should establish policies and procedures designed to provide it with reasonable assurance that the firm and its personnel comply with applicable ethical requirements.

Applicable ethical requirements establish the following principles of professional ethics:

- (a) integrity;
- (b) objectivity;
- (c) professional competence and due care;

- (d) confidentiality; and
- (e) professional behaviour.

### **9.2.6 Independence**

The firm should establish policies and procedures designed to provide it with reasonable assurance that the firm and its personnel maintain independence in all required circumstances.

### **9.2.7 Acceptance and Continuance of Client Relationships**

The firm should establish policies and procedures designed to provide it with reasonable assurance that it identifies and assesses the potential risks associated with a client relationship or specific project, and should not accept or undertake a project if there are constraints that would prevent the completion of the project in accordance with professional standards and regulatory and legal requirements.

### **9.2.8 Human Resources**

The firm should establish policies and procedures designed to provide it with reasonable assurance that it has sufficient personnel with the competencies and commitments to ethical principles necessary to perform its projects in accordance with professional standards and regulatory and legal requirements, and to enable it to issue reports that are appropriate in the circumstances.

Such policies and procedures address the following personnel issues:

- (a) recruitment;
- (b) performance evaluation;
- (c) competencies;
- (d) career development;
- (e) promotion;
- (f) compensation; and
- (g) the estimation of personnel needs.

Competencies are developed through a variety of methods, including the following;

- (a) professional education;
- (b) continuing professional development, including training;
- (c) work experience; and
- (d) coaching by experienced staff.

### **Assignment of Personnel to a Project**

The firm should establish policies and procedures designed to provide it with reasonable assurance that it has appointed the appropriate project team that collectively possesses the competencies and sufficient time to undertake the work in accordance with professional standards and regulatory and legal requirements, and to issue the reports that are appropriate in the circumstances.

### 9.3 Project Performance and Measurement

The firm should establish policies and procedures designed to provide it with reasonable assurance that projects are performed in accordance with professional standards and regulatory and legal requirements, and that reports are issued that are appropriate in the circumstances. In particular the firm should establish policies and procedures requiring that projects be adequately planned, properly supervised and appropriately reviewed.

For those aspects of the project that are client focused, the firm should establish performance targets for all significant milestones to be met and provide a mechanism to enable client feedback on the project.

#### **Planning, Supervision and Review**

**Planning** normally includes the development of an overall strategy and the preparation of a detailed approach to the performance of a project, and may also outline the supervision and review responsibilities and other quality control procedures specific to the project. Planning also includes informing members of the project team of their responsibilities, the objectives of their work and important matters relevant to the project.

**Supervision** occurs at various levels of responsibility and includes:

- (a) confirming that the project team members have the competencies to carry out the work expected of them and the time to adequately carry out the work, that they understand the requirements and that the work is being carried out in accordance with the plan;
- (b) addressing and communicating significant issues as they arise, assessing their implications and modifying the plan if required;
- (c) tracking progress of the project;
- (d) identifying and communicating other matters as they arise during the project.

**Review** responsibilities are determined on the basis that more experienced team members review the work of less experienced team members. Reviewers should consider:

- (a) the work has been conducted in accordance with the project plan;
- (b) the work has been performed in accordance with professional standards and regulatory and legal requirements;
- (c) significant matters have been identified;
- (d) appropriate consultations have taken place and conclusions have been documented and implemented;
- (e) the work performed supports the conclusions reached and is appropriately documented;
- (f) the evidence obtained is sufficient and appropriate to support the member's report;
- (g) the objectives of the project have been achieved.

#### **Consultation**

The firm should establish policies and procedures designed to provide it with reasonable assurance that:

- (a) appropriate consultation takes place on difficult or contentious matters;
- (b) sufficient resources are available to enable appropriate consultation to take place;
- (c) the nature and scope of, and conclusions resulting from, such consultations are documented and agreed with the party consulted; and
- (d) conclusions resulting from consultations are implemented.

### **Differences of Opinion**

The firm should establish policies and procedures for dealing with and resolving differences of opinion within the project team, with those consulted and, where applicable, between the practitioner who will issue the report and the project quality control reviewer. The practitioner has ultimate responsibility for the report but should consider whether the member's report should be issued until the difference of opinion is resolved.

### **Project quality control overview**

Projects are performed for a wide variety of clients and subject matters and the significance of a particular report to a user may vary greatly, depending on a number of factors, such as: the nature of the subject matter; the nature of the opinion or conclusions reached; and the extent that the user relies on the report to make decisions. An objective overview of the work of the project team, prior to issuance of the report, may involve a review of key aspects of the team's work, including the appropriateness of the report. The objective of the review is to provide an objective evaluation, before the report is issued, of any significant judgments made by the project team and the conclusions reached.

The firm should set out criteria for the eligibility of persons who may perform a project quality overview. Such criteria should address the technical expertise and experience necessary to perform the role.

## **9.3.1 Project Documentation**

The firm should establish policies and procedures designed to maintain the confidentiality, safe custody, integrity, accessibility and retrievability of project documentation.

Whether project documentation is in paper, electronic or other media, the integrity, accessibility or retrievability of the underlying data may be compromised if the documentation could be altered, added to or deleted without the practitioner's knowledge, or if it could be permanently destroyed. Accordingly a firm would establish appropriate controls for project documentation to:

- (a) enable the determination of when and by whom project documentation was created, changed or reviewed;
- (b) protect the integrity of the information at all stages of the project;
- (c) prevent unauthorized changes to the documentation;

- (d) allow access to the documentation by the project team and other parties to properly discharge their responsibilities.

### **Retention of project documentation**

The firm should establish policies and procedures requiring the retention of project documentation for a period sufficient to meet the needs of the firm or as required by law or regulation.

### **Ownership of project documentation**

Unless otherwise specified by legislation, regulation or contract, the project documentation is the property of the firm. The firm may, at its discretion, make portions of, or extracts from, project documentation available to clients, provided such disclosure does not undermine the validity of the work performed.

## **9.3.2 Monitoring**

The firm should establish policies and procedures designed to provide it with reasonable assurance that the policies and procedures relating to the quality management system are relevant, adequate, operating effectively and complied with in practice. Such policies and procedures should include an ongoing consideration and evaluation of the firm's quality management system, including periodic inspection of a selection of completed projects.

## **9.3.3 Complaints and Allegations**

The firm should establish policies and procedures designed to provide it with reasonable assurance that it deals appropriately with:

- (a) complaints and allegations that the work performed by the firm fails to comply with professional standards and regulatory and legal requirements; and
- (b) allegations of non-compliance with the firm's quality management system.

## **9.4 Documentation**

The firm should establish policies and procedures requiring appropriate documentation to provide evidence of the operation of each element of its quality management system.

Large firms may use electronic databases or central depositories to document staff training, performance reviews, acceptance and continuance of client relationships and results of monitoring. Smaller firms may use manual notes, checklists and forms. Factors to consider when determining the form and content of documentation evidencing the operation of each element of the quality management system would include:

- (a) the size of the firm and number of offices;
- (b) the degree of authority afforded to personnel and offices;
- (c) the nature and complexity of the firm's practice and organization.

### **9.4.1 Specific Documentation Considerations**

Documents prepared and collected by the project team during the project provide the single most important support for the representations regarding compliance with generally accepted professional surveying standards and other regulatory requirements.

They provide the repository for the competent evidential matter necessary for forming an opinion or certification with respect to those matters considered under the definition of professional surveying.

Every project should result in a “working paper” file that achieves the following objectives:

- Documents the work done by the firm, including support for significant judgments made and conclusions reached;
- Provides evidence that the work done was adequately planned, properly supervised and appropriately reviewed in accordance with the firm’s quality management system;
- Provides for a valuable reference in future years with respect to continuing services to the client (continuity of values, rationale for conclusions, etc.); and
- Serves to support the firm’s defense if the project becomes the subject of, or is included in, a legal claim against the firm.

The file should also contain evidence obtained electronically, such as through e-mail and electronic data capture. It is recommended that a complete record of electronic communication between the firm’s personnel and the client that relate to the project should be retained, filed and backed-up electronically if stored in that medium.

#### **9.4.2 File retention and amendments**

The working papers remain the property of the firm and the firm should retain them for a prescribed period of time, as established by the firm’s policies.

Project documentation should not be deleted or discarded after the project is completed. If amendments to a completed file are required, the original documentation should be cross-referenced to the new information included in the file. The new documentation should include the nature of the change, the date, the name of the person who prepared the change, and the reason.

#### **9.4.3 Documentation Standards**

Project documentation should include sufficient information that an experienced file reviewer can review the working papers without the need for additional oral explanations, including:

- When and by whom each document was created, changed and reviewed;
- Identifying characteristics of specific evidence sought;
- Details of evidence obtained, and the conclusions reached. This will include all documents (created, sent or received) that contain conclusions, opinions, analyses, or data that form the basis of the project;
- Information identified related to significant findings or issues that is inconsistent with or contradicts the final conclusion;
- Quality records, which are completed and signed off. These include the project completion checklist, including the required sign offs by the project surveyor and file reviewer ;



- Communications (correspondence, e-mail, etc.) and memoranda of discussions and meetings held;

#### **9.4.4 Client project documentation**

Project documentation should include sufficient information that confirms the scope of the project, including correspondence with the client outlining services to be performed, expected report form and basis of and expected fee for services rendered.

#### **Research Documentation**

Research documentation should include applicable third party plans, reports, coordinate value lists and other data upon which the current project will be based. The documentation will also reference existing material in the firm’s records that is utilized as a basis for the current project.

#### **9.4.5 Measurement Equipment Documentation**

A record of equipment used by the firm, its history of repair and calibration and ongoing evaluation of accuracies should be maintained.

#### **Data capture, including field surveys**

- 1) Direct ground based surveys

Spatial data obtained by ground based surveys (traditional, total station, GPS, LIDAR, and other techniques) and captured electronically must be referenced to records produced manually at the time of observation so that the electronic data files can be analyzed for accuracy, consistency and integrity with the manually recorded observations of the site.

The “field records” must include the following metadata:

- the names and duties of persons in the field party;
- the date of observations and weather conditions under which observations were made, and general project location;

The “field notes” must include a representational sketch, either hand drawn or reproduced from available plans/files and annotated at the time of the observations, that indicates:

- geographic location of the project and the specific site definition, ie. lot, plan, PIN, or other such reference;
- relevant streets and boundaries and other physical features that assist in identifying the site;
- the orientation to “North” and pages numbered in a summarized fashion;
- the specific/general location of instrument set-ups/points of observation.

For all data capture, the “field records” must include:

- the type and identification of survey equipment used, and data related to multiple instruments and types, if any, and any parameters relevant to the measurement accuracy, ie. Prism offset, temperature and pressure settings, scale factors, etc.;
- the coordinate framework being used, if any, and the sources of coordinates (N,E,Z) for points used in the project, and the units of measurement, if other than metric;
- each quantitative (horizontal angle, vertical angle and distance or GPS/Lidar) observation or measurement. The quantitative data may be expressed directly on a sketch or in tabular form and where electronic data capture is used, a table indicating a range of point numbers and descriptors for each point or range of points to cross reference to the printed raw data file. The type of data presentation will be a function of the spatial measuring equipment employed;
- sufficient indication of the data capture method that the reviewer can identify the methodology and redundant measurements, including independent measurements to new points established, inputs (such as instrument/antenna and target heights), and geometric figure closures/station set-up/repeat observation confirmation.

For cadastral surveys, the “field records” must include:

- a complete description of every monument found, restored or placed, including markings and ancillary monumentation;
- searches made for monuments and other physical evidence, including boundary features / evidence such as fences, lines of vegetation, or any other physical feature on or near the boundary, preferably shown on the proper side of the boundary, along with a tie to the boundary;
- if applicable, reasons why monuments cannot be placed where specified in the instructions or regulations;
- the methods used to re-establish lost monuments;
- searches made for documentary or verbal evidence;

A field report should be included that summarizes

- the overall process used in the field work, and;
- any discrepancy or assessment of conflicting evidence or observations;  
and
- any issue that should be identified to the professional in charge of the file.

Field record entries must not be erased or obliterated. Stroke out incorrect entries in such a way that they remain legible but are obviously discarded. If field notes are re-copied, the original versions recorded at the time of the field survey must be attached to the re-copied version and retained. Any additions to the original field record must be adequately identified as to date and reason they are added.

## 2) Remote sensing

A report on the equipment used, relevant operating parameters, calibrations, reference frameworks and other significant matters, such as redundancy observation procedures, etc. should be retained along with a reference to the location of data if stored in electronic medium. Where electronic medium is the sole method of storage, the report should be appended as meta-data to the observation file.

## 3) Data acquired for other methods

Data may be acquired by reference to files of others, including non-professional sources (examples – provided by clients, downloaded from the Internet, acquired from government sources). A report should be retained that outlines the specific sources of the data, the rationale for the data used and the integrity and accuracy tests applied to ensure it is adequate for the intended use.

### **Raw data files**

Where using an automated or semi-automated data-logging device, including voice recordings, records field data, this data should be verified and transcribed/printed onto a permanent visually readable format attached to the field notes. A data “log form” indicating the origin of the electronic data, the repository file name, the software employed and the parties manipulating and reviewing it must be maintained.

### **Analysis and data manipulation**

Analysis documentation should include sufficient information that ensures data captured is consistent and appropriate for the intended use, ie. redundancies are proven, capture methods are satisfactory and the electronic file matches the field notes. The analysis of captured data will be supported by a checklist identifying the critical issues to be addressed. Any manipulation (Rotate, Translate, Scale) of the base data, including raw observations, must be traceable through a log file and reviewed by a supervisor.

### **Conclusions, Reports and Certification**

File conclusion documentation should include interim “check” copies indicating extent of review by a supervisor, including comparison to project and research documents, to the field records, calculations and final data. An office checklist that highlights the critical items to be considered should supplement the review copy.

The professional should only sign the final issued report when all items identified on the review checklist have been dealt with. On complex projects, the professional may undertake an “overview and reasonableness” approach to the comprehensive review completed by the supervisor.

# APPENDIX 1

## COPYRIGHT

The following three articles have been written on copyright as it pertains to surveyors.

1. Copyright and the Surveyor, by Ken Allred, ALS, CLS, 1994
2. Survey Plans, Copyright and Government Process in the Maritimes: Ownership and use of plans and third party liability, Rosalind Penfound, LLB, CISM Journal, 1990
3. Liability in the Digital World, by Marie Robidoux, LLB, CLS, LLM, March 12, 2003

### **Excerpts from reference #1 by Ken Allred, ALS, CLS**

#### **Liability**

The main issue for surveyors is the extension of liability for the unauthorized use of dated survey information by parties who rely on survey documents without knowledge as to the limitations of the product.

#### **Origin of copyright**

Copyright is not a custom established in the common law. It exists only as a function of the Copyright Act. The extent of copyright is only as outlined in the legislation and judicial interpretation thereof. Copyright in a work exists from the date of creation whether or not the copyright symbol is shown or the copyright is registered. The copyright symbol is a product of an international treaty known as the convention of Berne, which was signed in 1908. It is really only necessary to use the copyright symbol to protect work outside of Canada within jurisdictions that are party to the Berne Convention.

#### **Ownership of copyright**

It appears indisputable that the Copyright Act vests ownership of artistic works such as plans of survey in the first author (the surveyor) unless an agreement of contrary effect has been executed by the surveyor. It should be noted however, that where the surveyor is an employee, either of a proprietorship, a partnership or a company; the copyright to his/her plans would vest in the employer unless the copyright had been otherwise assigned.

#### **Embossed seals**

With the advent of sophisticated photocopiers, it is virtually impossible to determine the difference between a copy and the original. It would seem that the only protection for a surveyor to ensure that only originals are used is to use a crimp or embossed seal on

every plan issued from his/her office, and to emphasize that only such signed and sealed copies will be recognized as authentic.

## **Excerpts from reference #2 by Rosalind Penfound, LLB**

### **Conclusions:**

- 1) The copyright in survey plans is vested in the surveyor in the absence of an agreement to the contrary or where work is being prepared under specific instructions of the crown.
- 2) The provision of plan (s) to the client by the surveyor implies a licence to use them, including making copies, in the manner and for the purposes for which they were produced.
- 3) Submitting a survey plan to the development process passes the property in that plan (arguably the copyright as well) to the Crown. Even if the copyright is retained by the surveyor, the physical plan belongs to the crown and a licence is implied for them to be used in the generally accepted manner which includes filing in the Registry of Deeds and forwarding to LRIS (Land Registration and Information Service). Submission of a plan directly to a mapping office would similarly result in it becoming Crown property, or at least imply a licence for its use.
- 4) A plan filed in the Registry of Deeds is a public document open to public view and a copy of which may be obtained by the public.

The Association of Ontario Land Surveyors provides for its members a sample contract and recommends use of the universal copyright symbol together with the surveyor's name followed by the year. In addition, they suggest that all plans contain this statement located beneath the universal copyright symbol:

No person may copy, reproduce, distribute or alter this plan in whole or in part without the written permission of John Smith, OLS

Furthermore, the Association of Ontario Land Surveyors appropriately recommends that a surveyor address the copyright issue in a contract prior to undertaking work for the client. Defining the parameters of the surveyor-client relationship in a formal contract can be nothing but positive for both parties. Such a contract may be used as a means to discourage the unauthorized use of survey products, thereby limiting infringements of copyright and third party liability.

## **Excerpts from reference #3 by Marie C. Robidoux, LLB, CLS, LLM**

### **Intellectual Property**

#### **Copyrights**

Copyright depends on ownership and is concerned primarily with the prevention of unauthorized copying. Copyright is afforded not to ideas but to their expression. In Canada the requirements for securing copyright are originality and fixation.

However, fixation is a somewhat "passé" idea in a digital era where the ethereal nature of information is completely at odds with these legal requirements. This is problematic

because work in the digital world is generally considered fixed when it is transcribed into a digital format. What happens when the work is transmitted?

As more works incorporate copyrighted material, it may become more difficult for the users to produce information products for themselves without encroaching on copyrights. This is especially true with a digital basemap used as the backbone of a GIS. In Canada, in almost every occurrence, these works are copyright and the federal crown is generally the copyright owner.

Other convergence issues specifically relate to the powerful combination of GIS, remote sensing image utilization and interactive web-based applications. As these can all be used together in one digital application, the copyright issues become increasingly difficult to deal with and track. When digitized and downloaded into a computer, all works become interactive in the sense that the user can modify them. Therefore the work itself may change over time through a variety of applications. Is it then a single work or a collection? How are the rights applied?

Of additional concern is the movement of works between various computers through communication networks and the fact that users do not need to surrender a copy in order to transfer it to another computer. Digitized works placed on a communication network become widely available across the planet and are easily reproducible. This makes tracking, management and administration of copyrights very difficult.

### **Moral Rights**

Section 14.1(1) of the Copyright Act defines the moral rights attached to the author of copyrighted material as the right to the integrity of the work and to be associated with the work as its author. Moral rights are infringed upon by any act or omission that is contrary, including any active act to modify the work or omit the name of the author by name or pseudonym and including the right to remain anonymous. In order for moral rights to be violated, there must be “prejudice of the honour or reputation of the author” as a person’s work is considered to be an extension of the creator’s personality.

### **Database Protection in Canada**

Section 2 of the Canadian Copyright Act defines “compilation” in part as “a work resulting from the selection and arrangement of data” with effect from January 1, 1994. A database is therefore a compilation as defined in the Copyright Act and is usually electronic and digitized. Since 1994 Canadian copyright in a compilation is, under the Act, limited to the elements of selection and arrangement and not the content or subject matter of the compilation.

### **Copyright Protection**

The digital graphical representation of maps and plans potentially has the greater risk to copyright infringement inadvertently or otherwise. A suitable copyright notice will go a long way in notifying users of the copyright owner.

# APPENDIX 2

## Digital File Disclaimer Usage

Surveyors are commonly providing digital files, such as AutoCAD drawing files, PDFs, spreadsheets, etc., as part of their returns to clients and regulatory bodies. The release of data in digital format represents a significant professional and business risk, being that the data may be altered or improperly used after leaving the surveyor's office.

A digital file disclaimer or release between the surveyor and the recipient of the data may be sufficient to protect the surveyor against claims from the recipient or other third parties if the data is improperly used or manipulated. It is therefore suggested that when transmitting digital data, a disclaimer or release be included with the data. The following examples are suggestions of the parameters and wording that might be included in the conditions of release.

**1) Condition under which data is released – by contract or as courtesy**

These data may have *been delivered as a courtesy to the client* or other third parties in digital form.

OR

This file is prepared solely for the use by the party with whom Survey Company has entered into a contract and there are no representations of any kind made by Survey Company to any party with whom Survey Company has not entered into a contract.

**2) License conditions for use and distribution - single/multiple use**

This material is supplied for the purpose of (specify) and shall not be used by you or transferred to any other party for use in any other projects, additions to the current project or for any other purpose for which the material was not strictly intended by SURVEY COMPANY without our express written permission.

OR

The supplied data may be imbedded in or distributed with other data as part of the current contracted project. Any other use of the data is expressly prohibited without our further authorization in writing.

**3) Retention of copyright and control of distribution**

Digital data is considered to be intellectual property under the Canadian Copyright Act. This data shall not be altered, copied, used by you or distributed to any other party or for any purpose for which the data was not strictly intended by SURVEY COMPANY without our express written permission.

**4) Accuracy expectations and verification**

Survey Company has attempted to ensure that the data is complete and accurate. However, it is the responsibility of the user(s) of this information to verify the data's accuracy and completeness prior to utilizing it and to advise Survey Company of any irregularities.

OR

The most recent *signed and sealed paper print represents the delivery of professional services* and must be referred to for correct information. Survey Company shall not be responsible for modifications to, or products derived from, the electronic files which are not approved, signed and sealed by Survey Company.

OR

The data is provided "as is" without warranty of any kind either expressed or implied. Any person(s) or organization(s) making use of or relying upon this data is responsible for confirming its accuracy and completeness. These files do not include a professional surveyor's/engineer's stamp and only drawings with such stamp are to be considered as true and final.

**5) Responsibility of users and waiver of claims**

Any unauthorized modification or reuse of the material shall be at your sole risk, and you agree to defend, indemnify, and *hold SURVEY COMPANY harmless for all claims*, injuries, damages, losses, expenses and attorneys fees arising out of the unauthorized modification or use of these materials.

OR

By utilizing the information contained herein, you further agree that Survey Company's liability arising out of contract, negligence or strict liability in tort or warranty shall not exceed any amount paid by you for this information or product. Any written or oral information or advice given by employees of Survey Company will in no way increase the scope of any such warranty or liability, nor may you rely upon any such written or oral communication.

**6) Acknowledgement and sign-off**

Please note *that by using these files you understand and agree* to the following: (as examples)

1. Survey Company does not warrant or make any representations with respect to the accuracy of the data.
2. You shall make no claim nor initiate any action in law or equity against Survey Company with respect to any defect, errors or omissions in the data.
3. You agree to the fullest extent permitted by law to defend, indemnify and hold harmless Survey Company from and against all claims, damages, liabilities and costs (including reasonable attorney's fees and costs of defense) arising out of or resulting from the use of electronic data."

OR

The undersigned further acknowledges that the digital data file(s) being supplied are (were) created to an accuracy of (specify accuracy) as of "Date created", and that the digital file(s) may not reflect the currently existing conditions on the ground, and shall not hold Survey Company responsible for any damages arising from the use of the digital file(s) being supplied.

\_\_\_\_\_  
Receiving Party

\_\_\_\_\_  
Date



## **Amendments 2005**

All References to the “Manual of Instructions for the Survey of Canada Lands” changed to “General Instructions of the Surveyor General”

### **1.12 Vision statement changed June 2005**

#### **Remove 4.2 GPS Technology, June 2005**

GPS is a relatively new technology available to land surveyors. As with any measuring and positioning equipment, the surveyor must become acquainted with the limitations of the equipment and develop the necessary skills to meet the accuracy requirements for cadastral surveys on Canada Lands. It is the responsibility of the land surveyor to assess the methods and procedures that are to be applied to a cadastral survey project. The surveyor must perform adequate quality assurance to ensure that accuracy standards and survey requirements are met.

For Real-Time Kinematic surveys (RTK), it is recommended that each base station set-up be validated by visiting a Geodetic or Project control station at the beginning and/or end of set-up.

Replace with

#### **4.2 GPS Survey Methodology, June 2005**

Users should follow the recommendations set out in the manufacturer’s documentation. It is the responsibility of the land surveyor to assess which survey methods and procedures are to be applied to a cadastral survey project. All GPS data and results should be carefully scrutinised; the surveyor is reminded that ambiguities may not always resolve correctly. The surveyor must perform adequate quality control and assurance to ensure that accuracy standards and survey requirements are met.

The following additional information is available from the Geodetic Survey Division website ([www.geod.nrcan.gc.ca](http://www.geod.nrcan.gc.ca)):

- “Guidelines and Specifications for GPS Surveys, Release 2.1”, December 1992
- “Guidelines for the NAD83 Integration of Local GPS Surveys, Version 1.0”, January 1998

Correct index to reflect change

**2.16** Coordinates as evidence. Added additional sources of information. August 2005

Part 7 A proposed outline is included.

## Amendments 2006

**1.3** Sentence deleted: “However, many of the recommendations in this manual are considered minimum standards for surveys.”

**1.18** Sentence deleted: “Practices presently undergoing comprehensive reviews at the provincial level, may be fast-tracked through the process.”

**1.30** Added:

The use of the ‘certified correct’ statement, as per Section 38(1) of the CLS Regulations, has been widely embraced by members of the Association when certifying plans of survey. There are, however, times when this statement may not be applicable to the document being prepared. As per Section 38(2) of the CLS Regulations, the surveyor has the option of identifying which responsibilities he/she does want to accept when signing a particular document.

A surveyor will have to assess any plans or document he/she signs for the statement of responsibility he/she feels applies but should be aware that by using a statement of responsibility that is not in the form ‘certified correct’ but rather made up of Section 38(1)(a) to (d) or an elaboration thereof, a surveyor is able to limit his/her responsibility for the work being done. The surveyor should state what he/she is certifying in positive terms. By adding only a signature to a document as a way of limiting responsibility, the surveyor should be aware that he/she could be seen instead as accepting unlimited responsibility.

A surveyor may also wish to add some disclaimer statements to a document to limit his/her responsibility. For instance, the following example statements, or variations thereof, may be added to a plan that is prepared from various sources.

- *The information shown on this plan has been prepared using (insert list of sources). No fieldwork was performed to verify the monuments, measurements, topographic features, or potential boundary encroachments.*
- *New unsurveyed boundaries calculated from (insert list of sources) are shown thus: “calc”. The dimensions of calculated boundaries may change upon survey.*

**Part 6** Added Photogrammetry section 6.1 to 6.8

**Part 8** Added section 8.1 “Canada’s Offshore: Jurisdiction Rights and Management 3<sup>rd</sup> edition”

## **Amendments 2009**

All references to Legal Survey Division (LSD) and Canada Centre for Cadastral Management (CCCM) have been changed to Surveyor General Branch (SGB). This includes corrections/additions of websites.

### **Additions:**

**1.31(b)** Date of Certification

**2.1** Research website links

**2.17** Compiled Plans (under development)

**2.18** Registration Plans no survey (under development)

**4.6** Monumentation Guidelines

### **Appendix 2**

Plan Preparation Check List Sample

## **Amendments 2010**

### **Additions:**

**2.17** Compiled Plans

**2.18** Registration Plans no survey

### **Removed:**

**Part 7 GIT (Geographic Information Technology)** which made Property Rights Part 7 and Surveyor General Branch Part 8.

### **Housekeeping:**

Revised Table of Contents and page numbers

## **Amendments 2011**

### **Additions:**

**Part 9** Quality Management System

**1.31(c)** Signatures on Documents

### **Housekeeping:**

Section 4.14 has been removed

## **Amendments 2012**

### **Additions:**

**Sec 3.6** MyCLSS

**4.9** Geo-referencing

(which changed numbering/headings 4.9 through to 4.14)

**Appendix 3** Digital File Disclaimer Usage

### **Revision:**

**1.18** Practice Review Process

Revised section by removing the description of the Practice Review Process and added a cross reference to the ACLS Practice Review Department Manual of Administrative Procedures.

## **Amendments 2016**

All References to the “General Instructions of the Survey of Canada Lands, e-edition” changed to “National Standards for the Survey of Canada Lands.” The Table of Contents and hyperlinks have been updated. Typographic errors have been corrected.

### **Removed:**

**2.18** Registration Plans – partial or no survey

**8.3** Table of Contents

**Appendix 2** Plan Preparation Check List Sample

### **Revisions:**

**1.6** Definitions

**1.8** Code of Ethics

- 1.11** Committees
- 1.12** Vision Statement
- 1.13** Licence and Permit
- 1.16** Plan and Monument Fees
- 1.24** Limit
- 1.31** Signatures on documents
- 1.40** Contracts
- 2.17** Compiled Plans
- 3.1** Surveyor General
- 3.2** Management of Surveys
- 3.4** Specific Survey Instructions Required
- 3.6** MyCLSS
- 4.14** Confidence region – link has been added
- 4.15** Equipment, General
- 4.16** Adjustment and Testing of Measuring Equipment
- 4.17** Testing GPS Equipment