

Alberta Land Surveyors' Association

MANUAL OF STANDARD PRACTICE

April 25, 2009



2009 Revisions

These revisions were approved at the 2009 AGM and came into effect on April 25, 2009.

Part B: Standards of Practice

Section 1.1: The Code

- page 3: In the second bullet of the commentary, replaced “over the interest of an individual client” with *over any other interests*.

Part C: General Standards and Procedures

Section 4.3: Locating Natural Boundaries

- page 23: Revised all of Section 4.3 and moved Section 4.2 from page 21 to page 22.

Section 5.5.4: Conflicting Evidence

- page 26: If a boundary conflict cannot be resolved by the Surveyor, *the Surveyor should consider referring the matter to the ALSA Boundary Panel before resorting to the Provincial Court or the Court of Queen’s Bench. The Surveyor may be treated as an expert witness by each of these bodies.*

Part D: Standard Practice for Surveys and Plans

Section 1.2: Datum or Origin for Bearings and Coordinates

- page 36: Updated introduction and Section 1.2.2 on page 36 and moved Section 1.2.3 to page 37.

Section 2.2.5: Delayed Posting

- page 39: Grid *NAD83 (Original) or NAD83 (CSRS)* coordinates must be shown on the plan or on a separate document registered concurrently with the plan.

Section 5.7.3: Wellsite Plan Requirements

- page 52: Added Section 5.7.3.

These changes were also made:

- Updated cover page, Table of Contents, footers, Index, and cross-references to reflect 2009 revisions.
- Corrected CGVD28 acronym on pages 36 and 79.
- Updated hyperlinks on pages 35, 36, 40, 41, 59, 68, 69, 73, and 74.
- Housekeeping correction to Wellsite Certification on page 72 (2009.06.25).
- Updated hyperlinks on pages 3, 24, 73 and 74 (2009.08.12).



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PART A: INTRODUCTION

The Alberta Land Surveyors' Association (the Association, ALSA) is a self-governing profession established in accordance with the *Land Surveyors Act*. This legislation provides for the establishment and maintenance of standards for surveys conducted by Alberta Land Surveyors in keeping with the requirements of other regulatory authorities.

The purpose of the ALSA Manual of Standard Practice (the Manual) is to assist the Alberta Land Surveyor in practising the profession of land surveying with integrity and competence, and to ensure that surveys and plans of survey result in clear and unambiguous definitions of land boundaries.

The Alberta Land Surveyor should follow all standards identified in the Manual. Where full compliance is not possible because of local conditions, conflicting requirements of other authorities, or other circumstances, the onus is on the Alberta Land Surveyor to be able to defend the non-compliance.

There is also an onus on the Alberta Land Surveyor to improve the Manual and to participate in keeping it current. A Surveyor¹ who believes that it is appropriate to add, amend, or delete a standard has an obligation to bring recommendations for change to the ALSA membership.

¹ The Manual uses the terms "Alberta Land Surveyor" and "Surveyor" interchangeably to refer to an Alberta Land Surveyor as defined by the *Land Surveyors Act*.



PART B: STANDARDS OF PRACTICE

Those who rely on an Alberta Land Surveyor may find it difficult to assess the quality of the Surveyor's services but they have a right to expect that a professional Surveyor will be a person of integrity and competence. The legislated Code of Ethics presented in Part B, Section 1 on pages 3 to 9 defines standards of conduct for the Alberta Land Surveyor and stresses the Surveyor's responsibility to the public and to clients, staff, and colleagues.

Ethical behaviour goes beyond "the letter" of the law to include "the spirit" intended by the Code of Ethics. Abstract components of ethical behaviour are not easily defined so using the Code of Ethics to judge an Alberta Land Surveyor must be undertaken carefully. For example, there may be situations in which it would be unreasonable to strictly enforce a particular part of the Code in a specific instance, and there may be situations in which a person is guilty of unethical conduct even though the Code does not specifically prohibit the behaviour in question.

It is the responsibility of the Association to determine whether or not the Code has been followed, both in letter and in spirit, examining the situation thoughtfully and reasonably, and applying the Code in a way that maintains the membership's commitment to serving the public lawfully, ethically, and responsibly.



Section 1: Code of Ethics

Under the *Land Surveyors Act*, Alberta Regulation 324/82 legislates the Code of Ethics for Alberta Land Surveyors:

http://www.alsa.ab.ca/uploads/files/PDF/current_acts_and_regulations/code_of_ethics_regulation.pdf

This Section presents the legislated Code in bold print, followed by explanatory text.

The Code¹

- 1 An Alberta Land Surveyor shall serve society, his clientele, and his profession with the ultimate objective of contributing to the knowledge of land, to the better management of land, and to the preservation of peaceful and lawful enjoyment of land.**

An Alberta Land Surveyor:

- has a public responsibility to serve society, clients, and the land surveying profession. This includes the establishment or re-establishment of land boundaries. The correct survey or resurvey of land boundaries is essential to the maintenance of Alberta's land survey and titles system, and an Alberta Land Surveyor must always maintain the province's cadastral fabric.
- has an obligation to safeguard the public interest, and this must always take precedence over any other interests. The Surveyor's duties must be carried out without favour, affection, or partiality.

Duty to Personnel

- 2 (1) An Alberta Land Surveyor has a duty to assist his pupils and employees to achieve their optimum level of contribution to society through their contribution to the profession.**

An Alberta Land Surveyor:

- shall assist students, trainees, and employees to obtain instruction in the practical, ethical, and theoretical aspects of surveying.
- has a particular obligation to ensure that students and trainees receive instruction in the art, practice, ethics, and profession of an Alberta Land Surveyor.

¹ The legislated Code of Ethics uses "he" and "his" for "he/she" and "his/her," without prejudice. The Manual avoids the use of gender-specific terms.



Professional Impropriety

(2) An Alberta Land Surveyor should avoid even the appearance of professional impropriety.

An Alberta Land Surveyor:

- shall disclose to the client any conflict of interest, affiliation, or prior involvement that could have even the appearance of preventing the Surveyor from carrying out professional duties with independence and objectivity. The Surveyor should accept or continue such employment only if the client consents.
- in doing work for multiple clients who could have conflicting interests, must explain fully to each client the implications of common representation and should accept or continue the work only if all the clients consent and the duties can be carried out with independence and objectivity. A conflicting interest could occur, for example, where the timing or completion of projects or approval of plans gives one client an advantage over another.
- must recommend that the client retain another Alberta Land Surveyor if any conflict of interest, affiliation, or prior involvement prevents the Surveyor from carrying out professional duties with independence and objectivity.
- shall not solicit work by offering payment or other inducement to secure such work. This prohibition includes compensation to a third party for a recommendation or referral.
- must attempt to resolve amicably any controversy with clients regarding fees. The Surveyor shall explain all charges incurred and make available to the client copies of any details relevant to the assessment. Where differences cannot be resolved, the Surveyor shall ensure that the client has knowledge of the complaint and mediation procedures available through the Alberta Land Surveyors' Association.
- shall not influence improperly any public body or official, and shall not state or imply that such influence is possible.
- shall guard the reputation of the land surveying profession in the same way that one guards one's own reputation, rebutting unjustified criticism of the profession, of other Surveyors, and of oneself.
- shall not allow one's name to be associated in a professional manner with any person or enterprise of a dubious nature.



Professional Confidences

(3) An Alberta Land Surveyor has a duty to preserve the confidences of his client and regard as privileged the information he may obtain regarding the affairs of his client.

An Alberta Land Surveyor:

- shall maintain confidentiality of the client's affairs during and after the provision of services or following the termination of a contract or agreement for the provision of services.
- is responsible for the compliance of students, trainees, and staff with this article, and must therefore exercise care in selecting and training employees.

This article does not apply to the normal release on request of boundary definition survey information to other Alberta Land Surveyors.

Professional Judgement

(4) An Alberta Land Surveyor has a duty to exercise unbiased independent professional judgement on behalf of his client and shall represent his client competently.

An Alberta Land Surveyor:

- must decline to accept direction from employers, directors, officers, or other superiors in the organization if such direction compromises the Surveyor's integrity, independence, or objectivity. A written agreement should be in place between the organization and the Surveyor to define the relationship, prevent misunderstandings, and allow the Surveyor independence of action and decisions.
- when forming a corporation, must ensure that any director, officer, or stockholder cannot influence the independence of any Alberta Land Surveyor employed by the corporation in carrying out professional duties.
- shall not accept assignments that are beyond the Surveyor's capability to complete in a reasonable time, that are beyond the Surveyor's level of competence, or that the Surveyor cannot carry out in a professional manner. This does not necessarily preclude accepting work in an area in which the Surveyor is not completely proficient, provided that the client is made fully aware of the limitation, the Surveyor does expect to become qualified, and the Surveyor's accepting the assignment will not result in an undue delay or expense to the client.



- if offered work for which the Surveyor is not qualified and does not expect to become qualified, should either decline the work or, with the consent of the client, accept the work in association with another Alberta Land Surveyor with the required expertise.
- shall present clearly to the client any circumstances in which the Surveyor's professional judgement may be overruled by a regulatory or legal authority, and the consequences for the client.

Integrity and Competence

(5) An Alberta Land Surveyor shall assist in maintaining and improving the integrity and competence of the profession of surveying.

This responsibility includes maintaining the survey system by cooperating with colleagues to resolve any apparent errors or discrepancies in a Surveyor's work and taking all necessary measures to remedy those errors or discrepancies.

An Alberta Land Surveyor:

- shall report to the Association any instance of incompetence or disregard for good practice. Allowing an inappropriate practice to continue could result in a deterioration of the survey system and harm the integrity of the profession. However, occasional errors or oversights can often be resolved between Surveyors and need not be reported to the Association unless the parties cannot agree to a solution.
- shall assume professional responsibility for all authorized work carried out by the Surveyor's non-professional staff.
- before accepting an applicant for articleship, shall ensure that the applicant has the necessary personal attributes required of an Alberta Land Surveyor, including good character.
- shall devote some time to the affairs of the Association, thereby contributing to the Association's constant effort to maintain and improve the survey system, procedures, institutions, and profession.
- shall participate in proposing and supporting legislation and programs to improve the survey system, procedures, institutions, and profession. If a Surveyor believes that the existence or non-existence of a rule of law, regulation, or instruction causes or contributes to an unjust result, that Surveyor should endeavour to obtain appropriate changes.
- shall participate in the activities of the Association, relevant professional development programs, and related professions or societies.



Dignity of the Profession

(6) An Alberta Land Surveyor has a duty to maintain the dignity of the profession through his association with his clients, colleagues, and subordinates.

An Alberta Land Surveyor:

- shall limit advertising to the adequate provision of information to the public. Special care must be taken to ensure that information presented in advertising is relevant to the appropriate selection of a Surveyor. Preparation of advertisements and professional articles for lay publications and participation in seminars, lectures, and civic affairs should be motivated by a desire to educate the public and provide information relevant to the selection of the most appropriate Alberta Land Surveyor rather than to obtain publicity for particular Surveyors.
- shall refrain from making any false or misleading statements or using self-laudatory language in advertising.
- in dealing with a client or prospective client, shall not attempt to solicit assignments or projects that are being carried out by another Surveyor. If asked to participate in or complete a project being carried out by another Surveyor, an Alberta Land Surveyor shall do so only with the approval, withdrawal, or service termination of the previous Surveyor.
- shall not attempt to injure the professional reputation of any other Alberta Land Surveyor.
- shall refrain from public criticism of the conduct or practice of any other Alberta Land Surveyor.

Professional Services

(7) An Alberta Land Surveyor should assess and receive fair and just compensation from his client, commensurate with the technical complexity, level of responsibility, and liability potential of the services performed.

An Alberta Land Surveyor:

- shall assess a fee that will enable the Surveyor to serve the client effectively and complete the project using good survey practices. The Surveyor shall not charge more than a reasonable fee that could discourage potential clients from using professional land surveyors for the protection of their property rights and that could generally harm the reputation of Alberta Land Surveyors.
- shall arrive at a clear agreement with the client regarding fees to be charged for work, thereby preventing subsequent misunderstandings and contributing to good relations with the client.



- in estimates or quotations given to a prospective client, shall clearly outline the work covered by the estimate and any conditions that could contribute to additional costs. The Surveyor should not quote a fixed fee for an unknown quantity of work unless the fee includes all contingencies. Once the Surveyor has entered into an agreement to carry out survey work for a specified fee, the work shall be completed for the agreed amount.
- shall not reduce the quality of professional services to complete a project within the agreed cost.
- shall not divide a fee for surveying services with another Surveyor who is not a partner or associate of the Surveyor's firm unless:
 - the client agrees to the employment of an additional Surveyor after full disclosure of the division of fees;
 - the division of fees is proportional to the services performed; and
 - the total fee does not exceed reasonable compensation for all services provided to the client.
- shall not use the advantage of a salaried position to compete unfairly with another Alberta Land Surveyor.
- shall not engage in outside work without the knowledge and consent of the Surveyor's employer.

Unauthorized Practice

(8) An Alberta Land Surveyor shall assist in preventing the unauthorized practice of land surveying.

An Alberta Land Surveyor:

- shall report to the Association any instance of an unqualified person practising land surveying in Alberta. Limiting the practice of land surveying to professionals is intended to ensure that services are delivered to the public with competence and integrity.
- shall not enter into any arrangement that will enable an unqualified person or corporate body to complete a land survey directly or indirectly.
- shall not join or become a member of a company that carries out survey work unless an Alberta Land Surveyor will be taking responsibility for all land survey work performed by the company.



- shall not establish offices or branches unless these centres are under the fulltime direction and management of a resident Alberta Land Surveyor. This requirement guards against the real danger that non-professional personnel will assume—or appear to assume—professional duties, and that supervision will be inadequate. It is essential to retain and maintain the Surveyor-client relationship in the practice of land surveying.

This article does not preclude an Alberta Land Surveyor from delegating tasks to field and office assistants, clerks, and others while the Alberta Land Surveyor maintains a direct relationship with the client and supervises the work.



Section 2: Advertising Guidelines

2.1 Advertisements

Advertisements shall:

- be in good taste;
- be in the best interest of the public;
- be factual, and contain no false or inaccurate information;
- not be self-laudatory;
- not harm the dignity, integrity, and honour of the profession;
- not be misleading by containing a misrepresentation of fact or creating unrealistic expectations; and
- make no reference to price or fees for professional services.

2.2 Vehicle Signage

Alberta Land Surveyors shall place identification signage on all field vehicles used in the practice of surveying, with the company name to be at least five centimetres high. The signage may also include a logo, address, and telephone number, or any combination thereof. Signage of sub-contractors shall not be visible.



Section 3: Technical Services Sub-Contracting

An Alberta Land Surveyor:

- may engage the services of a person or persons not in the Surveyor's direct employ to perform technical functions on the Surveyor's behalf. The sub-contractor's technical functions are not to include or encompass client liaison or new business development.
- shall assume full responsibility for the actions and conduct of the sub-contractor during the term of the engagement as though the sub-contractor were in the Surveyor's direct employ. The Surveyor will issue all work instructions to the sub-contractor in person and receive the sub-contractor's completed work in person.
- shall not remunerate any of the Surveyor's technical assistants or the sub-contractor for services based on a proportion of the entire fee which the Surveyor charges a client for the whole service, nor a fixed fee that may encourage inferior methods or time-reducing procedures at cross-purposes with professional survey standards.



PART C: GENERAL STANDARDS AND PROCEDURES

Section 1: Measurements and Accuracies

This Section deals with measurements and accuracies associated with cadastral boundary definition surveys. As measurement techniques evolve and new methodologies become available, the Alberta Land Surveyor responsible for the plan shall comply with these guidelines and their intent.

The measure of accuracy for cadastral surveys shall be determined by using either the method of misclosure or the method of least squares.

1.1 Method of Misclosure

Where the method of misclosure is used, the measure of accuracy shall be expressed as a ratio between the length of the misclosure and the length of the surveyed line or lines. For example, a misclosure of 0.10 metres over a distance of 1,600 metres is expressed as 1:16,000.

1.2 Method of Least Squares

Where the method of least squares is used, the measure of accuracy shall include both the observational residuals and the semi-major axis of the 95% relative 2-dimensional (horizontal) and/or 1-dimensional (vertical) confidence regions between monuments in the survey.

The 95% confidence regions used to assess accuracy shall be derived from a properly weighted, minimally constrained adjustment of the network. The global variance factor computed by the adjustment must be tested with the Chi-Square Goodness-of-Fit Test. In the event that the variance factor does not pass this test, the reasons should be determined and the problem rectified. Subsequently, if the test still is not passed, the variance-covariance matrix must be scaled by the global variance factor.

The minimum accuracy standard, when expressed as a confidence region, shall be obtained using the formula $c = 0.02 + bd$ metres where:

- **c** is the maximum allowable value of the semi-major axis of the 95% relative confidence region;
- **b** is the precision in parts per million (ppm); and
- **d** is the distance between monuments in metres.



1.3 New Surveys

The following minimum accuracy standards shall apply when closing on the Surveyor's own work in new surveys:

- When using the method of misclosure, the minimum accuracy standard shall be 1:7,500 or 0.02 metres.
- When using the method of least squares, both the observational residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 130 ppm.

1.4 Prior Surveys

The following minimum accuracy standards shall apply when closing on work performed by other Surveyors:

- When using the method of misclosure, the minimum accuracy standard shall be 1:5,000 or 0.02 metres.
- When using the method of least squares, both the observational residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 200 ppm.

1.5 Verifying Work

All surveys conducted under the *Surveys Act* must be verified by one or more of the following means:

- closure on prior or current work;
- closure on existing Alberta Survey Control;
- check-measuring all observations; or
- other appropriate means.

Sufficient field measurements shall be made to ensure there are no errors of layout or measurement.



1.6 Wellsite Surveys

The following vertical accuracy standards shall apply within the Surveyor's own level circuits:

- When using the method of misclosure, the misclosure in millimetres shall not exceed $50\sqrt{d}$ where **d** is the distance in kilometres.
- When using the method of least squares, both the observational residuals and the 1-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 20 ppm.
- A minimum of two benchmarks with published elevations should be used and the result related to the appropriate vertical datum as specified in Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 36 to 37.

The following horizontal accuracy standards shall apply to the Surveyor's own work:

- When using the method of misclosure, the minimum accuracy standard shall be 1:5,000 or 0.02 metres.
- When using the method of least squares, both the observation residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 200 ppm.

The following minimum accuracy standards shall apply when closing on work performed by other Surveyors:

- When using the method of misclosure, the minimum accuracy standard shall be 1:2,500 or 0.02 metres.
- When using the method of least squares, both the observational residuals and the semi-major axis from the 2-dimensional relative confidence regions shall be determined as indicated in the formula in Part C, Section 1.2 (Method of Least Squares) on page 12, using a **b** value of 400 ppm.



Section 2: Measurements and Accuracies for GNSS Surveys

This Section provides guidelines for Global Navigation Satellite System (GNSS) measurements and associated computations performed for cadastral boundary definition surveys. GNSS includes GPS (American NavStar Global Positioning System), GLONASS (Russian Satellite Positioning System), and any future satellite positioning systems.

2.1 Sources of Error in GNSS Measurements

There are several possible sources of error in static and Real Time Kinematic (RTK) GNSS measurements, and these must be detected and mitigated during a GNSS survey to produce accurate and verifiable results. The primary sources of error are:

User error:	Typical user errors include data entry error and measurement blunders (e.g., incorrect antenna height).
Multi-path signals:	Multi-path signals are typical at locations where there is an obstructed sky view at the GNSS receiver. Satellite signals are reflected off the surfaces of nearby objects, resulting in an inaccurate determination of the position.
Satellite geometry:	An insufficient number of visible satellites or their positions relative to the user can result in a poor geometrical determination of the position.
Atmospheric delays:	Atmospheric conditions can cause disruptions and delays in the transmission of signals from the satellites to the receiver.
Incorrect initializations:	Initialization refers to the ambiguity resolution of the satellite signal carrier—the determination of the integer number of wavelengths between the GNSS receiver and the satellite, a process that is critical to achieving centimetre-level results from kinematic surveys. Other GNSS sources of error can cause an incorrect initialization or integer count, which results in a position error.



2.2 Accuracy Guidelines for GNSS Surveys

Because GNSS measurement and data reduction processes are complex, the following guidelines focus primarily on assessing the reliability and accuracy of these surveys. As GNSS technologies evolve and new methodologies become available, the Alberta Land Surveyor responsible for the plan shall comply with these guidelines and their intent.

1. GNSS surveys will be assessed as horizontal (2D) and/or vertical (1D) surveys for the purposes of accuracy measure.
2. Surveys conducted in whole or in part with GNSS techniques shall comply with the accuracy requirements in Part C, Section 1 (Measurements and Accuracies) on pages 12 to 14.
3. Static network adjustment shall include only (n-1) position differences (where n = number of GNSS receivers running simultaneously) or, if trivial position differences are included, the Surveyor should properly account for the mathematical correlations.
4. The position of every monument included in a GNSS survey, either found or placed, shall be verified with sufficient redundant observations or comparison with published information (e.g., registered plans, survey control).
5. Monuments observed by radial observations shall be checked using commonly accepted redundancy methods. Examples include:
 - radial ties from another known station;
 - independent measurements by conventional survey methods; and
 - point re-occupation with separate observation parameters and an independent initialization
6. The map projection for a survey shall be suitable and validated.



Section 3: Boundaries and Monumentation

The current version of the **statutory iron post** is a hollow iron post that is approximately 90 centimetres long and is pointed at the bottom. It has a solid top that is 10 centimetres long and 2 centimetres square, and is marked with a crown. There have been variations to the statutory iron post over the years but all have been constructed essentially as described here.

A **standard post** is a hollow metal pipe 2.0 centimetres in diameter and 76 centimetres in length. A brass cap (tablet) 7.5 centimetres in diameter is fastened to the top of the post, and a 7.5-centimetre square brass foot-plate is fastened to the bottom of the post. The cap is marked with a crown and the words *Province of Alberta*. Standard posts are currently available from the Director of Surveys.

Historically, the standard post used for Alberta Township Surveys has included the following variations in size and design over the years:

- The metal pipe varied between 2.0 and 3.5 centimetres in diameter, was approximately 76 centimetres in length, and was sometimes filled with concrete.
- A bronze or brass cap (tablet) 7.5 centimetres in diameter was fastened to the top.
- A malleable iron or brass foot-plate 7.5 to 9.0 centimetres in diameter (or square) was fastened to the bottom.
- The cap was marked with a crown and the words *Province of Alberta* or *Dominion Lands Surveys*.

The 9th and 10th Editions of the Manual of Instructions for the Survey of Dominion Lands contain diagrams and written descriptions of a common version of this monument.

3.1 Recommended Monuments

1. Under the *Surveys Act*, statutory iron posts are required at all property corners.
2. Statutory iron posts must be used for all surveys carried out under the *Surveys Act* except when the Director of Surveys stipulates otherwise for surveys carried out under Part 2 of the Act—see Part C, Section 3.2 (Monuments) on page 18.
3. Where it is not practical to place a statutory iron post, one of the following should be used:
 - lead plug “with tack” in drill hole for rock or concrete conditions;
 - concrete nail “with washer” for asphalt conditions; or
 - round, 2-centimetre diameter, solid steel bar for gravel conditions, of a length to suit the circumstances.



4. Other monuments may be used at the Surveyor's discretion if one of the above is impractical.
5. Reference monuments may be used at an offset location if the actual corner is not accessible or if it is impractical to monument, but the reference monument must not create confusion or ambiguity.

3.2 Monuments

For surveys under Part 2 of the *Surveys Act*, standard posts are to be used unless the Director of Surveys approves the use of a different monument.

3.3 Marker Posts and Bearing Trees

Where practical, monuments shall be referenced by a marker post placed 0.3 metres from the monument, and the direction shall be noted on the plan.

1. Marker posts should not be placed where they may constitute a hazard to the public or interfere with the normal use of land. In general, marker posts should not be placed in developed urban areas.
2. Marker posts placed along road or right-of-way surveys should be situated on adjacent fence lines whenever possible.
3. For surveys in Unsurveyed Territory, bearing trees and/or marker posts are required.
4. Where a marker post is placed other than 0.3 metres from a monument, both the distance and the direction of the marker post from the monument shall be noted on the plan.
5. Marker posts must be of a design approved by the Alberta Land Surveyors' Association.

3.4 Intersections

When surveying boundaries that intersect surveyed section or quarter sections lines, the intersections shall be made using the nearest section or quarter section corners on each side of the point of intersection. If the monuments at these corners are lost, the lost corners and all section and quarter section corners between the survey evidence used to re-establish the lost corners shall be re-established and monumented, giving due consideration to all available evidence.



3.5 Frequency of Monumentation

In addition to monumenting intersections with existing survey lines, Part 3 of the *Surveys Act* requires (with some exceptions) that all new boundaries be monumented at every deflection and point of curvature. For further details, refer to the sections in the Manual that deal with specific types of surveys.

3.6 Countersinking Monuments

Monuments shall be countersunk in areas where they interfere with farming or grading operations, and noted on the plan. When practical, it is good practice to reference and raise to ground level any monuments found buried in urban residential areas.

3.7 Boundary Types

All surveyed boundaries other than natural boundaries must be either straight lines or circular curve segments.

3.8 Permit Number

Statutory iron posts placed shall be legibly and permanently marked with the survey corporation or partnership permit number, or with the registration number of the individual Surveyor not affiliated with a survey corporation or partnership. The markings placed on the iron post shall be noted in the legend on the plan.

3.9 Establishment of Monuments Plan

If a statutory monument has been established but is not shown on a plan registered in the Land Titles Office, the Surveyor must register an Establishment of Monuments Plan within two years of establishing the monument. This does not negate the requirements of Sections 44 and 46 of *the Surveys Act* regarding the re-establishment of survey monuments established under Part 2 or Part 3 of the Act.

3.10 Wellsites and Related Facilities

The type of monumentation found or placed for wellsites and related facilities shall be shown on the plan. The placement of 30-centimetre iron spikes or iron bars of at least 30 centimetres is recommended.



3.11 Iron Post Markings

If a statutory iron post is placed to re-establish a lost monument or to restore an obliterated monument originally placed at a section or quarter section corner, the iron post shall be marked with the same designation as the original monument and the numbers shall be applied legibly and permanently.

Corner	Markings
Section Corner	Section, Township, Range
Quarter Section	One Quarter (1/4)
Centre of Section	One Quarter (1/4)

3.12 Alberta Survey Control Marker Condition Reports

For every Alberta Survey Control Marker (ASCM) destroyed, found disturbed, not found, or incorrectly described on the ASCM ID card, the Surveyor shall prepare, certify, and submit to the Director of Surveys an ASCM Condition Report on a form provided by the Director of Surveys.



Section 4: Natural Boundaries

4.1 Common Law

In common law, a natural boundary at any instant is the designated natural feature as it exists at that instant, and the boundary position changes with the natural movements of the feature as long as these movements are gradual and imperceptible from moment to moment.

It is essential to designate clearly and concisely, both in the field notes and on the plan, the character of any natural feature adopted as a boundary. In the case of water boundaries, except where applicable legislation, judicial decision, or existing rights are to the contrary, the bank shall be used as the feature defining the boundary.

A Surveyor may determine a natural boundary using any method that accurately determines the location of that boundary at the time of survey.

In accordance with Section 17 of the *Surveys Act*, when surveying a natural boundary that is a body of water, the Surveyor shall determine the position of the line where the bed and shore of the body of water ceases, and that line shall be referred to as the bank of the body of water.

The “right” or “left” bank of a stream is the bank that is on the right or left side of the bed and shore when the observer is looking downstream. The “bed and shore” of a body of water is the land covered so long by water as to wrest it from vegetation or as to mark a distinct aquatic character on the vegetation or the soil itself where it extends into the water.



4.2 Riparian Rights

1. When it has been confirmed that an adjoining owner has riparian rights, the bank of the body of water shall be shown as it exists at the time of survey.
2. If it is found that an owner does not have riparian rights, the bank shall be shown according to the traverse of the river or lake on which the title is based. Field notes of these traverses are available from the Alberta Land Titles Spatial Information System (SPIN), the Provincial Archives, and the Director of Surveys Office.
3. If it is necessary to show the present bank and its position at the time of patent, both traverses shall be shown. The current title boundary shall be shown in a solid black line and the other in a broken black line. A notation of the date of traverse and the name of the Surveyor shall be shown on each.



4.3 Locating Natural Boundaries

1. The position of natural boundaries can be determined by any method, provided that the boundary is plotted at the final plan scale to an accuracy of 0.5 mm. This table shows the required positional accuracy for the captured natural boundary to achieve the required plan accuracy of 0.5 mm at various plan scales:

Plan Scale	Positional Accuracy
1:30,000	15.0 metres
1:20,000	10.0 metres
1:10,000	5.0 metres
1:5,000	2.5 metres
1:2,000	1.0 metre
1:1,000	0.5 metre

2. If natural boundaries are located using a ground survey network, the distance between bank identification points will not exceed 30-metre intervals.
3. If the natural boundary is plotted from aerial photographs, maps, digital imagery, or another information source that the Surveyor has not prepared, the Surveyor shall inspect the boundary on the ground to verify by appropriate means, including making sufficient measurements, that the plotting accuracy of 0.5 mm at the final plan scale will be achieved.
4. The plan showing the natural boundary shall clearly state the method used to determine its position. It shall also identify the aerial imagery or other remotely sensed data used, the method of data capture, and the date of data capture, and show all ground verification survey data. It may also be appropriate to show UTM or 3TM coordinates for ground verification positions.
5. The aerial photographs, maps, digital imagery, and other information used will be retained by the Surveyor as part of the field notes.
6. The information contained in Section 4.3 (Locating Natural Boundaries) on this page does not apply to Descriptive Plans, which are addressed by Part D, Section 7.2 (Descriptive Plans – Natural Boundaries) on page 59.



Section 5: Retracement, Restoration, and Re-Establishment

The guidelines in this Section must be considered in the context of fundamental survey law. They are not “prescriptive” but rather are intended to assist the Alberta Land Surveyor in making a “best evidence” determination.

Monuments placed and intended to govern boundaries pursuant to the *Surveys Act* shall govern those boundaries if they are found to be in their original position. The principle of using the “best evidence” of the original position of the monument shall guide the Surveyor in retracing boundaries and restoring or re-establishing obliterated or lost monuments.

5.1 Research

Prior to undertaking a retracement survey, a thorough review of all available information pertaining to the property boundary is mandatory. Relevant information includes, but is not limited to:

1. Land Titles Office registered plans, Certificates of Title, and other documents.
2. Director of Surveys Office original Township Plans, original field notes for the Township Surveys, and cadastral tie reports. Township Plans and original field notes are also available from the Alberta Land Titles Spatial Information System (SPIN) and the Provincial Archives.
3. Other Surveyors’ files and field notes when they are known to exist but the survey has not been publicly recorded.
4. Energy Resources Conservation Board (ERCB) wellsite plans and licensed pipelines.
5. *Bulletin 38 (Department of the Interior), giving a Description of Boundary Monuments Erected on Surveys of Dominion Lands 1871-1917:*
http://www.alsa.ab.ca/uploads/files/PDF/acts%20and%20reg/Bulletin_38_Final.pdf
6. Crown dispositions available from:

Surveys and Technical Services Section
Land Dispositions Branch, Lands Division
Alberta Sustainable Resource Development



5.2 Hierarchy of Evidence

When an Alberta Land Surveyor is contracted to retrace original or existing surveyed property boundaries, the Surveyor must make a thorough field investigation to unearth evidence regarding the position of the boundaries as originally surveyed.

The hierarchy of evidence regarding boundaries is as follows:

1. Natural boundaries or evidence of natural boundaries.
2. Original monuments or traces of original monuments.
3. Fences or evidence of possession reasonably dating back to the original survey.
4. Measurements as shown on previous plans of survey.

5.3 Verbal Evidence

Section 13 of the *Surveys Act* empowers Alberta Land Surveyors to examine witnesses under oath in relation to determining the true and original position of survey monuments that have been destroyed. Appropriate testimony from a reliable witness who has first-hand knowledge may be the best evidence available in retracement surveys. The evidence should be transcribed in writing and signed under oath by the witness.

5.4 Coordinates

Coordinates on property corners and ties to Alberta Survey Control Markers may be useful evidence of original monument locations and are deemed to be measurements in the hierarchy of evidence.



5.5 Conflicting Evidence

Positional conflicts arising from plan dimensions, monuments on the ground, or other sources are not uncommon in conducting retracement surveys. It is the responsibility of the Alberta Land Surveyor to resolve such conflicts objectively by considering the following:

1. Property lines established on a registered Subdivision Plan or original Township Plan cannot be altered by subsequent plans, although re-subdivision can be used to effect new boundaries between consenting owners.
2. Given ambiguity or conflict within a single plan, the “intent” of the original survey should guide the Surveyor in effecting re-establishment.
3. The advice of the Director of Surveys, experienced Surveyors, or the original Surveyor should be sought in difficult cases.
4. If a boundary conflict cannot be resolved by the Surveyor, the Surveyor should consider referring the matter to the ALSA Boundary Panel before resorting to the Provincial Court or the Court of Queen’s Bench. The Surveyor may be treated as an expert witness by each of these bodies.

5.6 Witness Monuments

When establishing a section or quarter section corner from a witness monument placed subsequent to 1890, that corner shall be defined by producing the line through the witness monument from the nearest section or quarter section corner on the same side of the witnessed corner. The corner in question shall be placed at the distance indicated for the witness monument.

Prior to 1890, the placement of witness monuments on a surveyed line was not required so corner establishment for monuments placed before that date should be based on the nature of the evidence.

5.7 Original Field Notes

When searching for original section or quarter section corner monuments, the original field notes for the Township Survey may be indispensable. Information such as direction of survey and ties to topographic features may assist in a thorough search for evidence. Copies of the original field notes for Township Surveys are available from the Alberta Land Titles Spatial Information System (SPIN), the Provincial Archives, and the Director of Surveys Office.



5.8 Lost Monuments on Subdivision Surveys

Before February 16, 1912, it was mandatory to monument all lot and block corners on subdivision surveys. Between February 16, 1912 and June 9, 1988, posting was required only for block outlines, deflections, and those lot corners falling on a curvilinear block boundary. On June 9, 1988 the *Surveys Act* was amended, again making monumentation mandatory at all lot and block corners.

It is therefore essential to search for original monuments at all corners when retracing lot boundaries originally created before February 16, 1912 and after June 9, 1988. When establishing or re-establishing a lot corner within a plan originally surveyed between February 16, 1912 and June 9, 1988, the positions of the property lines are governed by the plan dimensions in relation to the block corners and monuments on curvilinear boundaries. Proportioning from the original block corner monuments or from the re-established positions of these monuments is generally required.

5.9 Lost Monuments on Township Surveys

When monuments on original Township Survey boundaries cannot be restored from traces of the original monument remaining on the ground, from other physical evidence, or from testimony by witnesses, the Surveyor may proceed to re-establish the monument as a last resort by measurement from other monuments that are connected to it by survey.

If the re-establishment uses other monuments from the original Township Survey, the Surveyor shall consider the intent and sequence of the original survey.

If the lost monument is in the interior of the township, generally other monuments north and south of the lost corner should be used. If the lost monument is on the exterior boundary of the township, other monuments on either side of the lost corner on the same township boundary should be used. In re-establishing lost quarter corners on east-west section boundaries in the interior of the township, the Surveyor should consider the relationship of the lost quarter section corner to section corners on either side.

When re-establishing a lost monument, the Surveyor is responsible for assessing all available evidence, including other monuments placed on subsequent plans. The re-establishment should be performed using the best evidence available, and additional ties should be made to other monuments to validate the re-establishment.

When re-establishing lost corners in original Township Surveys, the Surveyor shall give due consideration to the bearings as shown on the official or registered plan.



5.10 Restoration of Monuments

All damaged or obliterated monuments used in a survey, whether urban or rural, should be restored. However, pits, mounds, and trenches on original Township Surveys shall not be reconstructed or restored unless the Surveyor is instructed to do so by the Director of Surveys.

5.11 Re-Establishment of Curves

Section 45(1)(a)(i) and Section 45(2) of the *Surveys Act* should be followed to define curvilinear property boundaries. The radius shown on the original plan of survey and the position of original monuments shall be held. The chord or radial bearing should be shown on the plan.



Section 6: Field Notes

The following requirements pertain to compiling, recording, and retaining hardcopy field notes and digital survey returns that are made in conjunction with all surveys.

6.1 Systematic Records

1. Systematic records shall be made of all field measurements at the time of observation and shall be identified as field notes.
2. The field notes shall be preserved permanently in their original form and filed such that ready retrieval is possible.

6.2 Content of Field Notes

The field notes shall give a clear and detailed account of everything found, observed, and done during the course of the survey, including:

1. Date of observations, location, and purpose of the survey.
2. Type and identification of equipment.
3. Environmental conditions, including meteorological readings.
4. Name of the person(s) making and recording the observations.
5. Complete description of the condition of every monument found, restored, and placed, and of every permanent structure referencing that monument.
6. Record of all physical, documentary, and/or verbal searches made for evidence, and identification of all lost monuments.
7. Diagram representing the survey.

6.3 No Changes to Field Notes

Entries in hardcopy or digital field notes shall not be erased, altered, or obliterated.

6.4 Remote Positioning Data

For surveys done partially or completely using remote positioning or satellite positioning techniques, the field records shall also include:

1. Observation procedures, raw data, and logistics.
2. Reduction procedures of the observed data, including software versions.
3. Processed remote positioning data from which cadastral survey measurements are derived.



Section 7: Integrated Surveys

7.1 Requirements

1. Every survey for which a plan is to be registered under the *Land Titles Act* requires integration with survey control if two or more monuments found or placed by the survey are each within one kilometre of any two Alberta Survey Control Markers (ASCMs).
2. “Integration with survey control” means obtaining sufficient measurements from ASCMs into the survey to permit the derivation of grid bearings and the computation of a closure starting at an ASCM and proceeding along the shortest path through the survey to another ASCM.
3. The error of closure when compared to the coordinates of the ASCMs, as confirmed and published by the Director of Surveys, shall not exceed the greater of:
 - the product of 0.00014 and the direct distance between the two ASCMs used for the closure, or
 - 25 millimetres.
4. If a Surveyor performs a survey within the bounds of a survey that has been integrated in accordance with the above requirements, the requirements in Part C, Section 7.1.1 above are optional.

7.2 Plan of Survey

A plan of a survey performed pursuant to Part C, Section 7.1 (Requirements) above shall show, in addition to the requirements of any enactment, all ASCMs to which the survey is connected, together with inter-connections determined by the Surveyor during the course of the survey. The plan must include the unique identifier number and tablet markings for the ASCMs.

7.3 Field Measurements

On every survey other than surveys meeting the requirements of Part C, Section 7.1 (Requirements) above, the Surveyor shall make field measurements connecting the survey to all ASCMs situated within one kilometre of any monument found or placed by the survey.



7.4 Non-Monumented Survey

1. A survey shall not be carried out under Section 47 of the *Surveys Act* unless the survey is related to a minimum of two Alberta Survey Control Markers (ASCMs).
2. The density of ASCMs or reference monuments shall be such that no property corner established by the survey is more than 200 metres from the nearest reference monument or ASCM.
3. When computing the accuracy of the control ties to property corners and reference monuments, the accuracies shall be determined thus:
 - For survey control less than two kilometres to all property corners and reference monuments, the error of closure shall not exceed the greater of:
 - the product of 0.00014 and the direct distance between the two ASCMs used for the closure, or
 - 25 millimetres.
 - For survey control greater than two kilometres to all property corners and reference monuments, the method of least squares shall be used (see Part C, Section 1.2 – Method of Least Squares, page 12) with the minimum standard value shown below:

Distance in Metres	b value in ppm
>2,000	12.5
>5,000	5.0
>10,000	2.5
>20,000	1.5

7.5 Plan of Non-Monumented Survey

Plans for surveys performed under Section 47 of the *Surveys Act* shall show, in addition to the requirements of any enactment, the following:

1. The location of all ASCMs, reference monuments, found monuments, and re-established monuments involved in the survey, together with their coordinate positions.
2. The location of all monuments that would have been placed if the survey had been carried out under Section 45(1) of the *Surveys Act*, together with their coordinate positions.



Section 8: Director of Surveys Road Allowance Policy

8.1 66-Foot and 99-Foot Road Allowances

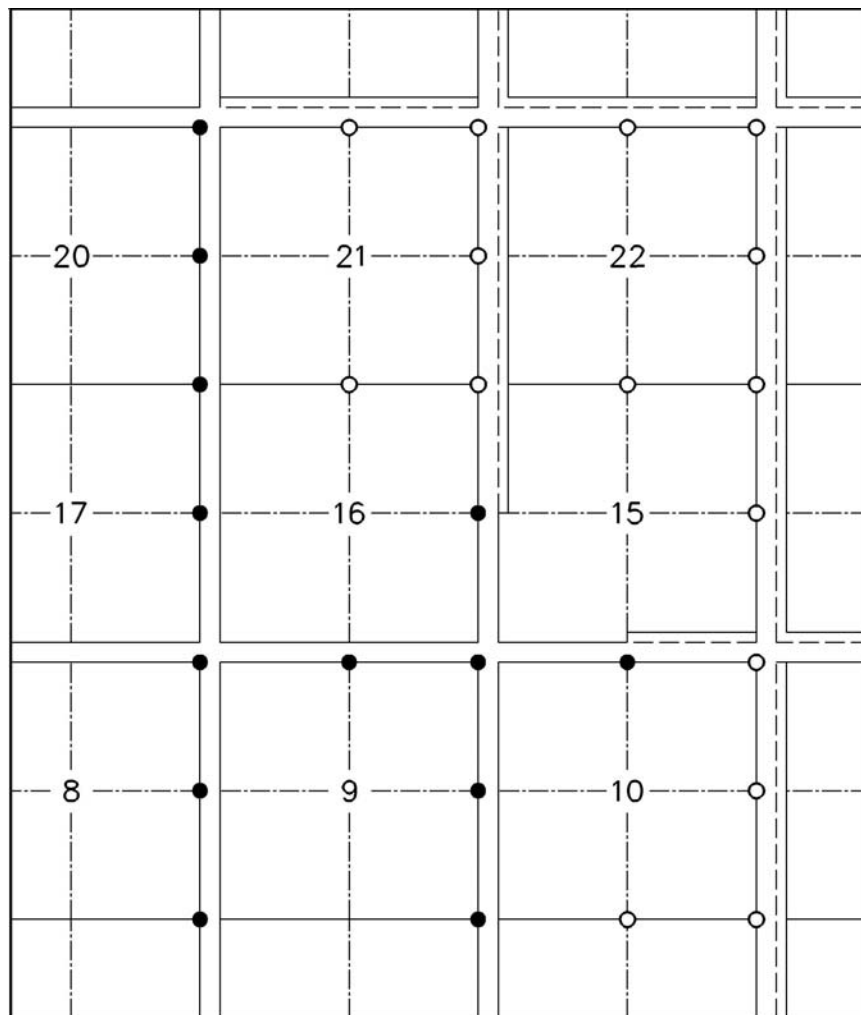
1. For all surveyed lines, the width of the road allowances shall be maintained as that shown on the official Township Plan. In cases where two different widths are shown on adjacent plans, the width shown on the most recent plan shall be used.
2. For all unsurveyed lines, the widths shall be established as 99 feet (1½ chains).
3. For correction lines with only one limit surveyed and shown as 66 feet (1 chain) on the official Township Plan, an 82.5-foot (1¼ chain) road allowance shall be established.
4. The transition from a 66-foot road allowance to a 99-foot road allowance shall follow these guidelines:
 - Part C, Section 8.2: Guidelines for Partially Surveyed Townships, page 33
 - Part C, Section 8.3: Guidelines for Correction Lines, page 34



8.2 Guidelines for Partially Surveyed Townships

On all boundaries except those along correction lines, the limit of the road allowance shall jog 33 feet, at approximately right angles (depending on the direction of the section or quarter section line), beginning at the position of the last corner defining a 66-foot road allowance.

In the diagram below, the N $\frac{1}{4}$ 10 is the last corner defining a 66-foot allowance and the 33-foot jog begins there. The E $\frac{1}{4}$ 16 and the NE 20 are similar examples.



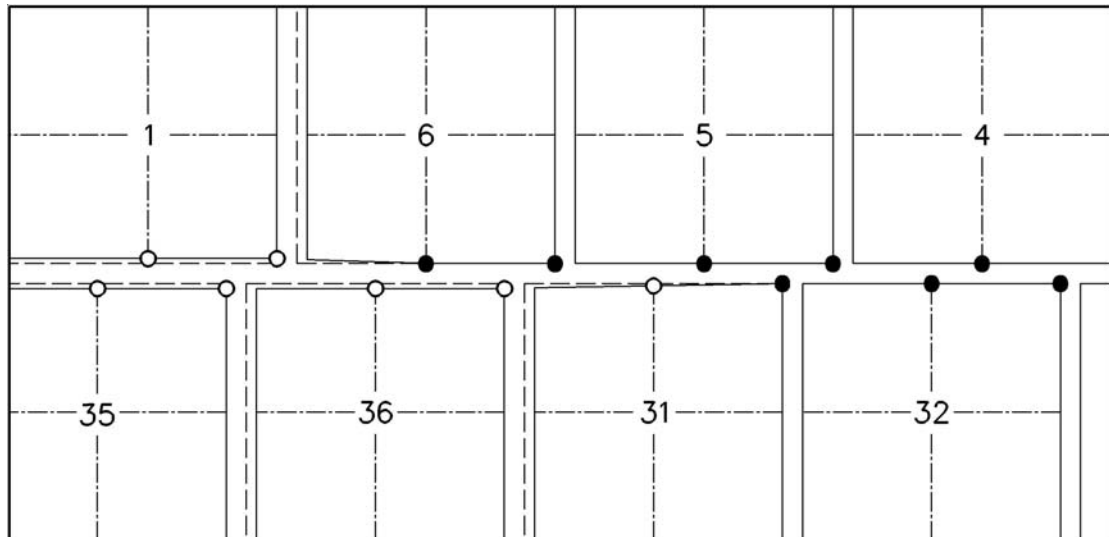
Partially Surveyed Township Diagram



8.3 Guidelines for Correction Lines

Along correction lines, the limit of the road allowance shall taper from the position of the last corner defining a 66-foot road allowance to the nearest section corner defining a 99-foot road allowance.

In the diagram below, the NE 31 is the last corner defining a 66-foot road allowance, the NE 36 is the nearest section corner defining a 99-foot road allowance, and the limit tapers one mile. In Section 6, the S $\frac{1}{4}$ 6 is the last corner defining a 66-foot road allowance, the SE 1 is the nearest section corner defining a 99-foot road allowance, and the limit tapers $\frac{1}{2}$ mile.



Correction Line Diagram

Note: The 33 feet ($\frac{1}{2}$ chain) required to create a 99-foot road allowance shall be taken from the quarter sections adjacent to the east and north limits of the road allowances, with the exception being on correction lines, where 16.5 feet ($\frac{1}{4}$ chain) shall be taken from the quarter sections adjacent to both the north and south limits of the road allowances.



PART D: STANDARD PRACTICE FOR SURVEYS AND PLANS

Section 1: General Requirements for Plans

The *Surveys Act* defines the field requirements for surveys. The Land Titles Office and certain acts provide the authority for the registration of plans of survey and specify, to some extent, the information that must be shown on plans.

The information in this Section supplements and expands on statutory provisions to support effective plan preparation. Alberta Land Surveyors should also consult the following publications for direction:

1. Land Titles Procedures Manual:

<http://www.servicealberta.gov.ab.ca/836.cfm>

2. Consolidated Policy and Procedures Manual for the Submission of Digital Plans of Survey for Registration:

<http://www.servicealberta.gov.ab.ca/pdf/PPR/ppman.pdf>

3. Documentation Registration Request (DRR) Procedures:

- *Create DRR:*

<http://alta.registries.gov.ab.ca/SpinII/spin2help.aspx?referrer=PendingDRRCreate.aspx>

- *Modify DRR:*

<http://alta.registries.gov.ab.ca/SpinII/spin2help.aspx?referrer=PendingDRRModify.aspx>

- *Search DRR:*

<http://alta.registries.gov.ab.ca/SpinII/spin2help.aspx?referrer=PendingDRRSearch.aspx>



1.1 Method Used To Re-Establish Corners

A notation shall be placed on the plan of survey describing the method used in re-establishing lost corners if this is not clear. For details, see Part C, Section 5.8 (Lost Monuments on Subdivision Surveys) and Part C, Section 5.9 (Lost Monuments on Township Surveys) on page 27.

1.2 Datum or Origin for Bearings and Coordinates

The recognized horizontal datums for spatially-referenced data in Alberta are the North American Datum 1983 (Original) and the North American Datum 1983 (Canadian Spatial Reference System - CSRS). For more information on NAD83 (Original) and NAD83 (CSRS), refer to the Geodetic Fact Sheets available at this site:

<http://www.srd.gov.ab.ca/lands/directorsurveys/factsheet.aspx>

These datums and related ellipsoids shall be used on all plans of survey registered in the Land Titles Office when plan information relates to grid bearings or grid coordinates. The map projections chosen must be consistent with the requirements of the provincial mapping system.

The recommended vertical datum for spatially-referenced data in Alberta is CGVD28 (Canadian Geodetic Vertical Datum, 1928).

The plan of survey shall clearly show the datum or origin used for bearings and coordinates on the plan of survey as outlined below:

1. Unless circumstances require greater accuracy, bearings should be shown to the nearest 5 seconds of arc. Ties to Alberta Survey Control Markers shall reflect the actual angle determined.
2. All plans of survey prepared pursuant to Section 47 of the *Surveys Act* and Part C, Section 7 (Integrated Surveys) on pages 30 to 31 shall show NAD83 (Original) or NAD83 (CSRS) grid bearings and grid coordinates, and contain a note in the grid coordinate listing header and in the legend indicating:
 - the datum used;
 - the projection used;
 - the reference meridian; and
 - the combined factor (combining scale factor and elevation factor) used to scale ground distances to the projection plane.

A note shall also be placed in the legend indicating how the bearings were derived.



3. A Surveyor who prepares a plan of survey in Unsurveyed Territory shall ensure that it meets the following requirements:
 - Bearings are referred to either the astronomical meridian passing through the centre of the range in which the survey lies or the reference meridian appropriate to survey control, and an explanatory note stating the origin of the bearings is placed in the legend.
 - Connections to survey control or existing surveys are verified, and positions for all monuments can be determined relative to the position in the Alberta Township System (ATS) of the northeast corner of Section 33 on the Base Line that governs the positions of the theoretical ATS boundaries in the vicinity of the survey.
 - The bearings of lines derived from astronomical observations are shown as such on the plan.
 - On Establishment of Monuments Plans for Wellsite Control purposes, coordinates are shown in a table for points in the survey relative to the northeast corner of Section 33 on the closest Base Line in the range in which the survey lies, oriented to the astronomical meridian through the NE 33.

1.3 Tie Measurements

Linear and angular tie measurements must be shown in all directions from intersections with previously surveyed boundaries.

1.4 Curve Data

Where any boundary or limit of a block, parcel, or right-of-way has been surveyed as an arc of a circular curve, the length of the curve, its radius, and the central angle of curve shall be shown on the plan. Chord lengths and bearings with length of sub-tangents may also be shown but are not essential. When a circular curve boundary is non-tangential to an adjoining line segment boundary, radial bearings or a chord bearing and distance must also be shown.

Note: On subdivision plans with curvilinear boundaries, it may be desirable to show the delta angle to the nearest second of arc and the other curve-related information to millimetre precision. For multiple curves or curve segments, information may be shown in tabular form.

1.5 Closures

Each and every figure on a plan shall be checked for mathematical closure.



Section 2: Subdivision Surveys

2.1 Statutory Requirements

The standards provided in this Section are in addition to the statutory requirements of the *Municipal Government Act*, the *Land Titles Act*, the *Surveys Act*, and the related regulations regarding the survey and preparation of plans of subdivision.

2.2 Delayed Posting

Using the delayed posting provisions under the *Surveys Act* is optional. However, this option is recommended where the subdivision plan must be registered prior to the completion of construction.

In addition to other applicable standards, the following standards apply to the delayed posting of subdivisions:

1. The survey and reference control network shall be integrated with the surrounding and adjacent Alberta Survey Control Markers. Stable reference monuments shall be strategically placed to ensure their maintenance until completion of posting. The reference network shall be designed to provide for redundancy in observations and to avoid hanging lines or hanging networks.
2. All perimeter monumentation should be placed prior to registration of the plan of subdivision. At the Surveyor's discretion, perimeter monuments may be delayed when there is a possibility that they will be destroyed during construction. When a perimeter boundary is common to a previously registered but unposted boundary, the coordinate positions of the previous plan govern until a Monumentation Certificate (Form 11.1 under Section 77 of the *Land Titles Act*) is registered at the Land Titles Office. The respective Surveyors should coordinate their plans and surveys to ensure that no conflicts arise along the common boundary.
3. In accordance with Section 47(3) of the *Surveys Act*, within one year of the registration of the plan, the Surveyor shall either place the monuments required by Section 45(1) or submit to the Director of Surveys a request for an extension sufficient to complete the placing of the monuments, stating the reason for the request. In all cases, the Surveyor shall register a Monument Certificate within the above-specified or formally extended time limits once the placing of the monuments is complete. The certificate shall contain a detailed description of the type and condition of all monuments placed and reasons for non-posting if any monuments were not placed.



4. Every effort shall be made to prepare Section 47 plans on one sheet. However, where two sheets are necessary:
 - The second sheet shall contain only information relevant for the period that the statutory monuments are not in place, including the reference control network and a key plan of point numbers. It may also include the table of coordinates.
 - The second sheet shall be numbered “Sheet 2 of 2” and Sheet 1 of 2 must contain a statement indicating what information is contained on Sheet 2.
5. Grid NAD83 (Original) or NAD83 (CSRS) coordinates must be shown on the plan or on a separate document registered concurrently with the plan.



Section 3: Strata and Condominium Surveys

Consult these sections of the Land Titles Procedures Manual for specifications and guidelines regarding strata and condominium surveys:

1. Section Sur-2.1: Examination of Strata Space Plans
<http://www.servicealberta.gov.ab.ca/pdf/ltmanual/SUR-2.1.pdf>

2. Section Sur-4: Examination of Condominium Plans
<http://www.servicealberta.gov.ab.ca/pdf/ltmanual/SUR-4.pdf>



Section 4: Right-of-Way Surveys

This Section provides standards supplementary to the *Surveys Act* for surveys of new roads, utility rights-of-way, pipeline rights-of-way, and railways.

Alberta Land Surveyors should also consult these sections of the Land Titles Procedures Manual for direction:

1. Section Sur-5: Examination of Road Plans and Other Public Works Plans
<http://www.servicealberta.gov.ab.ca/pdf/ltmanual/SUR-5.pdf>
2. Section Sur-6: Examination of Right-of -Way Plans, Related Site Plans, and Miscellaneous Plans
<http://www.servicealberta.gov.ab.ca/pdf/ltmanual/SUR-6.pdf>

4.1 Posting Requirements

1. When only one limit of a right-of-way is monumented, the southerly and/or westerly limits are preferred for posting.
2. When surveying a new right-of-way that is adjacent and parallel to an existing right-of-way, monuments shall be placed on the limit that is not an existing right-of-way limit.
3. Subject to the above, monuments shall be placed:
 - at each deflection or terminal point of the limit(s);
 - at each beginning and end of curve;
 - at intervals not exceeding 1,000 metres, except for roads—for which intervals should not exceed 600 metres—and, in either case, at either the interval required to produce intervisibility or the specified interval, whichever is the lesser distance; and
 - at the intersection of the posted limit(s) with each surveyed boundary crossed, including blind lines.



4.2 Termination on Unsurveyed Quarter Line

When a boundary of a right-of-way or road is coincident with, terminates on, or purports to define an unsurveyed quarter line, the unsurveyed quarter line shall be surveyed in accordance with the *Surveys Act* except where the posted limit is within 30 metres of the posted quarter section corner.

In the latter case, the intersection may be made by adopting the bearing determined from the Township Plan or other registered plan. The calculated bearing and measured distance from the existing monument to the new monument shall be shown on the plan. The method chosen for making the intersection should take into consideration the preservation of the survey fabric and land owner concerns.

4.3 Calculated Distances to Unsurveyed Boundaries

Calculated distances shall be shown to unsurveyed quarter lines and parcel boundaries on Right-of-Way Plans (including Road Plans) for rights-of-way that cross unsurveyed quarter lines or unsurveyed parcel boundaries in surveyed territory.

4.4 Right-of-Way Widths

If the right-of-way surveyed has parallel limits, the perpendicular width and any right-of-way widths adopted from previous surveys shall be clearly shown.

4.5 Cancelled or Abandoned Plans

Boundaries shown on cancelled subdivision plans for which no titles exist or on abandoned Right-of-Way Plans need not be intersected. A right-of-way may be considered abandoned when no interest in the right-of-way exists.

To determine the status of current recorded interests, review records at the Land Titles Office, Alberta Sustainable Resource Development (Lands Division), and the Energy Resources Conservation Board (ERCB), as well as other available records.

4.6 Partial Abandonment of Road

Where a portion of a previously registered road is abandoned in favour of a new survey, any remaining portion of the previously surveyed road in the same quarter section or parcel should be retraced in the new plan of survey.



4.7 Tie-Backs

On the survey of a right-of-way that terminates within the interior of a section, the terminal monument shall be tied to some other known point so that a closure may be obtained from information shown on the plan.

4.8 Markings on Monuments

If a statutory iron post is placed to re-establish a lost monument originally placed on a road survey, the re-established monument shall be marked with the same designation as the original monument.

Although a marker post shall be placed in accordance with accepted practice, pits shall not be dug or restored.

4.9 New Railway Surveys

When a new railway right-of-way is surveyed and the track has been constructed prior to the survey, the centreline of actual track shall be related to the right-of-way survey and this relationship shall be shown on the plan of survey.

Any spiral curves existing on the centreline of track of a new railway shall be replaced with circular curves for the purpose of posting the railway limits in accordance with the table shown in Part D, Section 4.10 (Spiral Curve Replacement) on page 44.



4.10 Spiral Curve Replacement

When establishing the boundary of a previously surveyed but unposted railway right-of-way with the centreline shown as a spiral curve on the registered plan, the spiral shall be replaced with a circular curve in accordance with the table below. The three types of spiral curve are illustrated in Part D, Section 4.11 (Three Types of Spiral Curve) on page 45.

SPIRAL CURVE REPLACEMENT TABLE					
(distances are shown in feet and decimals thereof)					
Curve Data from Railway Plan			Replacement Curve Data		
D^o_C & R_C Degree and Radius of Central Curve	L_S Length of Spiral	Δ_S Total Spiral Angle	Δ_R Delta of Replacement Curve	R_R Radius of Replacement Curve	Type of Spiral Curve
2° 2,864.9	180	1° 48'	1° 48'	3,819.8	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	168	1° 40'	1° 40'	4,331.2	
	120	1° 12'	1° 12'	3,819.8	
2° 30' 2,292.0	210	2° 37.5'	2° 37.5'	3,055.7	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	200	2° 30'	2° 30'	3,359.2	
	150	1° 52.5'	1° 52.5'	3,055.7	
3° 1,910.1	240	3° 36'	3° 36'	2,546.6	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	234	3° 30'	3° 30'	2,765.7	
	180	2° 42'	2° 42'	2,546.6	
3° 30' 1,637.3	270	4° 43.5'	4° 43.5'	2,182.9	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	204	3° 30'	3° 30'	2,412.2	
	210	3° 40.5'	3° 40.5'	2,182.9	
4° 1,432.7	300	6° 00'	6° 00'	1,910.1	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	231	4° 40'	4° 40'	2,024.7	
	240	4° 48'	4° 48'	1,910.1	
4° 30' 1,273.6	300	6° 45'	6° 45'	1,697.9	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	264	6° 00'	6° 00'	1,786.0	
	270	6° 04.5'	6° 04.5'	1,697.9	
5° 1,146.3	300	7° 30'	7° 30'	1,528.2	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	248	6° 00'	6° 00'	1,677.2	
	300	7° 30'	7° 30'	1,528.2	
5° 30' 1,042.1	300	8° 15'	8° 15'	1,389.3	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	279	7° 30'	7° 30'	1,499.7	
	330	9° 04.5'	9° 04.5'	1,389.3	
6° 955.4	300	9° 00'	9° 00'	1,273.6	1. Sullivan Spiral 2. Searles Spiral 3. Holbrook Spiral
	310	9° 10'	9° 10'	1,357.2	
	360	10° 48'	10° 48'	1,273.6	



4.11 Three Types of Spiral Curve

There are three types of spiral curve:

1. Sullivan Spiral
2. Searles Spiral
3. Holbrook Spiral

Drawings and formulae for the three types of spiral curve are provided on the following pages for information purposes only.

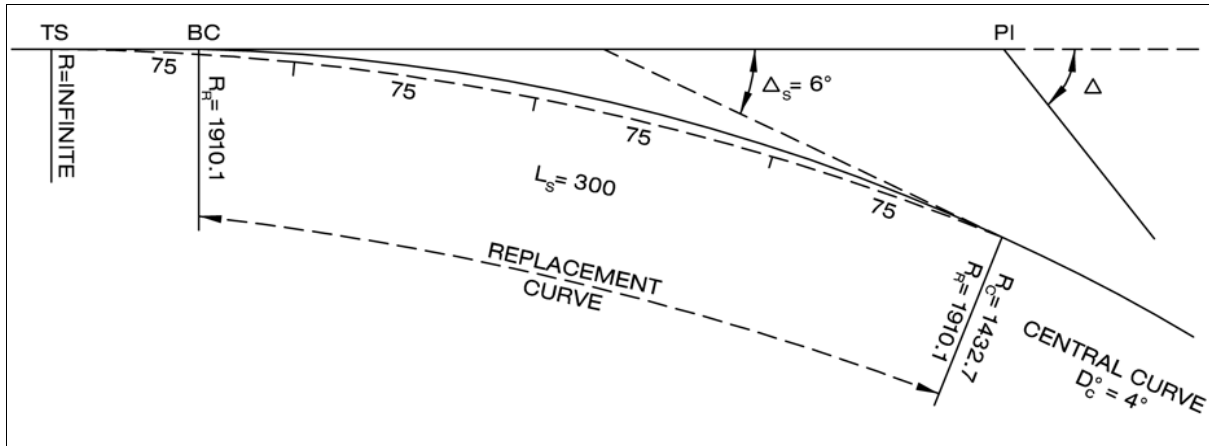
The Spiral Curve Replacement Table on the previous page and the three sets of drawings and formulae on the following pages use the symbols defined below.

SYMBOLS

- BC** - beginning of curve.
- C** - chord length.
- D_s** - deflection angle (chord ratio).
- D₁₀₀** - total **D_s** (deflection angle) from **TS**.
- D°** - degree of curvature (the number of degrees subtended by a 100-foot chord).
- D°_c** - degree of curvature of central circular curve.
- D°_R** - degree of curvature of replacement curve (Sullivan and Holbrook Spirals).
- D°_s** - spiral angle of individual chord.
- L_s** - length of spiral.
- N** - number of chords.
- PI** - point of intersection.
- R** - radius of curve (infinite at transition point from tangent to spiral curve).
- R_c** - radius of central curve.
- R_R** - radius of replacement curve.
- TS** - tangent to spiral curve.
- Δ_R** - delta of replacement curve – always the same as total spiral angle.
- Δ_s** - total spiral angle.



1. Sullivan Spiral



The Sullivan Spiral, which is found on the CPR, is a transition curve with a uniform increase in the degree of curvature. The number of degrees of the central curve equals the number of chords in the spiral.

Distances are shown in feet and decimals thereof.

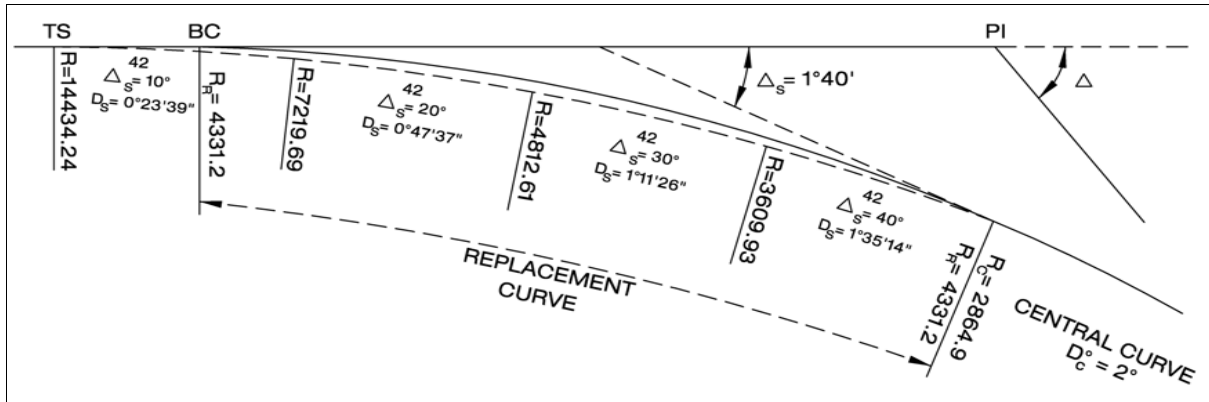
Example: $D_C^\circ = 4^\circ$, $L_S = 300$, $N = 4$, $\Delta_S = \frac{D_C^\circ L_S}{200} = 6^\circ$,

D_R° of replacement curve = $3/4 D_C^\circ$, $D_R^\circ = 3^\circ$, $R = 1910.1$

The Sullivan Spiral uses the number of degrees in the value D_C° as the number of chords in the value L_S . It involves laying out a series of equal chords so arranged that the spiral curve passing through the chord points has zero curvature at the **TS**, 1° of curvature at the first chord point, 2° at the second, and so on, so that at the end of n chords, the spiral has n degrees of curvature.



2. Searles Spiral



The Searles Spiral, which is found on the GTPR (now the CNR), is a multi-compound curve of decreasing radii approximating the properties of a cubic parabola.

Distances are shown in feet and decimals thereof.

Example: $D_C^0 = 2^\circ$, $L_S = 168$, $N = 4$, chord = 42, $X = 1.832$,

$$R_R = \frac{X}{(1 - \cos \Delta_S)} \text{ of spiral short tangent, Total } \Delta_S = 1^\circ 40', R_R = 4331.2$$

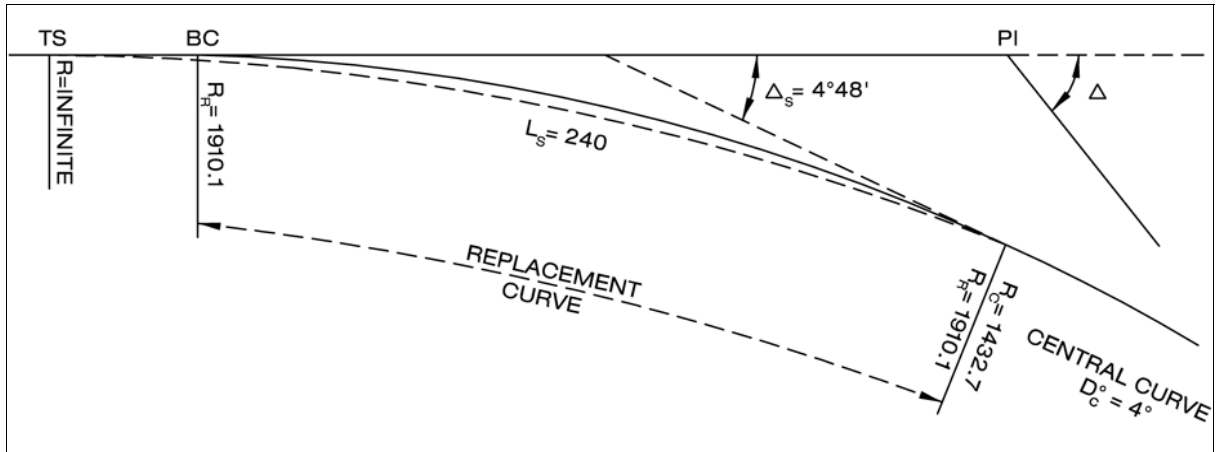
$$\text{The first chord ratio is } D_S = \frac{100}{\text{chord length}} \times 10 \text{ minutes.}$$

$$\text{More generally, } \sin \frac{1}{2} D_S = \frac{100 \sin \frac{1}{2} D_{100}}{\text{chord length}}.$$

The Searles Spiral is distinctive in that it is not a spiral. Instead, it is a series of compound curves with diminishing radius to that of the fixed radius of the central simple curve. Like the Holbrook and Sullivan Spirals, this curve approximates the properties of a cubic parabola. The difference is that it is not uniform throughout.



3. Holbrook Spiral



The Holbrook Spiral, which is found on the CNR, is a transition curve with a uniform increase in the degree of curvature. The number of minutes in the D_R° is equal to the number of feet in the spiral length. Therefore, degree of curvature increases 1 minute per foot of L_s .

Distances are shown in feet and decimals thereof.

Example: $D_C^\circ = 4^\circ$, $L_s = 240$, $\Delta_s = \frac{D_C^\circ L_s}{200} = 4^\circ 48'$, D_R° of replacement curve = $3/4 D_C^\circ$,
 $D_R^\circ = 3^\circ$, $R = 1910.1$

The Holbrook Spiral is a spiral of uniform, continuously increasing degree of curvature to that of a fixed degree of the central curve. It is distinctive in that the degree of curvature increases one minute for each foot of spiral length. For sharper curves, the degree of curvature increases two minutes for each foot of spiral length.



4.12 Definition of Railway Tangent

When establishing the location of a railway right-of-way based on an existing centreline of track, a statutory iron post shall be placed to define the tangent for subsequent use. The post shall be tied to the survey being conducted and shall be located at least 500 metres from the survey being conducted or near the next point of curvature, whichever is nearer.

4.13 Rail Line As-Located Surveys

Existing rights-of-way based on “location” plans may or may not correspond to actual rail location since “as located” surveys were conducted prior to rail construction. If it is found that the existing centreline of track agrees reasonably with the centreline as shown on the plan, it is likely that this is the best evidence of the original survey line. If not, an alternative procedure appropriate to the circumstances may be required.

4.14 Railway Centreline

Existing rights-of-way based on “as-constructed” or “as-built” surveys will generally refer to the centreline of track existing at the time of survey, and ownership is based on the location of this centreline. The centreline of track is therefore usually the best evidence of the original survey line, provided that no movement has occurred since the original survey.



Section 5: Wellsite and Public Land Dispositions

This Section deals with the survey of petroleum-related facilities and other public land dispositions, including the licensing of wells under the *Oil and Gas Conservation Regulations*. Surface tenure on patented lands is normally protected by caveats registered at the Land Titles Office, whereas interests in unpatented public lands are dealt with by the Minister responsible under the *Public Lands Act*.

5.1 Environmental Conditions Affecting Well Licensing

Alberta requires operators of upstream oil and gas facilities in environmentally sensitive areas to conserve and reclaim land and to mitigate the effects of their activities. For specifications and guidelines, consult the Alberta Environment Fact Sheet entitled *Siting an Upstream Oil and Gas Site in an Environmentally Sensitive Area on Private Land*:

<http://www3.gov.ab.ca/env/protenf/landrec/factsheets/DevelopmentOnSensitiveSites-v7.pdf>

5.2 Reference Boundary

1. An Alberta Land Surveyor performing a survey for the location of wellsites and related facilities in surveyed territory shall locate and confirm sufficient monuments within, on, or defining the section in which the facilities are located to determine the position of the wellsite and related facilities in relation to the section boundaries. The word “monuments” here refers to those placed in accordance with Part 2 or Part 3 of the *Surveys Act*.
2. An Alberta Land Surveyor performing a survey for the location of wellsites and related facilities in Unsurveyed Territory shall locate and confirm sufficient monuments to determine the position of the wellsite and related facilities in relation to the theoretical section boundaries. The word “monuments” here refers to:
 - monuments placed in accordance with Part 2 or Part 3 of the *Surveys Act*;
 - monuments shown on a Wellsite Control Plan on file with the Director of Surveys Office; or
 - Alberta Survey Control Markers directly connected to Part 2 or Part 3 monuments that define the theoretical section boundaries.

Theoretical section boundaries shall be determined using the *Supplement to the Manual of Instructions for the Survey of Canada Lands*.



5.3 Surveys Act

Where the boundaries of a wellsite or related facility purport to define a property boundary, the said boundary shall be defined in accordance with the *Surveys Act*, excepting thereout the provisions of Sections 44(3) and 46(3), to define the boundaries of the parcel.

However, when a related linear facility (access road) crosses or terminates on a property boundary, the intersection may be calculated, in which case the plan shall clearly indicate that the intersection is calculated.

5.4 Wellsite Control Plans

Wellsite Control Plans were formerly called Wellsite Traverse Plans or Wellsite Control Traverse Plans. Plans submitted prior to December 1, 1997 are still available from the Director of Surveys Office.

When performing a survey for a well location in Unsurveyed Territory, an Alberta Land Surveyor is required to prepare a plan of survey if the well location is more than two kilometres from an existing survey performed in accordance with the *Surveys Act*.

When performing this survey, the Surveyor shall:

1. Make ties to existing surveys as required to determine the relationship between the survey being performed and the theoretical section boundaries in accordance with the accuracies specified in Part C, Section 1.6 (Wellsite Surveys) on page 14.
2. Place monuments not further than 1,000 metres from the well location.
3. Place a monument at each survey point established.
4. Show this information on a Wellsite Control Plan and submit it to the Land Titles Office for registration as an Establishment of Monuments Plan within 180 days of completing the survey.

5.5 Monumentation

Refer to Part C, Section 3.9 (Establishment of Monuments Plan) on page 19.

5.6 Accuracies

Refer to Part C, Section 1.6 (Wellsite Surveys) on page 14.



5.7 Wellsite Plan Requirements

1. A Wellsite Survey Plan shall include, at minimum, the following administrative information:
 - name of licensee (applicant);
 - name of survey corporation and/or Alberta Land Surveyor;
 - dates of survey and any revisions; and
 - ALS Certification for Wellsites and Public Land Dispositions (Part E, Section 1 – ALS Certifications, page 72).
2. For technical requirements and guidelines, consult *Energy Resources Conservation Board Directive 056 – Energy Development Applications and Schedules*:

<http://www.eub.gov.ab.ca/bbs/documents/directives/directive056.pdf>
3. A Wellsite Survey Plan in Unsurveyed Territory shall clearly identify the survey evidence used as the datum and show the coordinates of the datum point or points relative to the northeast corner of Section 33 on the Base Line that governs the positions of the theoretical ATS boundaries in the vicinity of the wellsite.

5.8 Wellsite Plan Monuments

Notwithstanding the provisions of the Manual, a Surveyor may elect to register a plan of monuments under Part C, Section 3.9 (Establishment of Monuments Plan) on page 19. However, the Surveyor must adhere to all other provisions of the Manual.



5.9 Public Land Dispositions Except Licence of Occupation (LOC)

This sub-section refers to the requirements for surveys of public land dispositions. If disposition plans are registered at the Land Titles Office, the Surveyor should refer to the appropriate section of the Manual.

An Alberta Land Surveyor should be familiar with public land disposition types and the approving authority's plan requirements before carrying out surveys involving public lands. A list of various disposition types and plan preparation guidelines is available in the Alberta Sustainable Resource Development document entitled *Disposition Plan Types/Formats*:

http://www.srd.gov.ab.ca/lands/managingpublicland/landinformation/pdf/Disposition_Req.pdf

It is necessary to accurately define the location of activities and dispositions on public lands so that the approving authority does not grant conflicting authorizations on the same land. This is accomplished by requiring applicants to provide a detailed plan showing the location of the land for which the applicant is applying in relation to known survey evidence.

The above-cited document entitled *Disposition Plan Types/Formats* specifies:

- when a survey is required and when a proposed plan or sketch plan, without a survey, is allowed;
- the content requirements for a proposed plan or sketch plan at the application stage; and
- the content requirements for survey plans at the final stage after construction.

When determining the boundaries of public land dispositions, Surveyors should be guided by the following criteria:

- Where the disposition boundaries are surveyed and monumented, the boundaries shall be defined by the monuments placed for that purpose.
- Where the disposition boundaries are surveyed and not monumented, the boundaries shall be defined by the best evidence governing those boundaries.
- Where the disposition boundaries are not surveyed, the boundaries shall be defined by the best physical evidence governing those boundaries.



When conducting a survey and preparing a plan for a public land disposition, an Alberta Land Surveyor shall:

1. Mark the positions of the boundary lines to be established by placing monuments at every change in direction and at the beginning and end of every curve. The type of monument to be placed is stipulated in the document cited on the previous page entitled *Disposition Plan Types/Formats*.
2. Intersect and monument all surveyed section boundaries crossed.
3. In surveyed territory, locate and confirm sufficient monuments within, on, or defining the section in which the disposition is located to determine the position of the disposition in relation to the section boundaries. The word “monuments” here refers to those placed in accordance with Part 2 or Part 3 of the *Surveys Act*.
4. In Unsurveyed Territory, locate and confirm sufficient monuments to define the theoretical section in which the disposition is located in order to determine the position of the disposition in relation to the theoretical section boundaries. The word “monuments” here refers to those placed in accordance with Part 2 or Part 3 of the *Surveys Act*, those shown on a Wellsite Control Plan on file with the Director of Surveys Office, or Alberta Survey Control Markers integrated with the Alberta Survey Control System.
5. Derive and reference the bearings of all surveyed lines in accordance with Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 36 to 37.
6. Verify all bearings and distances to the level of accuracy specified in Part C, Section 1.6 (Wellsite Surveys) on page 14 except ties identified in Section 5.9.8 below.
7. Make sufficient field measurements to ensure that there are no errors of layout or measurement, and show these measurements on the plan.
8. Tie in and show on the plan all visible public land dispositions crossed or adjacent to the survey.
9. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 35 to 37 and the approving authority’s plan requirements.
10. Certify the plan in accordance with Part E, Section 1 (ALS Certifications – ALS Certification for Wellsites and Public Land Dispositions, page 72).



5.10 Remote Sensing for Public Land Dispositions and Wellsites on Private Land

An Alberta Land Surveyor preparing a disposition plan on public lands or wellsites on private land based on remotely sensed survey data such as LiDAR shall:

1. Use remotely sensed data only if it can be demonstrated that it meets accuracies of 0.5 m vertically and 2.0 m horizontally with respect to Alberta Survey Control Markers or other published benchmarks in the area at the 95% confidence level. Verifying this may include obtaining the calibration data and testing the collection method for quality assurance, comparing the data to data for a sample of areas surveyed using proven techniques, and comparison with points that have published horizontal and vertical positions.
2. Visit the subject area to confirm that all relevant topography has been identified and shown on the plan. For example, the Surveyor may find small creeks that were not discernible in the data.
3. Locate and confirm monuments in accordance with Part D, Section 5.2 (Reference Boundary) on page 50.
4. Identify the data collection technique prominently in the plan heading (e.g., LiDAR Survey).
5. Identify positions to be monumented (corners, changes in direction, and beginnings and ends of curves) with a symbol that is represented in the legend as a “remotely sensed position.”
6. Note on the plan when the remotely sensed data was collected.
7. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 35 to 37 and, if the survey includes public land, the approving authority’s plan requirements.
8. Certify the plan in accordance with Part E, Section 1 (ALS Certifications – ALS Certification for Wellsites and Public Land Dispositions, page 72).
9. If the survey includes public land, prepare a monumented as-built plan of survey within the time period specified by the approving authority in accordance with Part D, Section 5.9 (Public Land Dispositions Except Licence of Occupation) on pages 53 to 54, Section 5.11 (Licence of Occupation Linear Public Land Dispositions) on page 56, and the approving authority’s plan requirements.



10. If the wellsite survey includes private land, prepare a monumented as-built plan of survey based on non-remotely sensed techniques within the time period specified by the approving authority (ERCB) in accordance with the provisions of Part D, Section 5.2 (Reference Boundary), Section 5.3 (Survey Act), and Section 5.7 (Wellsite Plan Requirements) on pages 50 to 52.

5.11 Licence of Occupation (LOC) Linear Public Land Dispositions

An Alberta Land Surveyor performing a public land disposition survey for an as-built LOC access road shall:

1. Survey the location of the as-built access road. The disposition boundaries shall be determined from the centreline of the as-built road. The relationship of the centreline of the as-built road to the disposition boundaries shall be shown on the plan. The placement of monuments, marker posts, and bearing trees is not required.
2. Make ties to existing surveys as required to determine the relationship between the survey being performed and the Alberta Township System to the level of accuracy specified in Part C, Section 1.6 (Wellsite Surveys) on page 14. Tie the beginning and end points of the survey to existing surveys, which include the Alberta Survey Control System, surveyed section boundaries, plans of survey registered at the Land Titles Office, Wellsite Control Plans, and monumented disposition surveys.
3. Derive and reference the bearings of all surveyed lines in accordance with Part D, Section 1.2 (Datum or Origin for Bearings and Coordinates) on pages 36 to 37.
4. Verify all bearings and distances to the level of accuracy specified in Part C, Section 1.6 (Wellsite Surveys) on page 14 except ties made under Section 5.11.5 below.
5. Tie in and show on the plan all visible linear public land dispositions crossed or adjacent to the survey.
6. Prepare the plan in accordance with Part D, Section 1 (General Requirements for Plans) on pages 35 to 37 and the approving authority's plan requirements.
7. Certify the plan in accordance with Part E, Section 1 (ALS Certifications – ALS Certification for Wellsites and Public Land Dispositions, page 72).



5.12 Mineral Surface Lease (MSL)

An Alberta Land Surveyor performing a wellsite (MSL – maximum 2 hectares) disposition plan amendment shall locate and confirm by measurement sufficient evidence within, on, or defining the disposition to allow the determination of the boundaries. The amendment field survey shall not span more than 24 months.

The Surveyor shall:

- indicate pre-existing disposition survey evidence as found, restored, or re-established; and
- indicate the actual dates of the amendment field survey in accordance with Part E, Section 1 (ALS Certifications – ALS Certification for Wellsites and Public Land Dispositions, page 72).



Section 6: Other Surveys in Unsurveyed Territory

When performing a survey in Unsurveyed Territory pursuant to Part 3 of the *Surveys Act*, in addition to complying with the requirements of the Act, the Surveyor shall:

1. Make ties to existing surveys as required to determine the relationship between the survey being performed and the theoretical section boundaries in accordance with the accuracies specified in Part C, Section 1.1 (Method of Misclosure) or Part C, Section 1.2 (Method of Least Squares) on page 12.
2. Ensure that the bearings for all surveyed lines are derived and verified relative to either the astronomical meridian passing through the centre of the range in which the survey lies or the reference meridian appropriate to survey control.



Section 7: Descriptive Plans

This Section provides specifications and guidelines for the preparation of Descriptive Plans. Alberta Land Surveyors should also consult the Land Titles Procedures Manual for direction:

1. Land Titles Procedures Manual:

<http://www.servicealberta.gov.ab.ca/836.cfm>

2. Section Sur-3: Examination of Descriptive Plans:

<http://www.servicealberta.gov.ab.ca/pdf/ltmanual/SUR-3.pdf>

7.1 Subdivisions

For creation of new boundaries by subdivision, the Surveyor shall undertake sufficient research, including a field inspection if necessary, in order to:

- ensure that the boundaries being created by the Descriptive Plan are consistent with the intent of the subdivision;
- confirm that all improvements lie within the boundaries of the proposed parcel; and
- confirm that no encroachments exist onto the subject property from adjacent lands.

7.2 Natural Boundaries

Where a Descriptive Plan includes a natural boundary, the Surveyor should conduct a field inspection to confirm the location of the natural boundary.

7.3 Field Inspection Statement

Place one of the following statements on the Descriptive Plan:

- No field inspection was carried out and boundaries were not established on the ground.
- A field inspection was carried out on _____ (month) _____ (day), 2____, but boundaries were not established on the ground.



Section 8: Real Property Reports

A Surveyor performing a survey to identify, locate, and illustrate improvements on a parcel of land and the extent of that parcel shall prepare an Alberta Land Surveyor's Real Property Report in accordance with this Section. See also Part E, Section 1 (ALS Certifications – Alberta Land Surveyor's Real Property Report, pages 70 to 71).

8.1 Definition of Improvement

In this Section, the word “improvement” refers to any visible structure of a permanent nature, constructed or placed on, in, or over land.

8.2 Surveys Act

A Surveyor performing a survey to prepare an Alberta Land Surveyor's Real Property Report shall locate and confirm sufficient survey monuments to define the boundaries of the parcel in accordance with the *Surveys Act* excepting thereout the provisions of Sections 44(3) and 46(3).

8.3 Research

When conducting a survey for an Alberta Land Surveyor's Real Property Report, a Surveyor shall perform sufficient research to identify the parcel boundaries. A copy of the Certificate of Title that reflects the status of the property on the date of survey is to be retained in the file.



8.4 Plan Requirements

A plan for an Alberta Land Surveyor's Real Property Report shall show:

1. The legal description, municipality, and (where available) municipal address of the parcel.
2. The legal description of all lands adjoining the parcel.
3. That the plan is an "Alberta Land Surveyor's Real Property Report" (to be shown prominently).
4. All improvements as specified in Part D, Section 8.5 (Improvements) on page 62.
5. The nature of each improvement illustrated and, if it is incomplete, the current stage of its construction.
6. Any existing encroachment and the amount of the encroachment (to be shown clearly and prominently).
7. The length and bearing of each boundary of the subject parcel.
8. The survey monuments used to define the perimeter boundaries and the relationship of the monuments to those boundaries.
9. "Fd No Mk" at all locations where survey evidence was not found.
10. The condition of monuments recorded in the field notes as stipulated in Part C, Section 6.2.5 (Content of Field Notes – condition of monuments) on page 29.
11. A note on the plan containing the copyright symbol, the name of the Surveyor holding the copyright, and the current year.
12. All utility rights-of-way and easements that affect the extent of title, dimensioned and labelled.
13. All other surface interests affecting the extent of title.
14. Certification in accordance with Part E, Section 1 (ALS Certifications – Alberta Land Surveyor's Real Property Report, pages 70 to 71).



8.5 Improvements

The improvements to be shown on the plan for an Alberta Land Surveyor's Real Property Report include, at minimum, the following:

1. All buildings and projections therefrom, together with their dimensions. Minimum setback dimensions shall be shown from the boundaries of the subject parcel to exterior walls and/or foundation as required by the municipality. A statement clarifying the extent of setback dimensions is to be shown.
2. Eaves, dimensioned to the line of the fascia or foundation, together with a note showing this in the legend.
3. Driveways if they encroach onto the adjacent parcel.
4. Eavestroughs, steps, and landings if they encroach onto the adjacent parcel, street, or lane.
5. All permanent sheds and their dimensions.
6. Retaining walls that appear to define property lines or that encroach onto adjacent parcels, rights-of-way, streets, or lanes.
7. Utility poles and pedestals if they encroach onto the subject parcel.
8. Decks and their height above ground.
9. In-ground swimming pools.
10. In urban areas, fences that appear to define property lines. Indicate in the legend that all fences are within 0.20 metres of the property line unless otherwise noted. Fences more than 0.20 metres from the property line shall be dimensioned. Fences shall not be indicated as encroaching unless the encroachment is onto public lands. To avoid confusion and conflict, fence ownership should not be inferred.
11. Adjacent municipal sidewalks and curbs, together with the distance from the property line to the back of each sidewalk and curb.



8.6 Rural Real Property Reports

1. Locate and confirm evidence to define the perimeter boundaries of the parcel. If this is not practical, locate and confirm sufficient evidence to define, at minimum:
 - one boundary for parcels greater than 8 hectares.
 - two boundaries on different sides for parcels greater than 1 hectare but less than 8 hectares.
2. Critical boundaries, with encroachments or improvements close to minimum setback or sideyard requirements, must be defined in accordance with the *Surveys Act*.
3. Calculated distances may be derived from prior plans of survey but must be explained within the Real Property Report.
4. Fence lines are to be shown at the Surveyor's discretion. If they are not shown, the fence line statement should be removed and replaced with a statement that acknowledges the existence of fence(s) and indicates that they are not shown.

8.7 Updated and Re-Issued Reports

A field inspection and confirmation of title is required to update old Real Property Reports. Previous reports shall not be re-issued unless they are brought up to date and they conform to current standards.

8.8 Authentication

To identify original Real Property Reports, each original report shall bear a permit stamp, if applicable, and an original signature. The colour of both the permit stamp and the original signature are to be different from the colour of the printed document.



Section 9: Official Surveys

It is good practice for Alberta Land Surveyors engaged in Official Surveys to involve the appropriate offices early in the process.

9.1 Provincial Lands

Official Surveys executed pursuant to the *Surveys Act* include surveys of:

- Townships
- Settlements
- Métis Settlements
- Provincial Parks
- Provincial Boundary Resurveys

Official Surveys require specific instructions from the Director of Surveys under the *Surveys Act* or the *Boundary Surveys Act*.

9.2 Canada Lands

Official Surveys of Canada Lands require specific instructions from the Surveyor General of Canada.



Section 10: Construction Layout Surveys

When performing construction layout surveys, the following guidelines apply:

1. Field and office copies of the complete set of construction drawings designated as “Approved for Construction” should be obtained before commencing any site layout survey.
2. The construction drawings should be reviewed and any discrepancies or ambiguities clarified prior to the site layout survey. 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 that the layout is consistent with the original construction drawings.
4. Sufficient research should be carried out to ensure that the Surveyor has all information available to define the site boundaries, and the Surveyor should use a survey methodology that will produce the required accuracy.
5. Horizontal and vertical control to be used for the project should be verified prior to commencement of any site layout survey.
6. The Surveyor should verify who is responsible for locating underground facilities within the construction area.
7. If any changes to the location or dimensions of the facilities are requested, the revisions should be in writing and signed by an authorized person. This also applies to any positioning determined by site conditions.
8. Independent check-ties should be completed to identify any inconsistencies in layout and these should be rectified prior to construction.
9. In no instance should the Surveyor allow construction to begin where the layout has not been verified. If insufficient time is allowed to verify the field work, the field notes should be inspected and signed by an authorized person.



Section 11: Geometrical Deformation Survey Guidelines

Geometrical deformation surveys are performed to detect and measure movements, and can be used to complement more traditional deformation measurements usually performed by structural and geotechnical engineers. Surveyors are advised to consider the following guidelines when undertaking a geometrical deformation survey.

11.1 Expectations and Requirements

- nature of the deformation survey – relative or absolute
- accuracy required to detect the geometrical displacement
- observation period and frequency
- external effects and physical attributes of the deformable body

11.2 Network Design Monitoring

- instrumentation
- configuration – geometry and datum defects
- observations – number, type, and geotechnical considerations
- pre-analysis with appropriate observational weights
- environmental influences

11.3 Monumentation

- appropriate reference and object monuments/targets
- stability of reference and object monuments/targets
- logistics and site conditions

11.4 Equipment

- calibration – techniques, frequency, analysis, and implementation
- adjustment

11.5 Observation Procedures

- standardization between epochs
- environmental factors
- data monitoring and recording
- quality assurance/quality control and confirmation of expected results



11.6 Data Analysis

- pre-processing and reduction
- reduction network adjustment
- practical observation weighting scheme
- “best” definition of a common datum
- rigorous geometrical deformation analysis

11.7 Reporting

- history
- methodology
- results of individual epochs
- geometrical displacements
- quality of the geometrical displacements
- conclusions



Section 12: Métis Settlements Land Registry

When conducting a survey on a Métis Settlement, an Alberta Land Surveyor must register the plan with the Métis Settlements Land Registry. A client requesting a survey on a Métis Settlement should be advised that the plan has no effect unless so registered. The plan may also be filed or registered at the Land Titles Office for information purposes only.

Métis Settlements Land Registry plan requirements are similar to those of the Land Titles Office with a few exceptions:

- The Registry block refers to the Métis Settlements Land Registry.
- The plan must be on mylar.
- It is preferred that the Alberta Land Surveyor's affidavit be on the plan rather than separate.

Information on Métis Settlements is available at <http://www.msgc.ca/>.

Detailed plan requirements are available in Part 8, Division 6 of the *Métis Settlements Land Registry Regulation*:

http://www.qp.alberta.ca/574.cfm?page=1991_361.cfm&leg_type=Regs&isbncln=9780779732197



PART E: APPENDICES

Section 1: ALS Certifications

Most plans should be signed by the Alberta Land Surveyor who is responsible for the plan.

This Section contains templates for two standard Alberta Land Surveyor certifications on plans that are not registrable at the Land Titles Office:

1. Alberta Land Surveyor's Real Property Report
2. ALS Certification for Wellsites and Public Land Dispositions

Plans that are submitted for registration at the Land Titles Office also require various signatures, affidavits, and/or other approvals. The Surveyor should consult the Land Titles Procedures Manual regarding which of these are required for the type of plan being prepared and submitted for registration:

<http://www.servicealberta.gov.ab.ca/836.cfm>



ALBERTA LAND SURVEYOR'S REAL PROPERTY REPORT
[Firm Name and Address]

To: [Client Name and Address]

Re: [Legal Description, Address, Municipality] ("the Property")

Date of Survey: _____ Date of Title Search: _____
A copy of the title is attached.

Alberta Land Surveyor's Certification:

I hereby certify that this Report, which includes the attached plan and related survey, was prepared and performed under my personal supervision and in accordance with the Alberta Land Surveyors' Association's Manual of Standard Practice and supplements thereto. Accordingly, within those standards and as of the date of this Report, I am of the opinion that:

1. the plan illustrates the boundaries of the Property, the improvements as defined in Part D, Section 8.5 of the Alberta Land Surveyors' Association's Manual of Standard Practice, and registered easements and rights-of-way affecting the extent of the title to the Property;
2. the improvements are entirely within the boundaries of the Property [except _____ (to be used if applicable)];
3. no visible encroachments exist on the Property from any improvements situated on an adjoining property [except _____ (to be used if applicable)]; and
4. no visible encroachments exist on registered easements or rights-of-way affecting the extent of the Property [except _____ (to be used if applicable)].

[Note relevant extraordinary circumstances here.]

Purpose of Report:

This Report and attached plan have been prepared for the benefit of the Property owner, subsequent owners, and any of their agents for the purpose of (a land conveyance, support of a subdivision application, a mortgage application, a submittal to the municipality for a compliance certificate, etc.). Copying is permitted only for the benefit of these parties, and only if the plan remains attached. Where applicable, registered easements and utility rights-of-way affecting the extent of the Property have been shown on the attached plan. Unless shown otherwise, property corner markers have not been placed during the survey for this Report.

The attached plan should not be used to establish boundaries because of the risk of misinterpretation or measurement error by the user.

The information shown on this Report reflects the status of this Property as of the date of survey only. Users are encouraged to have the Real Property Report updated for future requirements.



Dated at _____, Alberta on _____ (month) ____ (day), 2____.

John L. Surveyor, ALS
(copyright reserved)

This document is not valid unless it bears an original signature (in blue ink) and a (survey company) permit stamp (in red ink) [if applicable].

[On the plan insert the following:

This plan is page 2 of a Real Property Report and is invalid if it is detached from page 1.]



ALS CERTIFICATION FOR WELLSITES AND PUBLIC LAND DISPOSITIONS

I, _____, Alberta Land Surveyor, of _____, Alberta, certify that the survey represented by this plan is true and correct to the best of my knowledge, has been carried out in accordance with the Alberta Land Surveyors' Association Manual of Standard Practice, and the field survey was performed between the ____ day of _____, 20__ and the ____ day of _____, 20__.

Alberta Land Surveyor

Date Signed

Witness (name of witness)



Section 2: References

Alberta Land Surveyors and their personnel should be familiar with a large amount of other information that is not contained in the Manual. Practitioners should always remain aware of ongoing events that may affect their profession and use the search feature on the ALSA website to find *ALS News* articles and other ALSA publications. The information appropriate to a given practice will vary to some extent with the type of practice.

This is an abbreviated list of references available on the ALSA website and other websites:

1. Acts and Regulations (current):
<http://www.alsa.ab.ca/acts-and-regulations>
2. Acts, Regulations, and Documents (historical):
<http://www.alsa.ab.ca/historical-acts-regulations-and-other-documents>
3. Alberta Land Surveyor's Commitment to Property Damage Mitigation:
http://www.alsa.ab.ca/uploads/files/PDF/best_practices.pdf
4. ALS News: <http://www.alsa.ab.ca/als-news>
5. *Boundary Surveys Act* (current):
http://www.qp.alberta.ca/574.cfm?page=B05.cfm&leg_type=Acts&isbncln=0779700473
6. *Boundary Surveys Act* (historical):
<http://www.alsa.ab.ca/uploads/files/PDF/history/bsab10.pdf>
7. Bulletin 38 (Department of the Interior), giving a Description of Boundary Monuments Erected on Surveys of Dominion Lands 1871-1917:
http://www.alsa.ab.ca/uploads/files/PDF/history/bulletin_38.pdf
8. Canada Lands Survey Manual: General Instructions for Surveys, e-Edition:
<http://class.nrcan.gc.ca/standards-normes/index-eng.asp>
9. Court Decisions:
<http://www.alsa.ab.ca/reference-material>
10. History of Re-Establishing from Road Plans (1942 *Surveys Act*):
http://www.alsa.ab.ca/uploads/files/PDF/history_road_plans.pdf
11. Indian Reserves Surveys (historical):
<http://www.alsa.ab.ca/historical-acts-regulations-and-other-documents>



12. *Land Surveyors Act* (current):
http://www.alsa.ab.ca/uploads/files/PDF/current_acts_and_regulations/land_surveyors_act.pdf
13. *Land Surveyors Act* (historical):
<http://www.alsa.ab.ca/historical-acts-regulations-and-other-documents>
14. *Land Titles Act*:
<http://www.alsa.ab.ca/uploads/files/PDF/acts%20and%20reg/LandTitlesAct2009.pdf>
15. Manual of Standard Practice (current):
<http://www.alsa.ab.ca/uploads/files/PDF/acts%20and%20reg/2009msp.pdf>
16. Manuals of Standard Practice (historical):
<http://www.alsa.ab.ca/historical-acts-regulations-and-other-documents>
17. Oil & Gas Rules, Regulations, and Requirements:
<http://www.ercb.ca/portal/server.pt?open=512&objID=253&PageID=0&cached=true&mode=2>
18. Practice Review Board Interpretive Bulletins:
<http://www.alsa.ab.ca/reference-material>
19. Standards, Specifications, and Guidelines for Establishment and Maintenance of Alberta Survey Control Using GPS:
<http://srd.alberta.ca/lands/directorsurveys/pubforms/gpsrep.pdf>
20. *Surveys Act*:
http://www.alsa.ab.ca/uploads/files/PDF/current_acts_and_regulations/surveys_act.pdf



Section 3: Glossary

The terms defined in this glossary are used by Alberta Land Surveyors in their professional practices. Additional definitions are available in the *Surveys Act*, *Land Titles Act*, *Municipal Government Act*, and related legislation.

- accuracy** the degree of conformity of a measured or calculated quantity to its true (actual) value. See also *precision*.
- azimuth** the azimuth of a point B from another point A is the angle formed by the vertical plane containing A and B with the plane of the astronomical meridian passing through A, such angle being determined from north, around through east, south, and west to 360°, east being 90°, south 180°, west 270°, and north 360° or 0°. Except in the case of a meridian or the equator, the azimuth of a straight line changes as the initial point moves along the line, and that direction is not defined by an azimuth unless the initial point is specified or implied.
- bearing** the bearing of a point B from another point A is the angle formed by the vertical plane containing A and B with the plane of a fixed astronomical meridian, which may or may not be the astronomical meridian passing through A, such angle being reckoned like the azimuth from north around through east, south, and west to 360°. A straight line has the same bearing at all its points but, except in the case of a meridian or the equator, a direction is not defined by a bearing unless the meridian to which the bearing is referred is specified or implied.
- bearing tree** a tree with a blaze approximately 1 metre above ground facing a monument.
- boundary** a line determining the limits of a parcel of land (see *parcel*), defined thus:
- in the case of **surveyed** parcels, by the original monuments or other undisputed monuments governing the corners thereof. For the purpose of this definition, a corner is defined as a deflection point, the beginning or end of a curve, or any point that was defined by the original survey of the parcel. Original monuments are deemed to be those monuments purported to have been placed during the original survey of the parcel.
 - in the case of **unsurveyed** parcels, by those lines that are or may be determined by reference to monuments of public record placed in accordance with the *Surveys Act*.



- as it relates to the *Surveys Act*, by a line between two monuments depicting a separation between two parcels. A line may be a straight line, a curved line, or a series of connected points used to depict a natural boundary. Parcels may be land surfaces, sub-surface regions, or airspace lying above parcels.

calculated data	information derived by computation from sources that may not have been entirely measured by the Alberta Land Surveyor who displays the information.
disturbed monument	a monument that has been moved by some means other than by an Alberta Land Surveyor during the course of a survey, and that can be proved beyond reasonable doubt to have been moved from its original position.
lost monument	a monument, the position of which can be re-established only by its bearing and distance from some other monument or monuments to which it was previously connected by survey.
monument	as it relates to the <i>Surveys Act</i> , a statutory iron post, standard post, wooden post, mound, pit, trench, or anything else used by a Surveyor to mark a boundary, corner, or line [Section 1(p), <i>Surveys Act</i>].
obliterated monument	a monument that can be restored with confidence from traces of the original monument remaining on the ground or from other physical evidence of the position of the original monument.
parcel	an area of land that has one or more boundaries surveyed in accordance with the <i>Surveys Act</i> , and which is capable of having an interest or right granted and registered in the Land Titles Office or filed in the Métis Settlements Land Registry.
precision	the degree to which repeated measurements or calculations of the same quantity show the same or similar results. See also <i>accuracy</i> .
public record	a record that includes a plan on record with the Land Titles Office, Métis Settlements Land Registry, Alberta Sustainable Resource Development, Canada Lands Survey Records, or any other federal or provincial agency.
re-establish	to determine the position of a lost monument.
reference monument	a mark, other than a monument or Alberta Survey Control Marker, that is set in the ground as a reference to the position of a boundary or other lines not marked by monuments under Section 47 of the <i>Surveys Act</i> .



restoration survey	a survey made to restore the obliterated monuments of a previous survey.
resurvey	the survey of a previously surveyed boundary made to effect changes in, or corrections to, the previous survey or to re-establish lost monuments or to place additional monuments on the boundary. A resurvey always includes a retracement of the boundary and often includes the restoration of obliterated monuments.
retracement survey	a survey of the existing monumentation of a previously surveyed boundary in order to determine the bearings and distances between the monuments.
surface improvement on wellsite surveys	a railway, pipeline, canal or other right-of-way, road allowance, surveyed roadway, dwelling, industrial plant, aircraft runway or taxiway, building used for military purposes, permanent farm building, school, or church (<i>ERCB Directive 056</i>).
surveyed boundary	the boundary defining the limits of a parcel that has been surveyed in accordance with the <i>Surveys Act</i> and is shown on a plan of public record.
surveyed line	any boundary shown as surveyed on a plan registered in the Land Titles Office or a blind line, whether surveyed on the original Township Plan or not, excepting thereout boundaries created by cancelled subdivision plans or abandoned Right-of-Way Plans as defined in Part D, Section 4.5 (Right-of-Way Surveys – Cancelled or Abandoned Plans) on page 42.
Surveyor	for the purposes of this Manual, an Alberta Land Surveyor as defined by the <i>Land Surveyors Act</i> .
theoretical section boundary	a line that would define the boundary of a section if the section were surveyed in accordance with Part 2 of the <i>Surveys Act</i> .
uncertainty	the range within which it is expected the error of measurement will fall.
Unsurveyed Territory	within the meaning of Part 2 of the <i>Surveys Act</i> , those lands that have not been surveyed and for which there is no official plan.
well	a well to be drilled for any purpose provided for in the <i>Oil and Gas Conservation Regulations</i> (Alberta Regulation 151/71).



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