Association of
British Columbia
Land Surveyors

Professional Reference Manual

Chapter 10

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Association of British Columbia Land Surveyors

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Part 1 – Field Surveys for Wellsites

1) Classification

Wellsite surveys in B.C. are handled differently if they are in the Petroleum and Natural Gas (P & NG) Grid System, or inside the Peace River Block. While there are other factors to consider if the land affected is Crown, Crown lease or private, there is virtually no difference in the actual surveys required.

2) Wellsites in the Petroleum & Natural Gas Grid System

Outside the Peace River Block, gas and oil spacing is defined by the P & NG grid system. Wellsites therefore are located and referred to by their P & NG designation, regardless of any form of tenure such as District Lots, Crown land subdivisions, bastard townships, etc. Surveys here are governed by the requirements issued in Part 10 of the Survey and Plan Rules. Surveys in these areas are relatively straightforward. Particular care should be taken to verify the datum, map projection and origin of coordinates given for existing control monuments.

3) Wellsites in the Peace River Block

Inside the Peace River Block, gas and oil spacing is defined as offsets from section boundaries. This is quite straightforward in surveyed sections, however proper research must be done to determine the DLS system of survey used to define the primary parcels in the area of the survey.

The most common systems used in the Peace River Block are the 3rd and 4th DLS systems, which differ primarily in the way road allowances are handled. In the 3rd system, road allowances of one chain were normally attached to the west boundary of every section, and to the south boundaries of every second row of sections, beginning with the first row (Sections 1 to 6). The target areas are offset from the section boundaries, which excludes the road allowances. In the 4th system, similar acreage for road allowances is included in each section but the actual road locations are not defined. As such, gas and oil targets are offset from these enlarged section boundaries, giving the 4th system larger target areas than the 3rd system.

In theoretical townships, government reserves and other unsurveyed areas, the theoretical section boundaries must first be created in order to define oil and gas target areas. An exhaustive and complete approach to the mathematical recreation of theoretical sections is beyond the scope of this manual. In the absence of official published coordinates for theoretical section corners, the land surveyor must calculate them to determine target boundaries in theoretical sections.

Polyconic NAD'27 coordinates for a limited number of theoretical section corners in the Peace River Block, (Monias and Inga fields as well as other areas mainly on the western side of the Peace River Block), were generated and published in the 1970's by the provincial geodetic control group at the time. These coordinates were specifically intended for oil and gas spacing only, not for legal

purposes. When using these coordinates, care shall be taken verify the datum and origin of the projection.

The normal convention is to follow the methodology for the 4th System of Survey, as described in the 10th Edition of the *Manual of Instructions for the Survey of Dominion (Canada) Lands*, first published in 1946. Chord azimuths and distances for section boundaries, as well as latitude of section corners, can be obtained by referring to the 2nd Edition of the Supplement to that manual, published in 1952. The University of Calgary's *Cadastral Studies Lecture Notes, 1983*, can also be of some assistance in understanding the different systems and how they are handled.

When calculating non-surveyed section boundaries for oil and gas spacing purposes, the surveyor should also consider locally accepted methods of retracement in an effort to maintain continuity of targets in a given field. For legal surveys however, the Manual and Supplement should be strictly followed in the absence of other specific survey instructions.

4) Wellsites on Canada Lands (e.g. Indian Reserves)

Surveys for oil and gas development on Indian Reserves, (or other similar types of Canada Lands in B.C.), involve both the federal and provincial governments. The Province has jurisdiction over the disposition of subsurface rights and therefore requires a standard wellsite plan. The spacing areas and target boundaries shown on this plan are consistent with those outside the Reserve. Surface rights on Indian Reserves are disposed under the *Indian Oil and Gas Regulations (1995)*.

For acquisition of the surface lease for the wellsite and access road, a licensed Canada Lands Surveyor must prepare a Canada Lands Survey Plan. Survey, posting and plan requirements are outlined in the Manual of Instructions for the Survey of Canada Lands (Third Edition), Chapter D6 - Indian Oil and Gas Surveys. As these surveys are covered under general instructions, specific instructions from the Surveyor General for Canada Lands are not required.

The resulting Canada Lands Survey Plan is submitted by the oil company to Indian Oil and Gas Canada, as part of their application for tenure. These plans are reviewed by Legal Surveys Division and upon approval are recorded in the Canada Lands Surveys Records.

Polyconic coordinates for certain section corners in the Peace River Block were generated and published on two occasions by the geodetic control group of the provincial government. These coordinates were specifically provided for the purposes of well location only. Again, care shall be taken to ensure these are valid coordinates published for spacing areas, that the datums are known, and the reliability is correctly ascertained.

5) Principles of Field Surveys for Wellsites

Wellsite surveys are a combination of cadastral and construction survey practices. Wellsite plans are used by a wide variety of people making critical decisions based on the information the plans contain, thereby exposing the surveyor to a high degree of potential liability. Therefore, extreme care should be taken with all aspects of wellsite surveys. Directional and horizontal wells are particularly high risk, as the drilling technology is very expensive, and they are often more

sensitive to horizontal position and elevation than standard vertical wells. Note that there are normally no disclaimers on a wellsite plan.

6) Important Elements for Well Site Surveys:

- Perform adequate land tenure research, particularly for the existence of rights of way and buried structures.
- On private land, plan and tenure records registered in the land title office, obtainable through myLTSA, are the main source of such information.
- All approved right of way plans over Crown land are also registered in the land title office and can also be obtained through myLTSA.
- For a spatial overview of rights of way plans over Crown land consult ParcelMap BC.
- IMAP BC should be consulted for the most up to date Crown land dispositions records. https://www2.gov.bc.ca/gov/content/data/geographic-data-services/web-based-mapping/imapbc
- Images of most of the well site plans that have been approved by the Surveyor General and detailed tenure information are available online using: Tantalis/GATOR http://a100.gov.bc.ca/pub/pls/gator/gator$queryforms.menu.
- The BC Energy Regulator's (BCER) website provides a wealth of information related to energy projects in British Columbia, making it a valuable resource for industry professionals and stakeholders. The website offers comprehensive information on the regulatory requirements and permitting processes for energy projects, including oil and gas development and some renewable energy initiatives. The website also provides updates on current and upcoming energy projects in the province, as well as data and statistics on energy production and consumption in British Columbia. The BCER's website is an essential tool for anyone involved in the energy industry in British Columbia, providing timely and relevant information to support informed decision-making and successful project outcomes.
- Obtain, from the client, proposed well position and acceptable options with respect to target areas.
- Ensure that horizontal and vertical survey control in the project area is available and satisfies the control requirements in the Rules.
- Be aware of possible discrepancies between surveyed elevations and local field datums. If a significant difference is discovered, it is often preferable to adopt the new datum from that point forward. In this case, ensure your client understands the way you intend to handle the situation, as any datum shift will likely affect geological information for the entire field.
- Perform at least one independent check on elevations, for example with seismic data, published contours, independent survey methodology etc.
- Ensure that coordinates given in the title block or on the face of the plan are clearly annotated to reflect the datum and projection they are referred to. Many petroleum companies still operate in NAD27, so they often assume everyone else does.
- Wellsite plans differ widely from client to client and from wellsite to wellsite, thus there is no standard procedure for plan preparation that can be used to cover all situations. Each surveyor should develop and use an internal wellsite checklist, which meets both the statutory

requirements of wellsite plans and the clients' expectations.

- Posting of wellsites is regulated by Part 10 of the Rules. It is left up to the individual surveyor and his client as to whether he places those posts during the wellsite survey, or only upon the well being proven and subsequent conversion to a long-term lease.
- GNSS is now widely used for wellsite and other petroleum and natural gas surveys and is regulated in other publications. It need only be stressed that any method used for horizontal or vertical wellsite positioning should incorporate an independent detection method for gross errors.

Part 2 – Pipeline Surveys

Pipeline surveys in B.C. are carried out in two distinct phases, the construction survey and the legal right of way survey. Pipeline construction surveys are performed essentially the same regardless of jurisdiction, whereas pipeline right of way surveys are classified as to provincial Crown lands, private lands or Canada Lands.

In all jurisdictions, the main concern with pipeline right of way surveys is that the buried structure is physically protected by the bounds of the right of way being created.

1) Pipeline Construction Surveys

Pipeline construction surveys are generally outside of the bounds of cadastral surveys. These surveys consist of route selection, on site location and flagging, determination of construction implications, location and identification of foreign pipeline and utility crossings, and the application process. As with wellsite plans, pipeline construction plans are used by a variety of different parties for different purposes, and thus can become quite complex. The surveyor should be aware of possible third-party use of these plans and clearly disclaim any unauthorized reliance.

The prime area of concern in pipeline construction surveys is the crossing of buried structures. Prior to location, a search should be made to identify all rights of way in the area, and all such information given to the field crews. Underground location in the field should only be done with quality equipment in good repair, with experienced and well-trained crews. Internal methods of checking should be used, such as tying in all located structures for comparison with right of way boundaries.

The surveyor should have an explicit agreement with his client outlining who has what responsibility with respect to the location, documentation and field marking of all crossings, especially immediately prior to construction.

Due to the fact that every petroleum company has different requirements as to what information is collected and shown, and the regulatory authorities change the application requirements regularly, it is impractical to lay down a procedure or checklist for construction surveys in this manual. Each surveyor, however, should maintain a current checklist to be used for construction plan preparation and checking.

2) Pipeline Right of Way Surveys – Provincial Jurisdiction

Survey posts required on pipeline rights of way in the provincial jurisdiction are covered under Part 5 of the Rules, with the following exceptions:

(a) The requirement to set Type 1 concrete posts was officially waived in 1994 for pipeline right of way surveys in the Peace River area. Because of frost jacking, and the high likelihood of disturbance by heavy equipment, pipe posts are usually a better choice of monument.

(b) Rule 5-4(1)(d) requires every intersection of every surveyed boundary, including existing rights of way, to be posted. In the vicinity of a facility or processing site, this can lead to confusing situations with a high density of posts in a very small area. In these cases, it may be preferable to post the external right of way intersections and show calculated values to the interior boundaries, however, prior approval should be obtained through the Association.

3) Pipeline Right of Way Surveys – Indian Reserves

Pipeline right of way surveys on Indian Reserves (or other similar types of Canada Lands) fall into two categories. If a pipeline or other facility crosses a Reserve, but does not service development on those lands, then rights are granted under the Indian Act, and specific instructions must be obtained. If a pipeline, road or other facility services resource development is on the Reserve, then it falls under the Indian Oil and Gas Regulations (1995), and as such are handled in the same manner as leases for wellsites as previously explained.

Part 3 – Reference Materials

1) Association of British Columbia Land Surveyors Survey and Plan Rules

- also see Chapter 6 - Part 1(14)(d) of this manual

2) Land Title and Survey Authority

- **Surveyor General Vault/Tantalis**
  - Petroleum and natural gas wellsite plans.
- **Land Title Office**
  - Statutory right of way plans on Crown and private land.

See also Chapter 6 - Part 1(2) of this manual for more details on LTSA holdings.

3) B.C. Energy Regulator Website

The BC Energy Regulator website includes links for a variety of information that land surveyors should review prior to working on any oil or gas project these include but are not limited to:

- An unofficial consolidation of B.C. Statutes and Regulations relating to Oil and Gas surveys https://www.bc-er.ca/how-we-regulate/legislative-framework/ This Documentation section houses the Oil and Gas Activity Application Manual and Oil and Gas Activity Operations Manual. These manuals, along with additional forms and guidelines, support industry during oil and gas

activity application processes, and throughout the duration of subsequent operations. The manuals detail application and regulatory requirements with which operators must comply, while guidelines outline best operational practices. https://www.bc-er.ca/energy-professionals/operations-documentation/

Before an applicant can submit an application for an oil and gas permit to the BC Oil and Gas Commission, certain consultation and notification activities have to be completed as per the Commission's new Consultation and Notification Regulation. This regulation creates a formalized public engagement process that allows landowners and affected parties to express concerns about how the proposed oil and gas activity may affect them. https://www.bc-er.ca/how-we-regulate/

- Important Safety Notices regarding Weather, Environment and Oil and Gas activities. https://www.bc-er.ca/news/category/safety-advisories/
- The BC Energy Regulator offers access to a variety of online applications, tools, services and reports. https://www.bc-er.ca/energy-professionals/online-systems/
- Important GIS downloads. Requires logon id and password. You will not be able to obtain without an BCER account – i.e. wellsites, pipeline attribute data. https://www.bc-er.ca/data-reports/
- Industry Bulletins - This area of the website deals with information regarding recent changes to BCER standards and policies. https://www.bc-er.ca/news/category/industry-bulletins/
- Updated list of B.C. wellsite locations, name, and status https://reports.bc-er.ca/ogc/f?p=AMS_REPORTS:WA_ISSUED
- weekly publication of active wells in B.C. https://iris.bcogc.ca/rig_list/rig_activity_list.html

4) Surveyor General Branch, Natural Resources Canada

Manual of Instructions for the Survey of Dominion (Canada) Lands

- 10th Edition (1946) – methodology for the re-creation of theoretical townships

5) Supplement to the Manual of Instructions for the Survey of Canada Lands

- 2nd Edition (1952) – pre-calculated values for theoretical sections

6) Bulletin 38

- Historic account of types and patterns of monumentation used over the years on DLS surveys
- This can be obtained from the Association office

7) Manual of Instructions for the Survey of Canada Lands

- 3rd Edition (1996) – administrative and survey requirements for surveys on Canada Lands

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