THE POSSIBILITIES ARE INFINITE **FUJITSU**

SDW / AltaLIS

Base Mapping Assessment

Final

January 18, 2005

Spatial Data
Warehouse Ltd.

AltaLIS

FUJITSU CONSULTING
3960 Quadra Street, Suite 500
Victoria, BC V8X 4A3
Tel: +1 250 479-2772
Fax: +1 250 479-0608

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report commissioned by Spatial Data Warehouse Ltd. and AltaLIS Ltd. examines the current state of base mapping across Canada. The purpose of the report is to provide a snapshot view of base mapping practices, the infrastructure used to manage and distribute products, the various business models in place, the data and where it comes from and how it is managed, and a short glimpse into how clients perceive the delivery and management of base mapping data.

The scope of this assessment covers approximately 26 key parameters ranging from data ownership to data use spanning three major base mapping products, specifically:

- Cadastral mapping
- Topographic mapping
- Administrative boundary mapping

Cadastral mapping in this report encompasses the creation and maintenance of a digital representation of the legal parcels as registered in the jurisdictions land registration system. This usually takes the form of a contiguous fabric in which individual legal parcels are identified and attributed. Topographic mapping is detailed and accurate graphical representation of cultural and natural features on the ground. Administrative boundary mapping is the graphical representation of the boundaries and areas that are established for the purposes of jurisdictional administration.

Information was gathered from 9 out of 10 provinces, the city of Edmonton and the Government of Canada. Only the province of Prince Edward Island and the city of Calgary were not able to respond to the survey within the period allotted for information gathering.

For base mapping information, survey participants responded by completing three comprehensive questionnaires and/or through follow-up telephone interviews. Information was then summarized and in some cases supplemental calls were done to verify or augment the questionnaire or interview responses. In addition to obtaining information from base mapping service providers, 10 clients were approached for information by questionnaire. Half of these (5) provided responses that are summarized in this report. These clients operating primarily in Alberta also provided some comments regarding their experiences in other jurisdictions.

Base mapping is a matter of considerable breadth and depth, so it was necessary to limit the number of questions, the interview length, and the number of participants. In jurisdictions where base mapping responsibilities are highly distributed, responses lack the comprehensiveness of jurisdictions where a single representative was identified and fully aware of that jurisdiction's base mapping program.

The scope of this report is limited to what jurisdictions are currently doing and does not document plans or new initiatives that may be underway.

Jurisdictional Differences

Before examining differences in base mapping programs it is necessary to understand the differences between jurisdictions. This is especially true for provincial jurisdictions in Canada where there are significant size differences between provinces. Figure 1 below provides an overview of provincial differences in both area and parcel count.
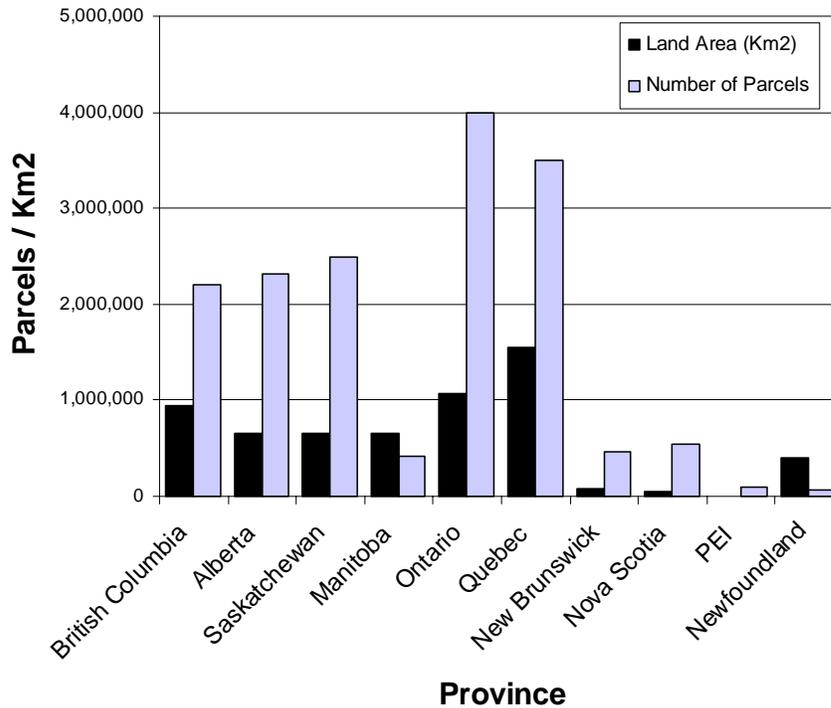

Figure 1 - Provincial Area and Parcel Count Comparison

Of course there are other factors such as base mapping program funding that has a big impact on base mapping programs and products that fell outside the scope of this assessment.

Cadastral Mapping

This assessment found a considerable amount of diversity in cadastral mapping products across Canada. The differences are primarily related to data completeness, currency, and governance.

The provinces with the most complete cadastral products are Alberta, Saskatchewan, New Brunswick, Nova Scotia and Quebec. These jurisdictions also provide the most current cadastral products by ensuring that updates are incorporated usually within days of plan registration. The leader in data currency is Saskatchewan, which provides for the cadastral base map update at the time of plan registration.

Most leading jurisdictions fund cadastral plan maintenance from fees charged for survey plan registration.

Of all the provinces Alberta is the most sensitive to the needs of base mapping users by providing the largest number of licencing and pricing combinations.

Topographic Mapping

Topographic base maps are owned, maintained and distributed primarily by provincial and federal governments in Canada. Unlike cadastral base mapping where updates are triggered by creation of parcels, topographic mapping completeness and currency is dependent on discretionary government funding. All jurisdictions report very good topographic coverage but less than optimal data currency. Average data age ranges from 1 to 40 years with an average of 5 years.

Jurisdictions reported their largest challenge with provision of topographic base mapping is to secure an adequate budget to maintain data currency.

Leading jurisdictions are British Columbia, Quebec, New Brunswick and Nova Scotia that reported having regular update programs (either centralized or centrally controlled data currency) that ensured most features are maintained according to demand. Alberta provides regular maintenance for access features however; other topographical data lacks currency expected from clients.

Administrative Boundary Mapping

In Canada administrative boundary mapping and maintenance of data is distributed among agencies and ministries or departments. This leads to unavoidable variability in both currency and completeness of data. To help overcome this inherent weakness in providing current administrative boundary map products to clients some jurisdictions such as Alberta have centralized the management and distribution of data. This model allows Alberta to provide more predictable and complete products by ensuring regular maintenance, geometric consistency with other base mapping products, and a single point of access for clients through AltaLIS.

Leading jurisdictions are British Columbia, Alberta, Saskatchewan, Quebec and Newfoundland all of which have defined centralized processes for maintenance and distribution. Alberta provides the greatest combination of access methods and data delivery options.

Client User Reviews

As part of this assessment a limited number (10) clients were contacted and asked to provide feedback on base mapping experiences. Of the 10 contacted 5 provided responses. Since most of the clients responding were based in Alberta the results are skewed toward that province.

Clients were asked to rate their experiences according to:

- Adequacy of the service provider
- Adequacy of the service infrastructure
- Data quality
- Product cost
- Willingness of the service provider to address client needs
- Overall satisfaction with the service provider

Alberta clients doing business through AltaLIS Ltd. reported the adequacy of the service provider and the infrastructure as excellent. These clients rated data accuracy in Alberta as good (3.8 on a scale of 1 to 5 with 5 being excellent). Those clients added that the accuracy of the data was not commensurate with the

price being charged for the data. This applies primarily to topographic data but also to cadastral data to a lesser extent.

Respondents identified cost as their primary concern with Alberta base mapping services. Clients provided the following suggestions for improvement of Alberta services:

- Resolution of the continuously moving base resulting from the cadastral maintenance process
- Implementation of a continuous update process for topographic data
- Enhancement of topographic features
- Enhancement of topographic metadata
- Implementation of a public land digital mapping program
- Adding crown land dispositions to the Alberta base map infrastructure
- Development of a topographic update program
- Inclusion of and implementation of a maintenance program for Federal Lands data

Respondents also provided limited feedback for the provinces of British Columbia and Saskatchewan. This input indicated that from their experiences that Saskatchewan was approachable and responsive to client input but that the product prices are excessive in Saskatchewan. Clients doing business in British Columbia noted that it lacks a single cadastral base mapping product and that they experienced:

- Inconsistent data quality
- Difficulty in locating cadastral data
- Incomplete data
- Inaccurate data

Client feedback in reference to base mapping experiences especially in reference to the provinces of British Columbia and Saskatchewan is not conclusive due to the small sample size.

Conclusion

The provision of base mapping products that have a high level of completeness and accuracy at a reasonable cost especially from a user perspective is a challenge for all jurisdictions in Canada. To address this challenge jurisdictions have used a number of different delivery approaches ranging from direct government funding and control, public-private organizations, or public agencies. There are examples of all of these models delivering good base mapping products.

The limiting factor (outside of the scope of this report) appears to relate to the amount of effort or funding that each province has relegated to producing and maintaining base mapping products.

In general Alberta, Saskatchewan and Quebec appear to be the current leaders in terms of base mapping products followed by Nova Scotia and New Brunswick. These jurisdictions have base mapping products that are available and in regular use by external clients as well as well developed processes for data distribution and data maintenance.

New governance and delivery processes are under development in many jurisdictions and although documenting these new initiatives is beyond the scope of this assessment, there is little doubt that significant progress is being made by all jurisdictions.

1.   Introduction

1.1   Purpose

The intent of this assessment is to provide a independent high level overview and assessment of base mapping across Canada. The original intended scope included all provinces, the federal government of Canada and the cities of Edmonton and Calgary.

1.2   Background

In the early 1970s, Albertans recognized the need for standardized, high quality, digital base maps to support planning, development and management activities in a collective and cost effective manner. In consultation with municipalities, utilities and private industry, the Government of Alberta initiated a series of base mapping programs that have resulted in an Alberta digital base mapping infrastructure that is the envy of most other jurisdictions in the world. It is estimated that the replacement value of this mapping infrastructure is in the order of $50 million.

As this mapping evolved, all levels of government, industry and others have collectively invested upwards of $100 million in Alberta building Automated Mapping/Facilities Management/Geographic Information Systems (AM/FM/GIS). These systems rely heavily upon the continued availability of a standardized, reasonably priced, easily accessed and up-to-date provincial base mapping infrastructure. The rate at which these new systems are being developed and implemented is increasing exponentially. Digital base mapping and the new technologies that use it (such as AM/FM/GIS) are key to the efficient delivery of many government and industry services as well as to the international competitiveness of a growing high technology geomatics services industry in Alberta.

As Alberta's base mapping infrastructure was compiled, it also had to be updated to reflect changes resulting from on-going development. Additionally, the mapping and its updates had to be stored and distributed to Albertans in an increasingly complex and rapidly evolving technological environment. In 1996, upon completing the geographic coverage of Alberta's digital mapping infrastructure, Alberta Environmental Protection (AEP) decided that it should not continue to be in the business of updating, storing and distributing and funding this mapping. At this time the GOA sought a third party who could assume financial and operational responsibilities for these on-going tasks - protecting Alberta's mapping infrastructure investment in exchange for the revenues collected from distributing the digital mapping.

By 1996, Alberta's major utility companies had contributed in excess of $5 million dollars towards the initial compilation of Rural Cadastral mapping in an unprecedented cost-sharing arrangement with the GOA. These utility companies constitute the largest non-government users of Alberta's digital mapping infrastructure. They also currently represent the largest single non-government stake in the continuance of this mapping. Out of this historic partnership and mutual, strategic need for the continuance of Alberta's

digital mapping infrastructure, Spatial Data Warehouse Ltd. (SDW) was formed as a not-for-profit partnership.

SDW selected AltaLIS Ltd. as the private sector company who would assist with the financing of the SDW initiative as well as become responsible for the re-engineering and day-to-day management and distribution of the mapping data sets. AltaLIS is a joint venture comprised of QC Data Ltd. of Calgary and Martin Newby Consulting Ltd. of Calgary.

In July of 2004 SDW together with AltaLIS initiated this independent study to gather comparative data from other Canadian jurisdictions to be used as a tool to highlight areas of potential improvement.

1.3   Scope

This assessment compares base mapping datasets, the organization of the base mapping administrative units, data parameters (data quality, data update and maintenance, functionality, etc.) and costing across all provinces and including the cities of Edmonton and Calgary.

In addition to base mapping information this assessment also contains feedback from clients of AltaLIS and where applicable feedback regarding base mapping experiences in other provinces.

This assessment also identifies areas of potential improvement within the Province of Alberta.

Datasets

This assessment focuses on six primary base mapping datasets in common use in Alberta and other areas of Canada, namely:

1. Large scale topographic mapping
2. Small scale topographic mapping
3. Urban cadastral mapping
4. Rural cadastral mapping
5. Title mapping
6. Other mapping such as survey grid or geoadministrative boundaries

Urban and Rural Cadastral mapping as distinct and separate products as used in Alberta are combined into a single cadastral mapping product in most jurisdictions.

Comparison Elements

Jurisdictions were assessed on three (3) base mapping infrastructures. Specifically the administration and operations pertaining to the following:

- Cadastral Base Mapping
- Topographic Base Mapping
- Administrative Boundary Mapping

Participants were asked for information specific to each of these infrastructures and although the questions are similar for each infrastructure, there are unique elements for each.

Cadastral Base Mapping

The information collected under this category pertains only to the cadastral base mapping infrastructure. The primary elements are:

- Ownership
- Maintenance
- Who distributes the data
- Governance model
- Funding model for initial build
- Funding model for maintenance
- Layers
- Accuracy (absolute and relative)
- Method(s) for data capture
- File formats for data
- Map projections
- Pricing and licencing options
- Main industry users of data

- Ownership of legal parcels
- Geographical area
- Attributes of parcels
- Data structure (GIS or CAD)
- Source documents
- Status of the build and maintenance
- Topological cleanliness
- Attributes of legal parcels
- Programs for improving data quality
- Co-ordinate datums
- Product or service packages offered
- Licences issued
- Pricing models

Topographic Boundary Mapping

The information collected under this category pertains only to topographic digital coverage at the 1:20,000 scale and smaller. In most cases these products also include a digital elevation model (DEM). The primary elements are:

- Ownership of data
- Organizational model
- Accuracy of data
- Area of responsibility
- Data upgrading program
- Data maintenance process
- Data delivery method(s)
- Co-ordinate datums
- Industry users by data package
- Pricing and licencing options
- Total number of end users

- Data distribution agent
- Funding model
- Identification of the major "layers" of data
- Build and maintenance status of data
- Currency of data
- Method of user access to data
- Data format(s) available
- Map projections
- Product or service packages offered
- Product based pricing

Administrative Boundary Mapping

The information collected under this category pertains only to the geo-administrative boundary infrastructure. The primary elements are:

- Ownership
- Maintenance
- Who distributes the data
- Data accuracy
- Names of boundaries
- Attributes of Parcels
- Source(s) of data
- Maintenance process
- Method(s) for data access
- File formats for data
- Map projections
- Pricing and licencing options
- Main industry users of data
- Breakdown of users by industry

- Method of data capture
- Area of responsibility
- Build and maintenance status of the data
- Data structure (GIS or CAD)
- Topological cleanliness
- Data upgrading program
- Currency of data
- Cost and estimate of effort for maintenance
- Delivery methods and data distribution
- Co-ordinate datums
- Product or service packages offered
- Prices for data
- Total number of end users

2. Assessment Approach

This section provides an overview of the process used to gather the comparative information summarized in Section 3.

2.1 Methodology

Comparative information was gathered from two different groups, owners or custodians of base mapping information and clients or users of the information. The same method was used to collect information from both groups. Information gathering was based on reviews of available published information augmented by questionnaires and telephone interviews with base mapping dataset managers.

In order to provide a common basis for comparison, only information pertaining to current base mapping practices was documented.

Preparation

The following activities were carried out in preparation for direct contact with base mapping dataset managers.

Web and Literature Scan – was conducted to obtain both contact and information regarding base mapping products, governance, pricing and other key facts for each jurisdiction. A copy of a table of relevant Web links containing base mapping information for each jurisdiction is appended as Appendix 6.

Identification of Contacts – was based on a letter of introduction sent to provincial representatives of Canadian Council of Geomatics (CCOG) and to other representatives. The letter (Appendix 7) provided high-level context and requested additional contact information for managers who could respond to more specific base mapping questions.

Assessment Criteria – was prepared in consultation with SDW/AltaLIS to provide a basis for development of the information questionnaire and interview questions. The Assessment Criteria are attached as Appendix 8.

Information Gathering

The following activities were used to collect information from the key contacts for each jurisdiction.

Information questionnaires – developed from the Assessment Criteria the questionnaires were emailed to all identified contacts in preparation for telephone interviews. The three questionnaires are appended as Appendices 2, 3 and 4. Three different questionnaires were used since many jurisdictions assign responsibilities for Administrative Boundary Mapping, Cadastral Mapping, and Topographic Mapping to different managers and in some cases, different organizations.

Telephone Interviews – were conducted with every jurisdictional contact either to confirm the information returned by the jurisdiction in their questionnaire or to obtain information in cases where the questionnaire was not returned. Only two jurisdictions (Prince Edward Island and the city of Calgary) were unable to provide information by either means.

Client Questionnaires – were emailed to key clients of SDW/AltaLIS data products to provide feedback relating to their satisfaction with SDW/AltaLIS and where applicable similar feedback on other jurisdictions. A copy of the Client Questionnaire is appended as Appendix 5.

Information Analysis

Information analysis to highlight similarities and differences between jurisdictions was performed independently by Fujitsu Consulting.

2.2   Definition of Terms

Providing definitions for commonly used base mapping terminology was required since it became evident during the interviews that the same term has different meanings in different jurisdictions. Definitions pertaining to the assessment criteria are documented in Appendix 8 – Assessment Criteria. The following definitions were used for other commonly used base mapping terms:

Administrative Boundary Mapping – Refers to program(s) that depict in a digital form, the boundaries and areas that are established for the purposes of jurisdictional administration. They are usually geo-referenced with respect to natural and man-made features, such as a "height of land" or "centerline of river", "centerline of road" or "high water mark." Other times, they are referenced to cadastral features such as "east side of district lot 2108."

Administrative boundaries are generally managed by the provincial government department or ministry that administers a specific statute, such as school district boundaries being managed by the Ministry or Department of Education.

Cadastral Mapping – In the context of this project is considered to be the creation and maintenance of a digital representation of the legal parcels as registered in the appropriate land registration system. This usually takes the form of a contiguous fabric in which individual legal parcels are identified and attributed. The cadastral map may or may not include secondary interests such as rights-of-way.

In the case of federal cadastral mapping, the legal parcels are considered "Canada Lands", surveyed under the Canada Land Act and comprise federal parks, territories, and lands within First Nations reservations.

Topographic Mapping – A detailed and accurate graphic representation of cultural and natural features on the ground. The information for this is usually captured by aerial

photogrammetry, satellite imagery supplemented with geo-referencing techniques using Global Positioning Systems (GPS), or Control Surveys.

In most cases, a Digital Elevation Model (DEM), which produces contour lines and facilitates the development of a three dimensional model is part of the product.

Features such as hydrography, hypsography, transportation, landforms and landmarks are among those captured by this mapping.

It should be noted that features are seldom co-terminus with legal parcel boundaries.

Title Mapping – Title or ownership mapping is also known as the "Assessment Parcel Fabric" or the "Ownership Layer Fabric."

In all jurisdictions, title mapping refers to the mapping of the shapes that represent the extent of "title" or "ownership" of each landowner. For example, the extent of the "title" of the owner of three adjacent lots will appear as a single shape encompassing the three individual legal lots.

In some provinces, both the legal parcel mapping and the title mapping are done at the same time and by the organization. Since both products share surveyed boundary lines, efficiencies can be gained by integrating the management of the data, either through geometry-dependant layers or by combining them into a "master coverage." In other provinces, the management of the two mapping products may be divided among provincial agencies (ministries or departments) or distributed among the municipal governments. The latter case presents a greater challenge to maintain consistency in the related geometries.

Licencing – A business arrangement, usually fee based, which establishes the method and terms relating to the acquisition and use of base mapping products.

Maintenance cost – The cost to "maintain" a certain product by adding new data and correcting or improving existing data.

Ownership Parcels – See "title mapping"

Legal Parcels – See "cadastral mapping"

GIS – Geographic Information Systems (GIS) is a system of capturing, storing, checking, integrating, analyzing, maintaining and displaying data about the earth that is spatially referenced. It normally includes a spatially referenced database supported by appropriate applications software.

CAD – Computed Aided Drawing (CAD) is a tool for capturing and maintaining spatial shapes. Limited in terms of its ability to create and maintain topology, updated applications enable full polygon creation with associated attributes. At this enhanced level, CAD remains a viable alternative to GIS for the capture and management of some mapping data.

Private/Public Partnership – A business venture with shared risks and rewards, between the Public Sector, usually the Provincial Government, and a Private Sector company. For base mapping these organizations provide services for data capture, maintenance and delivery to end users.

Geo-Administrative Boundary – See "Administrative Boundary Mapping."

Stewardship – Data stewardship is the process of managing information necessary to support end users, and ensuring that data captured and reported is accurate, accessible, timely, and usable for decision-making and activity monitoring. Stewardship may reside with the owner of the data or it can be held by a different organizational entity. Generally stewardship of a particular spatial feature rests with the business unit who has the power to create and remove the physical feature.

End Users – End users in this report refers to separate businesses or organizations that have access to base mapping data. Within the context of this report end users are not considered to be the total number of individual users.

Absolute Accuracy – The error variance, usually to a 95% confidence factor, of the co-ordinates of a point in the digital database, compared with the true coordinates on the ground of that same point.

Relative Accuracy – The error variance, usually to a 95% confidence factor, of a distance measured of a particular line on the database with its corresponding true distance as shown on a plan of survey.

Topological Cleanliness – In its most basic sense, clean topology means the removal of undershoots and overshoots as lines come together to form legal parcel polygons. There are many rules around the structure of topology that relate to single and multiple layers of mapping data depending on the data model and the established relationships between the various data elements in each layer. The preservation of these relationships and of guaranteeing clean topology, are best served with GIS systems.

2.3   Assumptions or Limitations

While every attempt was made to gather as much comprehensive information as possible and to ensure that the accuracy of the information, the following limitations apply:

Base Mapping Information

- It is assumed that individual respondents were knowledgeable and able to provide unbiased information.

- Questionnaires and interviews were limited to current processes and did not include future plans or new processes under development although most jurisdictions are actively working to improve their base mapping products and delivery methods.

- Due to the large amount of information being requested from respondents and the desire to limit interview sessions to a 1-hour maximum there was limited follow-up for incomplete responses to questions.

- Responses received from jurisdictions were not cross-verified with other sources from the same jurisdiction or other information with the exception of information received during the initial web scan.

- Interviews were limited to no more than one interview for administrative boundaries, one interview for cadastral mapping, and one interview for topographic mapping.

Client Surveys

- Client surveys were limited to an initial list of 10 clients obtained from SDW/AltaLIS. 5 of the 10 provided responses.

- Contact was made by a questionnaire and by telephone; however follow-up interviews with clients were limited.

- All clients surveyed were clients of SDW/AltaLIS and a limited number provided comments regarding adjacent provinces. Comments regarding other jurisdictions are included in Section 5 of this report.

- Client feedback particularly for jurisdictions other than Alberta should be considered anecdotal due to the small sample size.

3.   Jurisdictional Profiles

This section provides profiles for each jurisdiction contained in this report. The profiles are high-level views of the jurisdictions size and the administrative agencies responsible for base mapping.

Where the number of land parcels and the proportion of public and private lands was available it was included.

British Columbia

Total Land Area	944,735 km^2
Proportion of Private and Public Lands	500,000 crown parcels, 1,700,000 private parcels
Estimated Number of Land Parcels	2.2 million
Agencies Responsible for Base Mapping	Integrated Cadastral Information Society, Ministry of Sustainable Resource Management

British Columbia has a compiled and maintained topographic base map since the late 90's and administered it through the Ministry of Sustainable Resource Management. The same agency also provides administrative boundary maps compiled from a variety of government ministry sources, although not through a formal "owner/steward" maintenance protocol.

British Columbia has not produced a complete provincial cadastral map to date. The Integrated Cadastral Information Society (ICIS) was formed in 2001 as a partnership of provincial municipalities, utility companies, and the provincial government to maintain and distribute a provincial cadastral map. ICIS continues to make progress towards this goal.

Alberta

Total Land Area	661,848 km^2
Proportion of Private and Public Lands	600,000 crown parcels, 1,000,000 private parcels
Estimated Number of Land Parcels	1.6 million excluding Edmonton and Calgary
Agencies Responsible for Base Mapping	Spatial Data Warehouse Ltd., AltaLIS Ltd., Government of Alberta

The government of Alberta completed the current digital cadastral base-mapping product in 1996. Since 1996 the digital cadastral base-mapping product has been maintained through the not-for-profit organization Spatial Data Warehouse Ltd. (SDW). SDW provides for the long-term management (updating, storage and distribution) and associated funding of digital mapping "data sets" which collectively, constitute Alberta's digital mapping infrastructure.

Base mapping data held by SDW is maintained and distributed by AltaLIS Ltd. (AltaLIS), a joint venture company formed by QC DATA and Martin Newby Consulting for the purpose of making Alberta's base mapping infrastructure increasingly available, accessible, accurate and affordable.. A topographic base map at 1:20,000 and a DEM

have been available through AltaLIS since 1997. Within the last year, a GIS ready set of base features has been turned over by the government of Alberta to AltaLIS for distribution. In Alberta topographic base map maintenance is done by government and partially funded by SDW and AltaLIS. Most of the administrative boundary mapping is managed by individual government departments who provide the information to AltaLIS for distribution. AltaLIS also manages and maintains some administrative boundaries independently.

Saskatchewan

Total Land Area	651,036 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	2.5 million
Agencies Responsible for Base Mapping	Information Services Corporation

In Saskatchewan the administration of land titles, surveys, digital base mapping and geographic information services (GIS) is managed by Information Services Corporation (ISC) of Saskatchewan. Formed in December 1999 as a provincial crown corporation ISC has been successful in providing a broad range of land related products.

Manitoba

Total Land Area	647,797 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	420,000 available
Agencies Responsible for Base Mapping	Department of Conservation, Survey's& Mapping Program Geomatics Services

In Manitoba land related information, including cadastral and administrative boundary mapping, has been and to a large degree continues to be managed directly by individual government departments.

In 1999 the province of Manitoba created a new agency called the Manitoba Land Initiative (MLI). MLI is a cross-departmental partnership intended to serve the users of land related data in a harmonized and integrated way.

Currently, MLI is involved in establishing and managing data-sharing and distribution processes.

Ontario

Total Land Area	1,076,395 km^2
Proportion of Private and Public Lands	87% crown lands, 13% private lands
Estimated Number of Land Parcels	4.0 million
Agencies Responsible for Base Mapping	Government of Ontario, Teranet Inc.

The Ontario Ministry of Natural Resources (MNR), Science and Information Resources Division, Information Resource Management Branch is the agency responsible for managing geomatics interests.

Property assessment is managed directly by municipal governments some of whom also maintain spatial parcel data synchronized with legal parcel data as registered in the land registry.

The province of Ontario is currently working with Teranet Inc. to complete the Ontario Parcel database. This database is comprised of three separate synchronized data sets:

- Digital Ownership Parcel Fabric
- Digital Assessment Parcel Fabric
- Digital Crown Parcel Fabric

MNR is directly responsible for topographic base mapping and funds the maintenance of this data through normal government budget processes.

Administrative boundary mapping is managed by individual ministries and agencies throughout government. Administrative boundary mapping is not corporately managed for spatial integration.

Quebec

Total Land Area	1,542,056 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	3.5 million
Agencies Responsible for Base Mapping	Ministère des Ressources Naturelles, de la Faune et des Parcs

In 1992, the Quebec Government (Canada) launched the Cadastral Reform Program. The Ministry of Natural Resources Lands and Parks division has been responsible for the development and distribution of a cadastral fabric database of 3.5 million parcels.

The same department is responsible for Topographic mapping where it has developed a private/public partnership for distribution with a company called Photocartothèque Québécoise.

Administrative boundary mapping is collected and managed by separate agencies each responsible for their respective spatial datasets. Administrative data is distributed through Photocartothèque Québécoise.

New Brunswick

Total Land Area	72,908 km2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	460,000 available
Agencies Responsible for Base Mapping	Service New Brunswick

The province of New Brunswick manages and distributes cadastral data through the 13 regional offices of Service New Brunswick (SNB).

Service New Brunswick is a corporation owned by the Province of New Brunswick, which delivers:

- Real and personal property registries including land and personal property
- Assessment of lands, buildings and improvements
- Maintain the province's survey control network and topographic mapping system

Administrative boundary mapping which is created and maintained by the various responsible agencies and ministries is also available through the distribution services of SNB.

Nova Scotia

Total Land Area	55,284 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	550,000
Agencies Responsible for Base Mapping	Service Nova Scotia

Digital cadastral mapping for Nova Scotia is managed under the agency Service Nova Scotia and Municipal Relations (SNSMR). The fabric is a representation of the parcels submitted to the land registry, which is being converted from a deeds registry to a modified Torrens system of land titles. SNSMR provides access to parcel data with the exception of assessment parcel boundaries, which are managed separately by another organization.

SNSMR also manages and distributes complete digital topographic coverage at a scale of 1/10,000 and is available publicly at no cost through GeoBase.

Only municipal boundaries are managed and distributed by SNSMR. Other administrative boundaries are managed by their responsible agencies / ministries. There is no indication that there is any reconciliation of co-terminus boundaries across data managing jurisdictions.

Prince Edward Island

Total Land Area	5,660 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	100,000
Agencies Responsible for Base Mapping	Provincial Treasury Taxation & Property Records

Prince Edward Island declined to participate in this assessment, as representatives were unable to respond within our timeframe.

Newfoundland

Total Land Area	405,212 km^2
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	60,000 available
Agencies Responsible for Base Mapping	Environment & Conservation Land Division

Crown title mapping is managed and maintained by the provincial government. Complete parcel cadastral mapping is not done for Newfoundland and Labrador. The tables in the following section (Section 4) pertain only to the digital crown title mapping.

The provincial government in association with the government of Canada also provides topographic mapping at two scales 1/50,000 and 1/ 2,500. All data is available publicly at no cost through GeoBase.

The administrative boundary mapping has been completed by the provincial Department of Surveys and Mapping, who are now in the process of turning over responsibility for maintenance to individual provincial agencies.

Edmonton

Total Land Area	72,000 ha.
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	350,000
Agencies Responsible for Base Mapping	City of Edmonton

The Transportation and Streets Department maintain the city's digital cadastral database. Fully built and in continuous maintenance, the product is commercially available to the public.

Administrative boundaries are managed according to interest by each city department. A completed and up-to-date product is available through the GeoEdmonton.

Calgary

Total Land Area	73,000 ha.
Proportion of Private and Public Lands	Not available
Estimated Number of Land Parcels	360,000
Agencies Responsible for Base Mapping	City of Calgary

The city of Calgary agreed to participate in this assessment however could not be reached to provide information.

Government of Canada (Federal Lands)

Total Land Area	9, 093, 507 km^2
Proportion of Private and Public Lands	All parcels are public lands
Estimated Number of Land Parcels	
Agencies Responsible for Base Mapping	Natural Resources Canada, Legal Service Division

The Federal Government assembles cadastral parcels that represent Canada Lands surveyed under the Canada Land Act. These lands are primarily federal parks, First Nations reserves, (perimeter and internal subdivisions) and territories. Information is compiled by the federal government in two locations (East and West offices). Only the internal subdivisions of First Nations reserves are made available commercially, all other products are available at no charge through "GeoBase".

There is a rich program of topographic digital mapping, starting at a 1/50,000 scale and smaller. All are available at no charge through "GeoBase".

The federal Department of Surveys is responsible for maintaining mapping of the boundaries of Canada lands, (including some conservation areas) and manages them as administrative boundaries. They are continually updated and available at no charge through the "GeoGratis.ca" website initiative.

4.   Comparative Assessment

This section contains comparisons of the administrative boundary, cadastral and topographical datasets across all the jurisdictions surveyed with respect to the assessment criteria.

Information is presented in tabular form for each jurisdiction to facilitate comparisons across jurisdictions.

4.1   Cadastral Mapping

4.1.1   Overview

This section contains information on cadastral mapping summarized in tabular form for all participating jurisdictions. In most cases administrative boundary mapping is a cooperative effort spread among a number of ministries, agencies, or departments of a provincial jurisdiction. As a result, some data was not available from a single source within the provincial jurisdiction.

4.1.2 Cross-jurisdiction Comparison

A summary table of the status of the mapping dataset across all jurisdictions surveyed with respect to the assessment criteria.

Table 1 - Cadastral Mapping Agency Structure

Jurisdiction	Assessment Criteria			
	Owner	**Maintained by**	**Distributed by**	**Accessible by**
British Columbia	Government of BC / Municipalities	Some by Municipalities; some by Government of BC	Some by Municipalities; some by Government of BC	Government and ICIS members
Alberta	Government of Alberta (GOA)	AltaLIS	AltaLIS	Public
Saskatchewan	Information Services Corporation (ISC)	Information Services Corporation (ISC)	Information Services Corporation (ISC)	Public
Manitoba	Provincial Government	Provincial Government	Provincial Government	Public
Ontario	Government of Ontario and Teranet Inc.	Government of Ontario and Teranet Inc.	Government of Ontario and Teranet Inc.	Public
Quebec	Quebec Government (MRNFP)	Quebec Government (MRNFP)	Quebec Government (MRNFP)	Public
New Brunswick	Services New Brunswick	Services New Brunswick	Services New Brunswick	Public
Nova Scotia	Province of Nova Scotia	Provincial Government (SNSMR)	SNSMR	Licensees
Newfoundland	Provincial Government	Provincial Government	Provincial Government	Public
Edmonton	City of Edmonton	City of Edmonton - Transportation and Streets Department	City of Edmonton	Public
Federal Government	NR Can – Legal services division	NR Can – Legal services division	NR Can – Legal services division	Licensees

Table 2 - Cadastral Mapping Infrastructure Model

Jurisdiction	Assessment Criteria		
	Governance Model	**Funding Model for Initial Build**	**Funding Model for Maintenance**
British Columbia	Provincial Government and non-profit agency (ICIS)	Provincial Government	To be established
Alberta	Private / Public partnership	Provincial Government and Utilities Companies	Registration fee as well as product sales and user fees
Saskatchewan	Single Agency (ISC) Public	Single Agency (ISC) Public	Single Agency (ISC) Public
Manitoba	Multi-Agency (Public)	Provincial Government	Provincial Government
Ontario	Provincial government and Teranet Inc.	Private/Public partnership	Public Agencies
Quebec	Provincial Government	Private/Public partnership	Fees charged when a right is registered
New Brunswick	Provincial Government	Private/Public partnership	Public agencies
Nova Scotia	Provincial Government	Provincial Government	SNSMR via product sales and fees
Newfoundland	Provincial Government	Provincial Government	Provincial Government
Edmonton	Municipal Government	Public Sector	Private / Public partnership
Federal Government	Natural Resources Canada (NRCan) – Legal Services Division	Natural Resources Canada (NRCan) – Legal Services Division	Natural Resources Canada (NRCan) – Legal Services Division

Table 3 - Cadastral Mapping Data Parameters

Jurisdiction	Assessment Criteria				
	Geographical Area	Ownership and Legal Parcels	Attributes of Parcels	Included Layers	Source Document Type
British Columbia	Whole province	Legal parcels only; Ownership parcels built and maintained by BCAA	Multiple; Unique ID, legal description and many others	Single	Survey plans
Alberta	Whole province except Calgary and Edmonton	Synchronized and in separate layers	Unique ID and legal description	Lot boundaries, legal and ownership parcels, secondary interests	Survey plans
Saskatchewan	Whole province	Integrated into master coverage	Unique Identifier, legal description parcel class code PPID	Lot, block or plan boundaries, legal parcels, ownership parcels, secondary interests, Mineral parcels, Regulatory areas	Survey plans, topographic plans, aerial photos
Manitoba	Southern Manitoba (49th to 53rd parallel)	Not synchronized	Unique identifier and legal description	Lot, block or Plan boundaries, legal parcels, regulatory areas	Survey plans
Ontario	Whole province	Synchronized and separate layers	Unique parcel identifier, parcel assessment number	Lot, block and plan boundaries, ownership parcels, secondary interests, assessment parcels and regulatory areas	Survey and reference plans, other source documents
Quebec	Whole province	Separate layers, not synchronized	Unique parcel identifier, legal description	Lot and plan boundaries, legal and ownership parcels, dimensions, owner, relation between old and new number	Survey plans, reference plans composite plans
New Brunswick	Whole province	Integrated into a master coverage	Unique parcel identifier, legal description, parcel assessment number, street address, other ownership info and references to documents	Lot, Block or Plan boundaries, legal parcels, Ownership parcels, Secondary Interests	Survey plans, reference plans
Nova Scotia	Whole province	Integrated into a master coverage	Unique parcel identifier, legal description, parcel assessment number, street address	Lot, Block and Plan boundaries, legal parcels, ownership parcels, Secondary interests	Survey plans and other reference documents
Newfoundland	Whole Province	Only Crown parcels mapped	Unique parcel identifier, Name and Address of Grantee, File references	Crown Titles, Court Titles, Crown Easements	Survey plans
Edmonton	City of Edmonton	Synchronized	Unique parcel identifier, legal description	Lot, Block and Plan boundaries, legal parcels, secondary interests	Survey plans
Federal Government	All Canada lands across the whole of the country	Not synchronized. Synchronization underway	Unique parcel identifier (in the East)	Legal parcels	Canada Lands Survey Records System

Table 4 - Cadastral Mapping Data Status

Jurisdiction	Assessment Criteria	
	Status of Build	**Status of Maintenance**
British Columbia	Partially built	Partially maintained (Crown parcels only)
Alberta	Fully built	Continually updated
Saskatchewan	Fully Built	Continually updated
Manitoba	Fully built	Partial Update
Ontario	Partially built	Continually updated
Quebec	Fully built	Continually updated
New Brunswick	Fully built	Continually updated
Nova Scotia	Fully built	Continually updated
Newfoundland	Partially built	Continually updated
Edmonton	Fully built	Continually updated
Federal Government	Fully built	Continually updated

Table 5 - Cadastral Mapping Data Quality

Jurisdiction	Assessment Criteria					
	Method of Data Capture	Data Structure	Topological Cleanliness	Absolute Accuracy	Relative Accuracy	Program for Improving Data Quality
British Columbia	Coordinate geometry	GIS	High	Variable from ± < 1m Urban to ± > 10m Rural	Urban ± 15cm Rural ± 3m	New surveys, positional quality info, error detection
Alberta	Coordinate geometry, Survey CAD files	CAD	High	Urban ± 0.15m Rural ± 1 to 3m	Urban ± 0.01m Rural ± 0.10m	New surveys, error detection, positional quality improvement, currency improvement
Saskatchewan	Coordinate geometry, scan / vectorize, photogrammetry, table digitizing	GIS	High	± 1m Urban =/- 5m Rural	± 0.5m Urban ± 5m Rural	Not at this time
Manitoba	Coordinate geometry	GIS	High	± 0.5 m for community areas ± 5m for dominion land surveys	± 4.0 m for township surveys	New data, error correction, and positional accuracy
Ontario	Scan / vectorize	GIS and CAD	Medium	Variable - unknown	Variable - unknown	New data, positional quality improvement, currency improvement
Quebec	Land surveys and Photogrammetry	GIS	High	± 0.15m in Urban regions ± 0.30m in rural regions	± 0.21m at a scale of 1/1000 ± 0.42m at a scale of 1/2000	Error detection and correction
New Brunswick	Coordinate geometry, Table digitizing	GIS	High	Variable depending on source, survey plans are ± 0.05m	Variable Survey plans ± 0.05m	Inclusion of new information, error detection, positional quality improvement, currency improvement
Nova Scotia	Coordinate geometry, table digitizing	GIS	High	Variable depending on the source of the data	Variable depending on the source of the data	Inclusion of new information, positional quality improvement, currency improvement
Newfoundland	Assumed Coordinate Geometry from legal surveys	GIS	High	Variable. not measured	Variable. not measured	Maintained daily with new surveys
Edmonton	Coordinate geometry	GIS	Medium	± 6 to 10 cm at a 95% confidence	± 2 to 6 cm at a 95% confidence	Positional quality improvement
Federal Government	Coordinate geometry	GIS, CAD. Soon to be all GIS	Approx 60%, High	± <2m for Urban ± >2m for Rural	Depends on the accuracy of the surveys	Inclusion of new survey information

Table 6 - Cadastral Mapping Data Maintenance

Jurisdiction	Assessment Criteria						
	Maintenance Process	**Currency of Data**	**Update Tools**	**Digital Submission Requirement (fee)**	**Cost to Maintain**	**Georeferencing**	**Tie to Control**
British Columbia	None	1 to 2 years	NA	None	NA	All plans in Integrated survey areas (ISA)	All plans in ISA areas
Alberta	Centralized	1 to 2 days	CAD, GIS, custom	Yes $100 / plan	$100 / plan	No	All plans within 1 km. of survey control
Saskatchewan	Centralized	Fabric concurrent with plan registration	GIS, Cadastral Editor (custom)	No	$200 / plan Non-burdened	All plans in unsubdivided areas (UA)	All UA plans within 800m of survey control
Manitoba	Centralized	1 year	GIS (CARIS)	No	Not calculated	No	No
Ontario	Distributed	Approx. 3 months	GIS	No	Unknown	No	No
Quebec	Centralized	Continually updated - daily	Customized tools	No	$485 / plan	Yes	Yes
New Brunswick	Distributed (regional office of SNB)	Variable from 1 or 2 days to 1 or 2 weeks	GIS	No	Not calculated	No	Yes
Nova Scotia	Centralized technical infrastructure, distributed process	Continually updated but delays could be as much as one week	GIS	No	$74/document includes the registration process	Yes	Yes, but voluntary
Newfoundland	Distributed, by Regional and Central Crown Land Offices	Daily updates	GIS and "Amanda"	No	NA	No	No
Edmonton	Centralized	1 week	Combination, moving to GIS	Yes, $100 per survey plan, average	$100 per survey plan, average	Yes	Yes
Federal Government	Distributed through regional office centres	Updated within 24 hrs of new plan registration	CAD and GIS, working towards GIS	No	NA	No	No

Table 7 - Cadastral Mapping Data Access

Jurisdiction	Assessment Criteria					
	Access Methods	**Delivery Methods**	**File Formats**	**Coordinate Datums**	**Map Projections**	**Product or Service Packages**
British Columbia	E-mail	FTP, CD, Batch download	ESRI shape, ESRI E00	NAD 83 CSRS	UTM, Geographic	Entire jurisdiction, area specific
Alberta	Phone, fax, E-mail website	FTP, Web, CD	DGN, DXF, ESRI shape	NAD 83 Adopted	3TM, 10TM, UTM Geographic	Entire jurisdiction, area specific, incremental updates
Saskatchewan	Over the counter, FTP, CD	Over the counter, FTP, CD	ESRI shape	NAD 83 CSRS 98	UTM	Entire jurisdiction, area specific core dataset, incremental updates
Manitoba	E-mail	Batch download	DXF, ESRI shape, CARIS	NAD83 Adopted	UTM	Area specific
Ontario	Hardcopy request	CD	DGN, ESRI shape, SNIF	NAD 83 adopted	Geographic	Entire jurisdiction, area specific, layer specific, complete core dataset, incremental updates and new dataset
Quebec	Web, FTP	FTP	DXF	NAD 83 adopted	Geographic, 3 degree MTM	Entire jurisdiction, area specific
New Brunswick	Web, over the counter and hard copy request	CD	DXF, CARIS NTX or ASCII	NAD 83 CSRS 95	NB Stereographic	Entire jurisdiction, area specific
Nova Scotia	Web, over the counter, FTP and hard copy request	FTP, CD	DXF, CARIS NTX, ESRI shape, ESRI E00	NAD 83 CSRS	UTM, 3 degree MTM	Entire jurisdiction, area specific, new dataset
Newfoundland	Web – for viewing only	NA	ESRI shape	NAD 83 adopted	UTM, 3 degree MTM	NA
Edmonton	Web, over the counter, FTP, hard copy request	Batch download, FTP, Web, CD and hardcopy	DGN, DXF and ESRI shape	NAD 83 adopted	3 degree MTM	Entire jurisdiction, area and layer specific
Federal Government	Web, over the counter, FTP and hard copy request	FTP, CD and hard copy	DXF, DWG, ESRI shape	NAD 83 CSRS	UTM	Entire jurisdiction, area and layer specific, complete core dataset

Table 8 - Cadastral Mapping Data Pricing and Usage

Jurisdiction	Assessment Criteria			
	Pricing Model	Pricing/Licencing Options	Licences Issued	Number of End Users
British Columbia	No charge	Data is not available for external use	NA	Unknown
Alberta	Licence	Subscription based, product based, transaction based, volume based, special discounts, value added discounts and lease to own.	618	Unknown
Saskatchewan	Licence	Subscription, product and transaction based. Special discounts for funding partners	Unknown	1000+
Manitoba	No charge	NA	NA	Unknown
Ontario	Licence	Volume based	Unknown	Unknown
Quebec	Licence	Subscription	500	Unknown
New Brunswick	Licence	Subscription, product, and transaction based, as well as value added discounts	Unknown	Unknown
Nova Scotia	Licence	Subscription based, volume based, special discounts	100	Unknown
Newfoundland	None	NA	NA	NA
Edmonton	Licence	Subscription, product, transaction, and volume based, special discounts, and value added discount	Unknown	Unknown
Federal Government	Licence	Subscription and volume based	Unknown	Unknown

4.1.3   Analysis of Results

Cadastral mapping in Canada is diverse in terms of its sophistication and funding.

Agency Structure and Governance

To start to gain an understanding of why there is such diversity this study examined the governance model specifically who owns the data, who maintains it, and who is responsible for distributing the information. In jurisdictions where there is clearly one owner and a definite and distinct relationship exists between the owner and the agency that maintains and distributes the data, cadastral mapping appears to be more highly developed. For example, in Saskatchewan, Alberta, and Quebec where there are clear lines of responsibility, the data is either updated concurrently with plan registration or within one to two days. This rapid update and maintenance process produces the most useable cadastral products.

Whether the governance model is a public private partnership as in Alberta or where it's wholly government owned agency as in Saskatchewan or a government ministry as in Quebec, the key to a successful cadastral mapping program appears to lie in consistency of vision and funding.

Mapping Data Parameters

Table 3 provides an insight into exactly what data is being captured in each jurisdictions cadastral mapping program. Most cadastral mapping programs with the exception of Manitoba's capture data for the whole province. In every province except for the province of British Columbia both legal and ownership parcels are captured as part of this data assembly. In British Columbia, a separate initiative under the direction of the BC Assessment Authority looks after the compilation of the "ownership" parcels. Parcel capture is done in three ways, in a single layer as in the case of British Columbia, in two separate layers which may be synchronized or not synchronized, or in a master coverage layer as in New Brunswick and Nova Scotia.

Survey participants were asked if they maintain their data with GIS tools or with CAD tools. All jurisdictions with the exception of Alberta and Ontario currently use GIS tools.

Most provinces are very similar in the method of data capture and the source document types employed to create and update cadastral information. Most jurisdictions utilize survey plans, reference plans, composite plans, legal plans and other legal documentation their basis of their cadastral information.

Data Quality and Accuracy

Table 5 is a summary of responses with regard to topological cleanliness, absolute accuracy, relative accuracy, and information with regard to the program for proving data quality within each jurisdiction. All jurisdictions with the exception of the Province of Ontario reported high topological cleanliness.

Respondents were asked to indicate accuracy based on their knowledge of the data. It would appear based on the responses that among the interviewees there is limited knowledge with regard to data accuracy. The ideal absolute accuracy values that were expected were ±10 cm for urban areas and ±2 to 5 m in rural areas.

Data Maintenance

Table 6 provides an overview of cadastral data maintenance across jurisdictions. With the exception of Alberta, Saskatchewan, and Nova Scotia the cost to maintain cadastral data is either unknown or not calculated. Saskatchewan which reported a cost of $200.00 per plan for maintenance also coincidentally has the most current data. This would suggest that the jurisdictions with properly funded maintenance programs are able to keep their data most current.

Data Access

Most jurisdictions offer access to cadastral products over the web and provide information in a wide variety of file formats, coordinate datums, and map projections.

In terms of data access, Alberta provides more options than any other jurisdiction and in so doing appears to provide the highest level of service to its clients.

Other jurisdictions however, would appear to only provide information based on a UTM map projection. Based on this report, it is unclear how they deliver data to clients where parcels straddle different UTM zones.

Data Pricing and Usage

Pricing of base mapping products varies considerably across Canada with Alberta having the most comprehensive licencing and pricing system. Alberta provides a variety of pricing options to provide base mapping data according to user type and requirements.

British Columbia does not provide universal access to cadastral data, Saskatchewan provides licencing packages priced from $50 to $31,200 per year, Quebec provides access to data for individuals starting at $6 per day to $3,200 per year for corporate users, and the balance of the jurisdictions either provide data free of charge or are currently working to establish fee and licencing structures.

Alberta, Quebec, and Nova Scotia were able to provide the best information with regard to data use however none of the jurisdictions were able to provide accurate estimates of the number of end users. This suggests that jurisdictions do not have a good understanding of end use of base mapping data.

4.1.4   Conclusions

Achieving a complete and up to date cadastral mapping base is a goal that has been achieved by only a few jurisdictions across Canada.

Alberta, Saskatchewan, Quebec, New Brunswick, and Nova Scotia appear to be the most advanced. Of these, Alberta followed by Saskatchewan provides the widest range of services to clients. All of these jurisdictions have one thing in common; they provide data that is current to within 2 days or less.

Data currency appears to the most important parameter of cadastral base mapping, even more so than accuracy.

The results revealed that overall there is limited knowledge of data use. Few organizations could name their major data users and none of the jurisdictions could provide an accurate estimate of the number of end users.

4.2　Topographic Mapping

4.2.1　Overview

This section contains information on topographic mapping summarized in tabular form for all participating jurisdictions. In most cases topographic boundary mapping is the responsibility of the provincial jurisdiction for that reason municipal jurisdictions such as the City of Edmonton do not maintain topographic base maps.

4.2.2 Cross-jurisdiction Comparison

A summary table of the status of the mapping dataset across all jurisdictions surveyed with respect to the assessment criteria.

Table 9 - Topographic Mapping Agency Structure

Jurisdiction	Assessment Criteria			
	Owner	Maintained by	Distributed by	Accessible by
British Columbia	Provincial Government	Provincial Government and contracted services	Provincial Government, hardcopy by licensed distributors	Public
Alberta	Provincial Government and Spatial Data Warehouse (SDW)	Provincial Government and AltaLIS	AltaLIS	Public
Saskatchewan	Public Sector (ISC)	Public Sector (ISC)	Public Sector (ISC)	Forestry, Government, Oil and Gas
Manitoba	Provincial Government	Provincial Government, Geomatics and Remote Sensing Branch	Provincial Government	Public
Ontario	Provincial Government	Provincial Government	Provincial Government (LIO)	Public
Quebec	Provincial Government (MRNFP)	Provincial Government	Private Public partnership with Photocartotheque Quebecoise	Public
New Brunswick	Provincial Government Service New Brunswick	Service New Brunswick	Service New Brunswick	Public
Nova Scotia	Provincial Government via SNSMR	Provincial Government via SNSMR	SNSMR through the Nova Scotia Geomatics Center	All Industry
Newfoundland	Provincial Government	Provincial Government	Provincial Government	Public Sector only. No services to Industry
Edmonton	No Product	NA	NA	NA
Federal Government	No Response	NA	NA	NA

Table 10 - Topographic Mapping Infrastructure Model

Jurisdiction	Assessment Criteria		
	Governance Model	Funding Model for Initial Build	Funding Model for Maintenance
British Columbia	Public Sector	Public Sector	Public sector, Product sales, Data users
Alberta	Public Sector	Public Sector	Provincial Government and Product sales
Saskatchewan	Public Sector	Partially built, funded as needed by private and public sector	None, at this time
Manitoba	Public Sector	Public Agencies	Public Agencies
Ontario	Public Sector	Public Agencies	Public Agencies
Quebec	Public sector	Public agencies and data users	Public Agencies and data users
New Brunswick	Public Sector	Public Sector	Public Sector, exploring private/public relationship model
Nova Scotia	Public Sector	Public Agencies	Public Agencies via fees, product sales and subscription which go into the "Nova Scotia Map Fund"
Newfoundland	Public Sector	Public Sector	Public Sector
Edmonton	No topographic product		
Federal Government	NA	NA	NA

Table 11 - Topographic Mapping Data Parameters

Jurisdiction	Assessment Criteria	
	Geographical Area	Included Layers
British Columbia	Whole province	Transportation, Hydrography, hypsography, Land cover, Cultural, Cutlines and Access trails, Landmarks, Landforms
Alberta	Whole province	Transportation, Hydrography, Hypsography, Administrative areas and Township system
Saskatchewan	Whole province	Ortho-Imagery only
Manitoba	Southern Manitoba (49th to 53rd parallel)	Transportation, Hydrography, Hypsography, Land Cover, Cultural, Cutlines, Landmark
Ontario	Whole province	Transportation, Hydrography, Hypsography, Land Cover, Cultural, Cutlines and access trails, Landmarks
Quebec	Mainly under the 52nd parallel of latitude	Transportation, Hydrography, Hypsography, Land Cover, Landmarks, Landforms
New Brunswick	Whole province	Transportation, Hydrography, Hypsography, with original but not upgraded Land Cover, Cultural, Cutlines, Landmarks, Landform, and coastal features
Nova Scotia	Whole province	Transportation, Hydrography, Hypsography, Land Cover, Cultural, Cutlines, Landmarks
Newfoundland	Whole Province	For 1/50K & 1/250K, all themes for Resource and community mapping, For 1/10K, just Hydrology, DEM and ortho rectified images – only 15% coverage of the Island of Newfoundland
Edmonton	NA	NA
Federal Government	NA	NA

Table 12 - Topographic Mapping Data Status and Quality

Jurisdiction	Assessment Criteria			
	Status of Build	**Status of Maintenance**	**Absolute Accuracy**	**Program for Improving Data Quality**
British Columbia	Fully built	Partially updated	1/20K ± 5m	New data integration, currency improvement
Alberta	Fully built	Partially updated	1/250K ± 100m 1/500K-1/2mill ± 500m 1/20K ± 5m	No
Saskatchewan	Partially built	No Maintenance	Only to the level of accuracy of the ortho imagery	No
Manitoba	Fully built	Partially updated	± 1-5 m	No
Ontario	Fully built	Partially updated	Variable	New information, error detection, positional quality improvement, currency improvement
Quebec	Fully built	Partially updated	Range of 1m to 5m	Positional quality improvement, currency improvement
New Brunswick	Fully built	Partially updated	Range of ± 2.5m	Inclusion of new information, error detection, positional quality improvement, currency improvement
Nova Scotia	Fully built	Updated	± 2.5m for 90% of well defined features	Inclusion of new information, error detection, positional quality improvement, currency improvement
Newfoundland	1/1m – Fully built; 1/50k & 250K – Fully built; 1/10K – very partially built, 1/2500 – fully built for most towns	1/50K – maintained with Fed Gov't; 1/2500 – continually updated, cost sharing with towns	1/50K – 25m to 150m;1/10K – 1m to 3m; 1/2500 – 1m	Inclusion of new information, remapping from aerial photography
Edmonton	NA	NA	NA	NA
Federal Government	NA	NA	NA	NA

Table 13 - Topographic Mapping Data Maintenance

Jurisdiction	Assessment Criteria		
	Maintenance Process	**Currency of Data by Layer**	**Update Source**
British Columbia	Centralized system in place, updated by feature	Varies by feature	Updated imagery, photos, surveys
Alberta	Some processes in place, distributed throughout Government Of Alberta	Access features= 1 to 5 years old Hypsography= 20 years old Alberta Township System= 7 years old	Various sources
Saskatchewan	No Maintenance process	Current to Photography 1991-2004	NA
Manitoba	No maintenance process		
Ontario	Distributed among public agencies	Variable, unknown	Various sources, unspecified
Quebec	Centralized process using aerial photographs based on annual cycles (5, 10, 15 years) corresponding to urban, rural and natural zones themes	Depends on the theme cycle	Aerial photographs
New Brunswick	Distributed maintenance with new data from source distributed to contracted maintainers	Varies, with an average of 6 years	Various sources, unspecified
Nova Scotia	A cycle of new aerial photography that would renew each area over a five-year period. Being developed is a feature based maintenance plan. Process is distributed with a centralized technical architecture.	One to five years old	New aerial photography
Newfoundland	Centralized	1/50K – 20-40 years 1/10K - <4 years 1/2500 – 0-20 years	New aerial photography
Edmonton	NA	NA	NA
Federal Government	NA	NA	NA

Table 14 - Topographic Mapping Data Access

Jurisdiction	Assessment Criteria					
	Access Methods	**Delivery Methods**	**File Formats**	**Coordinate Datums**	**Map Projections**	**Product or Service Packages**
British Columbia	Phone, e-mail, web request	Batch download, FTP	SAIF/MOEP, DGN	NAD 83	UTM and Albers	Map sheet, custom packages
Alberta	Phone, Fax, e-mail	Web, FTP, CD	ESRI, DGN	NAD 27 NAD 83 Adopted	Geographic, 10TM and UTM	Map sheet, entire jurisdiction, area and layer specific, core dataset
Saskatchewan	Download by FTP, CD, DVD	FTP, CD, DVD	Imagery in TIFF, DEM in DXF	NAD 83	UTM	Map sheet
Manitoba	Web	Web	DXF, ESRI shape	NAD83 Adopted	UTM	By Map sheet
Ontario	Web, over the counter and hardcopy request	Web, CD and hardcopy	SNIF, ESRI	NAD 83 adopted	Geographic	Map sheet, entire jurisdiction, area and layer specific, complete core dataset, incremental updates and new dataset
Quebec	Web, over the counter and FTP site	FTP, CD	DGN, SAIF, DWG, ESRI	NAD 83 Adopted NAD 83 CSRS	Geographic, UTM, 3 degree MTM	Map sheet, area and layer specific, complete core dataset
New Brunswick	Web and over the counter	CD and Web	ESRI shape, CARIS, DXF	NAD 83 CSRS	NB Stereographic double	Map sheet, Entire jurisdiction, complete core dataset
Nova Scotia	Web, over the counter, FTP and Hardcopy request	FTP, Web, CD and hardcopy	DWG, ESRI, CARIS NTX and MapInfo	NAD 83 CSRS and ATS 77	UTM, 3 degree MTM	Map sheet, Layer specific and New dataset
Newfoundland	Web and over the counter	CD	ESRI, DXF, CARIS	NAD 83 adopted	UTM, 3 degree MTM	Map sheet
Edmonton	NA	NA	NA	NA	NA	NA
Federal Government	NA	NA	NA	NA	NA	NA

Table 15 - Topographic Mapping Data Pricing and Usage

Jurisdiction	Assessment Criteria				
	Pricing Model	Pricing/Licencing Options	Licences Issued	Industry Sector Users	Total Number of End Users
British Columbia	Licence	Transaction and product based, value added discounts	1000+	Unknown	1000+
Alberta	Licence	Transaction and volume based, lease to own	206	Unknown	Unknown
Saskatchewan	Cost of delivery/processing	Product based	NA	Forestry, Government, Oil and Gas	2000+
Manitoba	No charge	NA	NA	Unknown	Unknown
Ontario	Unknown	NA	NA	Unknown	Unknown
Quebec	Licence	Product based, Volume based and Special discounts	Unknown	Unknown	Unknown
New Brunswick	No charge	NA	NA	Unknown	Unknown
Nova Scotia	No charge	NA	NA	Unknown	650
Newfoundland	Licence	End user license by data sets only	200	Unknown	200
Edmonton	NA	NA	NA	NA	NA
Federal Government	No charge	NA	NA	Unknown	Unknown

4.2.3   Analysis of Results

Topographic mapping is owned, maintained and distributed primarily by provincial and federal governments in Canada. Unlike cadastral mapping and administrative boundary mapping which are triggered by the initiation of a parcel, the currency of topographical mapping in Canada is largely based on client demand and discretionary government funding. Most jurisdictions report an average data age of 5 years.

Topographic map products are available in a wide range of formats, coordinate datums, map projections, and product packages. Clients may obtain products by various means ranging from hardcopy to web downloads.

As in cadastral mapping, Alberta has the most comprehensive pricing structure for topographic base map products. British Columbia, Saskatchewan, Quebec and Newfoundland also reported comprehensive transaction and product based pricing with special consideration for volume and value-added users.

4.2.4 Conclusions

It would appear that biggest challenge with topographic data is achieving a higher level of data currency. Undoubtedly, reductions in provincial funding levels have affected topographic mapping programs across Canada.

4.3 Administrative Boundary Mapping

4.3.1 Overview

This section contains information on administrative boundary mapping summarized in tabular form for all participating jurisdictions. In most cases administrative boundary mapping is a cooperative effort spread among a number of ministries, agencies, or departments of a provincial jurisdiction. As a result, some data was not available from a single source within the provincial jurisdiction.

4.3.2 Cross-jurisdiction Comparison

A summary table of the status of the mapping dataset across all jurisdictions surveyed with respect to the assessment criteria.

Table 16 – Administrative Boundary Mapping Agency Structure

| Jurisdiction | Assessment Criteria | | | |
	Owner	Maintained by	Distributed by	Accessible by
British Columbia	Government of British Columbia	Government of British Columbia	Government of British Columbia	Public
Alberta	Government of Alberta	AltaLIS / GOA	AltaLIS / GOA	Public
Saskatchewan	Government of Saskatchewan	Information Services Corporation (ISC)	Information Services Corporation (ISC)	Public
Manitoba	Individual Branches of the Provincial Government	Individual Branches of Provincial Government	Manitoba Land Initiative (MLI)	Public
Ontario	Government of Ontario (MMAH)	Government of Ontario (MNR)	Land Information Ontario (LIO) and others	Public
Quebec	Individual Agencies within the Provincial Government	MRNFP-DGIG Government Agency	MRNFP-PCQ Government Agency	Public
New Brunswick	Each layer is "owned" by its specific Government agency.	Maintained by each Government "owner" agency	Services New Brunswick	Public
Nova Scotia	Each layer has its own "owner" within the Government. This report refers to Municipal boundaries only	Maintained by each "owner" agency	SNSMR through the Nova Scotia Geomatics Centre	Public
Newfoundland	Provincial Government (Surveys and Mapping-SMD)	Not being maintained	SMD	Public
Edmonton	City of Edmonton	Departments delegated as "Stewards" of their own or others	GeoEdmonton office	Public
Federal Government	Natural Resources Canada (NR Can)	Legal Services Division of NR Can	NR Can / GeoConnections	Public

Table 17 - Administrative Boundary Mapping Data Parameters

Jurisdiction	Assessment Criteria						
	Geographical Area	Data Structure	Data Capture Method	Absolute Accuracy	Topological Cleanliness	Attributes of Parcels	Source Document Type
British Columbia	Whole province	GIS	Coordinate geometry	± 5m	High	Polygons with unique ID and descriptions	Legislation, Survey plans
Alberta	Whole province except for National Parks	CAD Some are GIS ready	Coordinate geometry, digitizing, scan/Vectorize. Depends on source	<1m Urban ± 5m Rural Synchronized with Cadastral mapping	High	Line segment descriptions Area descriptions Update info	Survey plans
Saskatchewan	Whole Province	GIS	Coordinate geometry Digitizing for water features	1m Urban 5m Rural	High	Polygons with line tables link	Legislation, Survey plans
Manitoba	Whole province	Both GIS and CAD	Coordinate geometry, Digitizing, Scan/Vectorize. Depends on source	Variable	Variable	Polygons with area description	Variable
Ontario	Whole province	Both GIS and CAD	Coordinate geometry, Digitizing, Scan/Vectorize. Depends on source	Unsure, variable	Medium	Polygons with Name of Township, lot, concession, block	Survey plans, reference plans
Quebec	Whole province	GIS	Coordinate geometry, topographic features, digitizing	± 4m where the lines relate to topographical features	High	Line segment attributes as well as polygonal attributes	Technical descriptions and survey plans
New Brunswick	Whole province	GIS	Coordinate geometry, Digitizing, Scan/Vectorize. Depends on source	Variable	High, for 21 of the 24 layers	Polygon area description	Varies, depending on the data type
Nova Scotia	Whole province	GIS	Coordinate geometry, table digitizing, photogrammetry	Varies depending on data capture method	High	Line segment description and update information	Survey Plans, reference plans, composite plans
Newfoundland	Whole Province	GIS	Legal descriptions snapped to 1/50K Photogrammetric base	Varies, unmeasured	High	Limited, undefined	Survey plans
Edmonton	City of Edmonton	GIS	Coordinate geometry	mm along parcel boundaries, 1m in road rights of way	High	Polygon based with associated attributes	Federal, Provincial and Municipal legislation, bylaws, reference plans
Federal Government	Canada	GIS	Coordinate geometry	Differs for each area	High	Each parcel has a Can code and name	Survey plans

Table 18 - Administrative Boundary Mapping Data Maintenance

Jurisdiction	Assessment Criteria			
	Program for Improving Data Quality	**Maintenance Process**	**Currency of Data**	**Cost to Maintain**
British Columbia	New Surveys Error detection	Centralized updating with Land Act surveys, distributed for all others	Variable. Owner ministries and agencies provide updating information on irregular basis.	Not calculated
Alberta	Error detection New surveys Currency	Centralized for some, distributed for others	Same day as information comes in. No control over the date of receipt from "owner" agencies.	Included with cadastral mapping cost
Saskatchewan	New survey plans	Centralized updating with cadastral information	Variable	Not calculated
Manitoba	No	Not Maintained	Variable	Not calculated
Ontario	Inclusion of new data, Error detection, Currency and positional improvement	Distributed but under development	Unknown	Not calculated
Quebec	New model under development EPEL expected in 2006	Centralized	Variable, as the info comes in. Most of it is within six months.	Not calculated
New Brunswick	Inclusion of new information, error detection, positional quality improvement, currency improvement	Being developed, to be a distributed system (SNB Regional offices)	Unknown. build process started in 2003	NA
Nova Scotia	Inclusion of new information, error detection, positional quality improvement, currency improvement	Distributed, provided by the data custodian	Municipal boundaries are fairly static. Changes made within one month of receiving new information	Not calculated
Newfoundland	None at this time	Centralized	2002	Not Calculated
Edmonton	Geo-referenced cadastral ties, inclusion of new information, Error detection and correction, positional quality improvement	A distributed process with database updated as soon as a change is approved	Anywhere from 48 hours to 1 week depending on the change	Not calculated
Federal Government	New surveys, positional quality improvement	Centralized, rolled up from other sources	One month	Not calculated

Table 19 - Administrative Boundary Mapping Data Access

Jurisdiction	Assessment Criteria					
	Access Methods	Delivery Methods	File Formats	Coordinate Datums	Map Projections	Product or Service Packages
British Columbia	Phone in, e-mail	FTP, online, batch download	ESRI shape, ESRI E00	NAD 83	UTM	Layer specific, entire jurisdiction, core dataset
Alberta	Web, over the counter	FTP, CD, and Web	DGN, DXF, ESRI shape	NAD 83 CSRS	Geographic, UTM, 10TM	Entire jurisdiction, area and layer specific
Saskatchewan	Over the counter, FTP	FTP, CD	DXF, ESRI shape	NAD 83 CSRS	Geographic, UTM	Entire jurisdiction, layer specific, area specific
Manitoba	Web	Web	DXF, ESRI shape	NAD83 Adopted	UTM	Area specific
Ontario	Web, over the counter, Hard copy request	Online, CD, Hardcopy	ESRI, SNIF	NAD 83 adopted	Geographic	Entire jurisdiction, area and layer specific, complete core dataset, incremental updates
Quebec	Over the counter and FTP for external to Government users.	CD, FTP and LAN/WAN connections	ESRI E00, shape, coverages, and DGN	NAD 83	Geographic	Complete datasets for each update
New Brunswick	Over the counter and Web	Web and CD	DXF, CARIS ASCII, ESRI shape	NAD 83 CSRS	NB stereographic double	Entire jurisdiction, layer specific, Complete core dataset
Nova Scotia	Web, over the counter, FTP and hard copy request	Web, FTP, CD and Hardcopy	DXF, ESRI shape, ESRI E00	NAD 83 CSRS, ATS 77	UTM, 3 degree MTM	Mapsheet, area or layer specific, new dataset
Newfoundland	Web service visualization	None	Data stored in ESRI shape	NAD 83 adopted	UTM, 3 Degree TM	None
Edmonton	Over the counter, mail, Internal online	Online batch, FTP, Direct download, CD, Hardcopy	GeoMedia, Oracle, DXF, DGN	NAD 83	3 Degree TM	Entire jurisdiction, area and layer specific, Incremental updates
Federal Government	Web	Web	ESRI shape	NAD 83 CSRS	Geographic	Complete core dataset

Table 20 - Administrative Boundary Mapping Data Pricing and Usage

Jurisdiction	Assessment Criteria				
	Pricing/Licencing Options	**Prices by Boundary Type**	**Industry Sector Users**	**Total Number of End Users**	**Percent of Industry Users**
British Columbia	No charge	NA	Public	Unknown	Unknown
Alberta	Product, subscription and transaction based; special discounts; one time purchase; updates only	One time purchase - $625 2 updates/year - $200 12 updates/year - $400	Pubic	450	95%
Saskatchewan	Integrated with cadastral product	NA	All industry sectors	2000 +	Geomatics industry 10%
Manitoba	None	NA	All industry sectors	5,000	40%
Ontario	Volume based Digital Township Fabric only-(DTF)	DTF resellers-$100 one time fee or, $16 / megabyte $8.50 for hardcopy maps	Public	Unknown	Unknown
Quebec	Transaction based and corporate licensing	$100 – municipal and regional boundaries $100 – School, Electoral, Judicial and Health Districts	All industry sector users	25+	33%
New Brunswick	Product based, special discounts – but going through a process of change.	Free	Public	Unknown	Unknown
Nova Scotia	Subscription and product based	Free	Public	650	Unknown
Newfoundland	NA	NA	Public	Unknown	Unknown
Edmonton	Subscription, product, transaction, and volume based, special discounts and value added discounts	Not declared	Public	U	Unknown
Federal Government	No charge	NA	Public	Unknown	Unknown

4.3.3 Analysis of Results

In most jurisdictions administrative boundary mapping is owned by the province but maintained by separate ministries, agencies, or departments. This splitting of responsibility, results a wide range of data capture methods, maintenance processes, and variable levels of data currency. This diversity also makes it difficult to calculate the cost of maintenance.

In Alberta in particular certain administrative boundaries are centralized while others are distributed. Obviously from a data maintenance, geometric consistency, distribution and a user perspective, centralized management and distribution results in a more predictable and complete service offering.

Of all of the jurisdictions Alberta offers the greatest combination of access methods delivery methods, file formats, coordinate datums and map projections to meet client needs.

Administrative boundary mapping data is generally publicly available in most jurisdictions. This makes estimating the total number of end users and the proportion of industry users very difficult.

For many jurisdictions the absolute accuracy of the data is as variable as the number of agencies, ministries, or departments that provide data.

4.3.4   Conclusions

Administrative boundary mapping is a foundation dataset required by users. The leading jurisdictions are Alberta, British Columbia, Saskatchewan, Quebec, New Brunswick, and Nova Scotia. In those provinces the attribution of parcels contains information based on line segments and polygons. All of these jurisdictions with the exception of Alberta use GIS as their data structure to ensure topological cleanliness. Alberta reports that a portion of its data is GIS ready and therefore meets the same topological level of cleanliness as if it were to use GIS tools. These five jurisdictions also appear to provide the widest range of administrative boundary mapping products.

As mentioned earlier, this information suggests that until administrative boundary mapping is entirely centralized, consistency in timeliness and accuracy will continue to be a challenge for all jurisdictions.

5.   Client User Reviews

As part of this report surveys were conducted to assess the strengths and weaknesses of the AltaLIS services and products from a data user perspective.

5.1   Methodology

In consultation with SDW/AltaLIS, 5 clients, all based primarily in Alberta, were selected to participate in a written user survey. Clients were asked to provide their ratings to the following criteria:

1. Adequacy of the primary information service provider to supply metadata and information relating to obtaining data

2. Adequacy of the service providers infrastructure to deliver data to users

3. Quality of the data including currency, accuracy and completeness

4. Cost of the products

5. Willingness of the service provider to address client needs

6. Overall satisfaction with the service provider

Where clients also obtained information from a service provider in another jurisdiction they were asked to provide the same information for the other jurisdiction

5.2   Results

Responses indicate areas of satisfaction and concern with the service delivered by SDW/AltaLIS. The questionnaire did not provide the opportunity to probe areas of discontent beyond identification of potential problem areas.

Alberta

Alberta clients surveyed primarily obtained base map data from AltaLIS and rated the service as good to excellent. They found it easy to navigate and to identify what data is available and at what cost. Likewise once they made the decision to buy data they are able to obtain the data quickly and in the format that they require.

When asked to rate the accuracy and cost of the data, many users felt that value could be increased. The specific concern is that the cost of the data is not commensurate with the accuracy. This is especially true for topographic data and to a lesser extent with cadastral products.

In spite of the identification of accuracy as a concern, users stated that they would continue using AltaLIS data since it was viewed as "government sanctioned" and that regulatory bodies use the same data in reviewing applications.

AltaLIS clients all acknowledged the willingness of AltaLIS to obtain and use client feedback to influence the direction and development of various products.

Client Survey Summary - AltaLIS
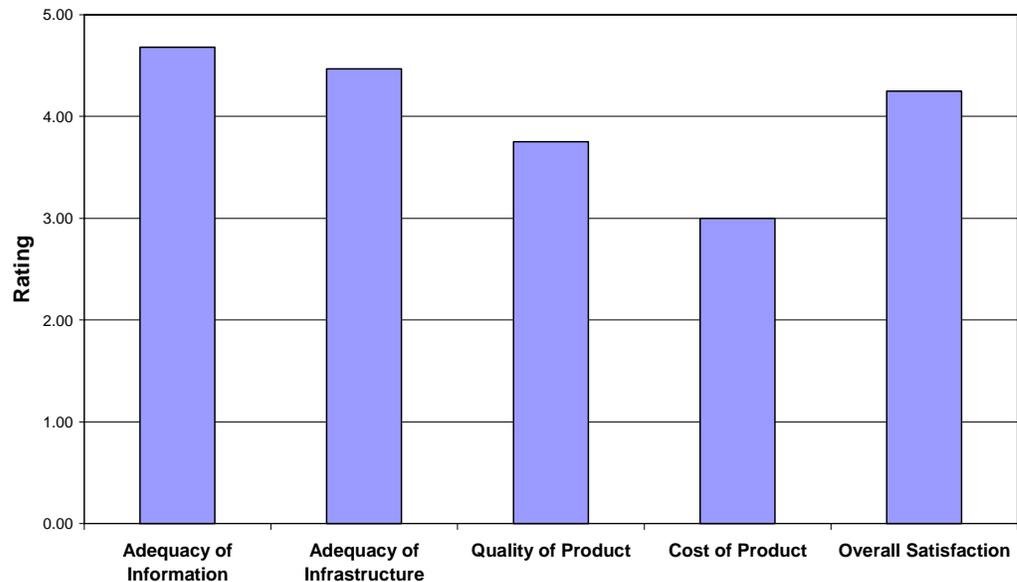
Figure 2 - Client Survey Summary – AltaLIS

Clients were asked to identify ways in which satisfaction could be increase. The following items are presented in unaltered form from the user responses:

- Implement continuous update process for topographic data
- Enhance the information content for topographic features
- Enhance metadata content and data catalogue functionality for topographic data
- Implement a public land digital mapping program
- Adding crown land dispositions would complete the Alberta base map infrastructure
- Resolve continuously moving base resulting from the cadastral maintenance process
- Developing a plan to update topographic layers in the base map is also a priority
- Getting the Federal lands data and an update process on that data would be beneficial to complete the fabric and eliminate the current holes
- The cost of the data is very high – many companies will choose not to buy it because of the cost. There are several other data vendors out there providing data at a much lower cost. However, that being said, the Alberta government 'sanctioned' data offers some positives on the regulatory /compliance side. Having the ability to match base map data queries that the regulatory government body creates is important to our industry
- A process to provide feedback to AltaLIS on an ongoing basis regarding specific data problems is required

In general the comments received by users of the Alberta services were constructive and indicate a desire to build upon the current services to improve or expand them. Users would like to see some improvement in accuracy and currency particularly with topographic data. They would also like to see public land digital data included to the SDW/AltaLIS services.

British Columbia

Only two respondents provided information with regard to the province of British Columbia. They indicated that the Integrated Cadastral Information Society (ICIS) is their source of base mapping information for British Columbia.

British Columbia does not currently offer a comparable service to Alberta. ICIS is intended to be the distribution agent for administrative, cadastral and topographic data when it becomes operational.

Adjacent Jurisdictions

The following comments were received through the detailed client survey questionnaires. Although separate questionnaires were not completed by survey participants for other jurisdictions the participants provided the following comments with regard to British Columbia and Saskatchewan.

- The jurisdiction is approachable and open to client feedback (Sask)
- Data prices are excessive (Sask)
- It is difficult to locate data since there is no central organization responsible for data (BC)
- Data quality is inconsistent (BC)
- Data is difficult to locate (BC)
- Data is incomplete and lacks the accuracy required (BC)

These comments were provided in contrast to the service that they receive in Alberta through SDW/AltaLIS.

6.   How Alberta compares to other Jurisdictions

As a part of this assessment, Fujitsu Consulting was asked to provide a synopsis of base mapping in Alberta relative to other jurisdictions. Section 4 – Comparative Assessment contains summarized responses from all Canadian jurisdictions that have base mapping programs similar to Alberta with the exception of Prince Edward Island. This section contains a more detailed synopsis specific to Alberta relative to other jurisdictions.

Organization and Governance

Alberta has one of the few successful public private partnerships in Canada for the management, maintenance and delivery of base mapping products. This business arrangement provides the formal structure that has allowed the program to develop and maintain the business case for base mapping operation in Alberta. This governance model by virtue of its structure makes it imperative to monitor such things as product delivery, client satisfaction, and costs that are essential elements of a successful program.

Our interviews revealed that the majority of jurisdictions in Canada do not track even high-level business parameters such as number of end-users, cost of maintenance, and user demand and as a result have corresponding less effective programs.

Examination of the cost/benefit relationships for base mapping by jurisdiction was beyond the scope of this assessment however, the governance model in place in Alberta is able to provide more information with regard to both the cost and benefit equation than any other jurisdiction.

Scope of Service

Alberta provides the greatest range of base mapping products of any jurisdiction sampled. The Alberta governance model through SDW and AltaLIS requires a direct relationship between base mapping product users and the delivery of base mapping products as well as the business practice of conducting client information sessions has help Alberta develop a very close tie between the delivery organization (AltaLIS) and the end users.

Not surprisingly, Alberta also provides the largest range of licencing options for Cadastral products to meet the needs of users.

Feedback from clients contacted during this assessment confirmed that they feel that Alberta is receptive to their requirements and reacts promptly to their needs.

Data Accuracy

Based on interviews and questionnaires, Alberta has the best relative accuracy of any jurisdiction and the second best in terms of absolute accuracy for cadastral data. Alberta also has a comprehensive program to improve cadastral data quality to ensure continued data improvement.

Topographical data in Alberta in contrast to the high level of accuracy of the cadastral data, appears to be of average accuracy and lacking a program to improve data quality.

This was confirmed by clients who indicated a desire to have better accuracy and currency of Alberta topographical data.

Cost of Products

In an attempt to compare the cost of base mapping products to clients, Fujitsu Consulting asked representatives from each jurisdiction to provide licencing and product price information. The majority of jurisdictions contacted provide topographic base mapping information free of charge or for a nominal access or media charge but most jurisdictions provide a subscription-based license for cadastral data.

Alberta provides the widest range of prices and licencing options for Cadastral data users approaching a customized licensing model. This is reflective of a business model where AltaLIS is attempting to address the needs of a diverse client base.

Information Currency

Alberta reported cadastral data currency (and associated administrative boundary data) at one (1) to two (2) days lag time. This is considered excellent with only Saskatchewan and Quebec reporting that they are able to provide updates at the time of plan registration.

Topographical data currency in Alberta is consistent with other jurisdictions. Access features are updated within 5 years, which is the same as reported by jurisdictions such as Nova Scotia, New Brunswick, and others.

Alberta client responses indicated a desire for more rapidly updated topographical data.

Challenges for Alberta

Alberta, while providing excellent client focused products for cadastral and administrative boundary information is faced with a number of challenges brought on by changing technology (move from CAD to GIS), user expectations, pricing pressures from clients, demand for increased topographic accuracy and currency, and integrating the cities of Edmonton and Calgary into a seamless provincial coverage.

Summary

The province of Alberta has an excellent governance model that focuses on meeting client needs and expectations. Through SDW and AltaLIS, the province of Alberta provides clients with a complete cadastral map base, the largest maintained cadastral parcel dataset in Canada.

Although the client sample for this assessment was small it would appear that like other jurisdictions, Alberta is not meeting the desires of clients for continuously updated and positionally accurate topographic information.

While faced with the constant challenge of providing better data at lower prices, Alberta has a sound business model and a good track record upon which to grow and improve. Of all provincial jurisdictions, Alberta is most attuned to the needs of its clients and provides the greatest range of products, pricing and licencing options to those clients.

7.   Overall Summary and Conclusions

This assessment provides an overview of administrative boundary, cadastral, and topographic mapping across Canada. To provide additional insight into the services provided by SDW/AltaLIS and to a limited extent services in Saskatchewan and British Columbia, additional user satisfaction information was added.

Jurisdictions in Canada vary greatly along an evolutionary scale. Provinces such as Alberta who made an early start in assembling mapping data and where adequate funding was available to create an initial a set of products are now emerging as leaders. Client responses indicate that industry users are becoming increasingly dependent on a constant supply of current and accurate base mapping data.

Not surprisingly there appears to be a strong relationship between funding levels and completeness and quality of base maps. The level of funding available for creation and maintenance is directly related to how these initiatives are funded. Currently there are 3 primary methods of funding base mapping in Canada:

1. Provincial funding through budget appropriations

2. Public-private funding through the formation of a partnership with private sector organizations

3. Public agency wholly or partially government owned

The most complete and up to date products exist in jurisdictions where the responsibility for base mapping rests with an organization outside of government ministries or departments. Public-private organizations such as SDW/AltaLIS in Alberta and arms length public agencies such as ISC in Saskatchewan, SNB in New Brunswick and SNS in Nova Scotia report the most complete and up-to-date products.

The least effective model appears to be in places where base mapping has not been centralized, either by standards or by execution, and where the responsibility is diffused among government ministries and departments. Clients have expressed concerns that they do not know where to obtain information in these jurisdictions.

Administrative boundary mapping in most jurisdictions is not centralized. The responsibility for each particular boundary rests with the ministry, agency or department responsible for managing that activity or program i.e. Parks boundaries are the responsibility of the parks department; school district boundaries are the responsibility of the education ministry, etc. It follows that the tools, accuracy, currency and other data attributes are as diverse as are the custodians of the data.

Cadastral mapping by contrast is generally centralized in both data capture and maintenance and is the most current, reliable and accurate base map information available. In jurisdictions where cadastral mapping is reported as "distributed" data is of a significantly lower quality. Alberta, Saskatchewan, and Quebec with centralized

maintenance processes report the most current data followed closely by Nova Scotia with a centralized technical and governance model but with distributed maintenance processes.

All jurisdictions reported a fully built topographical base map product with the exception of Saskatchewan, which is reporting a partially complete product. Every jurisdiction used provincial appropriations to build the topographical base maps and most rely on this funding source for maintenance. When asked, base mapping clients most commonly identified currency of topographical mapping as a concern.

In terms of all three base mapping areas (administrative boundaries, cadastral and topographic) Alberta, Saskatchewan and Quebec appear to be the current leaders in their ability to maintain and distribute high quality base mapping products. New Brunswick and Nova Scotia are well organized and will no doubt join the leaders in the upcoming years.

APPENDIX 1: JURISDICTIONAL CONTACTS

The following table lists the contacts who participated in the questionnaire and interview process.

Province or City	Large and Small Scale Topographic	Urban and Rural Cadastral	Title, Grids and Admin Boundary Mapping
Alberta	Jim Chorel / Leah Lilley (403) 268-3310 jim.chorel@altalis.com	Wayne Newby / Ellen Styner (403) 294-1028 wayne@martinnewby.com	Wayne Newby / Ellen Styner (403) 294-1028 wayne@martinnewby.com
British Columbia	Amin Kassam and Paul Quackenbush amin.kassam@gems6.gov.bc.ca	Amin Kassam Darrel Richardson amin.kassam@gems6.gov.bc.ca	Scott MacPhail Scott.Macphail@gems2.gov.bc.ca
Saskatchewan	Wayne Adams (306) 787-1170 Wayne.adams@isc.ca	Wayne Adams (306) 787-1170 Wayne.adams@isc.ca	Wayne Adams (306) 787-1170 Wayne.adams@isc.ca
Manitoba	Roy Dixon (204)-945-6597 rdixon@gov.mb.ca	Roy Dixon (204)-945-6597 rdixon@gov.mb.ca	Roy Dixon (204)-945-6597 rdixon@gov.mb.ca
Ontario	Tom Malone (705)-755-2130 tom.malone@mnr.gov.on.ca	Carla Jordan-Cooke (705)-755-1451 carla.jordan-cooke@mnr.gov.on.ca	Carla Jordan-Cooke (705)-755-1451 carla.jordan-cooke@mnr.gov.on.ca
Quebec	Daniel Pepin (418) 627-6283#2102 Daniel.pepin@mrnfp.gouv.qc.ca	Karl Gosselin (418) 627-6267#2895 Karl.gosselin@mrnfp.gouv.qc.ca	Louis Laberge (418) 627-6284#2072 Louis.laberge@mrnfp.gouv.qc.ca
New Brunswick	Bernard Arseneau (506) 457 4959 bernard.arseneau@snb.ca	Bernard Arseneau (506) 457 4959 bernard.arseneau@snb.ca	Bernard Arseneau (506) 457 4959 bernard.arseneau@snb.ca
Nova Scotia	Danny Gray 902-424-4966 dgray@gov.ns.ca	Danny Gray 902-424-4966 dgray@gov.ns.ca	Danny Gray 902-424-4966 dgray@gov.ns.ca
Prince Edward Island	James Ramsay (902) 368-4075 jbramsay@gov.pe.ca	James Ramsay (902) 368-4075 jbramsay@gov.pe.ca	James Ramsay (902) 368-4075 jbramsay@gov.pe.ca
Newfoundland	Neil MacNaughton (709)729-0602 nmacnaug@gov.nl.ca	Neil MacNaughton (709)729-0602 nmacnaug@gov.nl.ca	Neil MacNaughton (709)729-0602 nmacnaug@gov.nl.ca
City of Edmonton	No Product offering	Glenn Ritchie (780) 496-6703 gritchie@gov.edmonton.ab.ca	Gordon Willis
Federal Government		James Mackenzie (780) 495-6175 jmackenz@nrcan.gc.ca	James Mackenzie (780) 495-6175 jmackenz@nrcan.gc.ca

APPENDIX 2: QUESTIONNAIRE- ADMINISTRATIVE BOUNDARY MAPPING

Digital Administrative Boundary Mapping

This survey, conducted by Fujitsu Consulting, is being undertaken as a key element of independent research into the state of digital base mapping progress in Canada. It is hoped that the results of the survey will contribute to the advancement of digital mapping across the country. The survey will be conducted by telephone and the questions posted below will form the framework for the interview.

For the purposes of this survey, the questions below relate only to the digital geo-administrative boundary mapping such as land management regions, assessment areas, electoral areas, school districts, regional districts, and municipal boundaries. Companion survey questionnaires have also been prepared for topographic mapping and cadastral mapping.

Please feel free to provide detailed and more elaborate responses where the select options seem inadequate.

Thank you for agreeing to participate in completing this survey.

Interview Date:

Jurisdiction:

Interviewee Name(s):

Position / Role:

Base Mapping Dataset:

Organization of Geo-Administrative boundary Mapping Infrastructure

1: Who is the owner/custodian of the data? Does each Administrative boundary have an identified "Owner"?

2: Is the dataset maintained and if so, by whom? Is there a "stewardship" structure established for the building and/or the maintenance of each dataset? Please explain.

3: Who distributes the data?

Data Status and Quality

4: What is the positional or absolute accuracy of the data?

❑   Fixed value
❑   Range
❑   Tolerance

5: Please list the various geo-administrative boundaries that are captured and maintained.

	❏ Land Title Districts ❏ Electoral Districts ❏ Assessment Areas ❏ Regional Districts ❏ Municipality ❏ Agricultural land reserves ❏ Other

6: How was the data captured?

	❏ Co-ordinate geometry ❏ Table / screen digitizing ❏ Scan/vectorize ❏ Photogrammetric ❏ Other

7: Do you have a program for upgrading the quality of the data? The trigger for change will come from the collection of new information such as from new surveys, Global positioning points, improved technology, geo-referenced cadastral ties.

	❏ Inclusion of new information ❏ Error detection and correction ❏ Positional quality improvement ❏ Currency improvement

8: What is the geographic area (or jurisdiction) of your working responsibility?

	❏ Whole province ❏ Other

9: What is the build and maintenance status of the data? By "Upgrade", we mean the process of improving the positional accuracy of the data by the introduction of new information of a higher positional accuracy quality.

Build		Maintenance	
	❏ Not Built ❏ Partially Built ❏ Fully Built		❏ Updated ❏ Not Updated ❏ Partially updated ❏ Upgraded ❏ Not Upgraded ❏ Partially upgraded

10: Is the data structure GIS or CAD-based?

	❏ GIS ❏ CAD

11: How topologically clean is the data? Please describe the topological criteria to which the data is processed. By "topological" we mean the processes of creating closed polygons, removing slivers, undershoots and overshoots.

	❑ High ❑ Medium ❑ Low ❑ None

12: What attributes do the parcels carry?   If Administrative boundaries are captured as linear elements, please describe the attributes associated with each line.

	❑ Line segment description ❑ Area description ❑ Update info ❑ Other

13: What were the source documents for the construction of the base?

	❑ Survey plans ❑ Reference plans ❑ Composite plans ❑ Other

Data Maintenance

14: How current is the dataset? (i.e. when was it last updated?)

15: What is the time lapse between plan or document registration and the completion of the update?   In some cases boundary changes occur on the political approval of an Order in Council.

16: Is your maintenance process centralized?

	❑ Not maintained ❑ Centralized ❑ Distributed

17: How long does it take to incorporate an update? Please refer to the effort to update a single Order in Council description.

18: What does it cost to maintain the data? It would be helpful to know how many changes occur over a year.

Data Access

19: What methods are employed by users to access the data?

	❑ Online (i.e web) ❑ Over the counter ❑ FTP site ❑ Hard copy request ❑ Other

20: What delivery methods are employed in data distribution? "Online batch" would mean the ordering of the data in bulk form and having it delivered in many cases as an overnight delivery process.

	❑ Online batch ❑ File download (FTP) ❑ File download(direct) ❑ CD ❑ Hardcopy ❑ Other

21: What are the file formats that are supported in the delivery of the data?

	❑ DGN/IGDS ❑ DXF ❑ XML/GML ❑ ESRI shape ❑ ESRI geodatabase ❑ ESRI E00 ❑ Other

22: What co-ordinate datums are supported in the delivery of the data?

	❑ NAD 27 ❑ NAD 83 Adopted ❑ NAD 83 CSRS ❑ Other

23: What map projections are employed in the storage and delivery of the data?

	❑ Geographic ❑ UTM ❑ MTM (3degree) ❑ MTM (6degree) ❑ Other

24: What product or service packages are offered to users? These would be the various ways that the data can be ordered and delivered.

	❑ Entire jurisdiction ❑ Area specific ❑ Layer specific ❑ Complete core dataset ❑ Incremental updates ❑ New dataset

Data Pricing

25: Do you have any pricing or licensing options; if so, what are they based on?

	❑ Subscription based ❑ Product based ❑ Transaction based ❑ Volume based ❑ Special discounts (Education) ❑ Value added discount ❑ Other

26: What are the prices for data?

Boundary Type	Price

Data Usage

27: Which main Industry sector areas use the data?

	❑ Federal Government ❑ Provincial Government ❑ Local Government ❑ Utility companies ❑ Forestry companies ❑ Energy companies ❑ Land Development ❑ Survey and Mapping ❑ Data distributors ❑ Other

28: What is the estimate of the total number of end users? User agencies, not individual users.

29: What proportion of these are industry sector users?

User Input and Satisfaction

30: Is there a process for users to influence the direction, priorities, and quality of the dataset?

	❑ No Involvement ❑ User group committee ❑ Focus groups ❑ User surveys ❑ Other

APPENDIX 3: QUESTIONNAIRE- CADASTRAL MAPPING

Digital Cadastral Base Mapping

Interview Questions

This survey, conducted by Fujitsu Consulting, is being undertaken as a key element of independent research into the state of digital base mapping progress in Canada. It is hoped that the results of the survey will contribute to the advancement of digital mapping across the country. The survey will be conducted by this questionnaire and by a follow up telephone call, if necessary.

For the purposes of this survey, the questions below relate only to the digital cadastral mapping. Companion survey questionnaires have also been prepared for topographic mapping and geo-administrative boundary mapping.

Please feel free to provide detailed and more elaborate responses where the select options seem inadequate.

Thank you for agreeing to participate in completing this survey.

Interview Date:

Jurisdiction:

Interviewee Name(s):

Position / Role:

Base Mapping Dataset:

Organization of Base Mapping Infrastructure

1: Please identify the following organizational and governance responsibilities for the data. Please specify the agency or company in each responsibility area.

Ownership	Maintenance	Distribution	
			❏ Public (single agency) ❏ Multi-agency(public) ❏ Private ❏ Public/Private ❏ Other

2: What is/was the funding model for the initial build and maintenance of the data? Please specify the agency, company, or partnership that is responsible in both areas.

Build		Maintenance	
	❏ Private Sector ❏ Public Agency ❏ Private/Public partnership		❏ Private Sector ❏ Public Agencies ❏ Data Users ❏ Via product sales ❏ Via fees ❏ Via subscription

Data Status and Quality

3: What is the positional or absolute accuracy of the data? Must have been established using field verification. Positional accuracy would be the measure of the variation between the co-ordinates of the cadastral point in the database and those of the same point on the ground.

	❑ Fixed value ❑ Range ❑ Urban/Rural split ❑ Tolerance ❑ Other

4: What is the relative or dimensional accuracy? This should be related to the method of data capture. Relative accuracy would the dimensional variation between distances measured on the database and those referred to on the plan of survey.

	❑ Fixed Value ❑ Range ❑ Urban/Rural split ❑ Tolerance ❑ Other

5: What major layers or themes are included in the dataset?

❑ Lot, block or plan boundaries
❑ Legal (or surveyed) parcels
❑ Titled or ownership parcels
❑ Secondary interests (e.g. Rights-of-way, easements, leases, licenses, etc.)
❑ Regulatory areas (e.g. parks, reserves, planning zones, etc.)
❑ Other (please identify)

6: How was the cadastral data captured?

	❑ Co-ordinate geometry ❑ Table digitizing ❑ Scan/vectorize ❑ Photogrammetric ❑ Other

7: What were the source documents for the construction of the base?

	❑ Survey plans ❑ Reference plans ❑ Composite plans ❑ Other

8: What is the geographic area (or jurisdiction) of your working responsibility?

	❑ Whole province ❑ Other

9:   What is the build and maintenance status of the data?

Build	❏ Not Built ❏ Partially Built ❏ Fully Built	Maintenance	❏ Continually Updated ❏ Partially Updated ❏ Not updated ❏ Upgraded ❏ Partially upgraded ❏ Not upgraded

10: Is the data structure GIS or CAD-based?

	❏ GIS ❏ CAD

11: How topologically clean is the data? Please explain the type of topological criteria that is observed. By this we mean the extent of which polygons are created and closed without slivers, overshoots or undershoots.

	❏ High ❏ Medium ❏ Low ❏ None

12: How does the cadastral base deal with ownership parcels vs legal parcels? The legal parcels would be those that retain an individual identity in the registration process with a distinct legal description. Ownership parcels would consist of certain amounts of amalgamation and are those that are used mainly for taxation purposes.

	❏ Synchronized ❏ Not Synchronized ❏ Separate Layers ❏ Integrated into a master coverage

13: What attributes do the parcels carry? If necessary, please distinguish the attributes for legal parcels and those of Ownership parcels.

	❏ Unique parcel identifier ❏ Legal description ❏ Parcel assessment number ❏ Street Address ❏ Other

14: Do you have a program for upgrading the quality of the data? This trigger would usually come from the acquisition of new data of an improved positional value; examples would be new georeferenced surveys, cadastral ties, GPS surveyed points.

	❏ Inclusion of new information ❏ Error detection and correction ❏ Positional quality improvement ❏ Currency improvement

Data Maintenance

15: Is your maintenance process centralized? If maintenance is "Distributed", please explain the procedure.

	❑ Not maintained ❑ Centralized ❑ Distributed

16: How current is the dataset? (i.e. when was it last updated?)

	❑ 3 Months ago ❑ 6 Months ago ❑ 1 Year ago ❑ 2 Years ago ❑ Other (please specify)

17: What is the time lapse between plan registration and the completion of the update?

	❑ Less than 1 week ❑ 1 to 4 weeks ❑ 4 to 8 weeks ❑ 8 to 12 weeks ❑ Other (please specify)

18: What types of tools do you use to maintain the data?

	❑ CAD ❑ GIS ❑ Custom ❑ Combination ❑ Other

19: Is there a digital submission requirement?   If so, what are the filing fees?

❑ Yes ❑ No	Fee:

20: What does it cost to maintain the data? Please use plan or parcel count as a reference, and indicate if the cost is "burdened" or "non-burdened."

21: Is there a Provincial requirement for georeferencing new survey plans? Are the new plans tied to Survey Control?

Georeferencing	**Tied to Control**
❑ Yes ❑ No	❑ Yes ❑ No

Data Access

22: What methods are employed by users to access the data?

	❑ Online (i.e web)
	❑ Over the counter
	❑ FTP site
	❑ Hard copy request
	❑ Other

23: What delivery methods are employed in data distribution? " Online batch" would mean the receiving of a large data order and the batch processing of that order over night with delivery on the following day.

	❑ Online batch
	❑ File download (FTP)
	❑ File download (direct)
	❑ CD
	❑ Hardcopy
	❑ Other

24: What file formats are supported in the delivery of the data?

	❑ DGN/IGDS
	❑ DXF
	❑ XML/GML
	❑ ESRI shape
	❑ ESRI geodatabase
	❑ ESRI E00
	❑ Other

25: What co-ordinate datums are supported in the delivery of the data?

	❑ NAD 27
	❑ NAD 83 Adopted
	❑ NAD 83 CSRS
	❑ Other

26: What map projections are employed in the storage and delivery of the data?

	❑ Geographic (Lat Long)
	❑ UTM
	❑ MTM (3degree)
	❑ MTM (6degree)
	❑ Other

27: What product or service packages are offered to users? These are ways in which the data can be requested.

	❑ Entire jurisdiction
	❑ Area specific
	❑ Layer specific
	❑ Complete core dataset
	❑ Incremental updates
	❑ New dataset

28: What industry sector companies have access to the data? Which service packages do they require?

Company:	Service Packages:

Data Pricing

29: Do you have any pricing or licensing options and if so, what are they based on?

	❑ Subscription based ❑ Product based ❑ Transaction based ❑ Volume based ❑ Special discounts (Education) ❑ Value added discount ❑ Other

30: What are the prices for data? Please identify the packaging options along with the prices.

Cadastral Package Options	Price

31: What is the number of Licensed users for the various options?

Licensing Option	Number of Users

Data Usage

32: What is the estimate of the total number of end users? Not individual users.

33: What proportion of these are industry sector users?

User Input and Satisfaction

34: Is there a process for users to influence the direction, priorities, and quality of the dataset?

	❑ No Involvement ❑ User group committee ❑ Focus groups ❑ User surveys ❑ Other

A PPENDIX 4: Q UESTIONNAIRE - T OPOGRAPHIC M APPING

Digital Topographic Base Mapping

Interview Questions

This survey, conducted by Fujitsu Consulting, is being undertaken as a key element of independent research into the state of digital base mapping progress in Canada. It is hoped that the results of the survey will contribute to the advancement of digital mapping across the country. The survey will be conducted by this questionnaire and by a follow up telephone call, if necessary.

For the purposes of this survey, the questions below relate only to the digital topographic mapping at 1:20,000 scale and smaller and will include products such as the digital elevation model (DEM). Companion survey questionnaires have also been prepared for cadastral mapping and geo-administrative boundary mapping.

Please feel free to provide detailed and more elaborate responses where the select options seem inadequate.

Thank you for agreeing to participate in completing this survey.

Interview Date:	
Jurisdiction:	
Interviewee Name(s):	
Position / Role:	
Base Mapping Dataset:	

Organization of Topographic Base Mapping Infrastructure

1: Who is the owner/custodian of the data?

	❑ Private Sector ❑ Public Sector ❑ Private/Public Partnership

2: Who distributes the data? i.e. Who is responsible and who provides the service of delivery.

3: What is/was the organizational and funding model for the initial build and maintenance of the data?

Initial Build		**Maintenance**	
	❑ Private Sector ❑ Single Agency ❑ Public Agencies ❑ Data Users		❑ Public Agencies ❑ Single agency ❑ Data Users ❑ Via product sales ❑ Via fees ❑ Via subscription

Data Status and Quality

4: What is the positional or absolute accuracy of the data?

	❑ Fixed value ❑ Range ❑ Tolerance ❑ Varied	**Ranges** ❑ ± 1- 5m ❑ ± 5-10m ❑ ± 10-20m

5: What major layers or themes are included in the dataset? Please highlight the relevant layers.

❑ Transportation (e.g. roads, railways, etc.)
❑ Hydrography (e.g. lakes, rivers, streams, etc.)
❑ Hypsography (e.g. contours, landforms, DEM)
❑ Landcover (e.g. wooded areas)
❑ Cultural (i.e. man-made features and landmarks)
❑ Cutlines and access trails
❑ Landmark (e.g Buildings, designated areas, built up areas)
❑ Land Form (e.g CliffScarp, Foreshore, LavaBed, Slide area)
❑ Other (please identify)

6: What is the geographic area of your working responsibility?

	❑ Whole province ❑ Other

7: What is the build and maintenance status of the data?

Build		**Maintenance**	
	❑ Not Built ❑ Partially Built ❑ Fully Built		❑ Updated ❑ Partially updated ❑ Upgraded ❑ Partially upgraded

8: Do you have a program for upgrading the quality of the data? This would be triggered by the introduction of new data of an improved positional value; usually coming from updated technologies for data capture.

	❑ Inclusion of new information ❑ Error detection and correction ❑ Positional quality improvement ❑ Currency improvement

Data Maintenance

9: How current is the dataset? (i.e. when was it last updated?). Updating may come from specific sources and related to specific data features. Please explain how often the data changes would normally come in and the process for implementing the update procedure.

Address by Theme
❑ Transportation (e.g. roads, railways, etc.) ❑ Hydrography (e.g. lakes, rivers, streams, etc.) ❑ Hypsography (e.g. contours, landforms, DEM) ❑ Landcover (e.g. wooded areas) ❑ Cultural (i.e. man-made features and landmarks) ❑ Cutlines and access trails ❑ Landmarks ❑ Landforms ❑ Other (please identify)

10: Is your maintenance process centralized or distributed?

	❑ Not maintained ❑ Centralized ❑ Distributed

Data Access

11: What methods are employed by users to access the data?

	❑ Online (i.e web) ❑ Over the counter ❑ FTP site ❑ Hard copy request ❑ Other

12: What delivery methods are employed in data distribution? "Online batch" means the method of having a large volume request come in and being processed over night for delivery the next day.

	❑ Online batch ❑ File download (FTP) ❑ File download(direct) ❑ CD ❑ Hardcopy ❑ Other

13: What file formats are supported in the delivery of the data?

	❑ DGN/IGDS ❑ SAIF ❑ XML/GML ❑ MOEP? ❑ DWG ❑ ESRI ❑ Other

14: What co-ordinate datums are supported in the delivery of the data?

	❑ NAD 27 ❑ NAD 83 Adopted ❑ NAD 83 CSRS ❑ Other

15: What map projections are employed in the storage and delivery of the data?

	❑ Geographic (lat and long) ❑ UTM ❑ MTM (3degree) ❑ MTM (6degree) ❑ Other

16: What product or service packages are offered to users? This would be the way in which the data would be ordered.

	❑ By mapsheet ❑ Entire jurisdiction ❑ Area specific ❑ Layer specific ❑ Complete core dataset ❑ Incremental updates ❑ New dataset

17: What industry sector companies have access to the data? Which service packages do they require? See the above mentioned service packages

Company:	Service Packages:

Data Pricing

18: Do you have any pricing or licensing options and if so what are they based on?

	❑ Subscription based ❑ Product based ❑ Transaction based ❑ Volume based ❑ Special discounts (Education) ❑ Value added discount ❑ Other

19: What is the basic "product based" pricing offering? Please write n/a where the scale identified is not part of the offering.

Product	Price
❑ 1:20,000 ❑ 1:50,000 ❑ 1:100,000 ❑ 1:250,000 ❑ 1:500,000 ❑ 1:1,000,000 ❑ 1:2,000,000	

Data Usage

20: What is the estimate of the total number of end users? Not individual users.

User Input and Satisfaction

21: Is there a process for users to influence the direction, priorities, and quality of the dataset?

	❑ No Involvement ❑ User group committee ❑ Focus groups ❑ User surveys ❑ Other

22: What is the biggest dissatisfaction with mapping in your jurisdiction?

	❑ Delivery delays ❑ Price ❑ Out of date data ❑ Incorrect data ❑ Other (please specify)

APPENDIX 5: QUESTIONNAIRE- CLIENT USER REVIEW

Client User Questions

This survey, conducted by Fujitsu Consulting, is being undertaken as a key element of independent research into the state of digital base mapping progress in Canada and the feedback of client users like you. It is hoped that the results of the survey will contribute to the advancement of digital mapping across the country. The survey will be conducted by questionnaire and telephone interview and the discussion will be based on the questions posted below.

We are focusing our research into three "types" of digital mapping – Topographic (terrain mapping, land features, etc.), Cadastral, and Administrative (jurisdictional) boundaries. Please identify which mapping "type" your comments refer to.

Please feel free to provide detailed and more elaborate responses where the select options seem inadequate.

Thank you for agreeing to participate in completing this survey. Your comments will be of enormous help in the refinement of the development and offerings of the geomatics industry and its important service to the country.

Interview Date:
Client Company Name:
Interviewee Name(s):
Position / Role:
Base Mapping Dataset:

Throughout the questionnaire, please use a scale of 1 to 5 to describe your assessment of the service, 1 being of the lowest level and 5 being of the highest level.

Data Source

1: Please identify the data that you use and the source from which you access it.

Data Type	Source of Access
Large Scale Topographic	
Small Scale Topographic	
Urban Cadastral	
Rural Cadastral	
Administrative / Jurisdictional Boundary mapping	

Information about Base Mapping Data

2: Does the data provider supply adequate information about the following?

Comments	Info	1	2	3	4	5
	Metadata					
	Where to get the data					
	How to get the data					
	Cost for the data					
	Products description					

Access to Products

3: How would you rate the service on the following access issues?

Comments	Issue	1	2	3	4	5
	Response time					
	Ease of Access (The technology of delivery)					
	Availability of formatting options to suit your working environment					

Product Quality

4: How would you rate the quality of the product based on the following?

Comments	Quality Criteria	1	2	3	4	5
	Currency (up to date)					
	Accuracy (Absolute Positional)					
	Accuracy (Relative)					
	Completeness (All the data is there)					

Product Cost

5: What is your opinion of the cost structure of the various product offerings?

Comments	Rating
	Too Cheap
	Reasonable
	Expensive
	Too Expensive

User Feedback and Participation in Product Development

6: Do you get the opportunity to participate in the feedback that might influence the direction and development of the various products that you use? If so, please describe the process.

Comments	Response
	Yes
	No

7: What is the overall level of satisfaction with the base products?

Comments	Rating
	Very Satisfied
	Somewhat Satisfied
	Not Satisfied
	Other

8: Can you identify ways in which user satisfaction might be increased?
Comments

APPENDIX 6: WEB SEARCH SUMMARY

The following table identifies web links for Topographic and Cadastral Mapping used in or supporting this assessment.

Topographical Base Mapping

Jurisdiction	Web Site	Description
British Columbia	http://srmwww.gov.bc.ca/bmgs/sitemap.html	Website describes the programs, activities of the Base Mapping and Geomatics Branch of the Ministry of Sustainable Resource Management. It features mainly medium and small scale topographic mapping
Alberta	http://www.altalis.com/	AltaLIS website describing the availability of large , medium and small scale base features mapping with access facilities and pricing.
Saskatchewan	http://www.isc.ca/land/gis_public/scripts/gis.asp?cfgpage=MAPS_DIGITALDATA	Website of Information Services Corporation describing the medium and small scale topographical mapping with costs and metadata for each product.
Manitoba	http://web2.gov.mb.ca/mli/about_us/projectdetails.html	Manitoba Land Initiative (MLI) base maps of medium and small scale are identified with accuracies for each product.
Ontario	http://themnrstore.mnr.gov.on.ca/english/product_subcat.asp?tid=&cat=3	Website to the Ministry of Natural Resources retail outlet for maps of medium and small scales. It includes some pricing and online selection options but no metadata.
Quebec	http://photocartotheque.mrnfp.gouv.qc.ca/pcq/classes/selection_produit?&direct=oui	Shopping website for topographic maps of medium and small scale. Available only in French. No specifications or prices available – unless you go to the shopping cart.
New Brunswick		
Nova Scotia	http://www.gov.ns.ca/snsmr/land/products/topographic2.asp	Comprehensive website offers detail on large and medium (up to 1/50,000) scale products. Price list link also included.
Prince Edward Island	http://www.gov.pe.ca/infopei/index.php3?number=44290&lang=E	Website describes the availability of 2m contour map but gives little detail of scale, price or specs. The site does give a contact where more info can be accessed.
Newfoundland	http://www.gov.nl.ca/env/lands/sm/topo_mapping.html http://www.gov.nl.ca/env/lands/sm/metadata.html http://www.gov.nl.ca/env/lands/sm/product.html	This Government site offers two scales (large and medium). Only partially complete in GIS format. The legacy data is also available unstructured. Contacts provided. Metadata website with prices and delivery formats Listing of available topo products with pricing
Edmonton		
Calgary	http://content1.calgary.ca/NR/exeres/EA561A24-E352-448A-81D3-887E764BAFF5.htm	Listing of mapping products from the GIS Mapping Group. Would logically be large scale. No details without going to the shopping cart.

Cadastral Base Mapping

Jurisdiction	Web Site	Description
British Columbia	http://srmwww.gov.bc.ca/bmgs/sitemap.html http://www.icisociety.ca/	This site introduces the Cadastral Base Mapping Section responsible for the creation of the Integrated Cadastral Fabric, its data model and standard operating procedures. The ICI Society site describes governance, access, partnership structure, and related rules and policies.
Alberta	http://www.altalis.com/	The AltaLIS website offers a comprehensive description of cadastral mapping products with pricing, metadata
Saskatchewan	http://www.isc.ca/LAND/gis_public/scripts/gisMetadata.asp?entry=CADASTRAL	This site of the Information Services Corporation, contains detailed directions for obtaining data and provides metadata information regarding accuracy, currency, etc.
Manitoba	http://web2.gov.mb.ca/mli/about_us/projectdetails.html	This website explains the mission and intent of the Manitoba Land Initiative but does not provide a status on the project and its products.
Ontario	http://www.lio.mnr.gov.on.ca/dataprojects.cfm http://www.ontarioparcel.ca/english/index.htm	This site, through Land Information Ontario, leads to a description of the Ontario Parcel Alliance which is a private/public partnership formed to create and manage the Ontario Parcel database. This is the Ontario Parcel website contains details regarding information access, product definition, metadata, many details in a FAQ format.
Quebec	http://www.mrnfp.gouv.qc.ca/english/land/cadastre/index.jsp	Website of the Cadastral reform process that describes the state of the Province's cadastre and gives some examples of the final product now being constructed.
New Brunswick	http://www.snb.ca/e/1000/1008e.asp#3	Registry and Mapping Services of the Services New Brunswick corporation provides access to cadastral maps for every parcel in the Province. Fee structure is described.
Nova Scotia	http://www.gov.ns.ca/snsmr/land/products/property1.asp http://www.gov.ns.ca/natr/land/surveysgis.htm	Service Nova Scotia provides digital sales and access to property maps for the whole province from a cadastral fabric developed some years ago. Prices and directions to distribution centers are included. The GIS and Cartography section of the Natural Resources Ministry maintains the cadastral database digitally. No details on specs or metadata. Contact identified.
Prince Edward Island	http://www.gov.pe.ca/pt/taxandland/index.php3?number=73956&lang=E http://www.gov.pe.ca/infopei/onelisting.php3?number=14964	This site describes the creation of property maps that are available. Not sure if the product described is contiguous for the Province. InfoPEI website. No detailed info on product.
Newfoundland	http://www.gov.nl.ca/env/lands/sm/geomatics_strategy.html	Progress report from the Surveys and Mapping division on geomatics work with Geoconnections. No details of product specs or services.
Edmonton	http://www.edmonton.ca/portal/server.pt/gateway/PTARGS_0_2_104_0_0_35/http%3B/cmsserver/COEWeb/roads+and+traffic/roadway+design+and+mapping/digital_products.htm	This page identifies various products from the roadway design and mapping department, with prices- including cadastral parcels. No specifics on specs, metadata, etc.
Calgary	http://www.calgary.ca/cweb/gateway/gateway.asp?GID=365&CID=203&URL=http%3A%2F%2Fcontent%2Ecalgary%2Eca%2FCCA%2FCity%2BHall%2FBusiness%2BUnits%2FLand%2BInformation%2Band%2BMapping%2FGeomatics%2FCadastral%2BMapping%2Ehtm	This page describes in summary form, the various digital cadastral and cadastral related products that are managed by the City. The page does not give the details of the specs, data model, metadata or other detail.
	http://gis.esri.com/library/userconf/proc01/professional/papers/pap697/p697.htm	Development of a Municipal Spatial Information Management Process Infrastructure at the City of Calgary, a paper written by Gord Rasmussen, and Michael C. Szarmes.

APPENDIX 7: LETTER OF INTRODUCTION

Dear *<base mapping representative>*,

Fujitsu Consulting is conducting a cross-Canada survey of base mapping processes for each province. The results of this survey will be made available to survey participants.

In order to do this we are performing a series of interviews with representatives from each province asking a series of questions about the status of topographic, cadastral and geo-administrative mapping. The questions will be of a business and technical nature and the process will take less than an hour to complete.

Your name was identified in the Canadian Council of Geomatics (CCOG) reports, and we are asking for your help in identifying people in your jurisdiction that we should be talking with. A list of some of the interview questions is provided below to help you understand what we are interested in.

Sample Questions:

Topographic Base Mapping:

- What is the extent of Provincial coverage in large and small scale mapping?
- What is included in the datasets?
- How are these datasets maintained?

Cadastral Mapping:

- What is the extent of Provincial coverage in urban and rural cadastral mapping?
- Is the coverage integrated and contiguous?
- What are the various accuracies (positional/absolute, relative)?
- Is maintenance fully implemented? If so, what is the lag time on currency?

Other Mapping:

- Do the base mapping programs tie in with other programs? If this is the case, what are some of these programs and how are they integrated with the base mapping programs?
- Is there a mapping program for administrative boundaries? If so, how many boundaries come under that program?
- Any other "value added" mapping (such as title mapping, road mapping, etc.) in support of the above?

For all Datasets

- What are the policies on access, distribution, pricing and value added reselling?

We will be following up with you within the next week to obtain the list of contacts. Thank you in advance for your help, we look forward to talking with you.
If you would like to send us the list of contacts please address your email responses to
Vern.Danes@consulting.fujitsu.com or by telephone at (250) 708-2263.

APPENDIX 8: ASSESSMENT CRITERIA

The following tables define the criteria used in performing the cross-jurisdictional base mapping assessment. The assessment criteria are based on the assessment categories originally identified in the RFP and the initial kick-off meeting with SDW/AltaLIS.

The assessment criteria are designed as much as possible to support comparison of base mapping programs across jurisdictions. This is partly achieved by attempting to classify many of the anticipated responses into a pre-defined list. In addition, the criteria have been used as the basis for the questionnaires and interviews with the jurisdictional dataset contacts.

Assessment Criteria	Expected Values	Description
Base Mapping Agency Structure and Infrastructure Model		
Owner/Custodian	Agency Name	The agency recognized as owner or custodian of the dataset.
Maintained By	Agency Name(s)	The agency or agencies responsible for maintaining the dataset.
Distributed By	Agency Name(s)	The public or private sector agency or agencies responsible for distributing the dataset to end-users.
Accessible By	Agency Name and Industry sectors	Identification of the key agency names or industry sectors who have access to the dataset products and services.
Governance model (for cadastral and topographical mapping)	• Single Agency (Public) • Multi-Agency (Public) • Public/Private Partnership • Fully Private	The type of organizational and policy setting framework governing all aspects of building, maintaining and distributing the dataset.
Lifecycle Stage (for cadastral and topographical mapping)	• Not built • Partially built • Fully built (i.e. complete) • Updated • Upgraded	An indication of the stage in the lifecycle of the dataset on the assumption that a dataset moves from an initial build stage to a maintenance stage that may include upgrading as well as updating. Partially or fully built datasets should be reflected in the value provided for 'level of completeness' in the data quality section. Datasets where update or upgrade programs are in place should be reflected in the data maintenance and data quality sections respectively.

Funding Model (for cadastral and topographical mapping)	Who pays, in what relative proportion and under what terms and conditions
	• Public agencies
	• Data users
	  • Via product sales
	  • Via fees
	  • Via subscription
	• Private sector
		The agency or agencies responsible for funding the initial building and ongoing maintenance of the datasets.
		
		The funding model may include various participating groups under various types of contractual arrangements or agreements including public agencies, private sector organizations, or end-users in the form of revenue from licenses, subscriptions or other fees.
		
		The funding model may be different depending on the lifecycle stage of the dataset. For example, the level of participation and arrangements between agencies may be different during the maintenance stage than during the initial build stage.

Data Parameters		
Geographical Area	• Whole province • Description of Area	The area to which the information gathered applies.
Data Structure (for administrative boundaries and cadastral mapping)	• GIS-based • CAD-based	The fundamental structure of the data or the type of platform used to manage the data.
Data Capture Method (for administrative boundaries and cadastral mapping)	Coordinate geometry Digitizing Scanning	A description of the method used to capture the data.

Assessment Criteria	Expected Values	Description
Absolute Accuracy	Range or tolerance	The relationship of a point in the dataset to its true or actual location.
Relative Accuracy (cadastral and topographic mapping)	Range or tolerance	The relationship of a point in the dataset to other points in the dataset in proximity.
Included Layers (for cadastral and topographical mapping)	Identify and list major layers.	The data layers or themes included in the dataset
Topologic Cleanliness (for administrative boundaries and cadastral mapping)	• High • Medium • Low • None	Whether the data is topologically accurate and consistent. The existence of line overshoots or undershoots, or overlaps or slivers in the dataset would indicate a low level topological cleanliness. • High – high level of topologic consistency • Medium – some topologic consistency but some errors • Low – many known topological errors • None – dataset is not topologically consistent
Program for Improving Data Quality	• Inclusion of new information • Error detection & correction • Positional quality improvement • Currency improvement	Programs to upgrade the quality of the dataset over time. The dataset can be enhanced with the inclusion of new information, formal processes for detecting and correcting errors on in the data, or for improving the positional accuracy or currency of the dataset.
Attributes of Parcels (for administrative boundaries and cadastral mapping)	• Unique ID • Legal description • Assessment number	List of attributes carried by parcel polygons.
Source Document Type	• Survey Plans • Legislation (OIC) • Aerial photos	Identification of the source of data for the mapping layer.
Ownership and Legal Parcels (cadastral mapping)	• Synchronized in same layer • Synchronized in separate layer • Not synchronized	Indication of how the ownership parcels are recorded relative to the legal parcels.
Data Status and Maintenance		
Status of Build (cadastral and topographical mapping)	• Fully built • Partially built • Not built	Indication of completion of the mapping dataset.
Status of Maintenance (cadastral and topographical mapping)	• Continually updated • Partially updated • No Maintenance	Indication of the degree of maintenance.
Maintenance Process	• Fully automated • Partially automated • Manual process • Not maintained • Centralized • De-centralized	The types of processes employed to maintain the data, particularly with regard to data updating, and whether the processes are centralized or de-centralized.
Currency of Data by Layer	List of layers with currency expressed in days, months or years.	The level, currency, or obsolescence of the data layers.
Update Source (topographical mapping)	• Aerial photos • Other mapping products or imagery	The source of information for updating topographic mapping.
Cost to Maintain (administrative boundaries and cadastral mapping)	$ per plan $ per km^2	The unit cost to maintain the data. In many jurisdictions the costs may not be tracked.

Assessment Criteria	Expected Values	Description
Update Tools (cadastral mapping)	• CAD • GIS • Custom • Other with description	The tools used to perform updates to the cadastral base map.
Digital Submission Requirement Fee (cadastral mapping)	$ per plan	Where digital survey plans are submitted and a fee is charged to update the base map, the amount of that fee should be noted.
Georeferencing (cadastral mapping)	Yes or No	Indication of whether plans are georeferenced.
Tie to Control (cadastral mapping)	Yes or No	Indication of whether or not plans are tied to survey control.
Data Access		
Access Methods	• Web (i.e. online) • Over the Counter • Hard copy request • Other	The methods by which end-users can gain access to the various products and services available for the dataset.
Delivery Methods	• File download (FTP) • Online batch • CD • Hardcopy • Other	The options for delivery of dataset products and services to end-users.
File Formats	• DGN/IGDS • DXF • XML/GML • ESRI Shape • ESRI Geodatabase • ESRI E00 • Other	The file formats supported in the delivery of dataset products and services to end-users.
Coordinate Datums	• NAD 27 • NAD 83 • Other (e.g. 10TM)	The geo-spatial coordinate datums supported in the delivery of dataset products and services to end-users.
Map Projections	• Geographic • UTM • Other	The geo-spatial mapping projections supported in the delivery of dataset products and services to end-users.
Product/Service Packages	• Entire jurisdiction • Map sheet • Layer specific • Area specific • Incremental updates • Other product/service packages	The types of packages product/service packages available. Entire jurisdiction means a current and complete version of an entire core data set, such as a map sheet. Incremental updates apply to the mechanisms for the delivery of changes in a core dataset that have occurred over a period of time.
Data Pricing		
Pricing Model (cadastral and topographical mapping)	• Licence • Cost of delivery/processing • No charge	The model used as the basis for setting the pricing level of the data. The pricing model is probably a key component of the overall funding model. • **Licence** – prices set up according to a predetermined value that is based on market demand. • **Cost of delivery/processing** – Prices are set to recover the incremental cost of processing requests for data. **No charge** – The data may be acquired (e.g. accessed and downloaded) at no charge.

Assessment Criteria	Expected Values	Description
Pricing/Licensing Options	• Subscription-based • Product-based • Transaction-based • Volume-based • Industry sector discounts of exceptions (e.g. education sector) • Value-added or embedded discounts • Other (specify)	The types of pricing and licensing options available for the dataset. All the types listed below will imply specific conditions of use to be respected by end-users. • **Subscription-based** – Users pay a subscription fee (monthly or yearly) enabling access to the dataset. • **Product-based** – Users pay a specific amount for a particular data product or service. • **Transaction-based** – Users pay a particular amount for each transaction (e.g. query) requested by them. • **Volume-based** – Users pay a particular amount per unit of volume such as per megabyte of data transferred by per number of updates. • **Value-added or embedded discounts** – Discounts available to end-users in which all or portion of the dataset is combined or embedded with other data or technology to form a value-added data product or service (e.g. street network and address to support the GPS-based navigation industry). Would expect to see a high degree of variability of licensing options within any of the above types across all jurisdictions.
Licenses Issued (cadastral and topographical mapping)	• Matrix showing number of licensed users of the dataset by license type	An estimate of the number of licensed users of the dataset by licensing option.
Data Usage		
Industry Sector Users	• Public • Federal government • Provincial government • Local government • Utility companies • Forestry companies • Energy companies • Land development companies • Survey/mapping companies • Data distributors, wholesalers or VA resellers • Other	Identification of the main industry sectors that are users of the data. If all data is publicly available it is assumed that all sectors have access to the data.
Total Number of End-Users	• Number • Unknown • Group Name	**Number** - An estimate of the number of end-users of the data set in known. **Group Name** – The name of the business group, if data is available only to members of a data sharing group.
Percent of Industry Users (administrative boundary mapping)	• Sector & percentage	An estimate of the proportion of the end-users by industry sector.
Prices by Boundary Type (administrative boundary mapping)	• Monetary value	The value for an annual subscription, map sheet, megabyte or other unit of sale.