

# **LAND-RELATED DATA MODEL**

**GOVERNMENT OF THE YUKON  
ENERGY, MINES AND RESOURCES, CANADA  
INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, CANADA**

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## MANAGEMENT OVERVIEW

### Introduction

With the increased awareness of issues surrounding devolution, land claims negotiations, and the availability and disbursement of Yukon land, Geographic Information Systems (GIS) have been a topic of great interest within and between the Federal and Territorial governments. As part of the on-going efforts to coordinate the activities of both governments in this area, this project has developed a framework and proposes a process for furthering coordinated developments.

The basis of the framework is a model of the land, resource and infrastructure data collected and used by the governments. Well over 100 data types have been documented, most of which are shared within and between the sponsoring governments. This suggests that the development of applications designed to facilitate the sharing of land-related data will provide opportunities for short and long term cost-savings and more streamlined government processes. Implementation of the applications described in this report will result in improved service to the public in areas such as land and resource management.

### Objective

The primary objective of this project was to identify, model, and classify the land-related data used in the business functions of the Government of Yukon and three agencies within the Federal Government.

### Results

The results of the interviews and analysis conducted during this project indicate that:

- There are many parallel activities between the federal and territorial governments, such as the evaluation of land-use permit applications and the management of mineral and wildlife resources.
- The same data may be collected by several agencies due to a lack of knowledge of where to find it, or because the data resides somewhere else but are incomplete. This has resulted in data collection activities for a single subject area to be duplicated and distributed among several different agencies.

### Proposed Initiatives

The following four initiatives are proposed for system development, increasing the availability of data, and administering the land-related data model. The first two initiatives listed below have been identified as requiring a combination of internal and external resources, while the following two will require resources from both governments.



- 1) **Land Interest Management** - Focussing on land interest (title, lease, licence, ...), detail the functional requirements for developing a computerized land interest application, and generate a specific plan for testing and prototyping the department of Energy, Mines and Resources' RESULTS land-management application. Estimated duration and cost: 8 weeks, \$40,000.
- 2) **Resource Management** - Focussing on resource information (minerals, forestry, fish and wildlife, ...) examine the alternatives for a co-ordinated systems development approach to resource management, recommend a feasible solution and propose concrete steps for implementation. Estimated duration and cost: 8 weeks, \$40,000.
- 3) **System Development Framework** - It was identified that three areas of expertise must be balanced for effective implementation of land-related information systems: the client's business, geographic information, and information systems. This activity proposes that policies and procedures be developed and adopted which ensure a consistent approach across both governments for land-related information system development. This should be addressed by July 31, 1993

Because of their existing coordinating role, it is proposed that the Yukon Geographic Information Systems Coordinating Unit (YGISCU) be responsible for the implementation of this action. The existing management structure should be examined to determine whether representatives from the client, geographic information, and information systems are included in YGISCU's steering committee and management committee. Further, it will be necessary for the YGISCU team to ensure that representatives from all three areas participate at the working level. An outline and skeletal draft of the framework should be completed by July 31, 1993.

- 4) **Examine the opportunity and costs associated with digitally converting a subset of the 1:50,000 NTS map sheets as well as improving the existing digital 1:250,000 sheets.** These map sheets are frequently used by government agencies as a reference base and can be distributed in digital form to support the disciplines who are currently using the paper form but wish to move to digital data collection and analysis. This opportunity evaluation is an internal government effort which may take several months to complete.

## Benefits

By implementing the proposed initiatives, the following major benefits will be realized.

- Continued efforts for federal, territorial and other non-government agencies to co-ordinate, co-sponsor and co-fund future application development will facilitate and reduce the organizational impacts and financial aspects of devolution. It will also provide a mechanism for skills transfer and provide an understanding of the business functions for the new custodians of the devolved programs. The efforts of both government bodies will also provide a common information basis that will be valuable for the land claims process.

- During times of fiscal restraint by all levels of government, cost-sharing and co-ordinated incentives are the only viable means of formulating an overall implementation strategy that includes the construction of operational systems.
- The limited population base and individuals with the specialized skill sets required for land-related systems development in the Yukon dictates that for economies of scale, joint ventures are the most cost-effective and efficient means of providing these services and delivering applications.
- The proposed incremental or phased approach for land-related systems development means that one massive and costly GIS implementation is not required. Applications can be planned and developed as budgets allow. Simultaneous development in different and independent application areas may also take place as long as co-ordination is the key.





## SECTION 1 INTRODUCTION

### 1.1 Introduction

With the increased awareness of issues surrounding devolution, land claims negotiations, and the availability and disbursement of Yukon land, Geographic Information Systems<sup>1</sup> and land-related data<sup>2</sup> (e.g., land title, lease, minerals, wildlife, vegetation and highways) are topical areas of great interest within and between the federal and territorial governments. As part of an ongoing initiative to integrate the efforts of both governments in this area, a project was initiated to examine the possibilities of coordinated applications development. The Land-Related Data Model project was sponsored and staffed by a number of different stakeholders from both governments. The Departments of Renewable Resources, Community and Transportation Services, and Government Services from the territorial government, as well as the Legal Surveys Division of Energy, Mines and Resources (EMR) from the Government of Canada and the Yukon Geographic Information System Coordinating Unit (YGISCU) financially contributed to the project. This report presents the findings of this joint initiative.

This section of the document identifies the objectives, scope, and major project participants.

The primary function of the team was to gain an understanding of the data and the business objectives of the two governments in terms of land-related functions. These are presented in Sections 2 and 3 respectively. Models of the data and the business functions resulting from these sections were combined and analyzed to determine common areas where joint application development is warranted. This is presented in Section 4.

In order to successfully implement the applications described in Section 4, an organizational framework is required. Such a framework is proposed in Section 5.

In Section 6, a set of actions are recommended which relate to specific development projects, maintenance of the models developed in this project, and procedures for making land-related data more available and accessible.

A number of Appendices and a Glossary provide supporting material for the reader.

As of April 1, 1993, the YTG Systems and Computing Services (S&CS) group was renamed the Information Services Branch (ISB). It is referred to by its new name throughout this document.

This report has several audiences, ranging from those who need an understanding of the

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<sup>1</sup> A Geographic Information System is computer-based software which supports the capture, maintenance, analysis and display of land-related data.

<sup>2</sup> Land-related data are objects of interest which can be described by a location, and can be shown on a map.



direction and recommendations to those who require the detail necessary to carry on with further development work. For those requiring an overview of the project, Sections 1, 5 and 6 are of most interest. The more detail and technically oriented reader will find Section 2, 3 and 4 of value.

## **1.2 Background**

In the last quarter of 1991, the Government of Yukon initiated a series of Information Resource Management (IRM) studies to identify an appropriate overall strategy for integrating information technology with government goals and objectives. During the initial study, Geographic Information Systems (GIS) were identified as potential tools to support government business functions. Subsequent studies recommended that GIS and land-related data be pursued as an opportunity to implement a common system throughout the organization. A common system in this area could capitalize on the management, use and sharing of land-related data to reduce redundancy in data collection and management, improve data sharing and reduce the costs associated with the implementation and operation of land-related applications. This project begins to examine the approach for the implementation of a common land-related system.

The Yukon Geographic Information System Coordinating Unit (YGISCU) (see Appendix C for information on YGISCU) identified that a considerable amount of land-related information is shared between the Government of Canada and the Government of Yukon. For this reason, it was determined by the project sponsors that a joint data modelling exercise would be useful. While this project examined all land-related data for the Government of Yukon, its scope only included the federal agencies of the Northern Affairs Program (NAP) of the Department of Indian Affairs and Northern Development (DIAND), the Legal Surveys Division (LSD) of Energy, Mines and Resources (EMR), and the Canadian Wildlife Service (CWS) within Environment Canada.

The IRM initiative developed a Government of the Yukon Strategic Plan for the implementation of information technology. The Strategic Plan offers two distinct types of information to the team. First, it provides a framework and scope for the data and business functions to be examined. Second, it describes a set of principles which helped to guide the formulation of applications and actions. This second type of information, while derived from the strategic plan, was developed using common information system technology concepts and were assumed to be generally applicable to the federal government as well.

## **1.3 Objectives of the Land-Related Data Model**

The primary objectives of this study were to:

- identify data and information requirements needed to support government goals, strategies, and business functions related to land, resources and infrastructure, through the completion of a corporate land-related data model for the Federal and Yukon governments; and

- make recommendations towards the development of a comprehensive strategy for developing integrated, cost-effective land-related data information system solutions which will respond to changing requirements, accommodate future growth, and incorporate proven, new and existing technology.

As part of this project, several secondary objectives were met, including:

- the transfer of data modelling skills to project analysts;
- the development of departmental and agency data models as well as data dictionary definitions; and
- the development of a common understanding by the project team of how both governments use land-related data.

#### **1.4 Project Scope**

This project had the primary purpose of identifying the land-related information used to support the operations of the Government of Yukon and the regional operations of three agencies of the Government of Canada. The information was used to develop proposals for the sharing and use of data within and between all participants.

The activities described by participating departments and agencies were used to facilitate the development of a corporate data model. It was not within the scope of this project to model a detailed representation of each land-related function, or to define the actual processes or data flows. There was no expectation that this project would develop a model for every land-related data entity used by the project participants.

#### **1.5 Project Participants**

This project was conducted in-house and facilitated by a consultant with expertise in the modelling of land-related data. Enthusiastic involvement by staff from YGISCU, ISB, Renewable Resources, Northern Affairs Program, and EMR contributed to the success of this project.

This project was supported by a number of individuals from departments and agencies who participated in interviews, validated data definitions and reviewed the models. The team expresses their gratitude to these individuals for the support they so willingly gave. They are listed along with the team members in Appendix A.

## SECTION 2 LAND-RELATED DATA MODEL

### 2.1 Introduction

Data modelling is a process which involves identifying and structuring the data of an organization. The goals of data modelling are:

- to establish a common language for land-related data;
- to turn the knowledge of a few into public knowledge;
- to work out a structure for the organization's data and to document it; and
- to control data redundancy;

#### *Tools and Techniques*

The data model is a representation of objects (people, places, things) and relationships between these objects. In this project, the MERISE entity-relationship diagramming technique, was used.

It presents objects in rounded boxes, and relationships in ovals. Arrows indicate which way to read the model, and in no way implies a flow of data.

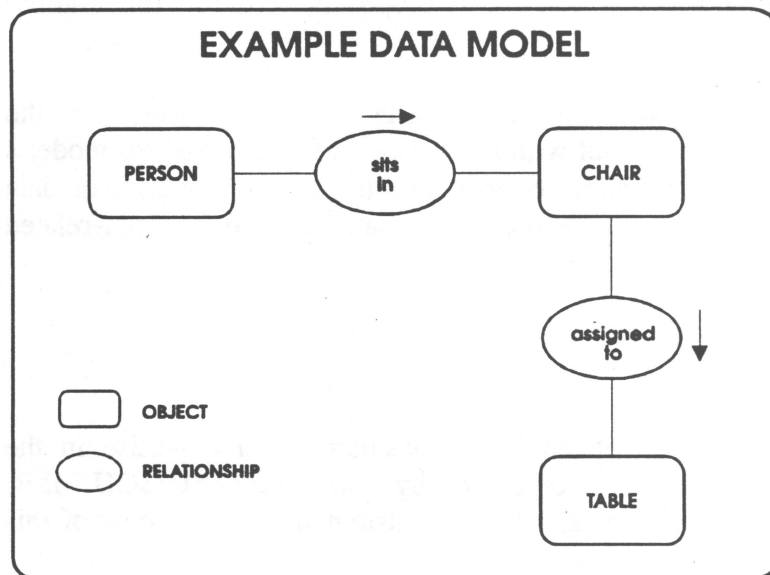


FIGURE 2-1.

In order to illustrate to participants how a data model is read, a simple example was developed. The diagram in Figure 2-1 shows that:

a person may sit in a chair;  
a chair may be sat in by a person;  
a chair may be placed at a table; and  
a table may have chairs placed around it.

Additional information can be added which further explains the relationship. These are called cardinalities. This additional information was added, where possible, in the models described in Appendix B. Further information regarding cardinalities and their impact on the models is also described as part of Appendix B.

The model and the corresponding data definitions are stored in a data dictionary. A data dictionary is a formal description of each object (entity) of interest. An entity refers to a class of objects that are described by the same set of attributes. The data dictionary identifies the name of the entity, its key attributes, the number of objects, its rate of increase in numbers, the relationships with other entities, and in the case of land-related data, it identifies whether the entity will be represented as a point, line, area, or volume. It is important to keep this information accessible, and to use it and update it as further studies and development projects are undertaken.

### *Data Model Development Approach*

Data modelling progresses from the general to the specific. The IRM Strategic Plan produced the highest level of model, called the Subject Area Model, shown in Figure 2-2. This project adds detail to the Land-Related subject area. The Land-Related subject area is partitioned into subjects which represent a focus of general interest. Subjects are further partitioned into facets which describe a particular aspect of the subject. The next partitioning identifies entities which represent a particular class of objects that are described by the same attributes.

This project focussed on the subject and facet levels, with some efforts directed toward major land-related entities. The development of the data model followed a three stage process:

First, a review of background documents and follow-up interviews was held with representatives from the Government of the Yukon (all departments and agencies), and the Federal Government (Energy, Mines and Resources, and selected Northern Affairs Program directorates). A Data Use/Department Cross Reference Matrix (shown in Appendix D) was developed to illustrate the utilization of data throughout the government organizations. This collection of information resulted in draft data models and data dictionary entries for each group.

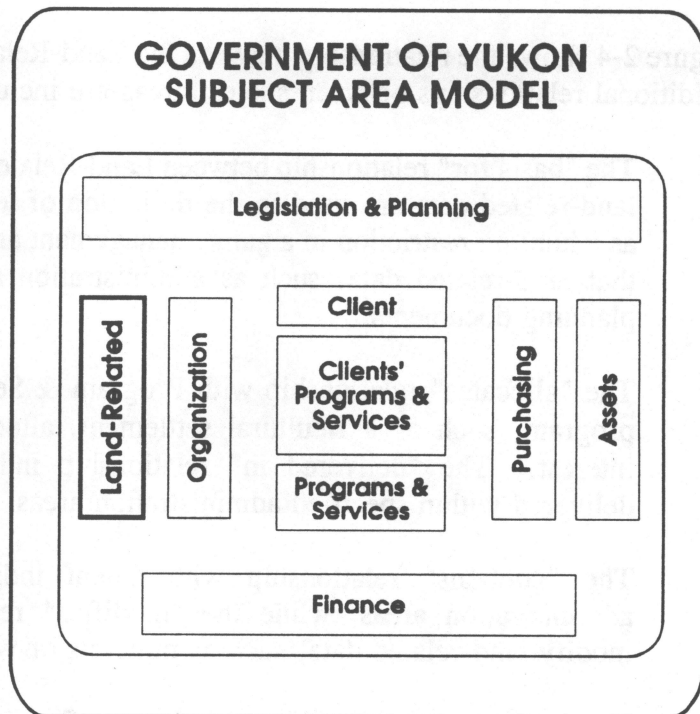


FIGURE 2-2.

Second, the individual models were analyzed and consolidated into a single model, eliminating the organizational influences. The result is a redefined data model for the Land-Related subject



area, including subjects, facets and major entities. These are described later in this Section.

The third stage of the model development was to update the data dictionary to reflect any model changes.

## 2.2 Land-Related Data Model

The Land-Related subject area contains data on land interests, administration areas, resources and infrastructure. These four subjects and their facets are shown in Figure 2-3. Note that the Administration Area subject has only one facet which is also called Administration Area. Important characteristics of land-related data are their shape in two or three-dimensions, their location, and descriptive attributes.

This model is described in three ways: by its relationship with other subject areas; through identification and description of the subjects, facets, and major land-related data entities; and through the identification of entities used to represent shape, location in space and time.

### *Relationship to Other Subject Areas*

Figure 2-4 shows the relationship between the Land-Related subject area and other subject areas. Additional relationships between subject areas are included for clarification.

The "basis for" relationship between Land-Related and Legislation & Planning shows that land-related data are used in the definition of legislation, policies, and directives, such as a hunting restriction in a game management area. The "defines" relationship indicates that land-related data, such as administration areas, are defined within legislation & planning documents.

The "allocates" relationship with Program & Service indicates that data pertaining to a program, such as agricultural settlement, allocates land-related data, such as a land interest. The "delivered in" relationship indicates that programs and services are delivered within specified administration areas.

The "contains" relationship with Client indicates that clients are located within administration areas, while the "modifies" relationship reflects that client activities modify land-related data, such as minerals or wildlife.

The "contains" relationship with Asset reflects that assets, such as a pile of gravel, are contained within administrations areas, such as a highway maintenance area.

During discussions with various participants, confusion arose over the data relationships associated with the granting of an interest in land and the permitting of land or water use. The external relationships between Legislation and Planning, Program & Service and Client serve to clarify those relationships.

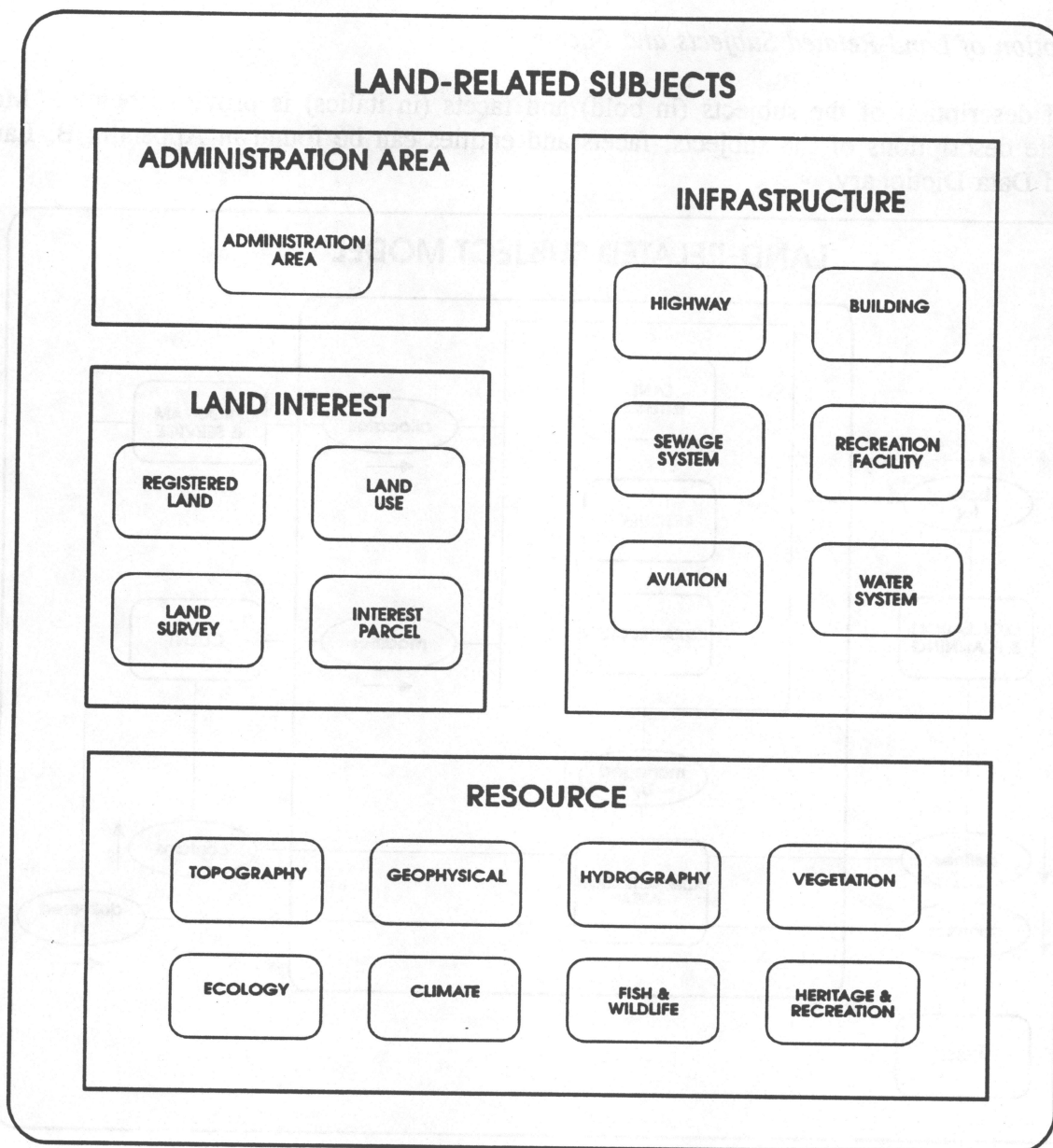


FIGURE 2-3.

An application which requests some form of land interest or land use must be validated using the corresponding legislation and policies (Legislation & Planning). Once validated and approved, an interest or permit (Program & Service) authorizes a client (Client) to conduct specified activities against the allocated land and resources (Land-Related).

### Description of Land-Related Subjects and Facets

A brief description of the subjects (in bold) and facets (in italics) is provided below. More complete descriptions of the subjects, facets and entities can be found in Appendix B, Land-Related Data Dictionary.

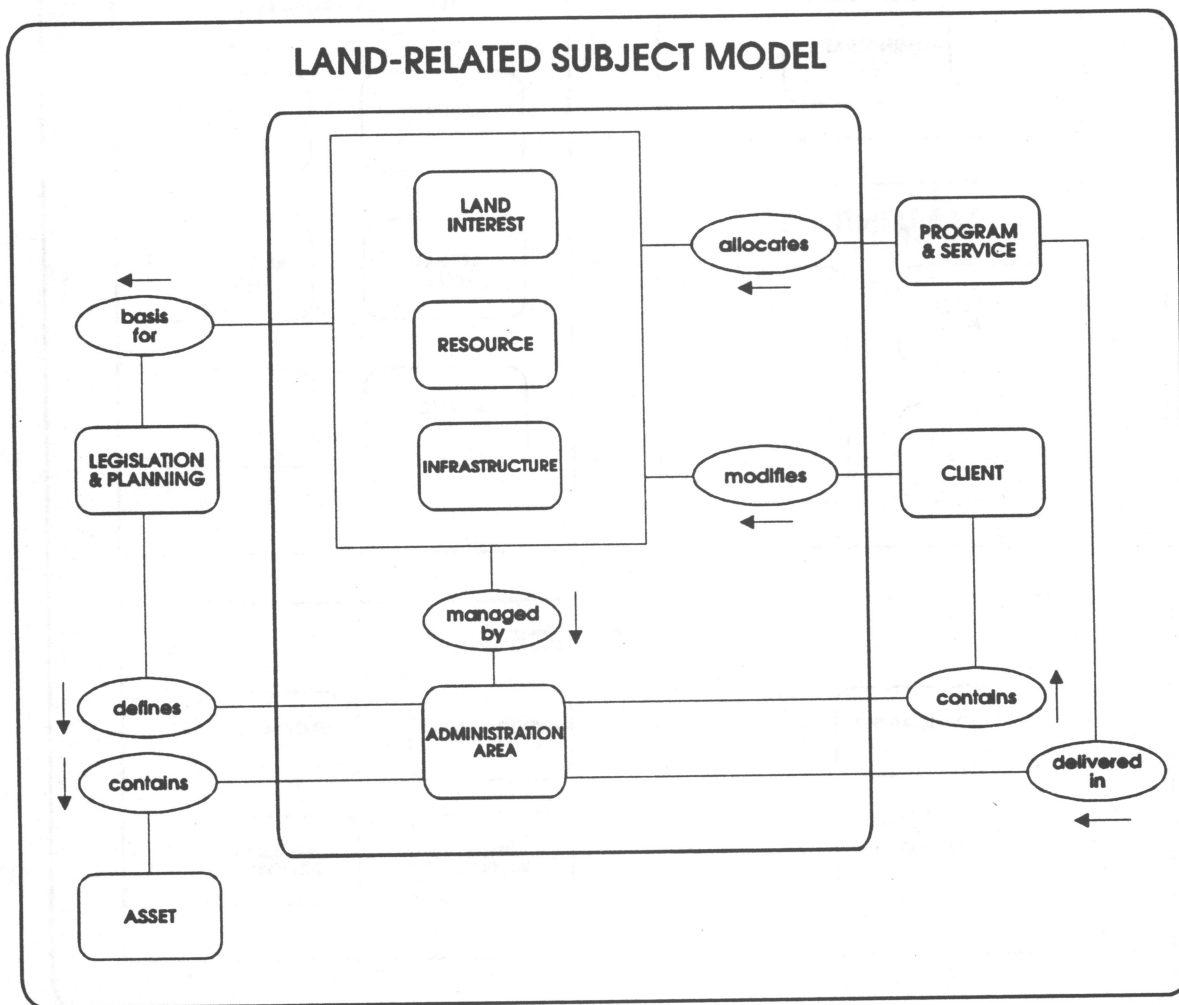


FIGURE 2-4.

### Administration Area

This subject area is comprised of only one facet bearing the same name (Figure 2-5).

#### Administration Area

This facet contains data on an area of land having explicitly defined boundaries defined for the purpose of administering programs, monitoring change and regulating activities. Examples of Administration Areas include: local improvement district; game management area; community; traffic route; socio-economic zone; land use

zone; health and social services delivery planning zone; and highway maintenance zone. Administration Areas do not include zones or areas resulting from the observation or interpretation of naturally occurring features, such as vegetation cover or animal habitat.

## Land Interest

This subject includes the data required to register an interest in land (Figure 2-6). It includes the description of land parcels, the survey foundation required to properly describe those parcels, as well as the registration of land and the rights associated with the registration.

### *Registered Land*

This facet contains data on the rights or ownership status of a parcel of land. It may include additional information such as when the land interest was granted and for what period, associated documents, and limitations or restrictions. Entities in this facet include: title, lease, licence, agreement for sale, reservation, notation, withdrawn land, and mineral claim. Registered Land often refers to an Interest Parcel.

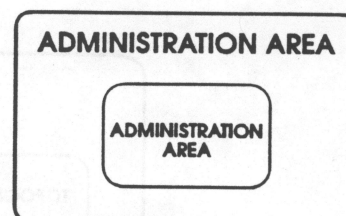


FIGURE 2-5.

### *Land Use*

This facet contains data about the area of land that has been designated for use by the authorization of a land or water use permit.

### *Land Survey*

This facet contains control points, survey plans and data used for defining the legal extent of Interest Parcels. Entities which fall under Land Survey include geodetic control point, land survey point, land survey line and cadastral plan.

### *Interest Parcel*

This facet contains data on an area of land for which a person or corporation may hold an interest. Entities included in Interest Parcel are: right of way, cadastral, easement, and sub-surface. Interest Parcels need not be surveyed. They may be described or defined through legislation, such as a highway easement.

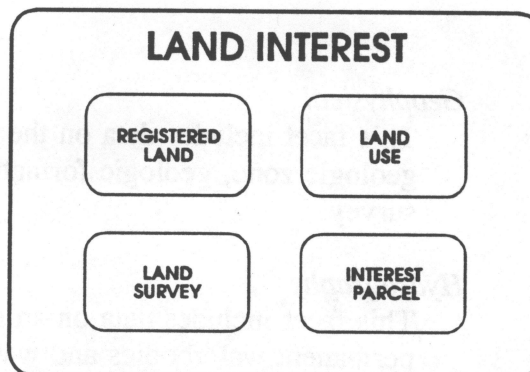


FIGURE 2-6.



## Resource

This subject deals with the natural resources contained in the Yukon (Figure 2-7). A resource occurs naturally, and may be managed to ensure benefit to current and future generations. A resource can be renewable or consumable, and it may or may not have commercial value at a given point in time.

### *Topography*

This facet contains data regarding the shape of the surface of the earth, characterised by elevation, slope, and slope orientation (aspect). Topography is characterized by elevation models, which are represented by spot heights, contours and other special techniques (i.e., Triangulated Irregular Networks and Digital Elevation Models).

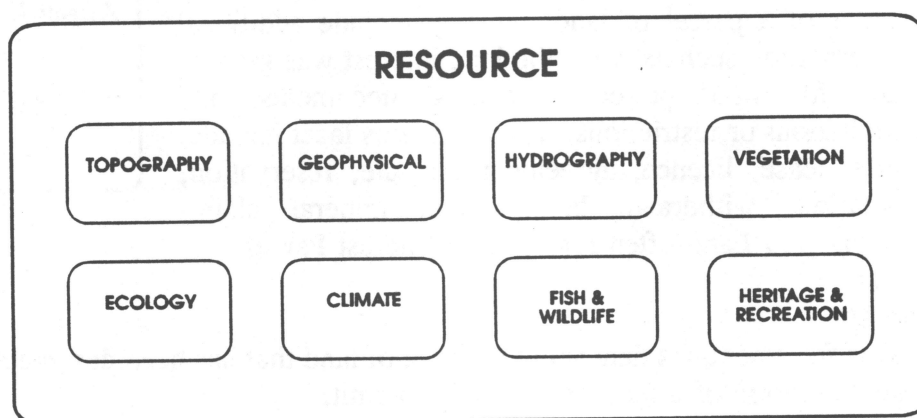


FIGURE 2-7.

### *Geophysical*

This facet includes data on the composition of the earth, including data on geologic zone, geologic formation, geologic survey, quarry, soil cover and soil survey.

### *Hydrography*

This facet includes data on an extent of land covered by intermittent and permanent waterbodies and watercourses, including ice, rivers, lakes, streams, snow, ice survey, water survey, and snow survey (snow accumulation, depth, density). This facet also contains data about the flow rates and qualities of water and watercourses.

### *Ecology*

This facet integrates data on vegetation, water and surficial geology. Types of ecological areas include ecological region, ecological district, and ecological section.

### *Vegetation*

This facet contains data pertaining to plant location, development and growth. Data on vegetation include vegetation cover, vegetation survey, timber stand and forest fire. Forest fire is included because it has a direct impact on vegetation cover.

### *Climate*

This facet contains data on various meteorological conditions of the Yukon, such as temperature, atmospheric pressure, humidity, precipitation, cloud cover, and wind speed and direction.

### *Fish and Wildlife*

This facet includes data pertaining to types, populations, distributions and use of fish, wildlife and migratory birds, including habitat and harvest.

### *Heritage and Recreation*

This facet includes data on artifacts and heritage sites in the Yukon. Data on Heritage and Recreation include archaeological site, historic resource, recreation cover and park land.

## **Infrastructure**

This subject includes structures which are established to facilitate human occupation of the earth (Figure 2-8). The land or land interest related to the infrastructure is included in the Land Interest subject described above.

It is recognized that other infrastructure, such as rail, telecommunications, electric, and cable television could be included here. However, only government sponsored infrastructure is within the scope of this project. It is valid to assume that these additional infrastructures would have similar data structure and relationships as the Highway facet described below.

### *Highway*

This facet contains data on the physical structure of the vehicular transport network and allows for the management of an area of land designated for use as a passage way. Data on highway includes highway (bridges, ferries), road, trail, highway inspection, traffic survey and accident information.

### *Building*

This facet includes information on structures which provide shelter from the natural elements. A building may be used for residential, commercial, industrial, agricultural, social or recreation activities.

### *Water System*

This facet includes those entities which together supply consumers with potable water, such as water main, pumping station and intake.

### *Sewage System*

This facet includes those entities which together allow the collection and treatment of industrial, commercial and residential

sewage. Examples of entities in this facet include sewage effluent site, sewage treatment plant, and sewer main.

### *Recreation Facility*

This facet includes entities describing a feature of interest used for recreation purposes. Example include, a rock wall for climbing, a river stretch for rafting, and a highway pull-off for viewing.

### *Aviation*

This facet includes data regarding community and territorial airports and runways. Airport buildings are not included in this facet as they are a part of the Building facet. Data on Aviation includes airport inspection, and air traffic survey.

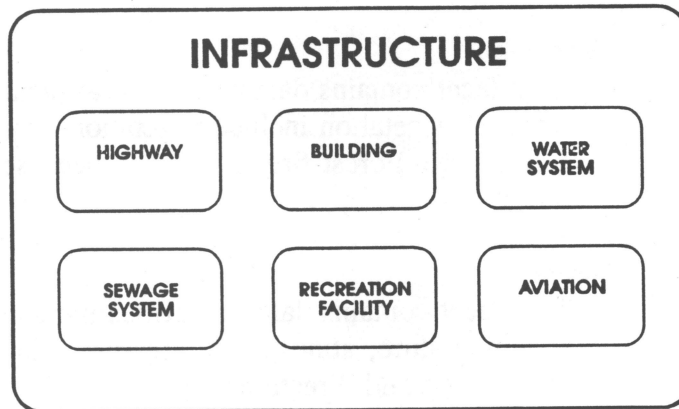


FIGURE 2-8.

## **2.3 Representation of Shape, Location in Space, and Time**

The following facets are used to represent the physical storage of land-related entities (Figure 2-9). While the data descriptions to this point have referred to objects of interest (e.g., land parcel, wildlife, ...), this group refers to how the objects are stored in either a manual or automated system.

### *Geographic Reference*

This facet supports the organization of data according to location. The most commonly used geographic reference entity is the National Topographic Series (NTS) map boundary. Other map boundaries would be included in this facet, as would latitude, longitude and UTM coordinates.

### *Spatial Description*

This facet includes the geometry to describe the shape of a land-related entity. The shape of an object must be described as a point (e.g., rock wall), a line (e.g., water main), an area (e.g., electoral district), or a volume (e.g., mineral deposit). Lines, areas and volumes are defined by a set of points.

### Representation

This facet includes the entities required to express the representation of a Spatial Description. It shows that a point, line, area or volume can be described in different ways. For example:

- a line could be defined as a straight segment between two end-points (vector), or as a mathematical spline curve through a set of points (function);
- an area could be described by a collection of pixels as in a satellite image (raster), or as an ordered set of lines which form a closed boundary (vector); and
- a point could be described by a coordinate set (vector), or by a textual description (text).

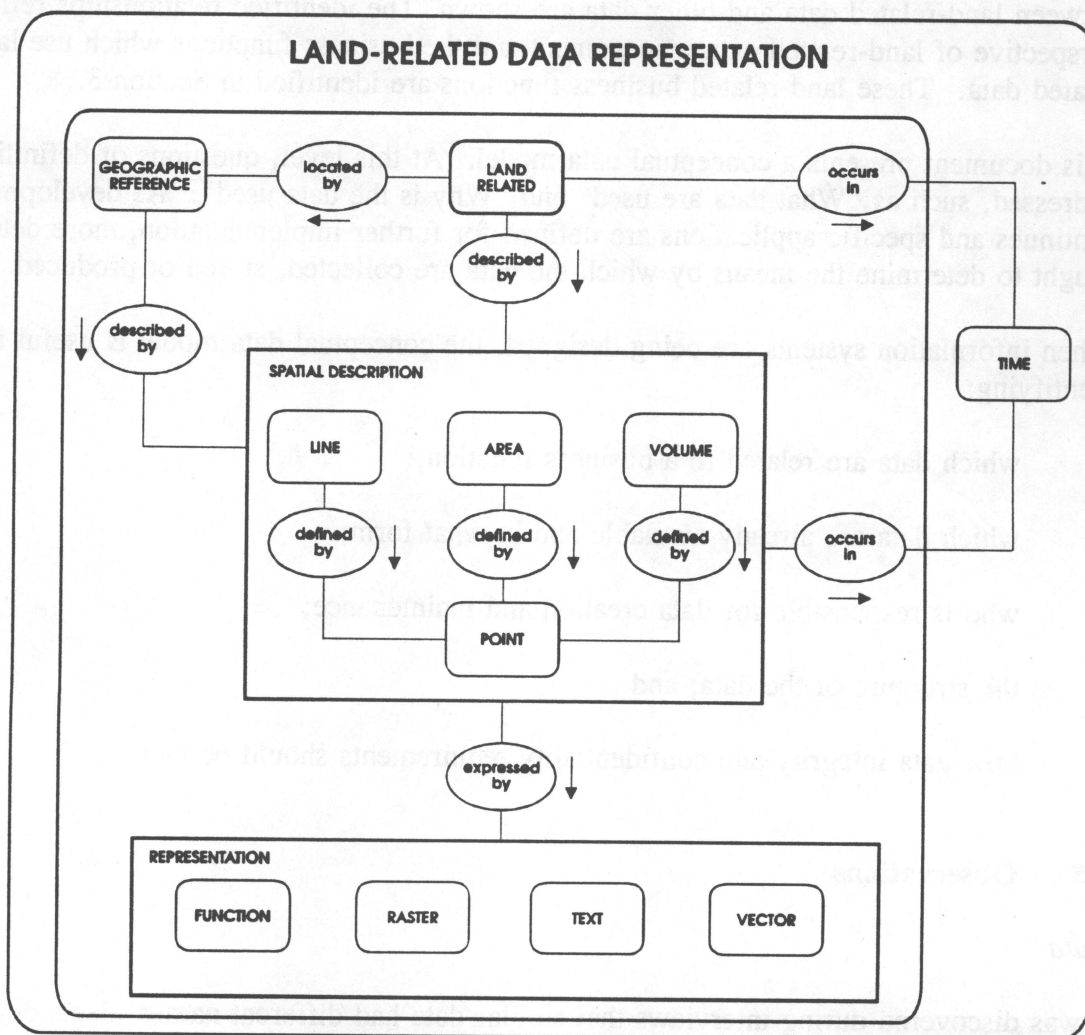


FIGURE 2-9.



### *Time*

Figure 2-9 shows the relationship between land-related data and time. Time is an important element in the business functions of the governments. Including time as part of land-related data supports the objectives of examining and understanding changes over time. It also supports the need to know when an activity took place (e.g., registration of a land interest), or when an action becomes effective or has expired (e.g., land-use permit). Time is depicted outside the Land-Related data model, since it can be used for all other subject areas as well.

## **2.4 The Use of the Land-Related Data Model**

The data model is used to ensure that land-related data, their relationships to each other and to data in other subject areas are recognized and consistently described. Not all relationships between land-related data and other data are shown. The identified relationships reflect the perspective of land-related data management and the business functions which use land-related data. These land-related business functions are identified in Section 3.

This document presents a conceptual data model. At this level, questions of definition are addressed, such as "What data are used" and "Why is the data used". As development continues and specific applications are defined for further implementation, more detail is sought to determine the means by which the data are collected, stored or produced.

When information systems are being designed, the conceptual data model is useful in identifying:

- which data are related to a business function;
- which data are already available and in what form;
- who is responsible for data creation and maintenance;
- the structure of the data; and
- how data integrity and confidentiality requirements should be met.

## **2.5 Observations**

### *Data*

It was discovered during interviews that similar data had different names, depending on the point of view of the participant. For example, "non-vegetation cover" is a term used by vegetation analysts to denote a lack of vegetation in an area. This area could be expressed using other names which are used in other disciplines, such as snow cover, ice, exposed rock

and exposed geology. Access to other discipline data would facilitate the sharing of data, promote the reuse of existing data and provide a more robust and descriptive data set.

Data management practices are of variable quality and impact on the ability to effectively share data. Data stewardship guidelines define the roles and responsibilities of land-related data stewards. As yet, there are no consistent guidelines within any of the groups involved in this project.

The percent annual increase component of the data definition sheets indicates that some data is static (e.g., NTS map boundary) while other data is volatile (e.g., land interest). This will have implications on the risk associated with implementing a single system or multiple systems, primarily due to the data conversion requirements. For example, if the data are static, as in the NTS map boundary, then having several systems replicate that data has low risk, since it is less likely that changes will be made to the boundary definitions. Therefore, the data conversions will be minimal. If data are volatile, the risk is higher, since data interchange will have to take place more often. This requires creating an output file, converting the file into the local format, then using this data to update or replace the existing data. Replacing existing data may require that links to databases be re-established.

No clear and consistent client location identifier was discovered during this project, however several existing data entities may be used as a basis for its development. These include municipality, NTS map boundary, and legal survey designator. During the course of this project, other location identifiers were discovered, such as "north of" and "near" with reference to a point, area, or crossroads. While these descriptions might give the reader a conceptual vision of the location, it is difficult to represent the location in a computer format.

### *Management of maps*

During the interview process, comments were made about the number of different map scales being used to share geographic data. It should be noted that digital data is independent of scale, allowing maps at any scale to be produced. However, if a map is digitized to acquire data, then the accuracy of the data is impacted by the scale and projection of the digitized map. The fact that different map scales may be the source for digital data will have an impact on the integration of manual and digital activities in a business function, but should not impact a function which makes total use of computer technology.

The project team conducting this study deliberated over the inclusion of "map" or any named mapping product as an entity. It was resolved that "map" was not an entity, but rather a collection of land-related data, graphically portrayed in a specific geographic area at a designated scale.

### *Data Dictionary*

The data model included in this report does not yet provide all of the information necessary

for system design, nor was it intended to do so. There is little benefit at this point in fully defining each and every land-related data entity, since there must always be a balance between the data model and the models which describe how the data are used (process models or data flow diagrams). This balance will be achieved in future projects, as applications for the management and use of land-related data are developed.

A number of definition sheets for lower level data entities are in draft form and have not been confirmed. They represent entities which were out of scope of this project, but which were identified during the data gathering phase. They have been captured in draft form (Appendix B) so that they can be used as a starting point in future application development.

## 2.6 Recommendations

### *Corporate Resource*

Land-related data is a corporate resource, is widely shared and is more stable over time than is process. The governments should promote a long term view to land-related data management, ensuring quality, consistency and availability. This is preferable to project specific definitions of data in which no consideration is given to future useability or sharing.

To assist those who support the principles that data is a corporate resource and should be available to everyone subject to confidentiality restrictions, a request should be made to the government informatics groups to provide data stewardship guidelines.

The collection of data should be business driven and evolutionary. This means that data should be collected as it is required to support a business activity (e.g., evaluating a land use permit application, or understanding wildlife habitat). Data should be collected in the area of interest rather than having blanket coverage for the entire Yukon where it is not warranted. In this way, the database will increase in size, and land coverage will expand as the government's requirements for data change. This will assist in the management of costs, while supporting the enhancement to client service through automation.

Plans are required for the overall collection or conversion of data. This plan should include a policy of gradual digital data conversion (convert data as you need it), and continuous improvement in quality. This will support the need for achieving short term results while ensuring that data quality will be enhanced over the long term.

### *Data Dictionary*

One deliverable of this project constitutes the beginning of a Yukon-wide (corporate) data dictionary. The following recommendations support its growth:

- The land-related data model should be used, validated, enhanced and updated as more detailed analyses are performed in future projects. New data may be added to this

model even if the primary focus of an application is not land-related.

- The data dictionary for land-related data should be incorporated in a data dictionary which supports both federal and territorial governments.
- The scope of the land-related data dictionary should be broadened to include the agencies of the federal government which were not included in this project, as well as the First Nations, private utility companies and local governments.
- The models and data dictionary from this project should be entered into a computer-aided software engineering (CASE) tool. The tool should be centrally available for use in future spatial data handling development projects.

### *Client Location Data*

A consistent approach to defining client location should be adopted.

Knowing the location of a client can be an important factor in the planning and delivery of services. The most common location identifier is address, and while this is generally effective, it is not a reliable indicator of location. One reason is that the address may simply be a mailing address and indicate a post office box, or the address of the recipient of communication. It may not describe the location of a client or the location to which a service is provided.

Specifically, location rather than address is important for such activities as assessment, inspections and the development of polling divisions. Currently, narrative descriptions are often used to reference a particular location (eg. "North of" or "beside").

To properly represent these location identifiers within a computer system, some consistency in defining location must be employed, and must be dependent on the level of precision required.



## SECTION 3 LAND-RELATED FUNCTIONS

### 3.1 Introduction

Business functions are the essence of what the government does. They define 'what' the government does separately from 'how' the government does it and 'who' in the government does it. Business functions, therefore, are independent of organization and operation. An organizational unit may perform multiple land-related functions (e.g., C&TS - land management and highways management). Conversely, a function may be performed by multiple organizational units (e.g., the evaluation process for land use permit applications).

The land-related functions are characterized as either managing or analyzing land-related data. Through their identification, an understanding of land-related activities is established and used to identify opportunities for system development.

The land-related business functions described herein are based on and derived from the top level functions identified in the Strategic Plan. Thirty-one land-related business functions have been identified during this project.

A table has been created which illustrates the land-related functions that each agency, department, branch, or section of the two governments perform. The Business Function/Department Cross Reference Matrix is shown in Appendix D.

### 3.2 Land-Related Functions

Due to their generic nature, the top level functions described in the Strategic Plan are used as the basis for defining the land-related functions. Figure 3-1 shows the land-related sub-classification of the top level functions.

#### 3.2.1 Prepare Policies and Legislation Plan and Develop Programs

The functions in this group determine what can be done with a resource, (land being considered a type of resource), and who has rights or interests associated with a resource. This is accomplished through strategic planning activities (e.g., identifying the need for new roads, or developing community plans), and by requesting registration of interest in defined land parcels. These functions require access to all land-related subjects.

##### *YTG Policy Development* *NAP Policy Development*

These functions involve the drafting of new legislation, policies, department mandates and program responsibilities under each government's jurisdiction. Other activities

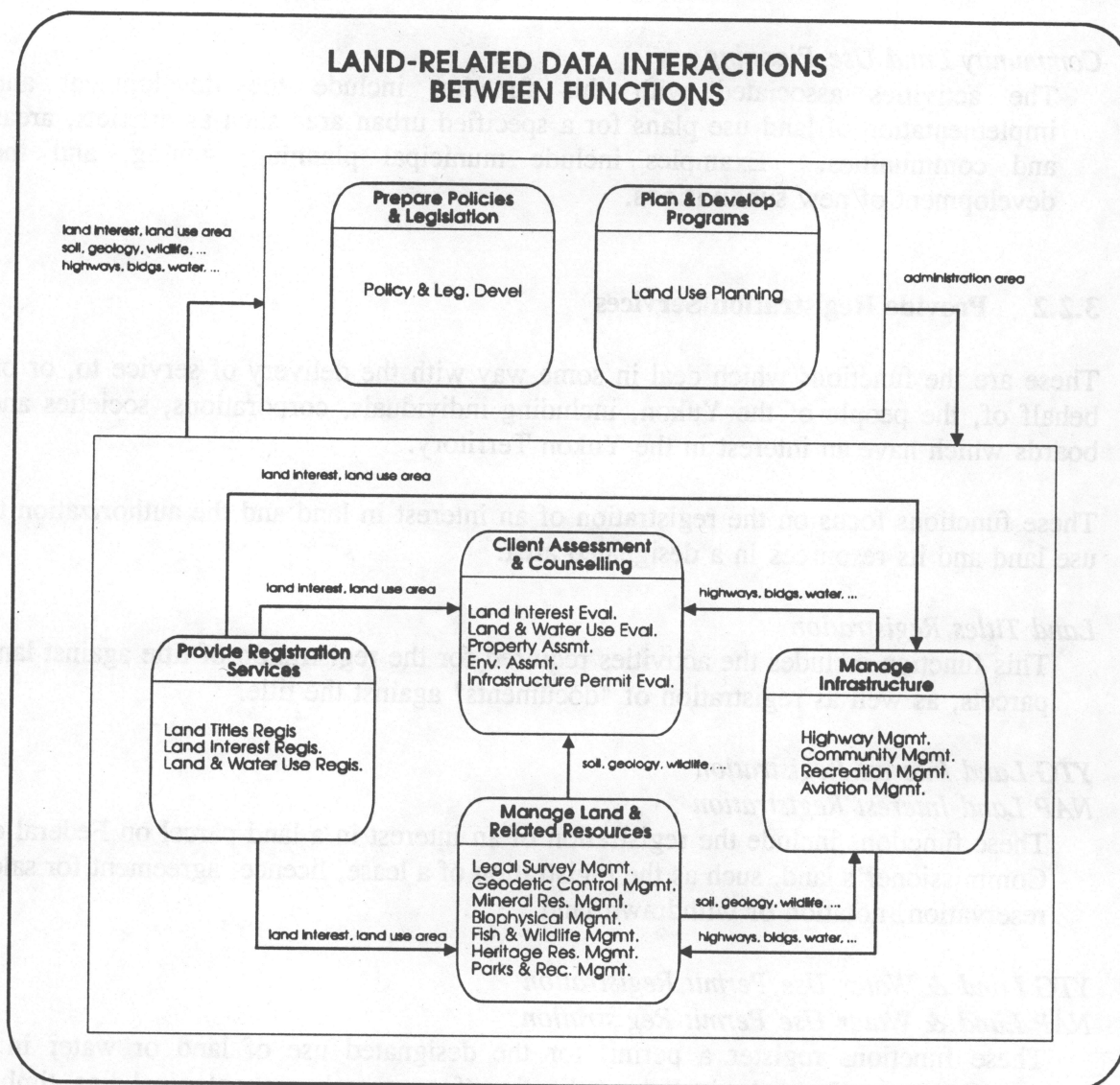


FIGURE 3-1.

associated with this function are the development, coordination and implementation of strategies and policies such as municipal services, land use, land claim negotiations, transportation issues, and emergency measures. These functions define administration areas such as wildlife management areas, electoral districts, and land use zones.

### *Regional Land Use Planning*

The activities associated with this function include planning for the development, conservation and management of the Yukon's cultural and recreational land and resources. Examples of regional land use planning include managing tourism products, identifying areas for use by wilderness operators and identifying restricted hunting areas. Administration area data, such as game management area, are created by this function.

### *Community Land Use Planning*

The activities associated with this function include the development and implementation of land use plans for a specified urban area such as districts, areas and communities. Examples include municipal planning, zoning, and the development of new subdivisions.

## **3.2.2 Provide Registration Services**

These are the functions which deal in some way with the delivery of service to, or on behalf of, the people of the Yukon, including individuals, corporations, societies and boards which have an interest in the Yukon Territory.

These functions focus on the registration of an interest in land and the authorization to use land and its resources in a designated area.

### *Land Titles Registration*

This function includes the activities required for the registration of title against land parcels, as well as registration of "documents" against the title.

### *YTG Land Interest Registration*

### *NAP Land Interest Registration*

These functions include the registration of an interest in a land parcel on Federal or Commissioner's land, such as the registration of a lease, licence, agreement for sale, reservation, notation or withdrawn land.

### *YTG Land & Water Use Permit Registration*

### *NAP Land & Water Use Permit Registration*

These functions register a permit for the designated use of land or water in a specified area. Examples include applications for research, archeological digs, timber cutting, agricultural permit, and mineral exploration. Issuing fishing or hunting licences is part of these functions. Land Use Permit Location data are created by these functions.

## **3.2.3 Client Assessment and Counselling**

These functions consist of all activities concerned with the evaluation or assessment of an application for a particular use of the land, or an application for an interest in a land parcel. This includes environmental assessments, an application for tenure; and a permit or licence for a type of land or water use.

#### *YTG Land Interest Evaluation*

#### *NAP Land Interest Evaluation*

These functions use all types of discipline data, including Land, Resource and Infrastructure to assess and evaluate applications for land interest in the Yukon on Federal and Commissioner's land. Land Interest Evaluation activities are performed for any application for land or land use. These functions use land-related data, but do not create any.

#### *YTG Land & Water Use Permit Evaluation*

#### *NAP Land & Water Use Permit Evaluation*

These functions use all types of discipline data, including Land, Resource and Infrastructure to assess and evaluate applications for land and water use in the Yukon. Evaluations are performed for many different types of applications, such as a request for an agriculture permit, timber cutting, and archaeological digs. These functions use land-related data, but do not create any.

#### *Environmental Assessment*

This function uses all types of discipline data, including Land, Resource and Infrastructure to assess and evaluate applications for land and water use to ensure environmental regulations are being met. This function is currently being performed by the Federal Government. This function uses land-related data, but does not create any.

#### *Infrastructure Permit Evaluation*

This function uses all types of discipline data including Land, Resource and Infrastructure to evaluate applications for developing man-made structures on a parcel of land. This function uses land-related data, but does not create any.

### **3.2.4 Manage Land and Related Resources**

The following functions focus on the collection and interpretation of data to portray the location, quantity and quality of naturally occurring resources. This includes the "lay of the land", soil and bedrock, vegetation, fish and wildlife, and areas of human interest. The primary objective of these functions is to understand the resource.

#### *YTG Mineral Resource Management*

#### *NAP Mineral Resource Management*

The activities associated with this function include the inventory and management of geophysical data. These activities include the identification of geologic formations and the collection of observations about the geological characteristics of a region. Geologic zone, geologic formation and geologic survey data are created by this function.



The activities associated with this function include the management of specified areas for mining operations, prospecting leases, mineral claims and leases, and coal explorations. Geologic zone and geologic survey data are created by this function.

*YTG Biophysical Management*

*CWS Biophysical Management*

The activities associated with these functions include the collection and study of biophysical data for the development of agricultural land, fuel wood resources, recreation resources, and the management of fish and wildlife habitat. Examples include soil productivity, water quality, and genetic diversity of crops. Quarry, soil cover, soil survey, ice, hydrography, snow, ice survey, vegetation cover, vegetation survey, forest fire and ecological area data are created by this function.

*NAP Biophysical Management*

The activities associated with this function include the collection of biophysical data for the purposes of water and forest resource management. This includes flood prediction activities and the inspection of timber cutting operations. Hydrography, snow, water survey, snow survey, vegetation cover, timber stand, vegetation survey, forest fire and ecological area data are created by this function.

*YTG Fish & Wildlife Management*

*CWS Wildlife Management*

The activities associated with these functions include the development and implementation of management programs for all Yukon fish and wildlife populations. This includes the collection of data regarding fish and wildlife, and the identification and management of habitat for selected species. Activities required for harvest management are also included in these functions, such as collecting data on numbers and types of species harvested during particular periods. Fish & wildlife species, species survey, habitat and harvest data are created by these functions.

*Heritage Resource Management*

The activities associated with this function include determination of where a heritage resource might be located, researching or examining sites to discover resources and inventorying objects found. This function creates data relating to archeological sites and historic resources.

*Parks & Outdoor Recreation Management*

The activities associated with this function include the conservation and management of the Yukon's natural, cultural and recreational features and landscapes for present and future generations. These include identifying recreation and tourism sites based on heritage, natural resource, and infrastructure information, as well as ensuring that appropriate land interest is possible and noted. Recreation cover and parkland data are created by this function.

### *Geodetic Control*

This function is responsible for establishing a survey control network for use in survey activities. Geodetic control point data are created by this function.

### *Legal Survey Management*

The function is responsible for the demarcation, definition and identification of cadastral parcels. Land survey point, land survey line, cadastral plan, and cadastral, easement and subsurface parcel data are created by this function.

## **3.2.5 Manage Infrastructure**

These functions are characterised by the planning, design, construction and maintenance of man-made structures. The activities in this functional area may result in acquiring an interest in land, such as a notation or a reserve. The management of infrastructure must be sensitive to the naturally-occurring environment as well, such as fish and wildlife habitat and ecoregions. Another function included within this set is the assessment of the value of land and property for taxation purposes

### *Highway Infrastructure Management*

The land-related activities associated with this business function include planning, design, construction, operation and maintenance of the highway infrastructure. The highway infrastructure includes marine ferries and bridges. Highway, road, trail, highway inspection, and traffic survey data are created by this function.

### *Community Infrastructure Management*

The land-related activities associated with this business function include planning, design, construction and maintenance of water, sewage, road, flood and erosion control, and waste disposal projects for the unincorporated communities throughout the Yukon. Building, water system and sewage system data are created by this function.

### *Property Assessment & Taxation*

This function is concerned with providing Yukon taxing authorities with current, accurate and equitable assessments for the purpose of levying property taxes. It uses both Land and Infrastructure data, but also creates building data.

### *Recreation Infrastructure Management*

The land-related activities associated with this business function include planning, design, construction, operation and maintenance of recreation facilities and tourism facilities such as campgrounds. Recreation facility data are created by this function.

### *Aviation Infrastructure Management*

The land-related activities associated with this business function include planning, design, construction, operation and maintenance of airport buildings, runways, and

utilities in order to provide safe and adequate airport facilities and services. Airport, airport inspection and air traffic survey data are created by this function.

### 3.3 Observations

#### *Land and Permit Application Evaluation*

It was determined during interviews that the demand for tenured land is increasing, and is for the most part concentrated along highway corridors.

The evaluation of land interest and land and water use permit applications represent critical business functions which require a number of different inputs and a considerable variety of land-related data.

The land use and land interest application review process is lengthy. Several government departments, First Nations, agencies and boards contribute their expertise to the process with the number of participants involved increasing. Today, one application can be evaluated on the order of twenty times by different government and non-government agencies. Appendix C lists the potential FTLAC and LARC review points required for land and water use permits.

The land use application review or evaluation process can be performed in two stages. The evaluation against land interest may preclude any further evaluation. However, if there are no conflicting land interests, a second stage of review may be initiated based on resource, infrastructure and administration area data.

#### *Parallel functions*

There are several functions that have similar activities between the Government of Yukon and Northern Affairs. These functions have been identified as creating and using much of the same types of data. They include Policy Development, Land Interest Evaluation and Registration, Land & Water Use Permit Evaluation and Registration, Mineral Resource Management, Biophysical Management, and Fish and Wildlife Management.

#### *Data collection*

Data are collected by several agencies because of a lack of knowledge of where to find it, or because the data received are incomplete. This has resulted in data about a single subject to be dispersed and duplicated among several different agencies.

### 3.4 Recommendations

The Government of Yukon, EMR and Northern Affairs should coordinate and share resources in any future development of land-related information systems. A pooling of funding and human resource efforts would be realized due to the similarity in functions and the likelihood of the devolution of programs.

Benefits would be realized both in the short and long term, by digitizing the frequently utilized data captured on the NTS map series for highway corridors. These areas represent the land locations of greatest interest for permits, tenure request and development. A digital format for this data would provide an essential common foundation for future automated systems to build upon.

The length of time taken and the sheer number of participants involved in land use and land interest application evaluations make this function a good candidate for applying Business Process Re-Engineering (BPR) techniques. BPR can be described as a fundamental analysis and overall re-design of how an organization does business in order to improve performance, increase productivity, realize cost-savings, and provide better service levels. This would be most effective if undertaken as a joint venture by the primary agencies. An examination and potential streamlining of these current manual procedures would deliver efficiency gains across organizations as well as improve public relations with the Yukon populace.

To help reduce the duplication of efforts for collecting and storing of subject data and to build a comprehensive inventory of topical data, data stewardship policies and procedures should be established. This will require a greater partnership between agencies performing similar functions in terms of assigning specific responsibilities, setting quality control parameters and providing easy access or distribution of the information collected. To facilitate greater data sharing, a means of publishing or advertising who has what available should be implemented.



## SECTION 4 LAND-RELATED APPLICATIONS ARCHITECTURE

### 4.1 Introduction

Through the combined examination of the data model (Section 2) and the function model (Section 3), it is possible to distinguish applications and identify their role in supporting government objectives. This section describes a set of applications to support the land-related activities of the participating government organizations.

An application is an organized set of functions, supported with data, designed to facilitate the achievement of one or more government objectives. The Applications Architecture provides the framework for the definition and later development of applications. Because much of the investment in information resources by an organization is devoted to the development and maintenance of systems, such a framework is essential to ensure that this investment results in systems which reflect government priorities and which satisfy the information needs of the organization.

The Application Architecture:

- describes and organizes opportunities to apply software tools to support specific government functions and activities;
- illustrates how multiple functions and organizational units depend upon common data;
- defines boundaries for subsequent detailed analysis, systems architecture and design;
- provides a basis for setting application system delivery project priorities; and
- provides a basis for assessing the current application systems, to eliminate redundant applications and data, promote consistency in business functions, and recognize the importance of accurate and consistent data by determining what applications are responsible for creating and maintaining data.

The applications architecture is portrayed by specific applications and general application areas, within which several related applications might be defined. The function and data models are key inputs to the development of the architecture. By taking a functional view of the business, regardless of current organizational structure, opportunities can be identified where common applications and common data could meet the needs of several organizational units. It also serves to remove the duplication in data capture and maintenance by separating application areas which create data from those which use the data.

## 4.2 Architecture Development

A number of inputs were used in the definition of the applications architecture: the goals, principles and driving forces of the organization; the functions of the organization; and the data used in support of these functions.

The following driving forces and principles served to guide the project team:

### Driving Forces:

- Open Government - responsive in providing information to politicians and public;
- Service - effective program delivery, value added, decentralized;
- Corporate view/approach (versus department); and
- Devolution - recognition of the potential transfer of authorities and responsibilities from the Federal Government to the Government of Yukon.

### Management Principles:

Management principles were formulated as part of the Government of the Yukon Information Resource Management initiative. Due to their general applicability, and the multi-government scope of this project, it is assumed that the following principles equally apply to the Federal Government stakeholders.

- The strategy for information resources will be aligned to the goals and objectives of the Governments;
- Data will be managed as a corporate resource (meaning inter-governmental);
- Each group of corporate data will have a single manager;
- Data will be available to users, subject to confidentiality and privacy guidelines; and
- Data will be captured once and validated as close to the source of capture as possible.

### *Land-Related Create/Use Matrix*

The create/use matrix is an evaluation technique that illustrates which functions create data, and which functions use data. In order to identify functions which manage(create, modify, delete) data, a process was carried out to develop a 'Create' matrix, which mapped business functions against the data they create. A similar process was followed to develop a 'Use' matrix, which identifies those functions which use data rather than create it. At this point the Create and Use matrices were combined and the functions and data were clustered into natural units called

application or business areas. All functions that create data about a particular facet or group of facets were grouped together. These functions naturally define an application area, from the information engineering perspective. Data flows from business areas that create data to others that use it. This traffic should be minimized, but cannot be eliminated.

The create/use matrix assists in defining applications by demonstrating the affinity between a set of functions and a set of data. A summary version of the create/use matrix showing functions on the horizontal axis and land-related data subjects and facets on the vertical, is shown in Table 4-1. The "C" identifies creation of data, while the "U" represents the use of the data in a function. The complete create/use matrix is shown in Appendix D.

Boxes with shading have been drawn around clusters of data classified as created, indicating data create applications. The inclusion of a "U" within a create application results from the importance of the data to the application, for example, the requirement for a land title to reference a land interest parcel. Implied in the creation of data is the use of that same data by the agency creating it. Boxes without shading have been drawn around clusters of data classified as used, indicating data use applications.

The size and shape of an application area does not reflect the size or complexity of the application area. The number of applications and their complexity is based on the data being maintained and the functions being supported.

### 4.3 Application Architecture

The architecture defines the applications necessary to support the land-related functions of the governments, as well as manage the data necessary to carry out those functions. Five data create and four data use application areas are defined.

#### 4.3.1 Data Create Applications

Data create applications support the creation and maintenance of data. They are responsible for the integrity, quality and accuracy of data, as well as the ability to query the data in a flexible manner. The land-related data create applications are shown in Figure 4-1. It should be noted that there may be considerable use and analysis of data in these create applications.

##### *Administration Area Registration*

This application involves the creation of the geographic boundaries of an administration area. The definition of an administration area results from policy, legislation and program activities.

This application creates administration area data, which includes game management areas, land-use zones, electoral districts and school attendance areas. The business functions supported include: policy planning, regional land use planning and community land use planning.



TABLE 4-1: LAND-RELATED DATA CREATE/ USE MATRIX

LAND- RELATED DATA		FUNCTION																															
ADMIN	Administration Area	YTG Policy Development	NAP Policy Development	Regional Land Use Planning	Community Land Use Planning	Land Titles Registration	YTG Land Interest Registration	NAP Land Interest Registration	YTG Land & Water Use Permit Regis.	NAP Land & Water Use Permit Regis.	Geodetic Control	Legal Survey Management	YTG Land Interest Evaluation	NAP Land Interest Evaluation	YTG Land & Water Use Permit Eval.	NAP Land & Water Use Permit Eval.	Environmental Assessment	Infrastructure Permit Evaluation	YTG Mineral Resource Management	NAP Mineral Resource Management	YTG Biophysical Management	NAP Biophysical Management	CWS Biophysical Management	YTG Fish & Wildlife Management	CWS Fish & Wildlife Management	Heritage Resource Management	Parks & Outdoor Recreation Management	Highway Infrastructure Management	Property Assessment & Taxation	Community Infrastructure Management	Recreation Infrastructure Management	Aviation Infrastructure Management	
LAND INTEREST	Registered Land Land Use Land Survey Interest Parcel	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
RESOURCE	Topography Geophysical Hydrography Vegetation Ecology Climate Fish & Wildlife Heritage & Recreation	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
INFRA-STRUCTURE	Highway Building Water System Sewage System Recreation Facility Aviation	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

C = CREATE

U = USE

ADMINISTRATION AREA APPLICATION

NATURAL RESOURCE APPLICATION AREA

DATA USE APPLICATION AREAS

LAND INTEREST APPLICATION AREA

INFRASTRUCTURE MANAGEMENT APPLICATION AREA



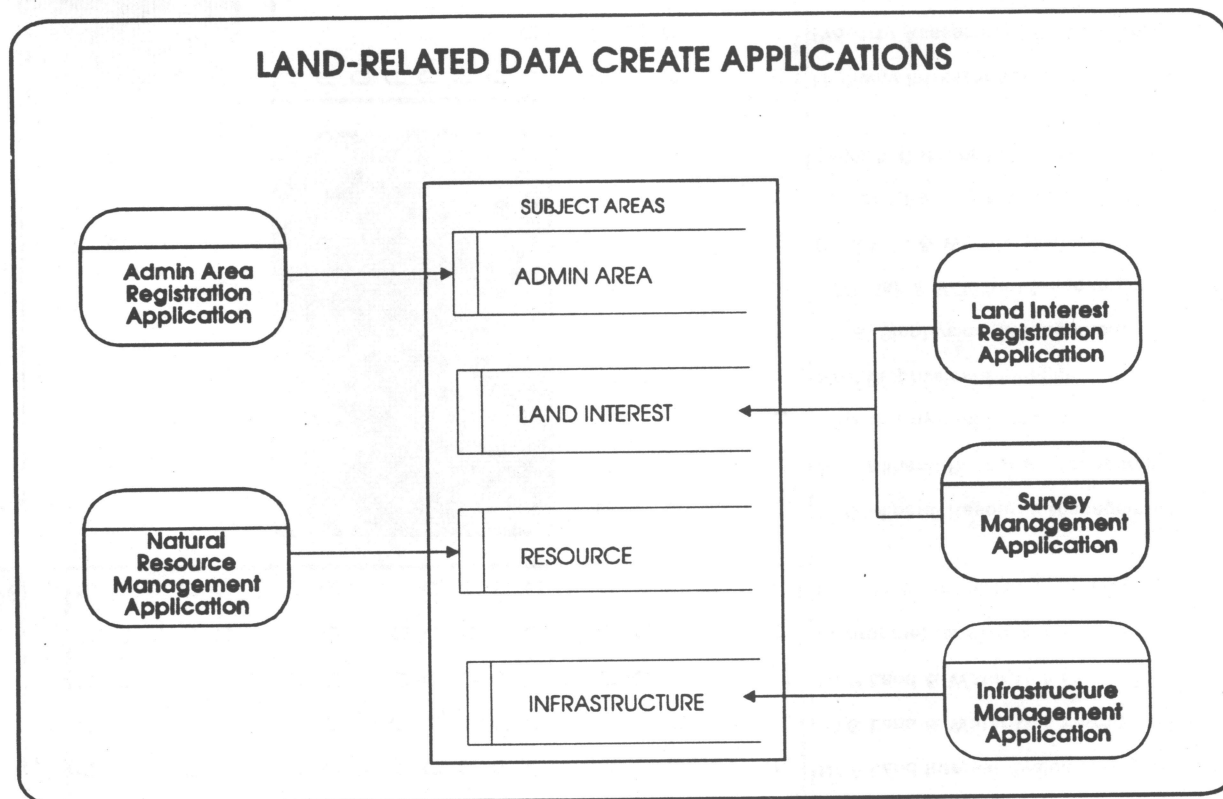


FIGURE 4-1.

### *Land Interest Registration*

This application area involves the registration of interest against land, such as a title, withdrawn land (resulting from a land claim), and land-use permit areas. It is considered an application area, since there may be distinctive requirements to support the land title registration function which may cause a separate application to be developed.

This application area creates registered land and land use data. It supports the land titles registration, land interest registration, and land & water use permit registration functions. The registration of land interest is often tied to surveyed parcels.

### *Survey Management*

This application manages the creation and registration of all Canada Land Survey documents, which includes all legal surveys conducted in the Yukon.

This application creates Land Survey and Interest Parcel data. It supports the geodetic control and legal survey management functions.

### *Natural Resource Management*

This application area involves the survey and inventory of natural resources. Included in this activity is the definition of survey areas, and the interpretation of data to identify, study and manage resources.

This application creates topography, geophysical, hydrography, vegetation, ecology, fish & wildlife and heritage & recreation data. It supports the mineral resource management, biophysical management, fish & wildlife management, heritage resource management and parks & outdoor recreation management functions.

#### *Infrastructure Management*

This application area supports the activities related to the construction and maintenance, and assessment of the infrastructure.

This application area creates highway, building, water system, sewage system, recreation facility and aviation data. The functions supported include: highway infrastructure management, community infrastructure management, property assessment and taxation, recreation infrastructure management and aviation infrastructure management.

### **4.3.2 Data Use Applications**

Data use applications support the manipulation and interpretation of data. Of particular importance to land-related functions is the ability to integrate data from different disciplines. For example, an application to support the environmental assessment function would require capabilities to integrate land interest, resource and infrastructure data; to apply information models; and to display the results. Because of the multi-dimensional nature of land-related data, special tools, such as geographic information systems are often required to support these complex applications. The land-related use functions are shown in Figure 4-2.

#### *Land-Use Permitting*

This application involves the evaluation of an expressed interest in land or the use of land. It uses almost every facet of land-related data described in Section 2. It supports the land interest evaluation, land & water use permit evaluation, environmental assessment and infrastructure permit evaluation functions. There are three sub-components of this application:

#### *Land Interest Conflict Evaluation*

This component evaluates whether a conflict exists between the land area identified in an application and land for which an interest has already been registered. This component is the most critical, since in general, a land interest conflict will be sufficient grounds for rejecting a land interest or land use application.

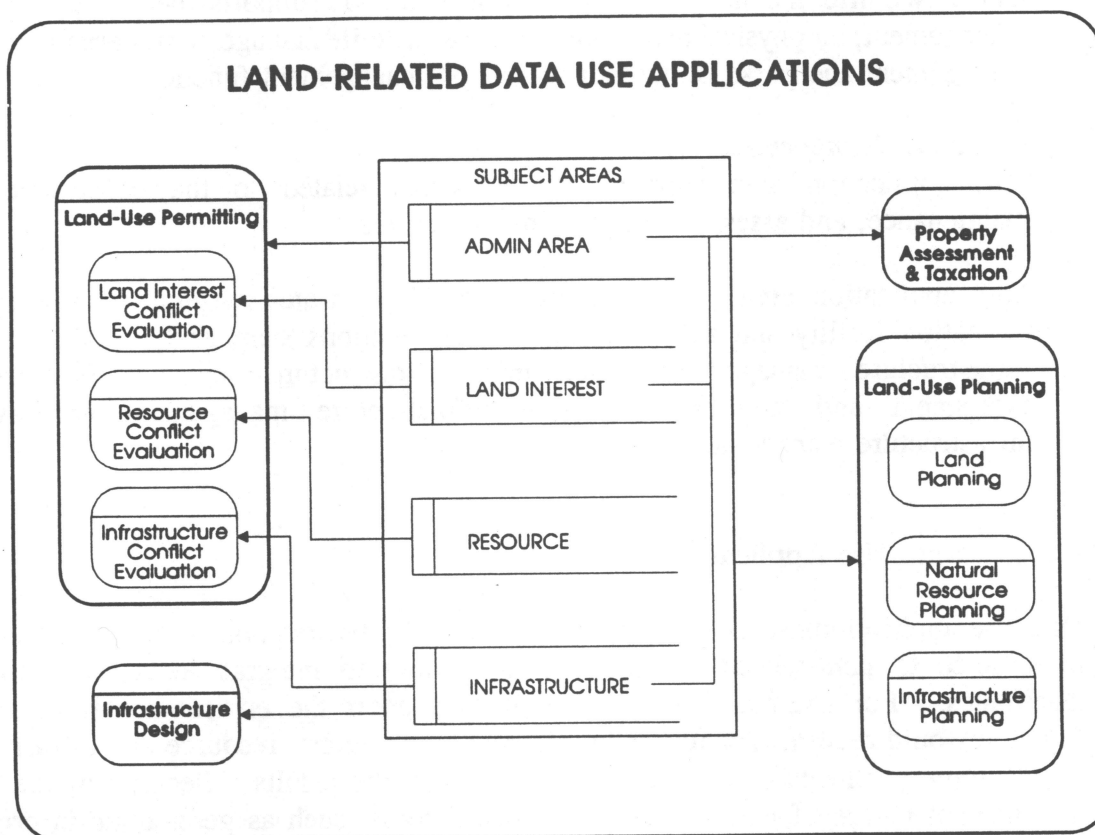


FIGURE 4-2.

### *Resource Conflict Evaluation*

This component evaluates the impact of a proposal on the natural environment. Typically, expert interpretation is required to properly evaluate the impact of a proposal.

### *Infrastructure Conflict Evaluation*

This component identifies the constraints that existing or proposed infrastructure might have on an application, such as distance to appropriate electric service. It also supports the determination of whether a particular construction activity (e.g., building construction) is permitted at a designated site.

### *Land-Use Planning*

The purpose of this application is to support the short term and long term planning for the use of land. This includes the use of land for many activities, such as settlement, industry, infrastructure, wildlife management, mineral exploration, and so on. This application has three sub-components:

### *Land Planning*

This component focusses on the availability, classification and development of land to meet the needs of the Yukon.

### *Natural Resource Planning*

This component will utilize the various natural resource data to develop strategies for the most appropriate use of the resources.

### *Infrastructure Planning.*

This component will determine what services are required to support the land use proposals.

These applications use almost every land-related data facet described in Section 2. It supports the regional and community land use planning functions.

### *Infrastructure Design*

The purpose of this application is to support the design of infrastructure. It supports the determination of a path to be taken by a utility corridor, taking into account land interest and environmental factors. It also supports other design activities such as cut and fill estimating, locating pumping stations and identifying capacity requirements.

This application supports the design component of highway infrastructure management, community infrastructure management, recreation infrastructure management, and aviation infrastructure management functions.

### *Property Assessment and Taxation*

The purpose of this application is to support the assessment of real properties for the purposes of taxation. This application supports the property assessment & taxation function. It uses registered land, land use, land survey, interest parcel and creates building data.

## **4.4 The Use Of The Application Model**

The application model and the Create/Use matrix:

- show overlap in data creation (more than one function creating a data entity);
- show what functions create data (the horizontal axis on the create/use matrix);
- show what functions use the data ;
- can be used in system development to create common applications by identifying commonalities between functions;



- demonstrate the separation between data create and use functions;
- can be used to reduce or eliminate data redundancy ensuring only one application is used in the creation of a single data type;
- can be used to understand the use of data, (examination of the "U"s on the matrix); and
- are the basis for the development of implementation plans, including the evaluation of risks associated with the duplication of data and data interchange.

#### 4.5 Observations

The number of functions managing or requiring land-related data demonstrates that the need for land-related data crosses department, agency and government boundaries.

There are several areas of overlap in the "creation" of data between the two governments. This occurs for the following data: administration area, registered land, geophysical, hydrography, vegetation, ecology, fish & wildlife, and heritage & recreation.

The extensive "use" of data across the business functions suggests that if applications were developed where the data required were maintained within each application, there would be enormous duplication of data.

Almost every function uses highway, topography, hydrography, and administration area, primarily for the purposes of reference.

#### 4.6 Recommendations

##### *Evolution, not revolution*

The application model, supported by the create/use matrix suggests different areas in which system development work can be completed. It also provides an overview of the relationships between data and applications. Based on this application architecture, it is possible to achieve long term goals as a series of relatively small, manageable and relevant development efforts. There is no need to have a one-shot, costly geographic information system (GIS) implementation.

Coordination of data sharing and application development is vital to the success of the overall implementation of land-related applications. Application development efforts should consider the data entities identified by the create/use matrix to be within the application area. This may require that several different interest groups be involved in the application development process.

Standards and procedures must be set up to ensure the coordination and sharing of data and the development of common applications. The data and application models within this document should be used as the basis for future developments. In addition, common standards for data stewardship and system development methods need to be in place.

A system development methodology should be followed for all development projects. Principles and guidelines for information technology should be sought from the information resource groups within the two governments and applied to system development projects.

### *Develop Applications in Three Areas*

The application architecture shows five applications which create and manage land-related data. The data from the four subjects are quite distinct from each other, as shown in the create/use matrix. This suggests that:

- independent development of: Administration Area Registration; Natural Resource Management; and Infrastructure Management is possible;
- the Land Interest Registration and Survey Management applications should be interrelated; and
- the Administration Area Registration application should be a common application, available to each of the other land-related applications.

A risk of moving forward with separate applications developments is the potential amount of data conversion required once the applications are operational. This is a valid concern, since a great deal of data sharing is demonstrated by the create/use matrix. It is believed that this risk can be managed by distributing data to applications on an as needed basis, rather than maintaining a duplicate set.

Based on interviews with project participants, it was discovered that evaluation and planning activities tended to take place in localized areas. This suggests that functions requiring data from other applications, such as land interest data to be used for wildlife planning, must:

- be able to request information for a specified area;
- have the data made available in an appropriate period of time;
- convert the data between formats if necessary (due to different hardware and software);
- use the data for the intended purpose; and then
- discard the data so that duplication is avoided.

Having such interactions will support data sharing and will ensure that the most up-to-date data are available. The data volumes reported in the data dictionary (Appendix B) suggest that a manageable amount of data conversion would be required on any given project, regardless of the area involved. For example, the amount of land interest data that is in the same area as an area used for wildlife planning is assumed to be small enough that conversion of the data for a temporary period is feasible. (This is in contrast to storing the land interest data in two applications, and managing changes and updates in both applications.)

Because of the similarity of data within a subject, it is recommended that consideration be given to developing each of the data create and corresponding use applications on a common hardware/software platform (e.g., Natural Resource Management). Apart from the benefits of reduced costs and concerns associated with purchase, training, implementation and support, there are on-going benefits related to the ability to more easily share and use data maintained by others. A re-occurring comment during interviews was that data sharing is already difficult because of differences in map scale, the age of data, and incompatibility in digital data formats; this could be perpetuated if independent applications on independent platforms are developed.

### *Coordinated Efforts*

Application developments should be conducted jointly by the Government of Yukon and Federal government agencies. In addition, the First Nations have a vested interest in the same land-related functions discussed in this report, and will require the same or similar data and applications which have been identified. Opportunities should be sought to include First Nations representatives in some system development roles, such as members of a project steering committee.

In addition, the private utility companies share similar needs as those identified for the Infrastructure Management functions in this report. Opportunities should be explored to evaluate joint developments, cost recovery or cost sharing with the utility agents. While the obvious area for joint efforts is in infrastructure management, private utilities should also benefit from the implementation of the Land Interest application.

## SECTION 5 ORGANIZATIONAL IMPACTS

### 5.1 Introduction

As the land claims implementation draws closer, and the devolution of programs continue in the Yukon, change will be a constant. In this section, organizational impacts regarding land-related application initiatives are addressed. The observations and recommendations in this section are based on the project team's efforts over the past few months, and from a more general understanding of land-related developments in the Yukon over the past few years.

### 5.2 Observations

Responsibility and authority of federal programs will continue to be transferred to the Government of the Yukon and the First Nations. With the devolution of programs, the management, administration, and control of land issue functions will transfer to territorial or band jurisdiction. Considerable land-related data will be involved in these program transfers. Joint management committees of Federal governments, Territorial governments, and First Nations representatives will be prominent.

The business function model (Section 3) illustrates that some units within both governments have virtually identical functions. These functions include policy development, land interest evaluation and registration, land & water use permit evaluation and registration, mineral resource management, biophysical management, and fish and wildlife management.

There is an opportunity for Federal and Yukon governments to co-ordinate, co-sponsor and co-fund future application development. This will help facilitate and reduce the organizational impact of devolution, provide a mechanism for skills transfer and an understanding of the business functions for the new custodians of the programs. This is a prime opportunity to introduce Business Process Re-Engineering (BPR) techniques. BPR can be described as a fundamental analysis and overall re-design of how an organization does business in order to improve performance, increase productivity, realize cost-savings, and provide better service levels. Present operational procedures would be questioned and if appropriate, more efficient processes would be introduced with an emphasis on total quality design and management.

The knowledge of the business provided by those interviewed, the knowledge of geography contributed by YGISCU staff and the knowledge of data modelling and system implementation provided by Government of the Yukon, Information Services Branch together contributed to the success of this project. A centralized team, composed of personnel with different skill sets has proved effective.

Further land-related initiatives will require additional expertise in the area of land-related data management and analysis. For the long term development and maintenance of land-related



applications, there is a need to continue developing land-related data handling and GIS skills locally.

The training received by the team in the use of data modelling techniques was valuable, as was the guidance provided by the DMR system development methodology. The software product (CorelDraw) used for the data model diagrams lacked the built-in integrity checking component which a Computer Assisted System Engineering (CASE) tool designed for this purpose would have provided.

### 5.3 Organizational Framework

Effective, long-term land-related information system development and implementation must be supported jointly by both governments with:

- a management-level team committed to the system implementation strategies of their respective governments;
- a Yukon-wide, inter-governmental strategy for land-related information system implementation;
- Yukon-wide standards, procedures, and guidelines for data management;
- a consistent system development methodology; and
- teams whose members possess the necessary skills and knowledge to apply towards land-related application development.

Effective utilization of the limited application development resources within the Yukon necessitates strong teams whose players have specific roles and focus areas. It entails having the means to assemble individuals for different phases of development in specific applications. Also, it requires evolving the Yukon-wide organizational structure to set long term direction and monitor progress.

Figure 5-1 indicates the categories of skill and knowledge sets required for land-related application development. They are Client Business, Geographic Information and Information Systems.

#### *Client Business*

This is knowledge of the specific business that a department or agency engages in. It includes an understanding of specific business functions as well as the broader discipline within which that business resides. It may include any business function within the government that uses land-related data such as wildlife management, road construction, land use permitting, and others.

The application development responsibilities of individuals in this category include:

- providing information on the business functions which are relevant to the development effort;
- validating the resultant data and process models to ensure that the business functions and data are adequately represented;
- conducting system testing; and
- accepting the system into production upon satisfactory implementation and training.

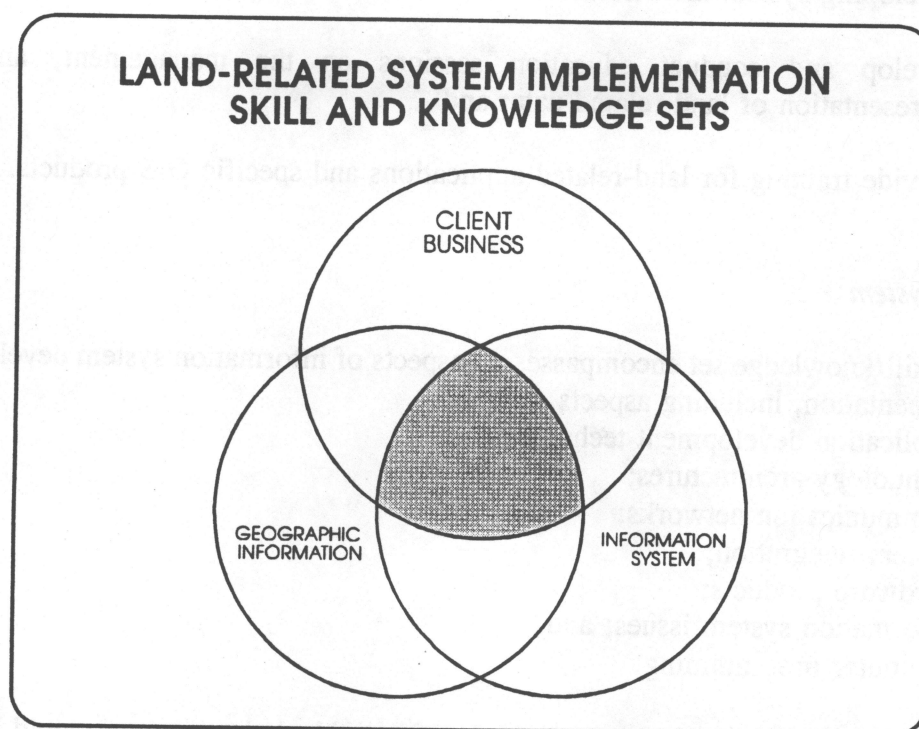


FIGURE 5-1.

### *Geographic Information*

This skill/knowledge set encompasses the management, analysis and representation of geographic (land-related) data. Topics of importance include, but extend beyond:

- digital spatial data structures;
- Digital Elevation Models (DEMs);
- coordinate systems;
- map projections;
- spatial analysis techniques;
- Geographic Information Systems (GIS);

cartographic generalization;  
vendor products; and  
GIS implementation issues.

During application development, the role of individuals in this area would be to:

- act as, or support, a business analyst and be involved in conceptual modelling;
- provide a link between the geographic business requirements of a project and information system capabilities;
- provide knowledge on the capabilities and configurations of GIS tools, and assist in developing system architectures;
- develop and conduct education sessions on the management, analysis and representation of land-related data; and
- provide training for land-related applications and specific GIS products.

### *Information System*

This skill/knowledge set encompasses all aspects of information system development and implementation, including aspects such as:

application development techniques;  
technology architectures;  
communication networks;  
system integration;  
hardware products;  
information system issues; and  
computer programming.

During application development, the role of individuals in this area would be to:

- act as business analysts during modelling;
- develop and ensure the accuracy of all models generated;
- develop system architectures;
- develop physical design models;
- provide project management skills;
- resolve IS technical issues; and

- provide software education and training.

The following observations can be made about the relationship of these three categories:

- An absence of any of these three sets would be detrimental to the success of any implementation project.
  - If the Client Business set is removed, then the system cannot adequately meet the needs of the business. It does not do what they need it to do;
  - An absence of Information System skills and knowledge will result in a system which may not integrate with other systems, is inflexible, and does not meet long term corporate technology strategies and requires excessive maintenance.
  - An absence of Geographic Information skills and knowledge results in a system which is inefficient in, or lacks, spatial analysis and display capabilities.
- Individuals may have some or all of the components of these skill/knowledge sets.
- Specific departments/agencies may have some or all of the components of these skill/knowledge sets.
- During the implementation life-cycle, the proportion of each set needed for any particular activity will vary. For example, at the business analysis stage, client business skills are heavily relied upon while at the system architecture stage, information system skills will predominate.

## 5.4 Recommendations

### *Yukon Wide Framework*

Because of the relatively small number of individuals with the Geographic Information skill/knowledge set, there should be a pool of these people available to both governments. The current mandate of YGISCU should be examined to see if it fits this role.

Continue the inter-agency coordination of activities and expand the circle of participants to include such players as the Council of Yukon Indians, utility companies, municipalities and other non-government groups.

The respective systems groups ( NAP Informatics, YTG Information Services Branch, and EMR systems groups) should accept responsibility for:



- adopting a standard system implementation methodology to be used in all future land-related information system development;
- developing data stewardship guidelines and data confidentiality guidelines. These are required to assist those who accept stewardship to understand their responsibilities and authorities; and
- showing co-operation and leadership in the area of Information Systems.

Develop and adopt a long-term strategy for the coordinated implementation of land-related information systems, supported by appropriate policies and procedures. As with application development, the development of the strategy will require a balance between Client Business, Geographic Information and Information System; with the skills and knowledge coming from various levels of management. The recommendations and the actions described in this report should provide guidance.

### *Application Development Framework*

For all land-related development, teams should be assembled such that the skills and knowledge essential to the project are addressed. An effective project team will have strong management and personal commitment.

Enhance existing skills and knowledge so that individual and corporate skill/knowledge sets will expand and improve through participation. For all land-related application development:

- inventory existing skills and knowledge which form part of the corporate resource;
- identify individuals with some/all of the required skills/knowledge in a set;
- identify the additional skills and knowledge required for individuals to be more effective;
- match those requirements to upcoming plans/activities;
- develop a plan for increasing the knowledge and skills of individuals during application development activities, by defining personal project goals; and
- incorporate training during projects whenever feasible.

Individuals and organizations should continually strive, through active participation in projects, to increase the overlap of the three skill/knowledge categories.

Develop and provide local opportunities to increase the knowledge base using videos, seminars on GIS and IS methodology, project reviews, and other such techniques.

## SECTION 6 ACTION PLAN

### 6.1 Introduction

This section contains concrete steps the Federal and Territorial governments can take to further the implementation of land-related applications. This action plan identifies short term actions which can be completed within the next six months to a year. The System Development Actions address areas which are considered to have the greatest impact and benefit in three of the "create" application areas. These will also lend themselves to furthering the present government's political goals of settling and implementing land claims, providing improved land and resource management, and making Yukon land available to its people.

The key ingredient for the success of the system development actions proposed is a joint effort between the Federal and Territorial resources. This is looked on as the only viable option in light of the continuing budget cutbacks and limited speciality pool of human resources residing in the Yukon. It will also address the priority agenda items of both governments in their efforts to move the land claim process forward and realize program transfers through devolution.

### 6.2 Summary of Recommendations

The following is a summary of the recommendations made in Sections 2 through 5.

#### *Land-Related Data Model*

- The governments should promote a long term view to land-related data management, ensuring quality, consistency and availability.
- The governments should adopt a policy of gradual digital data conversion and continuous improvement in data quality.
- The land-related data model should be used, validated, enhanced and updated as more detailed analyses are performed in future projects.
- The scope of the land-related data dictionary(including the models and descriptions) should be broadened to include the First Nations, private utility companies, local governments and the departments and agencies who have an interest in land-related data, but were not within the scope of this project.
- The models and data dictionary from this project should be entered into a CASE tool.
- A consistent approach to defining client location should be adopted.

### *Land-Related Applications Architecture*

- There is no need to plan a one-time, single, large-scale Geographic Information System (GIS) implementation. The coordinated implementation of several GIS is essential. With a coordinated approach between the identified application areas, the risks are identified and understood up front and therefore can be managed.
- Within the current organizations interviewed and embarking on individual GIS applications, data quality issues, technical incompatibilities and data conversion and management burdens have already been identified as creating operational problems.
- Standards and procedures must be set up to ensure the coordination and sharing of data and the development of common applications.
- Independent development of the Administration Area Registration, Natural Resource Management and Infrastructure Management is possible.
- The development of Land Interest Registrations and Survey Management applications should be tied together.
- Because of the similarity of data within a subject, it is recommended that consideration be given to developing each of the data "create" and corresponding "use" applications on a common hardware/software platform.
- Application developments should be conducted jointly by Government of the Yukon and Federal government agencies.
- Opportunities should be explored to evaluate joint developments and cost sharing between private companies all levels of government.
- A centralized team, composed of personnel from different organizations has proven effective in this project. It is recommended that similar projects use a similar cross-organizational team composition representing the identified skill sets.
- The success of this project suggests that the development of land-related applications can and should follow a standard information system methodology.

### *Organizational Impact*

- Because of the relatively small number of resources with skills and knowledge in the area of Geographic Information Systems, there should be an identified set of these resources who can be made available to both governments. The current mandate of YGISCU should be examined to see if it fits this role.
- Continue with inter-agency activities and expand the circle of participants to include such players as the Council of Yukon Indians, utility companies, municipalities and other non-government groups.
- The governments' information systems groups (NAP Informatics, YTG Information Services Branch, and any relevant EMR systems group) should accept responsibility for:
  - adopting a standard system implementation methodology to be used in all future land-related information system development;
  - developing data stewardship guidelines and data confidentiality guidelines. These are required to assist those who accept stewardship for a particular set of data to understand their responsibilities and authorities;
  - coordinating the training and access to centralized CASE tools required for future projects; and
  - showing co-operation and leadership in the area of Information Systems.
- Develop and adopt a strategy for the long-term implementation of land-related information systems. As with application development, the development of the strategy will require a balance between Client Business, Geographic Information and Information Systems; with the skills and knowledge coming from various levels of management.
- Develop and provide local opportunities to increase the knowledge base using videos, seminars on GIS and IS methodology, project reviews, and other techniques.

### **6.3 System Development Actions**

The following actions describe the first development steps for delivering land-related applications. The actions represent areas which will have the most significant impact in providing a common base of land-related information.



## *Land Interest Application Development*

The primary objective of this action item is to conduct a preliminary analysis of the Land Interest Application identified in Section 4. At the end of this action item, it will be possible to test and evaluate the RESULTS application (see Appendix C) against the requirements for land interest management in the Yukon.

This action item is selected because it is a common application area which impacts both governments and has a direct impact on the public. It was identified during this study that the demand for land is increasing and that the public is demanding faster, more timely service in the area of land disposition. The successful implementation of this application will give access to the land interest data which is widely used and of major importance to many of the identified business functions, including land interest evaluation, land use permit evaluation, environmental assessment, policy development, program planning and infrastructure planning.

**The preliminary analysis is the first step in the development of an application system.** The activities to be conducted and documented during this phase of development include:

- a brief review of the existing system(s);
- identification of the system objectives and scope;
- conceptual data and process models describing the data used and managed by the application, and the processes applied to the data;
- the definition of the scope and objectives of a prototype, (including the defining success criteria);
- a review of implementation alternatives;
- development of an overall implementation strategy;
- evaluation of impacts on the organization; and
- a cost benefit analysis.

A multi-disciplinary team will be required, as described in Section 5, with skills and knowledge in land interest registration, use of geographic information systems, and information system development. It is proposed that the project team be composed of members from NAP; EMR; YGISCU; ISB; C&TS; and the Land Titles Office of Justice.

This action will deliver:

- documented requirements and models for the land-interest application;
- an evaluation of the potential for using RESULTS as a development platform, with an action plan for prototyping if appropriate; and
- an implementation plan for the construction of the land-interest application.

**The anticipated duration of this action is 8 weeks. Estimated cost \$40,000.**

## *Resource Management Application Development*

Several initiatives for the development of land-related applications and GIS are on-going in the resources area, some of which include the Renewable Resource GIS (RRGIS), the use of GIS products at the Canadian Wildlife Service (CWS), CYI, the Department of Tourism, and the forestry, and MinFile application at the Northern Affairs Program.

It is recommended that a preliminary analysis be conducted for the Resource Management Application. The objective of this action is to expand the data and process structures currently in use or under development in order to accommodate the requirements of other government organizations. The plan will identify the opportunity of using existing systems and identify any changes required to make them a common system. Further, the action will develop and evaluate alternative strategies for ensuring the coordinated development of future applications.

Considerable system development efforts have been made within different organizations. The information and ideas from those projects should form the basis of this action, notably the efforts of Renewable Resources and NAP. The activities of this action will include:

- reviewing the existing situation (documentation exists for this);
- validating and refining the data and process models generated for the base projects;
- developing and evaluating alternative system implementation strategies; and
- recommending a strategy and developing specific system development actions for implementing a coordinated resource management applications approach across the governments.

A multi-disciplinary team will be required, as described in Section 5, with skills and knowledge in the various disciplines of resource management, use of geographic information systems, and information system development. It is proposed that the project team be composed of members from Renewable Resources, Canadian Wildlife Service, Economic Development, NAP, YGISCU and ISB. Project participants may come from other departments as well, for example, Tourism and Canadian Parks Service.

This action will deliver:

- a review of existing applications and other development efforts;
- an evaluation of additional requirements to enhance their capability to be common systems;
- a common set of data and process models to facilitate future developments;
- an evaluation of alternative approaches to ensuring inter-governmental and inter-departmental sharing of data and applications; and
- the identification of a specific application development plan.

**The anticipated duration of this action is 8 weeks. Estimated cost \$40,000.**

### *Digital Conversion of the NTS Map Base*

This project identified several data entities which are commonly used, primarily for reference; namely: highway, hydrography, topography and both the 1:50,000 and 1:250,000 scale map sheet boundaries. The purpose of this action is to explore the opportunity to digitally convert these data from the paper NTS Map Base.

Presently, digital 1:250,000 maps covering the entire Yukon are housed in both YTG and NAP. With respect to the 1:250,000 scale digital maps, actions should include:

- reviewing the quality of the existing sheets;
- cataloguing the present format of the sheets;
- developing a plan for maintenance and upgrade of these sheets; and
- developing a strategy for the dissemination of this data.

The result of this action will be a recommendation on a strategy for maintaining the existing 1:250,000 digital map base.

Digital 1:50,000 maps covering only a small portion of the Yukon are also housed in both YTG and NAP. With respect to the 1:50,000 scale digital maps, actions should include:

- determination of specific sheets to be converted (suggest those along the highway corridors which would constitute a subset of the 900+ sheets that cover the Yukon);
- developing a strategy for the dissemination of this data (this data is static and could possibly be replicated among different applications);
- determination of initial data stewards and a plan for changing stewards if necessary;
- identifying standards for the data (can look at adopting the National Topographic Data Base - NTDB standards);
- determination of the initial format and storage location of the data; and
- determination of project costs and sources of funding (EMR may be able to enter into a cost sharing arrangement).

The result of this action is a recommendation on whether to proceed with conversion of the 1:50,000 maps, identifying:  
the data types to be collected;  
the most appropriate sheets to be converted;  
a plan for completing the effort; and  
total cost and cost sharing strategies.

These actions should be conducted by YGISCU in conjunction with EMR.

**This action should be completed by October 1, 1993.**



## 6.4 Administration Actions

### *Develop and Adopt a Framework for Land-Related Information System Development*

In Section 5, it was identified that three suites of knowledge and skill sets must be balanced for effective implementation of land-related information systems: the Clients Business, Geographic Information and Information Systems. This activity proposes that policies and procedures be developed and adopted, which ensure a consistent approach across both governments. To accomplish this, executive level support will be sought. Bodies such as the Government of Yukon's Information Resource Management Committee (IRMC) and Land Information Systems Steering Committee (LISSC) will be asked to provide guidance and direction in formulating and promoting such an organizational structure for land-related application development projects. It will become the responsibilities of the primary players within the three skill set areas to actually develop and implement the steps necessary to create this environment.

Because of their existing coordinating role, it is proposed that YGISCU be responsible for the implementation of this action. The existing management structure should be examined to determine whether representatives from the client, geographic information, and information systems are included in YGISCU's steering and management committees. Further, it will be necessary for the YGISCU team to ensure that representatives from all three areas participate at the working level. The Government of Yukon GIS Working Group is a valuable source of client business knowledge.

This action will deliver an outline and skeletal draft of the framework.

**The action should be completed by July 31, 1993.**

### *Create a Centralized Digital Data Dictionary for Land-Related Data*

It is recommended that the stewardship of the Land-related data dictionary reside with YGISCU. This will enable common access to the data dictionary, since YGISCU is the coordinating body for federal and territorial departments and agencies. The data dictionary is the data about the data (often called meta-data), and does not imply that there will be a central storage area, or a central stewardship, for land-related data.

As stewards, YGISCU will have the responsibility for ensuring the accuracy, integrity and completeness of the data dictionary. This responsibility should be transferred to one of the information system groups if YGISCU is unable to assume this responsibility.

The land-related data models and data dictionary should be entered into a CASE tool as soon as possible. The transfer should be conducted by a member of the current project team, thereby ensuring another critical evaluation of the models. A hard copy data dictionary will be maintained until a CASE tool is available.



This action will require:

- acceptance of stewardship by the proposed group;
- adoption of data stewardship guidelines (look to federal informatics and ISB); and
- adoption of a CASE tool (look to federal informatics and ISB).

This action will deliver:

- a statement of the stewardship responsibilities and the data involved; and
- a digital version of the data dictionary currently in paper form in Appendix B.

**The estimated time required for transferring the land-related data dictionary to the CASE environment is 6 weeks, assuming proficiency in the selected tool.**

### *Map Catalogue*

The transition from the existing map-based approach to land-related data management into a digital format will occur over several years, and it is reasonable to expect that some map-based data management will continue. It is therefore necessary to maintain a catalogue of all available maps, and the data contained on them. The catalogue should be cross-referenced to the digital land-related data bases as they are developed.

The catalogue should be collated and maintained centrally by YGISCU. Since this activity is within the Manage Information Services function, defined in the Strategic Plan, it is recommended that assistance be sought from ISB and others to determine the best method of implementing this action.

This action will deliver a list of maps available, including information such as source, scale, projection, data represented and contact.

**This will be an ongoing effort, commencing with the collection and updating of existing catalogues. A target completion date should be set around November 30, 1993.**

### *Promote the Results of The Land-Related Data Model Project*

To ensure the continued success of land-related systems implementation, a positive and supportive environment must be created. The results of this study must be distributed with follow-up presentations made to parties at all levels throughout both governments, and other interested groups, including the following groups:

- YGISCU Steering Committee;
- YGISCU Management Committee;
- YTG Information Resource Management Committee (IRMC);
- YTG Land Information Systems Steering Committee (LISSC);
- YTG GIS Working Group;
- Northern Affairs - Directors;

- First Nations - CYI;
- YTG Deputy Minister Review Committee (DMRC);
- YTG Department Administrator's Liaison Committee (DALC);
- C&TS GIS Requirements Study Committee & GIS User Needs Steering Committee;
- Renewable Resources GIS Implementation Committee;
- All interested participants and other parties; and the
- Canadian Information Processing Society (CIPS) Klondike Chapter.

Depending on the audience, these presentations will deliver the results of the project, as well as suggestions for how the recommended actions should be realized.

**Presentations to project sponsors, committee members and participants should be completed prior to the end of June.**

#### *Updates to YTG IRM Strategic Plan*

The YTG IRM Strategic Plan proved to be a valuable resource to the project team. Recognizing that it is a document of potential value to other projects, it is recommended that the following changes, resulting from this project, be made to the Strategic Plan document.

- Remove "setting electoral boundaries; and land titles" from the description of 7- Manage Land Use (IRM Strategic Plan, p. C 19).
- Change name of 7 - Manage Land Use to "7 - Manage Land And Related Resources".
- Update the Land-Related subject area description to reflect the new list of subjects and definitions found in this document.

This action must be performed within ISB with the updates distributed to all departments and interested parties.

**This should be completed by June 30, 1993.**

## APPENDIX A

### 7.1 Project Participants

#### *Sponsors*

Mr. Dan Odin, Deputy Minister of Government Services (Government of Yukon)  
Mr. LeWayne Howg, Regional Informatics Manager, NAP and  
Mr. Gord Campbell, Head, Information Systems and Development Section, LSD/EMR (Government of Canada)

#### *Project Clients*

Mr. Rick Curial, Director, Information Services Branch (ISB) (Government of Yukon)  
Mr. LeWayne Howg, Regional Informatics Manager, Yukon Region (Government of Canada)

#### *Steering Committee*

The Land Information System (LIS) members comprised of the Deputy Ministers of Justice, Community and Transportation Services, and Renewable Resources will act as the Steering Committee for the Government of Yukon component of the project and Mr. LeWayne Howg and Mr. David McArthur, Manager, Survey Program will represent the Federal agencies.

#### *Project Manager*

Mrs. Pamela Briemon, Acting Project Manager, Information Services Branch (ISB)

#### *Project Consultant*

Mr. J.P. Lauzon, GIS Consultant, DMR Group Inc.

#### *Project Analysts*

Ms. Terry Neis, Systems Analyst (Government of Yukon) (100% time commitment)  
Mr. Bob Gray, Head, Yukon Geographic Information Systems Coordinating Unit (80% time commitment), and  
Mr. Ross McLachlan, GIS Applications Specialist (YGISCU) (100% time commitment)

#### *Adjunct Project Analysts*

Ms. Beth Hawkings, GIS Manager, Renewable Resources  
Ms. Lauren Crooks, GIS Manager, Renewable Resources

#### *Quality Assurance*

Mr. Robert Forward, Data Resource Co-ordinator (Government of Yukon)  
Mr. Alex Frater, Senior Consultant, DMR Group Inc.

#### *Project Administrators*

Project administration will be provided by the Administration Unit of Information Services Branch (ISB)

## **7.2 Workshop Participants, Interviewees, and Contributors**

### ***Government of Canada***

#### **Energy, Mines and Resources, Legal Surveys Division**

Stanley Hutchinson - Regional Surveyor  
David McArthur - Head, Survey Program  
Brian Thompson - Head, Regulations

#### **Northern Affairs Program**

Kirstie Simpson - Manager, Environment and Conservation, Environment & Land Claims  
Rosanna White - Project Assessment Officer, Environment and Land Claims  
Peter Henry - Project Forester, Forest Resources  
Mabel Macyshen - A/Supervisor of Federal Lands  
Mark Zrum - Head, Land Use  
Roland Ronaghan - Regional Manager, Mineral Rights  
Diane Emond - Environmental Geologist, Geological Services  
Trevor Bremner - Mineral Deposits Geologist, Geological Services  
Dan Cornett - Head AES, Water Resources

#### **Canadian Wildlife Service**

Jim Hawkings - Biologist  
Debbie Van De Wetering - Wildlife Technician

### ***Government of Yukon***

#### **Executive Council Office**

Kathy Kosuta - Land Negotiator, Land Claims Secretariat  
Jim Tousignant - Senior Statistician, Bureau of Statistics

#### **Legislative Assembly**

Jo-Ann Waugh - Assistant Chief Electoral Officer, Elections Office

#### **Community and Transportation Services**

Gerry Gerein - Manager, Property Assessment and Taxation  
Anna Hausleitner - Assessment Technician, Property Assessment and Taxation  
Elsie Elrose - Land Disposal Officer, Land Disposition Section  
Bryony McIntyre - Land Disposal Projects Officer, Land Disposition Section  
Don Ammond - Manager, Land Planning and Policy  
Greg Kent - Planning Technician  
Bernie Cross - Transportation Planning and Programming Engineer  
Wally Hidinger - Manager, Transportation Planning and Programming  
Fred Jennex - Deputy Registrar, Motor Vehicle Section

#### **Economic Development**

Richard Lloyd - Senior Planner, Regional Economic Development  
Don Murphy - Senior Project Geologist, Canada/Yukon MDA



## Education

Ross Kelly - Educational Computing Consultant, Curriculum  
Gary Wilson - Junior Planner, Planning and Support Services  
Bob Sharp - Coordinator, Curriculum Development, Curriculum

## Finance

Declined to participate

## Government Services

Michael Barton - Architect, Design

## Health and Social Services

Mike Cottrell-Tribes - A/MIS Coordinator  
Peter Snell - Manager, Ambulance Services

## Justice

Dianne Gau - Registrar  
Denise Leschart - Deputy Registrar, Land Titles

## Public Service Commission

Don Trochim - Director, Compensation  
David Krockner - Compensation Analyst

## Renewable Resources

Beth Hawkings - GIS Manager  
Lauren Crooks - GIS Manager  
Brian Pelchat - Chief, Regional Fish and Wildlife Programs  
Yvonne Harris - Manager, Planning and Assessment  
David Murray - Agriculture Technician  
Nick DeGraff - Fisheries Biologist  
Val Loewen - Habitat Inventory Coordinator  
John Meikle - Park Management Planner

## Tourism

Jeff Hunston - Director, Heritage  
Robert Clark - Development Officer, Development

## Women's Directorate

Elda Ward - Coordinator, Policy and Programs

## Workers' Compensation Health and Safety Board

Sheila Lilles - Director, Client Services  
Al Clark - Manager, Occupational Health and Safety

## Yukon Development Corporation / Yukon Energy Corporation

Ron Millos - Vice-President, Finance and Administration  
John Maissan - Senior Utilities Engineer

**Yukon Housing Corporation**

Donald Flinn - Director, Construction and Maintenance  
Allyn Lyon - Manager, Program Services

**Yukon Liquor Corporation**

David Steele - Director, Corporate Services  
Bob Morris - Director, Operations and Purchasing

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## Women's Directorate

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## APPENDIX B

### Cardinality

Cardinality is an indication of what is allowed, takes place, or must be enforced within a business. In general, a way or documenting a business rule. Putting it another way, cardinality indicates the minimum and maximum number of times that any given occurrence of an entity may appear among the occurrences of it's related entity. Figure A-1 demonstrates cardinality.

'0,1' (zero to one) - means that there may be one occurrence of the relationship at one time, but it is possible that there will be none occurring at a time. In the example of the relationship between chair and table in our Example Data Model, A chair may be assigned to one table, but not more than one table at a time. A chair does not have to be assigned to any tables, in the case of an armchair. Following the Merice method of data modelling, in this example the cardinality would be entered near the entity 'Chair'.

'0,N' (zero to many) - means that it is possible not to have any occurrences of a relationship, or several occurrences. Again in our table chair relationship, a table may have no chairs assigned to it, as would an End Table or Coffee Table, where a Kitchen Table may have several chairs assigned to it. Again, following the Merice method, the cardinality for this example would be located near the entity 'Table'.

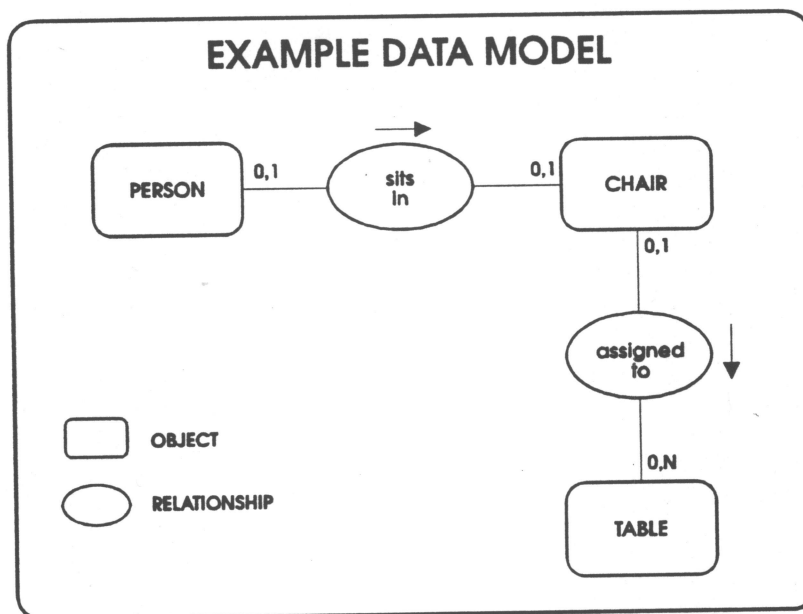


FIGURE B-1

**'1,N' (one to many)** - means there must be at least one occurrence of the relationship, or there can be several. i.e., a polling station must be established for at least one polling division, but a polling station may be established for more than one polling division. The cardinality for this example would be located near the entity 'Polling Station'.

The Land-Related Data Dictionary and is a separately bound document. To view this document contact the Yukon GIS Coordinating Unit at 667-3960 or Terry Neis (YTG ISB) at 667-5490.

## APPENDIX C

Appendix C contains:

A description of the RESULTS GIS application

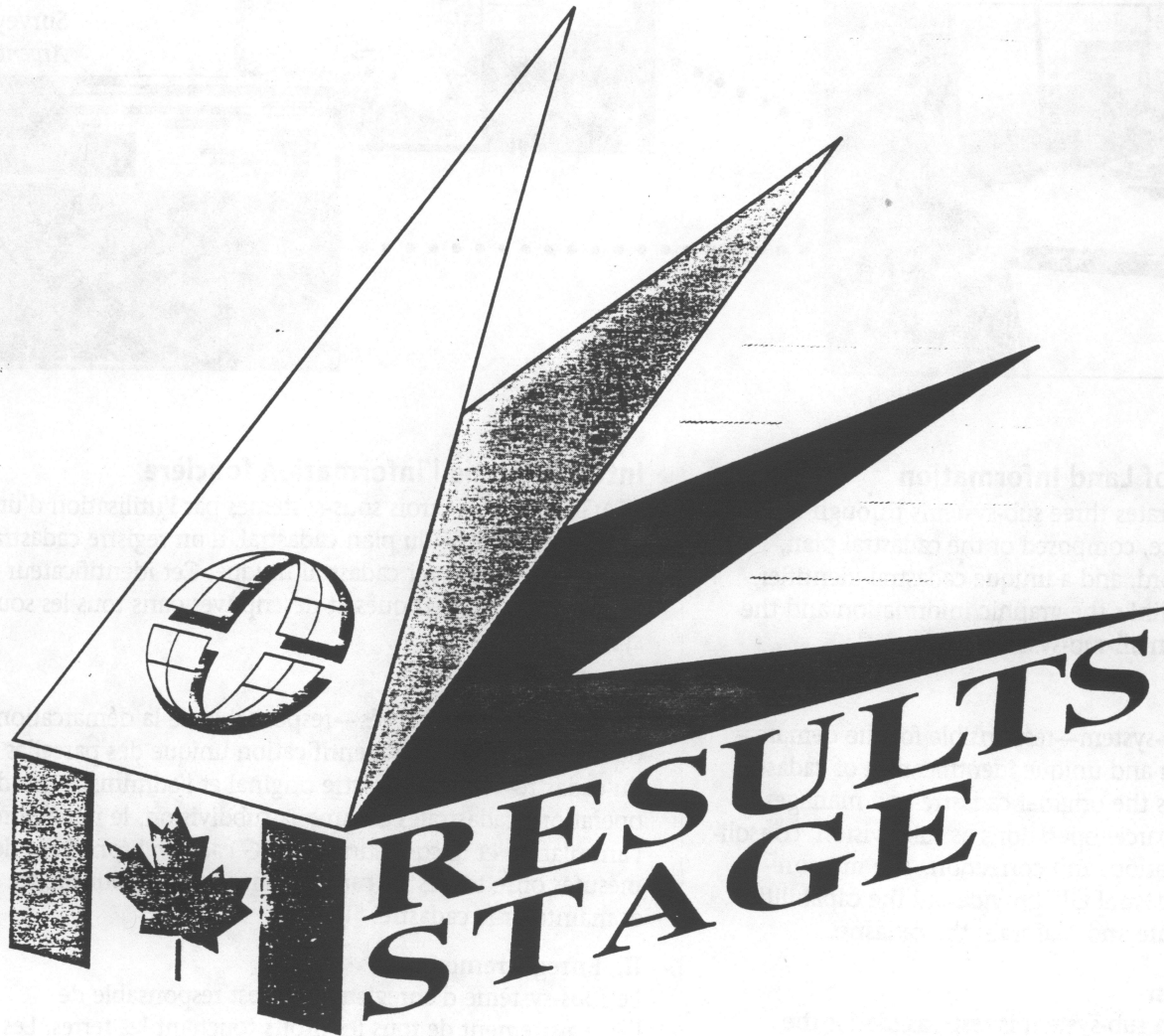
Information about the FTLAC and LARC

Information about YGISCU

Surveys, Mapping and  
Remote Sensing Sector



Secteur des levés, de la  
cartographie et de la télédétection

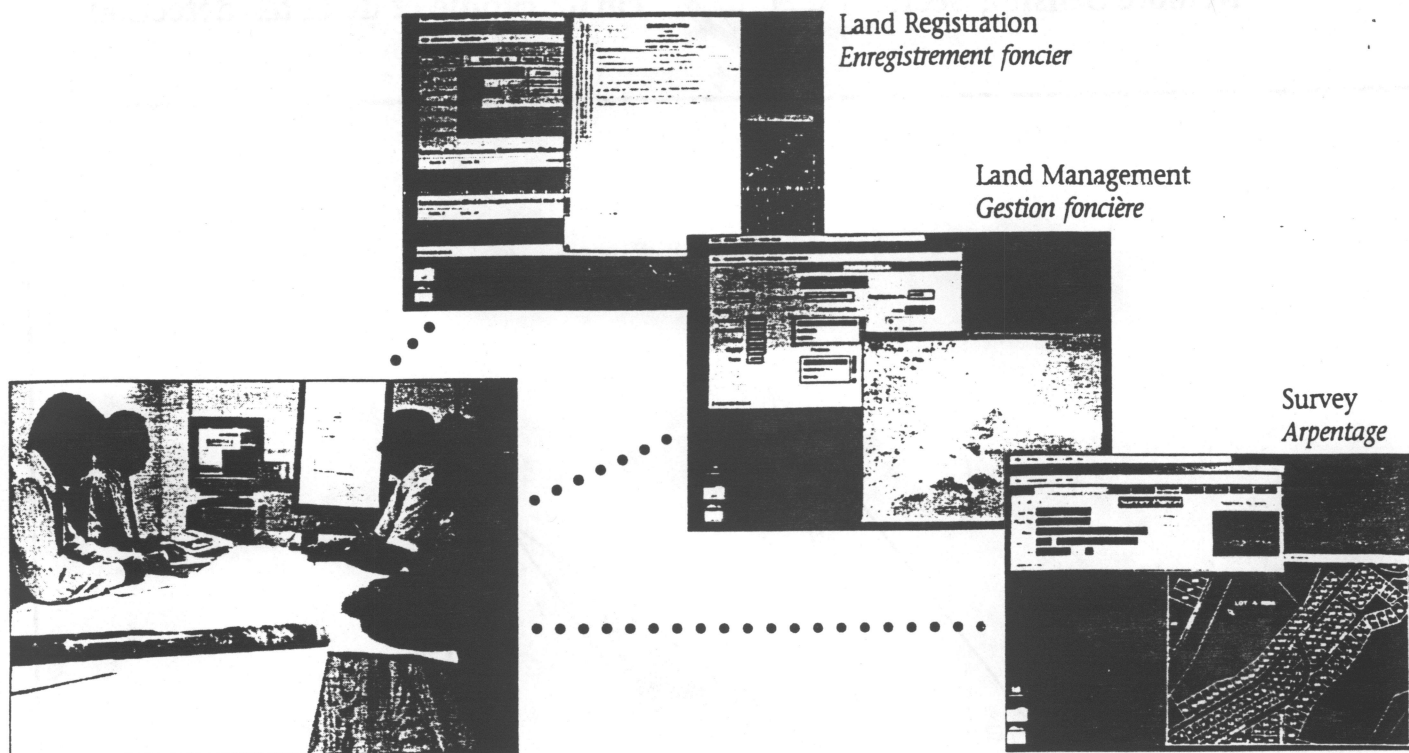


Energy, Mines and  
Resources Canada

Énergie, Mines et  
Ressources Canada

Canada





## Integration of Land Information

RESULTS integrates three sub-systems through the use of a cadastre, composed of the cadastral plan, a cadastral record, and a unique cadastral identifier. This identifier links the graphic information and the attribute data in all sub-systems.

### I. Survey

The survey sub-system—responsible for the demarcation, definition and unique identification of cadastral parcels—creates the original cadastre and manages it through such parcel operations as subdivision, consolidation, cancellation, and correction. The measurement-based cadastral GIS provides all the capabilities needed to update and maintain the cadastre.

### II. Registration

The registration sub-system is responsible for the registration of all rights affecting land. Rights are recorded and indexed against the unique cadastral identifier. The RESULTS registration sub-system can be based on various types of land registration systems, such as deeds recording or land titles.

### III. Land management

The land management sub-system is responsible for expanding the basic cadastre into a multipurpose cadastre for parcel-based information, such as taxation or land use. It ensures that a common spatial reference framework integrates all polygon-based information (such as zoning or resources) and network information (such as utilities or roads) with the cadastre.

## Intégration de l'information foncière

STAGE intègre les trois sous-systèmes par l'utilisation d'un cadastre, composé du plan cadastral, d'un registre cadastral et d'un identificateur cadastral unique. Cet identificateur relie les données géométriques et descriptives dans tous les sous-systèmes.

### I. Arpentage

Le sous-système des levés—responsable de la démarcation, de la définition et de l'identification unique des parcelles du cadastre—crée le cadastre original et l'administre par des opérations cadastrales comme la subdivision, le remembrement, l'annulation et la correction. Le SIG cadastral fondé sur des mesures offre toutes les capacités nécessaires pour mettre à jour et maintenir le cadastre.

### II. Enregistrement

Le sous-système d'enregistrement est responsable de l'enregistrement de tous les droits touchant les terres. Les droits sont enregistrés et indexés par rapport à l'identificateur cadastral unique. Le sous-système d'enregistrement de STAGE peut être fondé sur divers types de système d'enregistrement foncier, comme l'enregistrement des actes ou les titres fonciers.

### III. Gestion foncière

Le sous-système de gestion foncière est responsable d'élargir le cadastre de base pour en faire un cadastre à usages multiples pour les besoins de l'information foncière, par exemple la fiscalité ou l'utilisation des terres. Ce sous-système veille à ce qu'un cadre de référence spatiale commun intègre toutes les données polygonales—comme le zonage ou les ressources—et l'information de réseau—comme les services publics et les routes—au cadastre.

## Canada gets RESULTS

Since 1960, when the Government of Canada developed the first Geographic Information System (GIS), Energy, Mines and Resources Canada (EMR) has played a leading role in the development and use of GIS technology in Canada.

### Cadastral systems

One important application of GIS technology is in cadastral systems. A cadastre is a public record of land for purposes of registration, description, administration and taxation.

With the legal surveying responsibility for over four million square kilometres of federally administered land and over six million square kilometres offshore, known as Canada Lands, the Legal Surveys Division of EMR's Surveys, Mapping and Remote Sensing Sector (SMRSS) has taken the lead in applying GIS technology to cadastral information systems.

### Setting the standard

SMRSS, as lead agency at the Federal level, has developed an integrated, multipurpose cadastral information system, known as RESULTS, which will set a new standard for cadastral information systems for Canada Lands.

The office of the Surveyor General of Canada Lands, which is responsible for managing surveys on Canada Lands and for keeping survey records, is implementing RESULTS and promoting development of a seamless digital cadastre, land registration and land management system for all Canada Lands.

### Multipurpose Cadastre for today and tomorrow

RESULTS—Registration, Survey and Land management Triangular System—integrates three sub-systems that manage data for surveys, land registration and land management. RESULTS is an application developed by cadastral experts, using GIS and relational data base technology to efficiently maintain the cadastre through a measurement-based approach. This approach uses measurements to establish the position of graphic features. RESULTS will be one component of the Total Digital Platform now under development in SMRSS.

RESULTS uses scanning, digitizing, existing graphic data or survey measurements to construct and maintain the cadastre within a measurement-based data structure. This means that less precise and inexpensive methods can be used to create the original cadastre. When more accurate measurements become available, they can be incorporated to upgrade the overall accuracy of the cadastre.

## Le Canada obtient des résultats

Depuis 1960, lorsque le gouvernement du Canada a mis au point le premier système d'information géographique (SIG), Énergie, Mines et Ressources joue un rôle de chef de file dans le développement et l'utilisation de la technologie SIG au Canada.

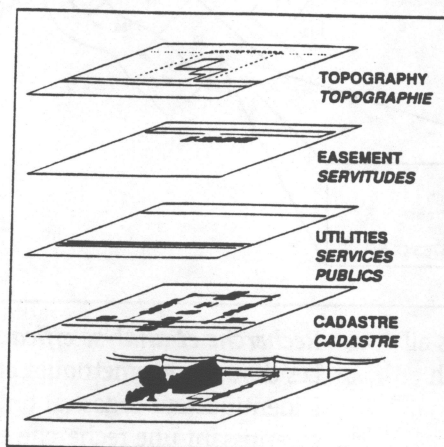
### Les systèmes cadastraux

Une importante application de la technologie SIG se retrouve dans les systèmes cadastraux. Un cadastre est un registre public des terres aux fins d'enregistrement, de description, d'administration et de fiscalité.

Étant responsable de gérer les terres du Canada—ce qui représente plus de 4 millions de km carrés de terres administrées par le fédéral et plus de 6 millions de km carrés de terres extracôtières—la Division des levés officiels du Secteur des levés, de la cartographie et de la télédétection (SLCT) d'EMR joue un rôle de premier plan dans l'application de la technologie SIG aux systèmes d'information cadastrale.

### Établir la norme

En tant qu'organisme principal au niveau fédéral, le SLCT a mis au point un système d'information cadastrale intégré à usages multiples appelé STAGE, qui établira une nouvelle norme pour les systèmes d'information cadastrale pour les terres du Canada.



Le Bureau de l'arpenteur général des terres du Canada est chargé d'administrer les levés des terres du Canada et de tenir les registres sur les levés. Il met en oeuvre le système STAGE et favorise le développement d'un système numérique transparent de cadastre, d'enregistrement des terres et de gestion foncière pour les terres du Canada.

### Un cadastre à usages multiples pour aujourd'hui et demain

STAGE—le Système Triangulaire d'Arpentage, de Gestion foncière et d'Enregistrement—intègre trois sous-systèmes qui administrent les données des levés, l'enregistrement des terres et la gestion foncière. STAGE est une application élaborée par des experts en cadastre qui utilisent la technologie des SIG et des bases de données relationnelles pour gérer efficacement le cadastre à l'aide d'une méthode fondée sur des mesures. Cette méthode utilise des mesures pour déterminer la position des entités graphiques. STAGE sera une composante de la «plateforme numérique globale» en voie d'élaboration au SLCT.

STAGE fait appel au balayage, à la numérisation, aux données graphiques existantes ou à des mesures de levés pour construire et tenir à jour le cadastre dans une structure de données fondée sur des mesures. Cela signifie qu'on peut utiliser des méthodes moins précises et moins coûteuses pour créer le cadastre original. Lorsque des mesures plus précises deviennent disponibles, elles peuvent être intégrées pour améliorer la précision globale du cadastre.

## Why RESULTS?

RESULTS will make management of property rights and other land-related data easier, efficient and economical not only for Canada Lands, but for application in other countries.

### *Fast, low-cost implementation*

The measurement-based structure of RESULTS allows the cadastral plan to be efficiently created from existing graphic data, lowering data capture costs.

### *Efficient, economical updating*

Measurements can be added during day-to-day operation of the survey sub-system, reducing maintenance costs.

### *Efficient accuracy upgrading*

The accuracy of the data base can be upgraded easily by using new measurements as they are added to the system.

### *Efficient search and analysis*

Graphic and attribute data are integrated. The unique cadastral identifier links all parcel information, guaranteeing efficient search and analysis over multiple databases.

## Check these RESULTS

**Lower costs**—improved management and reliability of land-related information will lower land administration costs.

**Economic spinoffs**—implementing the system will stimulate industry and create a market for expertise, support and training services, and technology.

**Better management**—faster access to data and better land management will benefit all levels of society.

## Pourquoi utiliser STAGE

STAGE rendra la gestion des droits fonciers et des autres données foncières plus facile, plus efficace et plus économique pour les terres du Canada. Il pourra aussi être utilisé dans d'autres pays.

### *Mise en oeuvre rapide et peu coûteuse*

Grâce à sa structure de données fondée sur des mesures, STAGE permet de créer efficacement le plan cadastral à partir de données graphiques existantes, permettant ainsi de réduire les coûts de saisie de données.

### *Mise à jour efficace et économique*

Les mesures peuvent être mises à jour pendant le fonctionnement quotidien du sous-système des levés, ce qui permet de réduire les coûts de maintenance.

### *Amélioration efficace de la précision*

La précision de la base de données peut être améliorée facilement à l'aide de nouvelles mesures au fur et à mesure qu'elles s'ajoutent au système.

### *Recherche et analyse efficaces*

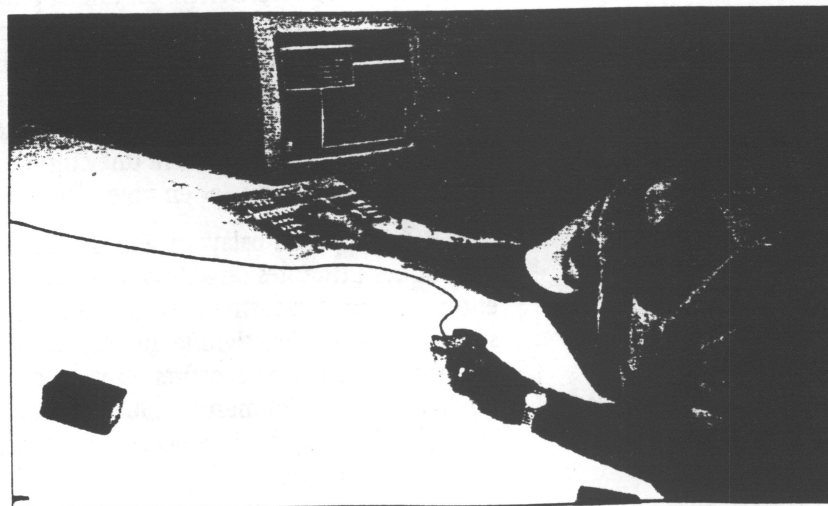
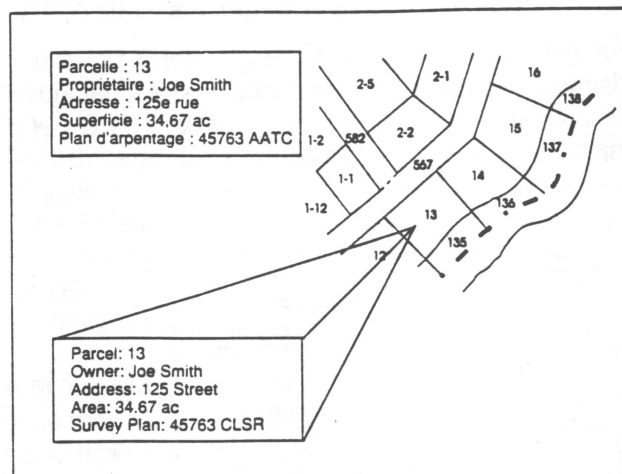
Les données géométriques et descriptives sont intégrées. L'identificateur cadastral unique relie toutes les données foncières, garantissant une recherche et une analyse efficaces sur plusieurs bases de données.

## Constatez ces résultats

**Coûts réduits**—la gestion et la fiabilité améliorées de l'information foncière réduiront les coûts administratifs.

**Retombées économiques**—la mise en oeuvre du système stimulera l'industrie et établira un marché technologique, d'expertise, et de services de soutien et de formation.

**Meilleure gestion**—Chacun pourra bénéficier d'un accès plus rapide aux données et d'une meilleure gestion foncière.





## Technical details

### Interface

- window-based (mouse)
- pull-down menus
- integrated graphics and database

### Data capture

- keyboard input (measurements)
- digitizing
- scanning
- reformat from other graphic files

### Data management (measurement-based)

- Editing
  - keyboard input (measurements)
  - digitizing
- Adjustment
  - least squares (observations, weights, constraints)
  - accuracy indicators

### Query and Analysis

- attributes and graphic features are fully integrated
- attribute searches (one or more attribute can be specified)
- graphic selections (one or many features)
- graphic highlights
- polygon overlays
- buffering capabilities (zones)
- network and polygon topology
- graphic search by user-defined area
- display of historical information

### Outputs

- attribute reports
- cartographic outputs
- reformat into other graphic file formats

### Display functions

- zoom and pan
- colour table definition
- display parameter settings (feature code, theme, etc)
- raster image backdrop

### Development software

- INGRES™ RDBMS
- INGRES™/W4GL
- CARIS™ GIS
- SCO/ODT™ operating system
- VMS™ operating system
- SUN OS™ operating system

### Development hardware

- DEC MICROVAX II
- SUN Sparc2
- IBM PC compatible

### Trademarks

INGRES	Trademark of INGRES Corporation
INGRES/Windows4GL	Trademark of INGRES Corporation
CARIS	Trademark of Universal Systems Ltd.
SCO/Open Desktop	Trademark of The Santa Cruz Operation, Inc.
VMS	Trademark of Digital Equipment Corporation
SUN OS	Trademark of SUN Microsystems
UNIX	Trademark of AT&T

## Fiche technique

### Interface

- écran à base de fenêtres (souris)
- menus déroulants
- graphiques et base de données intégrés

### Saisie des données

- introduction au clavier (mesures)
- numérisation
- balayage
- reformatage à partir d'autres fichiers de graphiques

### Gestion des données (fondée sur des mesures)

- édition
  - introduction au clavier (mesures)
  - numérisation
- compensation
  - moindres carrés (observations, poids, contraintes)
  - Indicateur de précision

### Consultation et analyse

- les attributs et les entités graphiques sont pleinement intégrés
- recherches d'attributs (un ou plusieurs attributs peuvent être précisés)
- sélections de graphiques (une ou plusieurs entités)
- mise en évidence des entités graphiques
- superposition des polygones
- capacités de mise en mémoire tampon (zones)
- topologie de réseaux et de polygones
- recherche graphique à l'aide d'une surface définie par l'utilisateur
- affichage de l'information historique

### Sorties

- rapports sur les attributs
- sorties cartographiques
- reformatage dans d'autres formats de fichiers graphiques

### Fonctions d'affichage

- zoom et plan panoramique
- définition de la table des couleurs
- affichage des paramètres (code d'entité, thème, etc.)
- Image matricielle en toile de fond

### Logiciels de développement

- INGRES RDBMS
- INGRES W4GL
- CARIS GIS
- SCO/ODT système d'exploitation
- VMS système d'exploitation
- SUN OS système d'exploitation

### Matériel informatique

- DEC MICROVAX II
- SUN Sparc2
- IBM PC compatible

### Marques de commerce

INGRES	Marque de commerce de INGRES Corporation
INGRES/Window4GL	Marque de commerce de INGRES Corporation
CARIS	Marque de commerce de Universal Systems Ltd.
SCO/Open Desktop	Marque de commerce de The Santa Cruz Operation Inc.
VMS	Marque de commerce de Digital Equipment Corporation
SUN OS	Marque de commerce de SUN Microsystems
UNIX	Marque de commerce de AT&T



**DISTRIBUTION LIST FOR APPLICATIONS TO BE  
PRESENTED AT FTLAC**

* Senior Land Claims Analyst:	Environment & Land Claims, NAP
Regional Manager:	Land Resources, NAP
Regional Manager:	Water Resources, NAP
Regional Manager:	Forest Resources, MAP
Director:	Lands, Revenues & Trusts, I & I (2)
Regional Manager:	Environmental Health, NH&W
Manager:	Lands Branch, YTG (2)
Renewable Resource Planner:	Lands & Regional Planning, YTG (2)
Council For Yukon Indians:	Attention: Fred Green

\* Affected Bands

93-02-24

### LARC MAILING LIST

S-3    Highways  
Robin Walsh, 5994

M-5    Land Planning Tech  
Greg Kent, 5306

R-4    Renewable Resources  
Alan Parkinson, 5409

M-5    Lands Manager  
Perry Savoie, 5882

R-4    Renewable Resources  
Perry Diamond, 3523

M-5    Lands Inspector  
Dan Carruthers, 5357

A-14    Land Claims  
Ron Sumanik, 5689

M-5    Lands Agriculture Co-ord  
Edward Lee, 3022

M3A    Protective Services  
Marvin Brooks, 5445

L-1    Heritage Branch  
Jeff Hunston, 5363

M-5    Land Disposal Project  
Officer  
Bryony McIntyre/Ross Burnett, 3453

Federal Government  
Health and Welfare Canada  
Environmental Health  
No. 4 Hospital Road  
Whitehorse, Yukon Y1A 3H8  
Don Taylor, 667-8350

City of Whitehorse  
2121 - Second Avenue  
Whitehorse, Yukon Y1A 1C2  
Judy Linton  
Development Officer, 667-6401

Northern Affairs Program  
Federal Lands  
200 Range Road  
Whitehorse, Yukon Y1A 3V1  
Mabel Macyshen, 667-3174

\* ANY AFFECTED FIRST NATIONS

\* ANY " COMMUNITIES

## L.A.R.C.

## LANDS APPLICATION REVIEW COMMITTEE

Rec'd 89.1

Committee was established within Department of Community & Transportation Services, Lands Branch in May 1983, to review individual applications for disposition of Commissioner's land not normally handled through over-the-counter sales procedures. The applications range from commercial proposals, through lot enlargements, to recreational leases and sales.

The purpose of the Committee is to review and evaluate the applications for recommendation, to the Director, for acceptance, refusal, or modification, as to the disposition of the land.

Note: All Agricultural applications pending review by the Agricultural Committee are reviewed by L.A.R.C. and if Commissioner Land - recommendation for decision is made; if Federal Land, a recommendation is made to F.T.L.A.C. (Federal/Territorial Land Advisory Committee).

All native or Land Claims issues are referred to the Land Claims Secretariat.

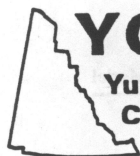
The Committee is generally comprised of:

- Manager, Lands Disposal
- Community Planner
- Land Disposal Officer
- Land Use Officer

but also seeks consultation in the approval process of:

- Environmental Health
- Protective Services
- Economic Development: Mines & Small Business
- Tourism, Heritage Branch
- City of Whitehorse, and
- other Municipalities/Communities

The Committee meets on a regular monthly bases, ensuring impartiality and quick processing of applications. (Some applications can be dealt with expeditiously - less than 30 days - or can take substantially longer, depending on location of property and complexity of application.) An average application turn-around time is about 2 months.



# YGISCU

Yukon Geographic Information System  
Coordinating Unit

## FACT SHEET

### GIS - Geographic Information System

A GIS is a set of computer-based tools which captures, stores, displays, analyses, and outputs spatial (map-based) information.

GISs' are used to support the decision making processes of institutions. Used effectively, they assist in making spatial data analyses more timely, more accurate, and more easily documented and displayed.

In the Yukon, GISs' are being used, or are at various stages of implementation, by many of the Territorial and the Federal Government departments, the Council for Yukon Indians, many of the Yukon First Nations, many of the Community Government departments and several organizations in private industry.

### THE UNIT

To successfully implement GIS technology in the Yukon, a coordinated approach was recognized as a key step. To this end the Yukon GIS Coordinating Unit was created.

The Yukon GIS Coordinating Unit is a partnership between the Departments of Renewable Resource, and Community and Transportation Services, of the Government of Yukon Territory; and the Departments of Energy, Mines and Resources, and Indian and Northern Affairs, of the Government of Canada. The Unit became operational in April 1992, and the present agreement allows for the shared resourcing of the Unit, by the departments, for an initial 3 year period.

The primary function of the Unit is to provide technical and management advice/support to the contributing agencies, by developing and promoting mutually agreed upon GIS implementation and management methods. This also includes promotion and coordination of digital data sharing and GIS training opportunities.

Listed below are some of the ways anyone interested in GIS can gain benefit from the creation of the Yukon GIS Coordinating Unit.

1. Access to the GIS Resource Centre comprised of technical journals and books, training videos and other resource material.
2. Access to the Yukon GIS Activity (Situational) Summary which will include a general directory of existing data sets (topic, format, contact name) and a description of GIS initiatives in the Yukon.
3. Access to GIS training programs to be held in Whitehorse.
4. Opportunity to join the Yukon GIS Users Group which will be a forum to exchange information and to allow for input into the activities of the Coordinating Unit.

### LOCATION and CONTACTS

The Yukon GIS Coordinating Unit is located in the new Federal Building in Whitehorse (Room 225, 300 Main Street). The Unit is headed up by Bob Gray (phone no. 667-3957, fax 668-2383), with Ross McLachlan acting as the GIS Application Specialist (phone no. 667-3960).



## APPENDIX D

Appendix D contains:

Detailed Land-Related Create/Use Matrix  
Business Function/Department Cross Reference Matrix  
Data Use/Department Cross Reference Matrix

## DETAILED LAND-RELATED CREATE/USE MATRIX

LAND - RELATED DATA			FUNCTION																																	
			YTG Policy Development	NAP Policy Development	Regional Land Use Planning	Community Land Use Planning	Land Titles Registration	YTG Land Interest Registration	NAP Land Interest Registration	YTG Land & Water Use Permit Regia.	NAP Land & Water Use Permit Regia.	Geodetic Control	Legal Survey Management	YTG Land Interest Evaluation	NAP Land Interest Evaluation	YTG Land & Water Use Permit Eval.	NAP Land & Water Use Permit Eval.	Environmental Assessment	Infrastructure Permit Evaluation	YTG Mineral Resource Management	NAP Mineral Resource Management	YTG Biophysical Management	NAP Biophysical Management	CWS Biophysical Management	YTG Fish & Wildlife Management	CWS Fish & Wildlife Management	Heritage Resource Management	Parks & Outdoor Recreation Management	Highway Infrastructure Management	Property Assessment & Taxation	Community Infrastructure Management	Recreation Infrastructure Management	Aviation Infrastructure Management			
ADMIN	Administration Area	admin area	C	C	C	C	U	U	U	U	U			U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U			
LAND INTEREST	Registered Land	titled	U	U	U	U	C			U	U			U	U	U	U	U	U	U								U		U	U	U	U	U		
		lease	U	U	U	U		C	C	U	U			U	U	U	U	U	U	U										U	U	U	U	U		
		licence	U	U	U	U		C	C	U	U			U	U	U	U	U	U	U											U	U	U	U	U	
		agreement for sale	U	U	U	U		C	C	U	U			U	U	U	U	U	U	U												U	U	U	U	U
		reservation	U	U	U	U		C	C					U	U	U	U	U	U	U									U	U	U	U	U	U		
		notation	U	U	U	U		C	C					U	U	U	U	U	U	U											U	U	U	U	U	
		withdrawn land	U	U	U	U		C	C					U	U	U	U	U	U	U												U	U	U	U	
		mineral claim	U	U	U	U					C		U			U	U	U	U	U		U	U									U	U	U	U	
		Land Use	water / land use permit location	U	U	U	U					C	C			U	U	U	U	U	U		U	U					U	U	U	U	U	U	U	U
		Land Survey	geodetic control point												C	U																				
land survey point													U	C																						
land survey line													U	C																						
cadastral plan	U		U	U	U		U	U	U	U	U			U	U	U	U	U	U									U		U	U	U	U	U		
Interest Parcel	right of way		U	U	U	U		U	U	U	U			C	U	U	U	U	U	U		U	U							U	U	U	U	U		
	cadastral	U	U	U	U		U	U	U	U			C	U	U	U	U	U	U											U	U	U	U	U		
	assessment	U	U	U	U		U	U	U	U			C	U	U	U	U	U	U											U	U	U	U	U		
	sub-surface	U	U	U	U		U	U	U	U			C	U	U	U	U	U	U		U	U								U	U	U	U	U		
RESOURCE	Topography	elevation model	U	U	U	U									U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U			
	Geophysical	geologic zone	U	U	U										U	U	U	U	U																	
		geologic formation	U	U	U	U									U	U	U	U	U	U																
		geologic survey													U	U	U	U	U	U																
		quarry	U	U	U	U									U	U	U	U	U	U																
		soil cover	U	U	U	U									U	U	U	U	U	U																
		soil survey													U	U	U	U	U	U																
	Hydrography	ice	U	U	U										U	U	U	U	U	U		U	U													
		hydrography	U	U	U	U									U	U	U	U	U	U		U	U													
		snow	U	U	U										U	U	U	U	U	U		U	U													
		ice survey													U	U	U	U	U	U																
		water survey					U								U	U	U	U	U	U																
		snow survey													U	U	U	U	U		U	U														
	Vegetation	vegetation cover	U	U	U	U									U	U	U	U	U	U																
		vegetation survey													U	U	U	U	U	U																
		forest fire	U	U	U										U	U	U	U	U	U																
	Ecology	ecological area	U	U	U										U	U	U	U	U	U																
	Climate Fish & Wildlife	F & W species	U	U	U										U	U	U	U	U	U																
		F & W species survey													U	U	U	U	U	U																
		F & W habitat	U	U	U										U	U	U	U	U	U																
		F & W harvest	U	U	U										U	U	U	U	U	U																
																U	U	U	U	U	U															
	Heritage & Recreation	archeological site	U	U	U	U									U	U	U	U	U	U																
		historic resource	U	U	U	U									U	U	U	U	U	U																
		recreation cover	U	U	U	U									U	U	U	U	U	U																
		park land	U	U	U										U	U	U	U	U	U																
	INFRA-STRUCTURE	Highway	highway	U	U	U	U								U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U		
			road	U	U	U	U								U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U		
			trail	U	U	U	U								U	U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U		
			highway inspection	U	U	U	U								U	U	U	U	U	U																
		traffic survey	U	U	U	U								U	U	U	U	U	U																	
			U	U	U	U								U	U	U	U	U	U																	
			U	U	U	U								U	U	U	U	U	U																	
			U	U	U	U								U	U	U	U	U	U																	
			U	U	U	U								U	U	U	U	U	U																	
			U	U	U	U								U	U	U	U	U	U																	
		U	U	U	U								U	U	U	U	U	U																		
Building	Water System			U	U									U	U	U	U	U	U																	
	Sewage System			U	U									U	U	U	U	U	U																	
	Recreation Facility			U	U	U								U	U	U	U	U	U																	
	Aviation																																			
		airport	U	U	U	U									U	U	U	U	U	U																
	airport inspection													U	U	U	U	U	U																	
	air traffic survey	U	U	U	U									U	U	U	U	U	U																	

**C = CREATE      U = USE**

# BUSINESS FUNCTION/DEPARTMENT CROSS REFERENCE MATRIX

DEPARTMENT		BUSINESS FUNCTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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**BUSINESS FUNCTION/DEPARTMENT CROSS REFERENCE MATRIX**

DEPARTMENT		BUSINESS FUNCTION	
Department of Education	X	YTG Policy Development	
Ec Dev - Policy Planning & Research	X	NAP Policy Development	
Ec Dev - Mineral Resources Program	X	Regional Land Use Planning	
Ec Dev - Canada/Yukon Mineral Dev Agr.	X	Community Land Use Planning	
Department of Finance	X	Land Titles Registration	
Department of Government Services	X	YTG Land Interest Registration	
Department of Health & Social Services	X	NAP Land Interest Registration	
Justice - Land Titles Office		YTG Land & Water Use Permit Registration	
Public Service Commission	X	NAP Land & Water Use Permit Registration	
Tourism - Heritage	X	YTG Land Interest Evaluation	
Tourism - Development	X	NAP Land Interest Evaluation	
Tourism - Marketing	X	YTG Land & Water Use Permit Evaluation	
Women's Directorate	X	NAP Land & Water Use Permit Evaluation	
Worker's Compensation Board	X	Environmental Assessment	
Yukon Dev Corp./Yukon Energy Corp.	X	Infrastructure Permit Evaluation	
Yukon Housing Corp.	X	Property Assessment & Taxation	
Yukon Liquor Corp.	X	Geodetic Control	
RR - Land Claims Coord Section	X	Legal Survey Management	
RR - Policy, Planning & Assessment Branch	X	NTS Mapping	
RR - Wildlife Management	X	YTG Mineral Resource Management	
RR - Regional Fish & Wildlife Programs	X	NAP Mineral Resource Management	
RR - Fisheries Habitat	X	YTG Biophysical Management	
RR - Habitat Management & Research	X	NAP Biophysical Management	
RR - Agriculture Branch	X	Fish & Wildlife Management	
RR - Environmental Protection	X	Heritage Resource Management	
RR - Parks & Outdoor Rec. Branch	X	Parks & outdoor Recreation Management	
		Highway Infrastructure Management	
		Community Infrastructure Management	
		Recreation Infrastructure Management	
		Aviation Infrastructure Management	
		CWS - Biophysical Management	
		CWS - Fish & Wildlife Management	



# DATA USE/DEPARTMENT CROSS REFERENCE MATRIX

DEPARTMENT	DATA
EM&R - Topo Division	admin. area titled lease licence agreement for sale reservation notation withdrawn land mineral claim water and land use permit geodetic control point land survey point land survey line cadastral plan right of way cadastral easement sub-surface elevation model geologic zone geologic formation geologic survey quarry soil cover soil survey ice hydrography snow ice survey water survey snow survey vegetation cover vegetation survey forest fire ecological area climate fish and wildlife species f&w species survey f&w habitat F&W harvest archaeological site historic resource recreation cover park land highway road trail highway inspection traffic survey building water system sewage system recreation facility airport airport inspection air traffic survey
EM&R - Legal Survey Division	
EM&R - Geodetic Survey.	
NAP - Water Res.	
NAP - Forest Res.	
NAP - Env. & Land Claims	
NAP - Mineral Resources	
NAP - Land Resources	
NAP - Land Use	
Canadian Wildlife Service	
ECO - Bureau of Statistics	
ECO - Land Claims Secretariat	
Legislative Assembly - Elections Office	
C&TS - Policy Planning & Evaluation	
C&TS - Property Assessment & Taxation	
C&TS - Public Safety Branch	
C&TS - Municipal Engineering Branch	
C&TS - Land Disposal Section	
C&TS - Land Development Section	
C&TS - Land Planning Section	
C&TS - Design & Construction	
C&TS - Bridges & Technical Services	
C&TS - Geotechnical Services	
C&TS - Operational Services	
C&TS - Transport Services Branch	
C&TS - Transport Planning & Programming	
C&TS - Aviation & Marine	

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# DATA USE/DEPARTMENT CROSS REFERENCE MATRIX

DEPARTMENT	DATA
Department of Education	admin. area titled lease licence agreement for sale reservation notation withdrawn land mineral claim water and land use permit geodetic control point land survey point land survey line cadastral plan right of way cadastral easement sub-surface elevation model geologic zone geologic formation geologic survey quarry soil cover soil survey ice hydrography snow ice survey water survey snow survey vegetation cover vegetation survey forest fire ecological area climate fish and wildlife species f&w species survey f&w habitat F&W harvest archaeological site historic resource recreation cover park land highway road trail highway inspection traffic survey building water system sewage system recreation facility airport airport inspection air traffic survey
Ec Dev - Policy Planning & Research	X
Ec Dev - Mineral Resources Program	X
Ec Dev - Canada/Yukon Mineral Dev Agr.	X
Department of Finance	X
Department of Government Services	X
Department of Health & Social Services	X
Justice - Land Titles Office	X
Public Service Commission	X
Tourism - Heritage	X
Tourism - Development	X
Tourism - Marketing	X
Women's Directorate	X
Worker's Compensation Board	X
Yukon Dev Corp./Yukon Energy Corp.	X
Yukon Housing Corp.	X
Yukon Liquor Corp.	X
RR - Land Claims Coord Section	X
RR - Policy, Planning & Assessment Br.	X
RR - Wildlife Management	X
RR - Regional Fish & Wildlife Programs	X
RR - Fisheries Habitat	X
RR - Habitat Management & Research	X
RR - Agriculture Branch	X
RR - Environmental Protection	X
RR - Parks & Outdoor Rec. Branch	X

## GLOSSARY OF TERMS & ACRONYMS

The following descriptions are provided as background to the discussion. They are not meant to be a definition, but rather, to provide a common understanding of terms used in this report.

### APPLICATION

Data and business functions which have been organized into natural business areas according to their affinity with each other.

### APPLICATION AREA

A group of functions that create data about a particular entity or group of entities.

### APPLICATIONS ARCHITECTURE

Provides a framework for the definition and development of applications. Without this framework, application systems are often developed as a consequence of local needs without regard for global issues. Because much of the investment in information technology is devoted to the development and maintenance of systems, applications architectures are essential to ensure that the government's investment results in systems which reflect overall business priorities.

### ARCHITECTURE

In the context of Information Resource Management, an architecture is a structure, or blueprint of data, technology and applications. The architectures are usually defined as a graphic model.

### BUSINESS FUNCTION

A group of activities that together support one aspect of furthering the mission of the enterprise. A function categorizes what is done, not how; is ongoing and continuous; and is not based on organizational structures.

### CANADA LANDS

Lands over which the Government of Canada has jurisdiction.

### CARDINALITY

This descriptor indicates the minimum and maximum frequencies of an occurrence of an entity, within a relationship to another entity.

### CONFIDENTIALITY

The state of classifying data of which unauthorized disclosure and use could cause serious damage to the organization.

### CONVERSION OF DATA

The encoding of data into a specific computer readable format. Includes both conversion from paper (analogue) to computer form and from one computer format to another.



## **CORPORATE DATA MODEL**

A graphical representation of the complete set of objects which are prepared, collected or stored in conducting the government's business, about which the government needs information, as understood at senior management and Deputy Minister level. The model represents the associations, or relationships occurring among these objects.

### **CWS - Canadian Wildlife Service**

A division of the federal department of Environment Canada.

## **DATA INTEGRITY**

The state that exists when computerized data is accurate, reflects the source document information and has not been exposed to accidental or malicious alteration or destruction. It can then be used confidently to support business decisions and operations.

## **DATA ARCHITECTURE**

The data architecture describes the things that the government must know about in order to operate. Data is stable as long as the business itself does not change. Data architecture ensures that the design of any segment of the government's data resource serves all legitimate functions, so that data is globally rather than locally exploited.

## **DATA STEWARDSHIP**

A function assigned to individuals on behalf of the enterprise to ensure responsible management of a particular group or set of data.

### **DEM - Digital Elevation Model**

A two dimensional grid of numbers which represents the elevation of some area on the earth. Each 'cell' in the grid is of a specific size on the ground ( for example, 100m by 100m) and contains a value which is an aggregate of elevation for the area covered by that cell.

## **EMERGING TECHNOLOGY**

A technology where skills sets, training, policies and procedures have not been put into place, and is not used on a day to day basis in the enterprise.

## **ENTITY**

A descriptive element of a facet representing a class of objects (persons, places, things, etc.) that are all described by the same attributes in conceptual modelling.

## **FACET**

A descriptive element of a data subject, comprising the data describing a particular aspect of the subject.

### **GIS - Geographic Information System**

A set of software tools for the collection, maintenance, display and analysis of geographically referenced objects. The tools most frequently include proprietary software for the management of the geometric component, with links to a database management system (RDBMS being most popular) for the management of the alphanumeric component.



## **INFORMATION TECHNOLOGY**

Information technology is the data, applications and technology means (hardware, software) which allow for the creation, storage, retrieval and communication of information.

## **INFORMATION RESOURCE MANAGEMENT**

Information Resource Management is a business approach to the management of the government's information which focuses on business priorities and business strategies. It is those functions which are required to manage information and the delivery mechanism (both manual and automated) throughout the government. The concept of Information Resource Management is an implicit recognition of the value of the information asset to the government.

## **LAND-RELATED DATA**

Land-related data are objects of interest which can be described by a location, and can be shown on a map. Also referred to as spatial data or geographic data. The categories of land-related data are land, resource, and thematic.

**Land data** refers, in general, to the management and distribution of land for tenure, particularly legal lots, tax parcels, land claims.

**Resource data** refers, in general, to the natural environment, such as hydrography, vegetation, soils, climate, geology, and hypsography.

**Thematic data** refers, in general, to data which is specific to a given activity. Examples of this data include, among many others, wildlife habitat, electoral districts, historic sites, transportation and utilities infrastructures, exploration sites, and emergency service districts.

Representations of land-related data include **geometric** and **referential**.

**Geometric** land-related data is at minimum two-dimensional, having both an (x,y) coordinate, and often a third dimension indicating height (x,y,z). Means of representing spatial objects include point, line, polygon (boundary enclosing an area), raster (like grid blocks on a sheet of graph paper), and digital elevation model.

**Referential** land-related data is one-dimensional. Examples of common attributes which are used to reference objects in space include address, city, building, census tract, and zone.

Methods for **collecting** land-related data include: surveying, global positioning systems (GPS), digitizing existing maps, scanning maps (or other hard copy documents) and performing feature recognition, remote sensing and interpretation (image analysis), and forms.

The **management** of spatial data revolves primarily around the maintenance of the relationships between entities. For example, a change in the location of a boundary of one political riding has an impact on all contiguous political ridings. Another example is that relationships may exist between lot boundaries and block boundaries - if the lot boundary changes then so too must the block boundary.

**Examples of analysis** of land-related data include determining the distance between two entities (e.g., logging area to a road), the overlap of two entities (e.g., wildlife habitat and land claims area; air pollution plumes and an area of disease increases), intervisibility analysis (e.g., determining wildlife viewing areas along a highway corridor). An emerging trend in the analysis of spatial data is in the support of impact analysis (e.g., what is the impact on the environment, wildlife, the local economy, ..., of locating a high traffic tourist attraction in a particular area).

**Examples of reporting** land-related data include screen graphic displays, plots (hardcopy maps) and reports. Integration with other technologies has allowed for a more complete business solution. Sample integrations include: automatic generation of electronic mail, triggers to other applications such as Computer Aided Design (CAD), automatic generation of "letters of notification" (mail merge).

#### **NAP - Northern Affairs Program**

One of two divisions of the federal department of Indian Affairs and Northern Development.

#### **NTS**

National Topographic System. The referencing system used to identify topographic maps created by Energy, Mines and Resources.

#### **PIXEL**

The smallest addressable unit in a display or an image. Acronym for picture element.

#### **POPULATING THE DATABASE**

The process of entering data into a database. This can include various techniques such as manual data entry or conversion of digitized data.

#### **RASTER**

A spatial data structure that can be thought of as a grid of points. Each point contains a value that is displayed or not display (with or without colour) to create a meaningful image. Satellite images and DEMs are raster data.

#### **RDBMS - RELATIONAL DATA BASE MANAGEMENT SYSTEM**

A system whose overall purpose is to record and maintain information. Information is presented to the client as if it were stored as a table of rows and columns. The information can be anything that is significant to the organization the system is serving - anything that may be necessary to the decision making process involved in the management of that organization.

#### **RELATIONSHIP**

The descriptive element of the conceptual data model, representing an association of two subjects, two facets, or two or more entities.

#### **SPATIAL DATA STRUCTURES**

Computer representations of data specifically designed for the storage and manipulation of spatial information. Typical data spatial data structures include raster and vector.

### **SPLINE CURVE**

A mathematical equation used to describe a line through a series of points. Splines are a means of representing spatial data and are a type of spatial data structure.

### **SUBJECT**

A set of data of related meaning, describing a focus of general interest for the organization, resulting from the top-level partitioning of an organization's business and strategies in conceptual data modelling. Examples of subjects are "Resource" and "Infrastructure".

### **TECHNOLOGY ARCHITECTURE**

Deals with the hardware, software and communications strategies which satisfy the need identified by business requirements and the data and applications architectures. It facilitates the integration of data, application systems and tools with the business operations of the government.

### **TIN - TRIANGULATED IRREGULAR NETWORK**

A spatial data structure generated by the tessellation of space into irregular exclusive triangles.

### **VECTOR**

A spatial data structure. Images are represented by vectors, that is, points ( as X,Y coordinates) and lines connecting the points.

### **YTG - Yukon Territorial Government**

Also Government of the Yukon and Government of Yukon.