

**PROCEEDINGS OF THE
SEMINAR SERIES ON
LAND INFORMATION AND
THE LAND SURVEYOR**

**Editor
ANGUS C. HAMILTON**

October 1986



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NO. 126**

PREFACE

In order to make our extensive series of technical reports more readily available, we have scanned the old master copies and produced electronic versions in Portable Document Format. The quality of the images varies depending on the quality of the originals. The images have not been converted to searchable text.

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P.O. Box 4400
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Preface and Acknowledgements

In February, 1985, Mr Bernhard Kauter, a licensed surveyor practicing in the Nidau district in the canton of Bern was the featured speaker at a series of presentations of a one-day seminar entitled "Land Information and the Land Surveyor". The seminar, sponsored jointly by the L.I. committee of C.I.S. and by C.I.S. branches, was presented at Fredericton on Feb. 12, at Toronto on Feb 14, at Calgary on Feb. 17, at Edmonton on Feb. 19, at Victoria on Feb. 21.

At each seminar, Bernhard described the Swiss cadastre and his role as the District Surveyor in the maintaining of it. At most of the presentations there was time for only a few questions before the lunch break. In the afternoon, after a panel, or a speaker, addressed some aspect of land information of particular interest to the Branch, there was general discussion.

Bernhard's text, edited and complemented with partial copies of the many maps he displayed, is presented in Part I. In Part II, the input from the panelists, along with an edited transcript of the discussion at each branch, is presented. Although the same or similar questions about Bernhard's presentation were asked on different occasions, no attempt has been made to avoid redundancy.

The discussions were intentionally informal, consequently not all of those who asked questions or made comments were recorded and in some instances the taped record was inaudible. To all who remain anonymous or whose words were lost to posterity, my apologies.

To Ed Kennedy, then President of C.I.S., for pressing me to do something with the L.I. committee;

to Branch officers and committees for their whole-hearted cooperation and especially to:

Rejean Castonguay and Doug Morgan, Fredericton Branch;

Dave Lever, Toronto Branch and Lorraine Petzold, Association of Ontario Land Surveyors;

Stephen Nichol, Calgary Branch;

Ric Beaumont and Ted Smith, Edmonton Branch;

Gary Sawayama, Victoria Branch

to my graduate students, Dave Coleman, Sylvie Laroche, Walter Mayr, David Pullar, Matthias Uhlenbruck, Michal Lodin and Albert Yeung for their assistance in preparing the transcripts;

to Prof. Alphonse Miserez of Lauzon University for liaison with the Swiss Association of Surveyors

to the Swiss Association of Surveyors for answering my request for someone in private practice to explain the Swiss system to us in Canada;

to Monique Kauter for her patience and good humour in listening to Bernhard and I talk shop as we travelled between seminars and, finally;

to Bernhard Kauter for preparing a very clear description of both the Swiss cadastre and the role of the District Surveyor in maintaining it, for bringing a display of some 25 maps to Canada and for taking two weeks away from his practice to present these seminars, my sincere thanks.

ACH

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PART I

CADASTRAL SURVEYING IN SWITZERLAND

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Introduction

A. C. Hamilton
Chairman, Land Information Committee
Canadian Institute of Surveying

A presentation on the maintenance of the cadastre in Switzerland is timely because it is only recently that we, in Canada, have recognized that the data in the cadastre should be kept up-to-date; in Switzerland, and in most of Europe, they have been keeping cadastral mapping up-to-date for a long time. The Swiss example is of special interest because, with minor exceptions the cadastral map is kept up-to-date by private practitioners.

Gradually the mechanisms to keep cadastral mapping up-to-date in Canada are evolving and in a decade or two they will be firmly in place and proposals for significant change are not likely to be welcome. At this stage there is a state of flux and it would seem to be prudent to explore a wide variety of options before any one method becomes firmly entrenched.

Before Mr. Kauter describes the Swiss cadastre and explains his role in its maintenance as a private practitioner, it may be useful to summarize what we have in Canada now and also to take a look at history for an explanation of the fact that Switzerland and Canada are at quite different stages of evolution.

Status of cadastral (property) mapping in Canada.

Province	Progress on initial compilation
Newfoundland	Still under study
Nova Scotia	Started in 1973 now two-thirds completed
Prince Edward Island	Started in 1970, completed in 1972
New Brunswick	Started in 1970, virtually completed
Quebec	Major program announced recently
Ontario	Pilot projects under way
Manitoba	Still under study
Saskatchewan	Cities completed; starting rural areas
Alberta*	Started in 1970, 80% completed
British Columbia	Started in 1980, 20% completed

* Only in Alberta is the compilation being done from coordinates

Note: In Nova Scotia, Prince Edward Island, New Brunswick and Alberta maintenance programs have now been sustained for several years.

Attitudes towards Land, Land Values and Land Information

Europe

From the Middle Ages to 1900

- Land, in Europe, has always had a "security value" over and above its economic value. This is because in times of national distress, land, as well as gold, retains its value.
- Those who owned land were unwilling to sell it at a price that could be justified by the yield.

Land Information

- With minor exceptions, occupancy preceded survey. Many efforts to compile an orderly record of land ownership:
 - William the Conqueror's Domesday Book in the 11th century.
 - Swedish survey office established in the 1600s.
 - Napoleon's introduction of the cadastre about 1800.
 - Large scale mapping by the British Ordnance Survey initiated in late 1700s.
 - Systematic surveys and a cadastre for the Austrian Empire started in early 1800s.

North America

From Settlement to 1900

- Land was a "free good" available somewhere to anyone who had enough energy to make it productive.
- Competition from this free land generally kept the prices of occupied land within reasonable bounds.

- Except for some regions along the east coast, survey preceded occupancy. Thereafter, however, Jefferson's dictum of "The less government the better" prevailed. It was conceded that the tax collector might need some simple records of where property was but beyond that no further need for location information was recognized.

- In fact governments did so little about it that in the 1860s and 1870s innovative entrepreneurs were publishing local atlases that were little more than instant cadastres.

Recently some of these have been reprinted (See for example: The Atlas of York County, New Brunswick, published by Halpenny and Co., Fredericton, NB, 1878. Offset edition reprinted in 1973 by Mika Publishing, Belleville, Ont).

Europe

From 1900 to World War II

- Emigration ceased to be a viable solution to the pressure on land. People accepted the fact that they were going to have to live with what they had.
- Any change in land use became a very public matter and elaborate procedures evolved for approving any change in land use.

Land Information

- Administration of these tight controls requires detailed and up-to-date information about land.

From World War II to 1986

- Entrenchment of procedures and regulations pertaining to the use of land.
- Enhancement of the "security value" of land.

Land Information

- Proposals put forward for applying new technology to the well established procedures.

North America

- Free wheeling approach to land use.
- Anyone with money could buy and do as he wished with land.

- Minimal requirements for land information. Land surveys tied only to previously established corners.
- Neither survey control nor large scale planimetric/topographic maps generally available.

- No more desirable free land. Recognition of the fact that here, too, land is a precious resource. Land developed a "security value" similar to what it has long had in Europe.
- Environmental issues become prominent. Elaborate zoning and planning procedures adopted.

- Multiple copies of detailed plans required for approvals of any change in land use.
- The concept of integrated surveys recognized in late 1950s. Densification of the geodetic network begun. Efforts to require that boundary surveys be tied to control initiated.
- Systematic cadastral mapping program underway (as summarized above).

The objective of this series of seminars is to learn from the experience of a country where :

- Cadastral maps are kept up to date and have been for more than three quarters of a century.
- The maintenance of the cadastral maps as well as the cadastral surveying is done by private practitioners.
- Cadastral records (maps and coordinates) take precedence over markers on the ground.

Mr. Bernhard Kauter is a registered surveyor practicing in the Nidau District of Switzerland (Exhibits 1.1 and 1.2) . He has had his own practice since 1975. In his office there are 19 employees: 3 registered surveyors, 4 technicians, 3 draftsmen, 1 secretary, 3 apprentices, and 5 assistants.

The activities of his firm are:

- Maintaining the cadastral maps (this includes doing all the boundary surevys in the district as well as keeping the maps up to date) of 25 villages, which together are forming the district of Nidau (6800 hectares). 40%
- Land consolidation. This includes project management and construction engineering as well as engineering and cadastral surveying. 30%
- Cadastral renewal - establishment of new cadastral maps for regions where the old maps date from 1880 to 1900. 20%
- Engineering surveys. 10%

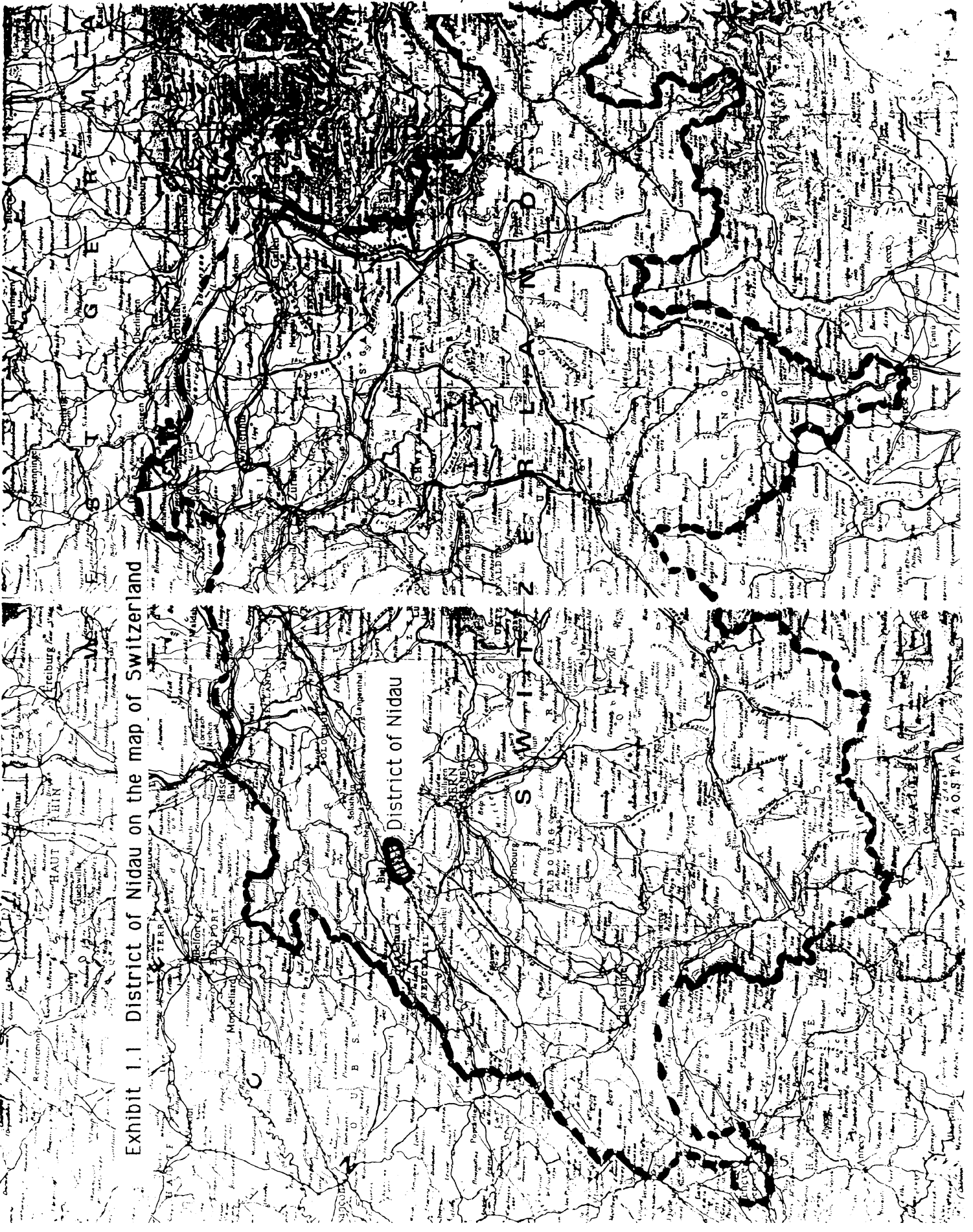


Exhibit 1.1 District of Nidau on the map of Switzerland

District of Nidau

SWITZERLAND

The Swiss Cadastre

Bernhard Kauter
District Surveyor
Nidau District
Switzerland

2.1 INTRODUCTION

Switzerland, like Canada, is a federal state. As in Canada there are three levels of government: federal, cantonal (provincial) and municipal. Switzerland differs from Canada in that it has 6 000 000 people compared to Canada's 24 000 000 and it has 16 015 square miles compared to Canada's 3 621 000. It is different, too, in that it was able to establish geodetic control down to third order and to have complete topographic coverage at 1:25 000 before there were any topographic maps or even any control for much of northern Canada. Maintenance of its geodetic networks and of the medium and small scale topographic mapping is the responsibility of a federal Office of Topography in the Department of Defence.

Switzerland's federal system differs from Canada's in that the federal government has the overall responsibility for the exercise of ownership rights in land. The legal basis for Swiss survey services today was given in 1912 by the Swiss Civil Statute Book. This legislation established the cadastral register which shows comprehensively the private legal ownership rights on the ground and which provides for the mechanism to ensure that information on these rights is kept up-to-date. All plots of land must be entered and described in this register and a map must be maintained showing all boundaries and the different uses of land (vegetation, buildings, roads, etc.). Thus Switzerland has a juridical cadastre.

Although the federal government has the overall responsibility, the cantonal survey offices are charged with the day-to-day supervision of the private surveyors who do the surveys and maintain the cadastral maps. Consequently the Federal Survey Directorate has only 15 persons on staff; it is in the Department of Justice and Police.

2.2 THE ELEMENTS OF THE CADASTRE

- Survey control (fourth order) and traverse stations as required
- General maps
- Cadastral maps
- The "principle book" (in the land registry office).

Survey control. As noted above, geodetic control from first to third order is maintained by the Federal Office of Topography. The fourth order control, which is officially a component of the cadastral survey, with one or two control points per square kilometre (70 000 points in 41 000 km²) is maintained by the canton. Traverse stations, also part of the cadastral survey, are established as required. (Exhibit 2.1)

The general (planimetric/topographical) map. The general map (Exhibits 2.2 and 2.3) shows the planimetry, vegetation and topography at the scale of 1:10 000 or 1:5 000. Some show boundaries and some do not. The base of this map is a photogrammetric compilation done by the Federal Office of Topography; the up-dating is done by the cantonal offices with details provided by the district surveyors. This map, in turn, is used as a source of detail for updating the 1:25 000 maps.

The cadastral map. The cadastral map (Exhibit 2.4) is the basis of the cadastral register; it shows the geometric information on boundaries. Being a juridical cadastre, the validity of the cadastral map is the same as that of the records in the Land Register.

The "Principle Book" in the land registry office. For every plot of land there is one sheet in the principle book. This sheet (Exhibit 2.5) has the same number as that of the plot on the cadastral map. On this sheet are shown:

- the name of the owner
- servitudes and easements
- valuations (for taxes, fire insurance)
- mortgages.

The principle book is kept up to date in the Land Registry Office. This is a cantonal office, headed by a solicitor, and it is usually in the same vicinity as the District Surveyor's office. The principle book is open to the public.

2.3 MAINTENANCE OF THE CADASTRE

2.3.1 The Concept

In Switzerland the only "legal plan" is the original (master copy) of the cadastral map. Inking in new boundaries and deleting old ones on this master copy is the final step in the mutation (creating, moving or deleting) of boundaries. Copies of the master map or of portions of it, serve as source documents whenever surveys to create new boundaries or to change existing boundaries are being initiated; the "revision map" showing both the new and the old boundaries is signed by all affected owners and sent to the Registry Office; however, the only official document is this master sheet of the cadastral map.

When commencing a project there is no need to search for old plans; an inspection of the master cadastral sheet or a copy certified by the District Surveyor is all that is needed. This is similar to the "curtain principle" that is fundamental to Torrens registry systems. In a Torrens registry when the Registrar issues a Certificate of Title, there is no need to search for old ownership documents; in the Swiss cadastre when the District Surveyor certifies a copy of a cadastral map, there is no need to look for old survey plans.

What's more, the position of a boundary mark as determined by its coordinates takes precedence over the physical marker found on the ground! Acceptance of this may be difficult for those who have been taught to believe as an article of faith that evidence on the ground always takes precedence over all other evidence.

All boundary changes which do not involve a change in the cadastral framework (traverse points and fourth order control) are included under "maintenance". Whether many small lots are being created by the subdivision of one large lot, or whether a small

sliver of land is being transferred to an adjoining lot, it is called "maintenance". Cadastral surveys that are not "maintenance" will be described subsequently.

2.3.2 The District Surveyor

The responsibility for maintaining all the cadastral maps for a district (several municipalities with a total population of 20 or 30 000) and, as discussed above, for doing all the boundary surveys in the district is given by contract to one private practitioner. He is called the District Surveyor.

The licensed land surveyor performs his duties as a trustee with a state concession, even as a private professional he is an official of the state. He determines the relevant legal facts and opinions in survey matters and prepares the public documents. All the cadastral surveys (except of some large cities) and their updating are executed by about 270 private land surveyors.

In the canton of Bern the responsibility for cadastral maintenance is in the hands of the District Surveyor (licensed surveyor). The process of selecting a District Surveyor and the conditions under which he functions will be discussed in Chapter 3.

The cadastral system requires that everybody, including the private owner, the municipalities, even the cantonal authorities must contact the District Surveyor for all boundary surveys.

The District Surveyor's office is also open to the public. Anyone is entitled to request information which is needed. There will be a charge if one wants a certified copy of a map or even a photocopy - but usually the fee is nominal (See Sec. 8.4).

The qualifications of a District Surveyor, the method of his selection, the way in which his work is monitored, and the fees he may charge are discussed in detail in Chapter 3.

2.3.3 The Marking

Not only trigonometrical and traverse points are marked, but also every boundary-point, mainly by granite stones (12 x 12 cm and 60 cm long).

The importance of this marking is becoming more and more questionable because:

- (a) it is very expensive
- (b) if any differences between the cadastral map and the marking in the field occur, *the correctness of the map is assumed*.

Nevertheless there exists a law which protects the marked geodetic and boundary points. Unauthorized persons who change a marked point can be fined or even sentenced to a term in jail.

If a District Surveyor finds a boundary mark or a traverse point monument moved or destroyed he will replace or correct this mark immediately. If a control point of the 1st to 4th order is found destroyed or moved the Federal Office of Topography or the Cantonal Survey Office is informed and they will replace or correct the monument within 3-4 months.

2.3.4 Steps in Creating, Moving or Deleting Boundaries

The different steps which are taken by the surveyor, or his qualified employees, in creating, moving, or deleting a boundary follow:

- The application is entered on a special form and is submitted to the cantonal office for approval.
- In his office the District Surveyor calculates the position of the new boundaries.
- The first step of the field survey is to determine the positions of the old boundaries by searching for the boundary marks or when they can't be found, by setting out the boundaries with the help of the cadastral records. He then *sets out and marks the new boundaries and removes the old boundary marks* (Exhibit 2.9). The cadastral records are revised accordingly by the following steps:
- The ink-plot of the field sheet is amended by erasing the old boundaries and drawing in the new ones.
- The coordinates of the new boundary points and the new parcel areas are calculated (Exhibit 2.8).
- The original map (aluminum plate) is revised in pencil. Since it is the legal record of the boundaries the final ink corrections are only added after official registration in the registry office.
- The transparent copy of the original map is revised.
- The traverse net map is revised if necessary, as is the corresponding coordinate list.
- The parcel list is revised and also the alphabetical list of owner names if necessary.
- A revision map (Exhibit 2.7 and Exhibit 2.10) is drawn indicating the old boundaries (crossed out), the new boundaries (highlighted) and the new areas of the relevant parcels. These areas are also entered into the measuring deed (Exhibit 2.8 and Exhibit 2.11). This document must be signed by each land owner affected by the revision. Both of these documents are sent to a solicitor who prepares a contract determining mortgages and legal rights. After this contract is signed by the owners, the surveyor and by the solicitor, all the documents are sent to the Registry Office.
- The Registry staff revises the relevant parcel sheets and the new boundaries are registered legally in the land register. When this has been done the original cadastral map in the District Surveyor's office can be corrected permanently. All extracts issued before final registration show the new boundaries in red to indicate that they are not legal.
- A revision is also possible without marking the new boundary points. This is desirable in subdivisions where a lot of construction is likely to take place. The coordinates and the set out measurements are calculated and are registered in the relevant measuring deeds and revision maps. After the completion of construction, the actual marking is carried out.

Example #1: Small sub-division. In the community of Bellmund lot #912 has been subdivided into three lots: 953, 912, and 954; note that the largest of the three retains the number of the original lot. A copy of the "revision map" (Exhibit 2.7) is signed by the surveyor (Kauter). On the revision map the boundaries of the three new lots are highlighted, the old area (m²) is crossed out and the areas (m²) for each new lot are shown.

The measuring deed (Exhibit 2.8) lists the areas of all the lots and is signed by the owner; if more than one owner were involved, each owner would sign.

Example #2. Transfer of part of one lot to two adjoining lots. In the community of Aegerten the gore between lot 454 and lots 623 and 835 has been removed by adding 148 m² to lot 623 and 22 m² to lot 835 (Exhibit 2.10)

Exhibit 2.9 is a copy of the field sheet showing that markers 596 and 597 are being removed as are the measurements from these markers to the building on lots 623 and 835.

On the "revision map", Exhibit 2.10, the boundaries of the three affected lots are highlighted, the old areas are crossed out and the new areas are shown. From this map, the "measuring deed", Exhibit 11, has been prepared and signed by all three owners.

2.3.5 Adding New Buildings to the Cadastral Map and Deleting Removed Buildings From It.

As indicated in Exhibit 2.9 and Exhibit 2.12 building locations (ground line) are surveyed and plotted quite accurately on the cadastral map. Having the buildings accurately located means that they can be used as "markers" for locating utilities and other features.

To build a new house the owner of a parcel must obtain a building permit from the municipality. In order to do this he must present an extract from the cadastral map showing his parcel and the proposed building alignment. This document must be signed by the district surveyor (Exhibit 2.13).

After construction the building is valued for insurance and valuation purposes (Exhibit 2.5). The Cantonal Insurance office informs the Registry Office of the new valuation. After this is recorded in the Land Register the District Surveyor is advised of the new construction. It is now his responsibility to survey the new construction and revise the cadastral records. To minimize costs these surveys are carried out only once a year in each community.

2.4 OTHER CADASTRAL ACTIVITIES

In addition to the maintenance activities described in Section 2.3 above, there are two other important activities that may be undertaken by any licensed surveyor. These are:

- Renewal surveys
- Land consolidation surveys.

Renewal surveys. A renewal survey is a resurvey of an entire community. The lower order geodetic stations are re-observed and re-adjusted and new traverse lines are established that meet modern specifications. Then all the boundary markers are re-surveyed and a new cadastral map is prepared. Needless to say, a renewal survey is only done when there are a great many problems with the old system.

Any licensed surveyor may compete for the contract to do a renewal survey. If the surveyor who is awarded the contract is not the District Surveyor for that community, then he is authorized to take over the custody of all the cadastral documents pertaining to that community and he retains them until the contract is finished. The documents are then returned to the District Surveyor's Office.

A copy of the cadastral map and the list of parcels (with areas) are put on public view for 30 days. All owners are invited to examine these documents and have the right to appeal against them if they think the calculated area is wrong.

Land consolidation surveys. Land consolidation is a formalized and very complex matter. It is also a costly process that may drag on for as long as ten years.

Usually a surveyor is selected as the project manager for a land consolidation project; as such he has many duties in addition to the surveying aspects of the job.

A District Surveyor or any licensed surveyor may compete for any land consolidation contract. As in renewal surveys, described above, the surveyor who gets the contract is authorized to take custody of all the relevant cadastral documents and retain them for the duration of the project.

2.5 STANDARDS

The geodetic control is by triangulation of 1st to 4th order with 1 to 2 control points per square kilometre. (70,000 points on 41,000 km²)

The accuracy required must satisfy the following limits:

Fourth order control:

	Mean error position	Mean error height
city areas	± 2 cm	± 2 cm
agriculture areas	± 3 cm	± 4 cm
steep slopes	± 4 cm	± 6 cm

Traversing:

Degree of precision	Nature of usage
------------------------	-----------------

- 1 - regions with very high ground prices and high exploitation
- 2 - little towns, low exploitation
- 3 - agricultural exploitation, forest
- 4 - mountain pasture and forest

Some examples: (Note: $c = 0.54$ minutes of arc)

Angle-closing error of traverses:

degree of	max error	in $^{\circ}$	
1	a:1,0 $^{\circ}$ n	b:1,5 $^{\circ}$ n	a: primary traverse
2	a:1,5 $^{\circ}$ n	b:2,0 $^{\circ}$ n	b: secondary traverse
3	a:2,0 $^{\circ}$ n	b:3,0 $^{\circ}$ n	n: number of traverse- angle
4	a:3,0 $^{\circ}$ n	b:5,0 $^{\circ}$ n	

Linear closing error traverses:

degree of precision	max error in m		
1	a:0,05+0,005· s	b:0,005+0,010 s	s : sum of traverse sides e.g. degree 2, s = 1000 m a: max. error 0,35m
2	a:0,10+0,008· s	b:0,10+0,015 s	
3	a:0,10+0,01 s	b:0,10+0,02 s	
4	a:0,20+0,04 s	b:0,20+0,08 s	

Boundary-point (surveyed twice):

degree of precision:	1	2	3	4
d in cm	6	10	16	40

d: length of the difference vector of two independent surveys of the same plot

Plotting of points on cadastral maps:

$d \leq 0.2$ mm for all degrees of precision

d = max error for the difference between a length taken from the cadastral map and the length calculated from coordinates.

2.6 FUTURE EVOLUTION

The last few decades have shown that the requirements of the users of cadastral maps and registers have increased enormously. The use of land has become much more intensive and land has become an increasingly precious commodity. This fact leads to an increase in public laws reducing property rights. Up to the present time there is no information system about these kinds of property restrictions. Moreover maps of different scales, different content, are increasingly in demand by all kinds of users.

Therefore, a project called *Reform of the Swiss Cadastral Survey Systems* was started. The main purpose of the reform is to organize the transition from a single purpose survey cadastre to a multi-purpose information system taking into consideration the desire and needs of all potential users. The cadastral survey system is to be used as the basis of a multi-purpose LIS. This is possible, if the cadastral survey collects and controls the cadastral co-ordinates which serve as the linkage between all the other data inside and outside the cadastral survey. Modern electronic techniques will be used wherever possible (e.g. data registration, data processing, digital mapping).

J P O A C H

Exhibit 2.1 Typical Traverse network



Exhibit 2.2 General map.
1:10 000 with planimetry
and 10 m contours

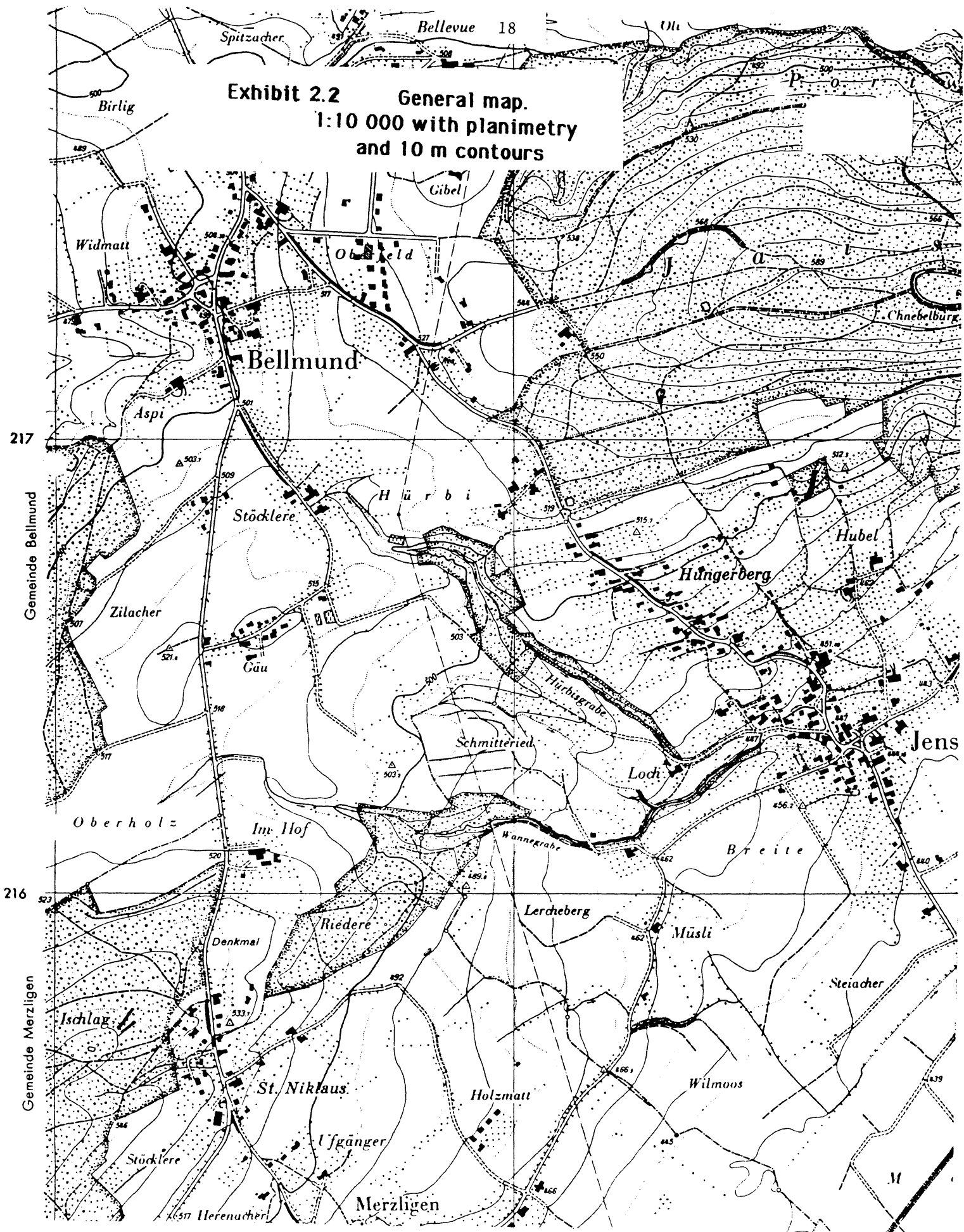
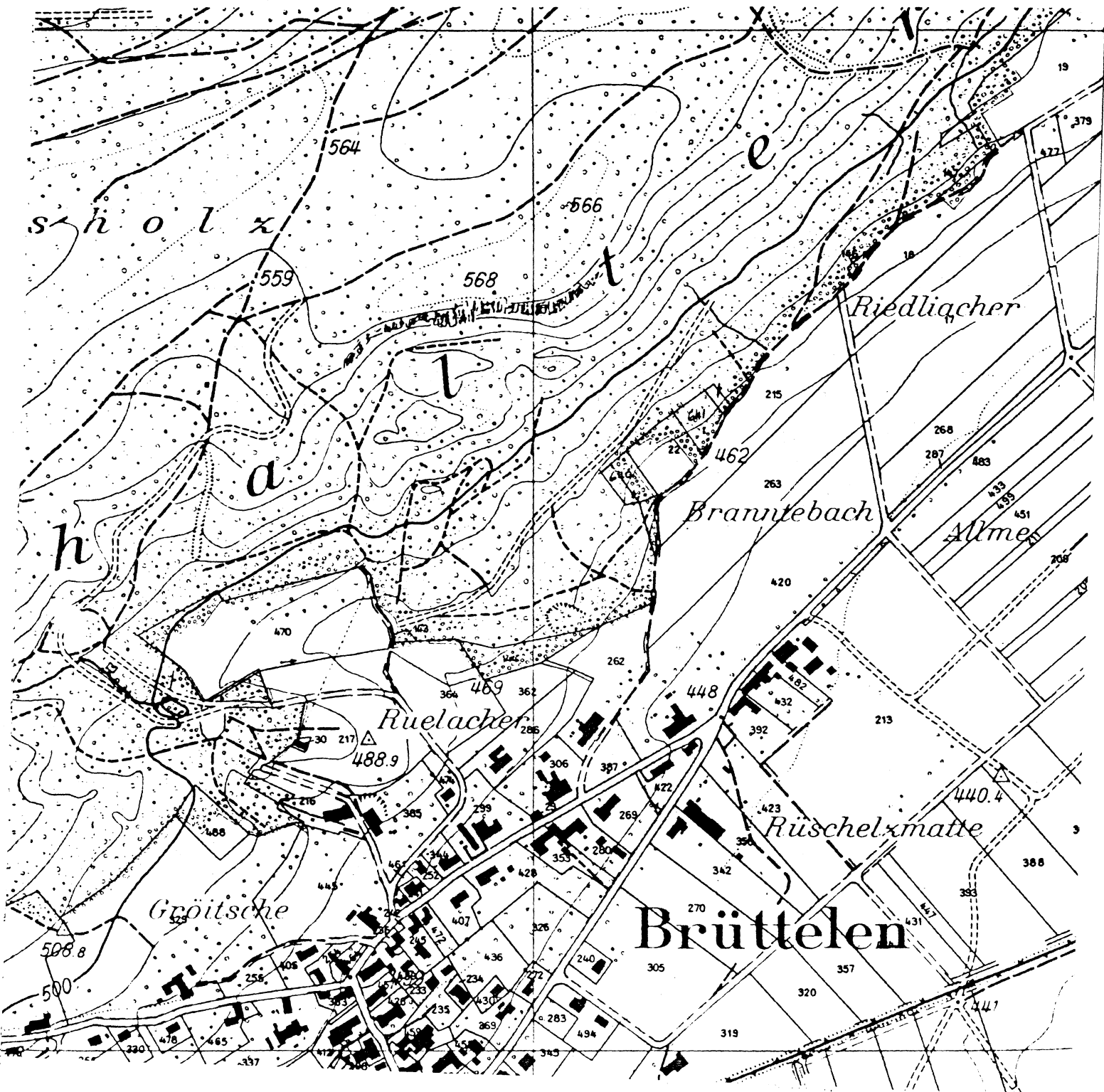


Exhibit 2.3 General map.
1:5 000 with planimetry, 10m contours,
boundaries and parcel numbers

1145.43



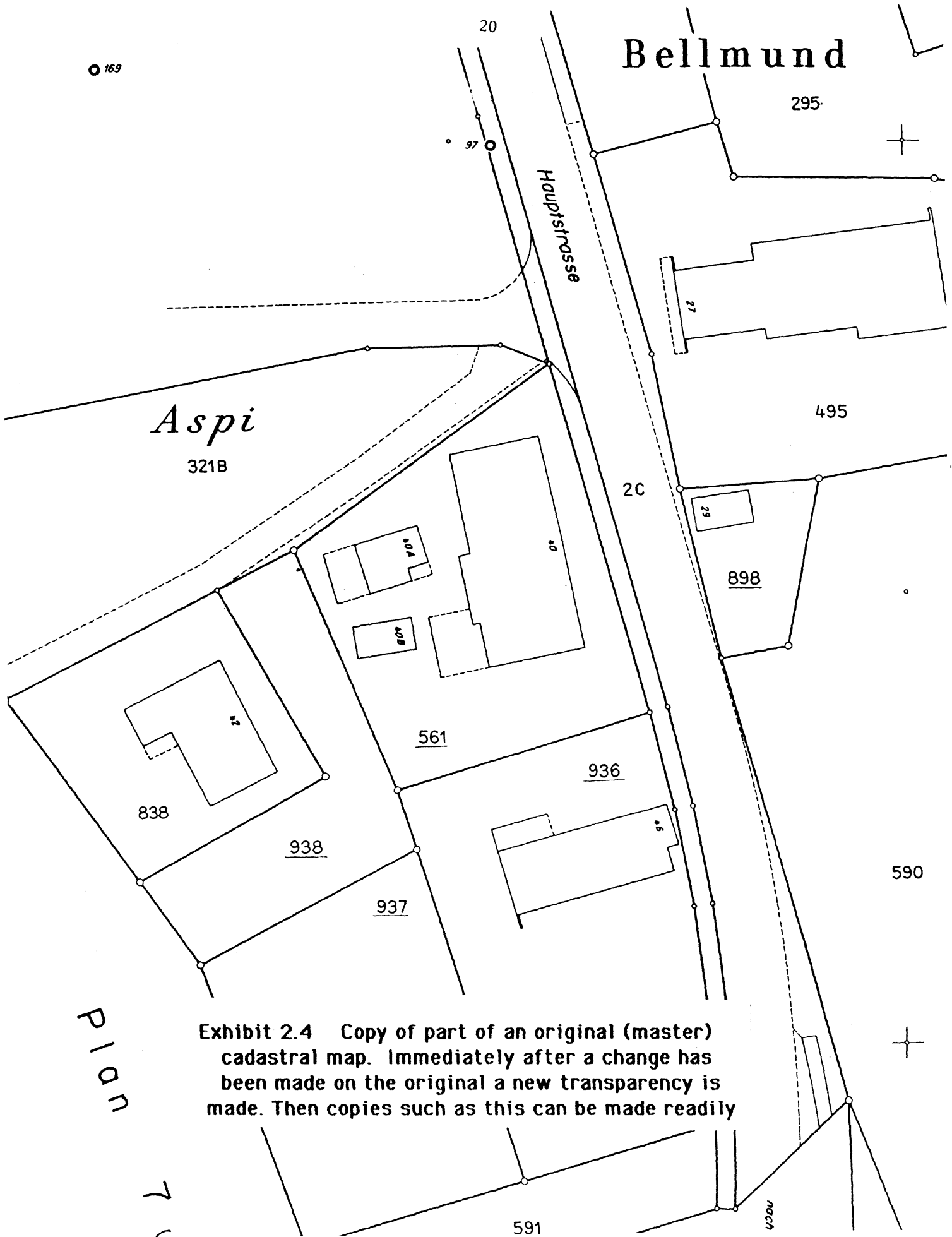


Exhibit 2.4 Copy of part of an original (master) cadastral map. Immediately after a change has been made on the original a new transparency is made. Then copies such as this can be made readily

Plan

7

21

Beschreibung des Grundstücks (Description)

Blatt 103	Plan Blatt V, Parzelle N° 54	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="3">Fläche</th></tr> <tr><th>no</th><th>a</th><th>m²</th></tr> <tr><td>1</td><td>20</td><td>3</td></tr> <tr><td colspan="3" style="text-align: center;">5</td></tr> <tr><td>1</td><td>19</td><td>98</td></tr> </table>	Fläche			no	a	m ²	1	20	3	5			1	19	98	Wohnhaus mit Schräne, Assck.-N° 66, und Sticllokal, Assck.-N° 66a, Garten und W'iseland. 9 a 40 m ² liegen in der Gemeinde Dürnten (GB Kreis Wald), OB Dürnten, N° 46. Abgang inf. Straßenkorrektio. 1926, April 18. B. 176.
Fläche																		
no	a	m ²																
1	20	3																
5																		
1	19	98																
Alte Nummern: 37 Neue Nummern: Fortsetzung fol.:	(Location) Ortsbezeichnung Im Moos Bachelstraße Wetzikon	Grenzen gemäß Plan. (Easements and Encumbrances)																

Vormerkungen Art. 908, 909, 901	Eigentum (Owner)					Dienstbarkeiten und Grundlasten							
	Eigentümer	Eintrag			Erwerbart	Bl. 101	UL	R-Rechte L-Lasten		Eintrag			
		Jahr	Monat	Tag				Jahr	Monat	Tag	Bl. 101		
1. Dienstbarkeitsvermerk der Rosa Brand, Art. 618 -SGB- 1818, Dec. 31. B. 7. Gelöschl. 1924, Aug. 9. B. 17 2. Pfändung: -Reg.-N° 1562- -Reg.-N° 1609- 3. V.-E. Eigentum.-Dienst- barkeitsvermerk Grundpfand- rechte, N° 13 606 1885, Aug. 4. v. A. v. grüßlich 1925, Nov. 12. 4. Verkaufrecht z. G. Max Schür für 7 Jahre. 1925, Okt. 3. N. 19.	Brand, F. Salto, Ernst	1918	Mai	31	Kauf	1	a	R. Fahrweg über N° 841 und 848	1918	Mai	31	8	
	Brand, Emilie Brand, Rosa	Mitübern.	1918	Okto	30	Erbgang	4	a	Fahrwegrecht gelöst. Denzler, OB Vorn.	1926	Mar	13	20
	Brand, Emilie		1918	Dec	31	Erbgang	7	b	R. Tränkrecht z. L. N° 253	1919	Febr	1	5
	Fuchsberger-Brand, Robert Baumann, Fritz Johann		1885	Mai	8	Erbgang	8	c	L. Unterhaltspflicht zu 1/2 betr. Brunnenhülle auf N° 253 (im Gesamtwert von Fr. 500.-, verbunden mit lit. b.	1919	Febr	1	5
	Furrer, Joh., Mürigen, zu 1/2 Furrer, Iserr, Mürigen, zu 1/2		1930	Juli	10	Kauf	25	d	R. Fußwegrecht z. L. N° 232	1924	Aug	9	16
								e	L. Fußwegrecht z. O. N° 232	1924	Aug	9	16
								f	L. Baurecht z. G. Fritz Burger, z. Bem. zu Grundpfand- rechten Lit. 11, Vererbungs- dipt z. G. B. N° 905.	1931	Febr	1	25

Exhibit 2.5 Copy of page in the land register for parcel 54

Anmerkungen (Notes)				Schatzungen (Valuations)											
1) Zugehör: Im Sticllokal: 1 Stickmaschine, 10 Yard, System Sourer, und 1 Fädelmaschine, System Gägäuf. 1918, Mai 31. B. 4. 2) Dem jeweiligen Eigentümer steht das Miteigentum zu 1/4 an GB N° 307 zu. 1918, Mai 31. B. 1a. 3) Gesetzliches Winterwegrecht über N° 509. 4) Mitgliedschaft zur öff.-rechtl. Flurgenoossenschaft im Moos. 1922, Mai 7. B. 37.				Jahr	Summe	V	Jahr	Summe	V	Jahr	Summe	V	Jahr	Summe	V
				(tax)			(fire)			Pfandrecht (security)					
				Grundsteuer			Brandversicherung			Pfandrecht (security)					
				1910	36 000	S. 34	1915	24 000	S. 110	1918	36 000	3			
				1920	40 000	102				1923	40 000	11			

Grundpfandrechte (Mortgages)												
Littera	Art	Gläubiger zur Zeit der Errichtung	Plandsumme			Zins	Pfl.-Stufe	Eintrag				Bemerkungen (Zu den Grundstandsnummern)
			Fr.	Ra.	X			Jahr	Monat	Tag	Bl. 101	
A	Gült	Schweiz. Hypothekenbank, Solothurn Bem. 1, 10 u. 11	1:0:0:0		4	I	1918	Mai	31	3	1. Zu A: N° 810 und 811 mitverpfändet. 1918, Mai 31 ⁰⁰ .	
B	Sch.-B.	Brand, Rosa, Hinwil	1:0:0:0		4 1/2	II	1919	Dec	31	8	2. Zu B: N° 810 und 811 mitverpfändet. 1919, Dec. 31	
B	gelöschl	F. N. Denzler, OB Vorn. -Bem. 8, 3, 6					1923	Juli	3	11	3. Zu B: Fr. 2000 abbez. 1920, Mai 1.	
C	Pf.-V.	Fuchsberger-Brand, Emilie	3:0:0:0		4 1/2	III	1921	Mai	2	10	4. Zu C: N° 810 und 811 mitverpfändet. 1921, Mai 1.	
C	gelöschl	F. N. Denzler, OB Vorn. -Bem. 4					1924	Aug	9	10a	5. Zu B: Fr. 4000 abbez. 1921, Juni 1.	
D	Sch.-B.	Brand, Rosa, Hinwil Bem. 6, 10 u. 11	1:0:0:0		4 1/2	II	1923	Juli	3	11	6. Zu D u. B: N° 810 und 811 mitverpfändet bzw. mitverpfändet. 1923, Juli 3.	
E		Leere Pfandstelle	8:0:0:0		4 1/2	II	1923	Juli	3	12	7. Zu O: N° 810 und 811 mitverpfändet. 1923, Dez. 13.	
E	gelöschl	F. N. Denzler, OB Vorn. -Bem. 6					1923	Dec	15	15		
F	Pf.-V.	Flurgenoossenschaft im Moos Bem. 10	1:0:0:0		4 1/2	B-V	1923	Aug	5	13	8. Zu O: Fr. 2000 abbez. und Zinsfuß auf 4% redud. 1924, Dez. 30.	
G	Sch.-B.	Inhaber Bem. 7, 8, 10 u. 11	8:0:0:0		4 1/2	II	1923	Dec	15	14	9. Zu H: Abschließ in 6 jährl. Raten. 1925, Aug. 9	
H	Pf.-V.	Keller, Hans, Baumeister Bem. 9, 10 u. 11	2:0:0:0		4 1/2	III	1925	Aug	9	13	10. Zu A, D, F, O u. H: 5 m ² aus der Pfandhaft entlassen. 1926, April 18. 11. Zu A, D, O u. H: Zur rumpfrund Errichtung des Baurechts rub lit. f zu gestimmt. 1931, Febr. 1	

*) Aus technischen Gründen wurde die Unterteilung der Kolonne weggelassen.
**) Es empfiehlt sich, außerdem die Belegnummer anzugeben.

Bild 3.6
Beispiel eines Grundbuchblattes

Owner and Address

~~Eigentümer:~~

~~Propriétaire:~~

Moser Verena (-Schneider), 1911, Witve des Walter, von Diessbach b. Bür
Hausfrau in Bellmund, Hauptstrasse 40

Community

Number of parcel

Gemeinden - Communes	Grundbuchnummern - Nos. des feuilletes									
Bellmund	<u>561</u>	506	512	248	251	255	257	259	265	286
	287	289	291	297	300	302	307	311	792	902
	898	915								
Aegerten	<u>208</u>	112	113	120						
Sutz - Lattrigen	22	23								

Form. 1515 - 6 (350.14)

**Exhibit 2.6 List of properties held by one owner:
Verena Moser-Schneider**

GEMEINDE BELLMUND

PL. 17

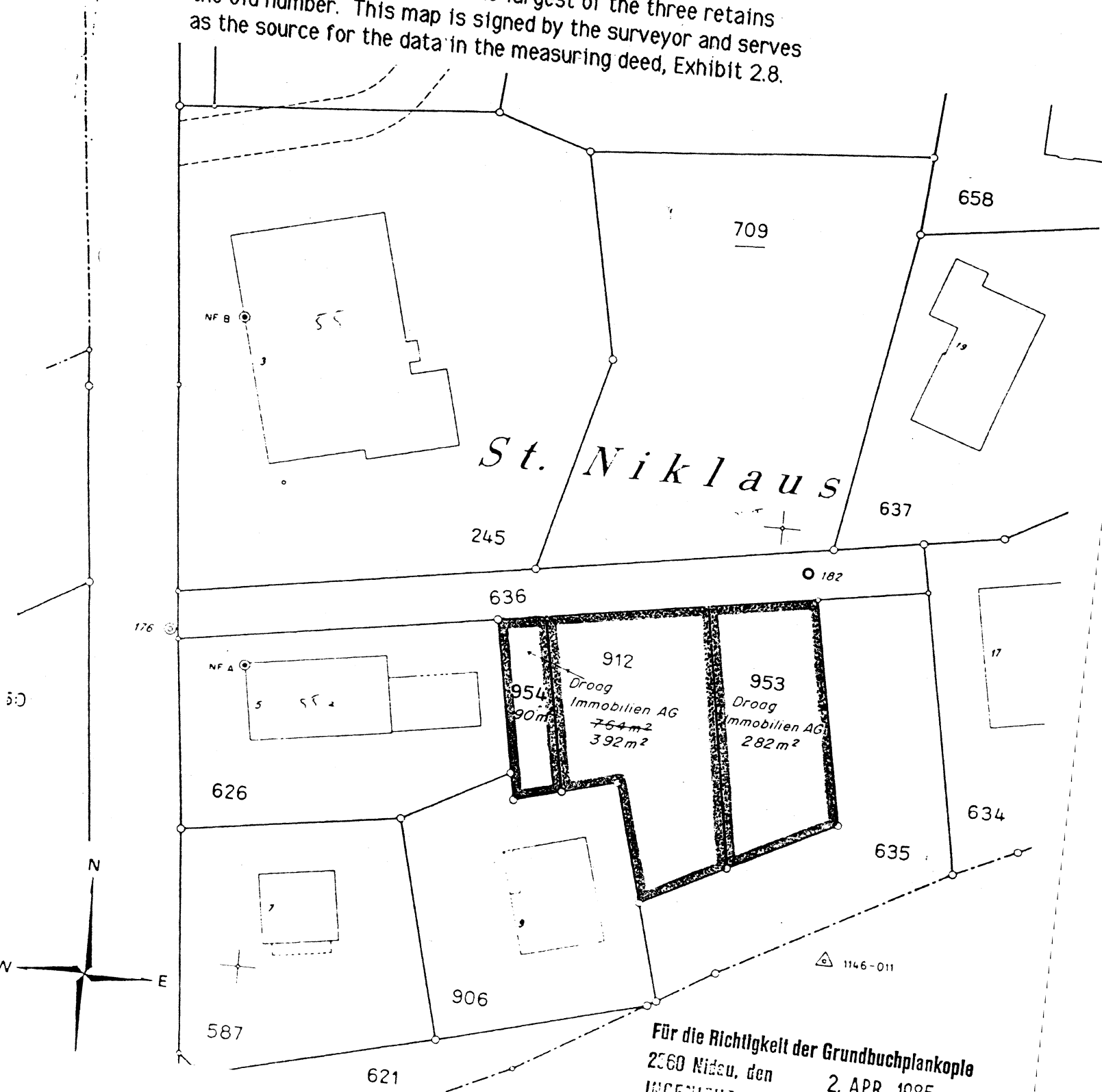
23

1:500

1470

Planänderung No. 17

Exhibit 2.7 Revision map. Parcel 912 (764 m²) has been divided into three parcels. The largest of the three retains the old number. This map is signed by the surveyor and serves as the source for the data in the measuring deed, Exhibit 2.8.



Für die Richtigkeit der Grundbuchplankopie
2060 Nidau, den 2. APR. 1985
INGENIEUR- UND VERMESSUNGSBÜRO
BERNHARD KAUTER - NIDAU

Gemeinde Bellmund

Pl. 17
-6. Aug. 1985

Grundbuchamt Nidau

Beleg Serie Nr.

1470

Meßkunde zur Planänderung Nr. 17


Erläuterung Parzellierung der Parzelle 912

Nummer der Grundstücke		Quadratmeter										Totallfläche der neuen Grundstücke	
neu ↓	alt →												
912		392											392
953		282											282
954		90											90
Totalfläche der alten Grundstücke		764											764


Exhibit 2.8 Measuring deed. Parcel 912 (old) that was 764 m² has been subdivided into three parcels; 912 has been reduced to 392 m²; 953 is a new parcel with 282 m²; 954 is a new parcel with 90 m². Deed is signed by the owner; if more than one owner were to be affected, the others would sign also.

Erklärung: Die Unterzeichneten erklären, daß die beiliegende Plankopie die Umgrenzung der neu entstandenen Grundstücke ihren Vereinbarungen entsprechend darstellt. In diesem Sinne anerkennen sie die Richtigkeit der Planänderung.

Die Parteien Nidau, den 10. Juli 1985

Droag Immobilien und Generalunternehmen AG:


Im Grundbuch eingetragen
 am -6. Aug. 1985 19

Der Grundbuchverwalter 

Im Originalvermessungswerk eingetragen

Der Nachführungsgeometer

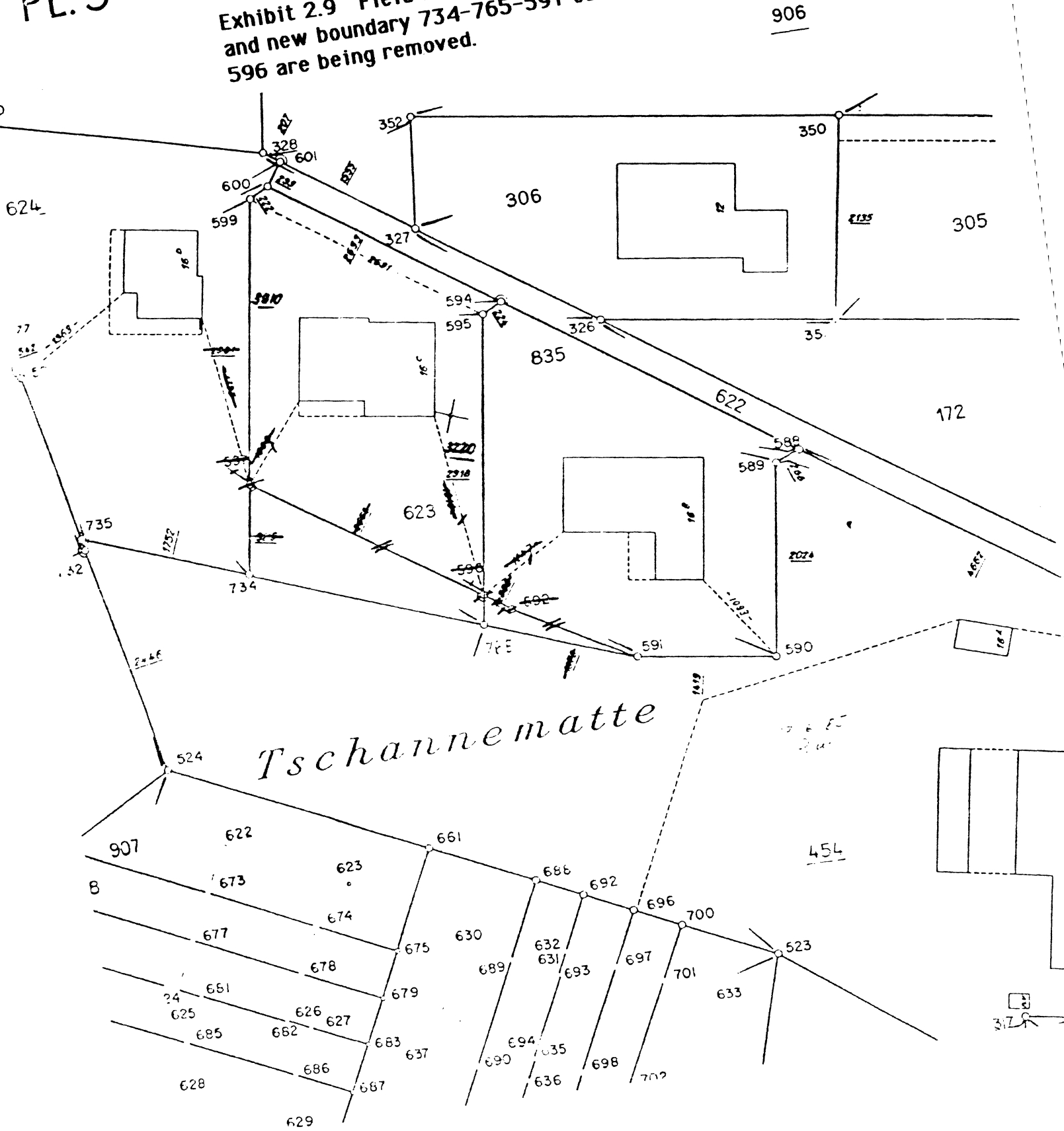
GEMEINDE AEGERTEN

PL. 5

25

Planänderung No. 130

Exhibit 2.9 Field sheet. Boundary 597-596-591 being deleted and new boundary 734-765-591 established. Markers 597 and 596 are being removed.



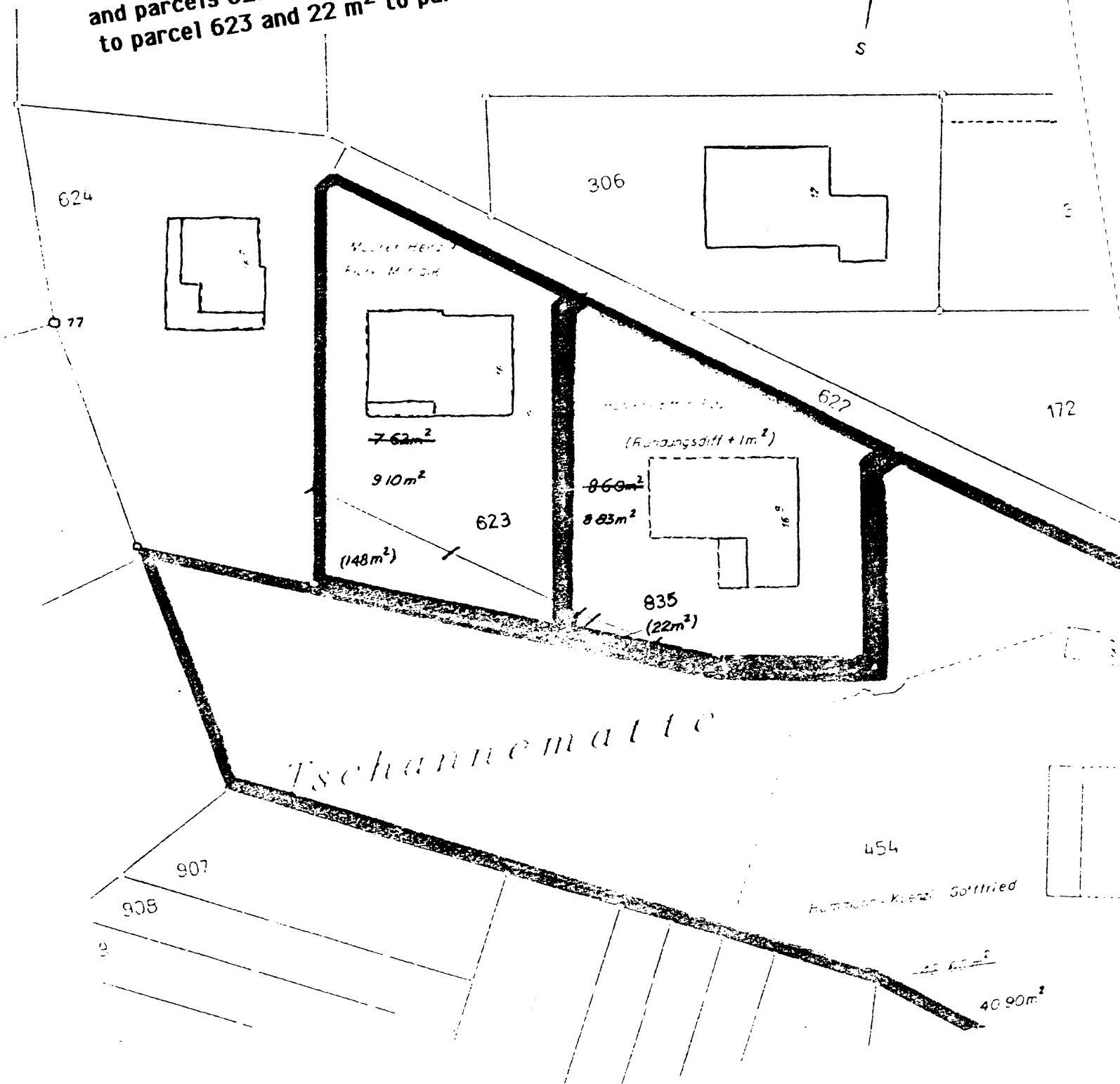
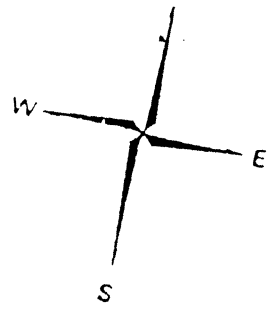
GEMEINDE ALGERIEN

PL.5

26

Planänderung No. 130

Exhibit 2.10 Revision map. Gore between parcel 454 and parcels 623 and 835 removed by transferring 148 m² to parcel 623 and 22 m² to parcel 835.



Für die Richtigkeit der Grundbuchblätter

Gemeinde Aegerlen

P.15 Grundbuchamt Nidau

15. Aug. 1985 Befug Serie - Nr.

1531

Meßurkunde zur Planänderung Nr. 130

Erläuterung Grenzänderung zw. den Parzellen 454, 623, 835

Folgt auf Planänderung 112 I

Nummer der Grundstücke	<u>454</u> <u>623</u> <u>835</u>			Rundungsdiff.	Totalfläche der neuen Grundstücke
	neu ↓	alt →	Quadratmeter		
<u>454</u>	<u>4090</u>				<u>4090</u>
<u>623</u>	<u>148</u>	<u>762</u>			<u>910</u>
<u>835</u>	<u>22</u>		<u>860</u>	<input checked="" type="checkbox"/>	<u>883</u>
Exhibit 2.11 Measuring deed signed by all the affected owners. Areas (m²) of the old and of the new parcels listed					
Totalfläche der alten Grundstücke	<u>4260</u>	<u>762</u>	<u>860</u>	<input checked="" type="checkbox"/>	<u>5883</u>

Erklärung: Die Unterzeichneten erklären, daß die beiliegende Plankopie die Umgrenzung der neu entstandenen Grundstücke ihren Vereinbarungen entsprechend darstellt. In diesem Sinne anerkennen sie die Richtigkeit der Planänderung:

Die Parteien

Brugg, den 12. August 1985

Der Eigentümer der Parzelle Nr. 454:

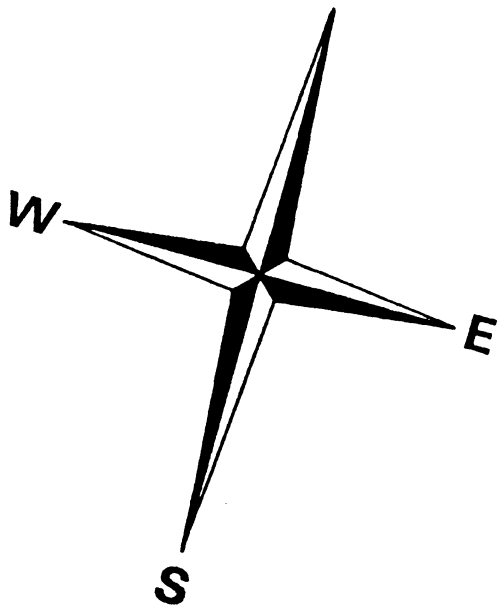
Der Eigentümer der Parzelle Nr. 623:

Der Eigentümer der Parzelle Nr. 835:

Im Grundbuch eingetragen

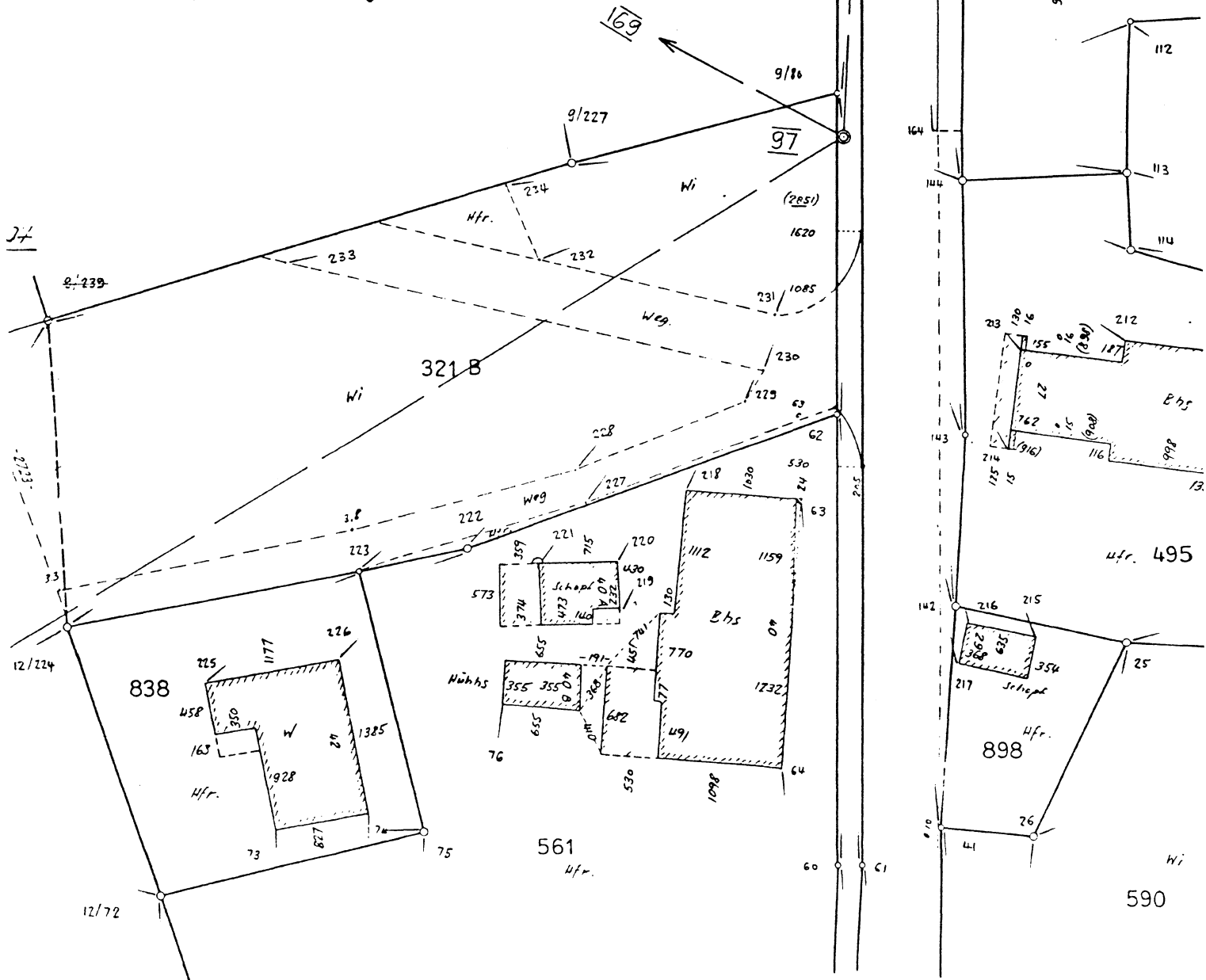
Der Grundbuchverwalter

15. Aug. 1985



28
SKIZZE

Exhibit 2.12 Field sheet for theodolite measurements.
Note that building corners are tied in systematically.



GEMEINDE PORT PL. 8 I: 500

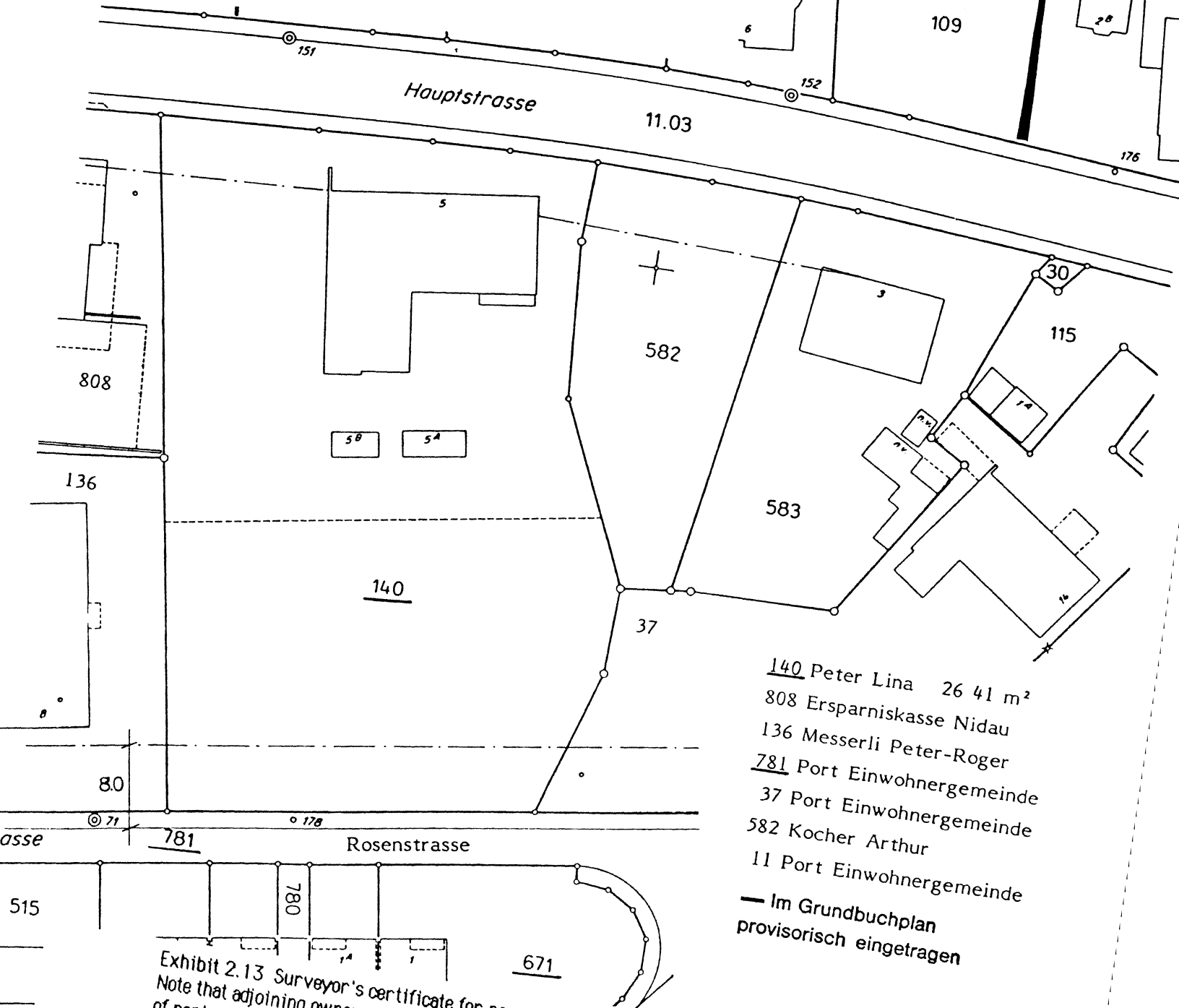
29

BAUGESUCH

für Parzelle 140

Port

N



- 140 Peter Lina 26 41 m²
- 808 Ersparniskasse Nidau
- 136 Messerli Peter-Roger
- 781 Port Einwohnergemeinde
- 37 Port Einwohnergemeinde
- 582 Kocher Arthur
- 11 Port Einwohnergemeinde
- Im Grundbuchplan
provisorisch eingetragen

Exhibit 2.13 Surveyor's certificate for parcel 140. Note that adjoining owners are listed. This is a copy of part of the original cadastral map dated and signed by the surveyor. A certificate such as this is required whenever any changes, physical or financial, are being initiated.

Für die Richtigkeit der Grundbuchplankopie
2560 Nidau, den 2. DEZ. 1985
INGENIEUR- UND VERMESSUNGSBÜRO
BERNHARD KAUFER - NIDAU

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3

The Role of the District Surveyor (a Private Practitioner) in Switzerland

Bernhard Kauter
District Surveyor
District of Nidau
Switzerland

3.1 WHO CAN DO CADASTRAL SURVEYS IN SWITZERLAND?

Only a licensed surveyor can do cadastral surveys in Switzerland. To become a licensed surveyor, one must:

- have a university degree in surveying (standard is between bachelor's and master's in Canada);
- have three years practice after university; and
- pass a 14-day examination organized by the Federal survey directorate.

Cadastral surveyors may work as employees of governments, as employees of private practitioners, or may become principals or partners in private practice.

Some of those in private practice hold contracts as "District Surveyors" and some do not. The way in which a district surveyor is selected, what he does and how he is paid for his work is described subsequently.

3.2 HOW ARE SURVEYORS ORGANIZED IN SWITZERLAND?

Every surveyor who has a university degree can become a member of the Swiss Association of Surveyors. There are about 800 members and dues are about 80 francs. Within the Association, there is a Group of Private Practitioners, open only to principals and partners in private practice. There are about 270 members; dues are four thousands of gross revenue from cadastral work. This Group appoints an executive committee, a remuneration commission and a secretary to look after its interests. The principal responsibilities of each follow:

Committee

- negotiation with the Swiss Association of Technicians and Draftsmen concerning salaries, conditions of employment (time of work, holidays, etc.);
- organization of the remuneration affairs in general; and
- maintenance and protection of professional and economical interests of the private practitioners.

Remuneration Commission

- responsible for on-going negotiations with the Survey Directorates on the general tariff and for representation on special renewal survey commissions. (See 2.4.1)

Secretary

- correspondence;
- collection of salary data from all categories of employees in the private practitioners' offices;
- collection of data on overhead costs, etc.; and
- organization of seminars, for private practitioners, especially management of an office.

3.3 HOW IS A DISTRICT SURVEYOR SELECTED?

The district surveyor is elected by the communities (municipalities) of the districts by:

- Announcement in the professional periodicals.
- The cantonal Surveyor General and the Governor of the district (he is a politically elected person) preselect (short list) the candidates, and normally present 3 to 5 candidates, with about the same professional qualities, to the communities.
- Every community of the district delegates two members of the community council to an election assembly, to which the candidates are also invited.
- Every candidate has to introduce himself for about 8-10 minutes to the delegates.
- After discussion, the district surveyor is elected by open vote.

The contract is renewed automatically every three years if there are no significant complaints from the communities or from the Cantonal or Federal Survey Directorates.

In some cantons (Vaud, Fribourg) there is a different system of maintaining the cadastre. The private surveyor is not responsible for a district as in the canton of Bern. He can do cadastral surveys in every community of the canton. All the documents are stored at the Cantonal Survey Directorate and every change of cadastre is checked when the private surveyor delivers the mutation map and the measuring deed. The plot onto the original map is done by the Cantonal Survey Directorate.

The advantage of this procedure is that there is direct and uninterrupted control by the canton.

3.4 WHAT IS THE WORK OF A DISTRICT SURVEYOR?

The work of a district surveyor is in two categories:

- i. There is the work on the cadastral maintenance (See 2.3 in Part I) that he is committed to do, and that only he is eligible to do under his contract with the district. This accounts for 40% of my practice.
- ii. There is other work that he, as a private practitioner, may compete for. This other work (See 2.4) includes:
 - renewal surveys, approximately 30%;
 - land consolidation (This is a complex business but, as it is not done in Canada, it will not be discussed here), approximately 30%; and
 - engineering, construction, etc. (much as in Canada), 10%.

3.4.1 The District Surveyor's Work on Cadastral Maintenance

The district surveyor, although a private practitioner, is a state official. In addition to doing surveys and keeping the cadastral map up-to-date (Sec. 2.3) he has a commitment to maintain certain supporting files and documents. Each year there is a "technical audit" of his office; as part of that audit, inspectors from the Federal Survey Directorate take some files from his office for several days and examine them in detail to ensure that his work is conforming to the regulations.

A list of the principle files follows:

- Theodolite observations (Ex. 2.12)
- Field Sheets (Ex. 2.9)
- Calculation of areas (Ex. 2.8 and 2.11)
- List of coordinates (Ex. 5)
 - Trig points
 - Traverse points
 - Boundary points
- Original (master) cadastral map on aluminum (An original was displayed at the seminars.)
- Tracing (in ink) of the rough draft.
- Transparent copy (stable base) of the original (A transparency was displayed at the seminars.)
- Definition of traverse lines and calculation of them.
- Map of the traverse net (Ex. 2.1)
- Division of sheets by communities.
- Map of nomenclature (names of communities).
- Parcel list: one sheet for each parcel (Ex. 2.5)
- Owner list: one sheet for each owner with all that owner's parcel numbers (Ex. 2.6)

3.4.2 The District Surveyor's Work on Renewal Surveys and on Land Consolidation Projects.

Theoretically every licensed surveyor, whether or not he is also a District Surveyor, can try to get a contract anywhere in Switzerland. But as you can imagine, it would be virtually impossible for me to get a renewal contract for a community in a part of Switzerland where I am not known. Similarly, it is very difficult for another surveyor to get a contract in the district of Nidau. It is up to me to have intensive and personal contact with the authorities of all communities for which I maintain the cadastre. Nevertheless, there are always two or three other surveyors from neighbouring districts who are asked by the communities for a proposal. Because the prices in the tariff are kept intentionally low, no offer more than 10% below the fixed costs by the above-mentioned commission will be accepted by the supervisors.

The renewal survey after a land consolidation project is always done by the surveyor who managed the land consolidation. Usually the land consolidation association has chosen a licensed surveyor as their project manager.

What is my reaction if another surveyor gets a renewal contract in the District of Nidau? Surely I am not happy, but it is senseless to be angry. In such a case, I try to find out a detailed analysis why one of my colleagues got the contract. Was it perhaps a

political decision of the community council? Are the contacts between the community and my firm, especially with myself, not good enough? Finally, it should be a lesson to me and cause me to review the way I am doing things or to look for a mistake I might have made.

3.5 WHO ENSURES THAT THE SURVEYORS' WORK MEETS SPECIFICATIONS? AND WHAT HAPPENS IF THE WORK DOES NOT MEET SPECIFICATIONS?

Cadastral maintenance work is inspected by the federal Directorate of Survey together with the cantonal Survey Directorate. Withdrawal of license is possible.

For renewal surveys, there is a specific sequence of steps:

- Surveyor does work in the field.
- Cantonal Survey Directorate does field checks and lists defects.
- Surveyor repeats work without payment.
- Surveyor continues calculations, compiles maps, registers, etc.
- Cantonal Survey Directorate does a final inspection.
- Maps, etc. open to the public to register objections for 30 days.
- Final approval given by both the Cantonal and Federal Survey Directorates.

Auditing of cadastral maintenance is mainly done by the Cantonal Survey Directorate. It has the authority to insist on its orders being carried out, however, the contracting parties for the maintaining of the cadastre are the communities and the district surveyor.

On renewal surveys, unsatisfactory work will not be accepted by the supervisors and payment will be held up until the work meets the specifications. The canton, which is always consulted by the communities with regard to new contracts, will not recommend a firm that has done one job badly.

3.6 WHO PAYS FOR THE CADASTRE AND HOW IS THE SCALE OF PAYMENT ESTABLISHED?

The surveyor is expected to recover his costs for maintaining the cadastre as follows:

- If new traverse points are necessary because of a change, costs are paid by the client.
- If old traverse points are destroyed or moved and must be renewed, the community pays for the renewal.
- All other costs are paid by the client.
- The surveyor establishes the bill and procures payment.

A copy of the invoice for the work shown on Exhibit 2.9 is shown in Exhibit 3.1.

For renewal projects the Federal and local governments share the costs as follows:

- the Federal Government provides a subsidy of 70%; and
- the community pays 30% but it may pass part of this on to the owners. The canton pays the surveyor directly and collects from the communities in annual installments.

For both maintenance and renewal, there is a basic tariff established through on-going negotiations between the Remuneration Commission of the Private Practitioners'

Group and representatives of the Federal Survey Directorate. In this tariff each task in the field and in the office is carefully analyzed and:

- the paths to be followed to meet the specifications are identified;
- the categories of personnel to be used are listed; and
- the time, in minutes, for each task is listed.

This scale is based on the supposition of a normal situation in the field (flat terrain, clear visibility of every marked point and no bushes, etc.) "Field factors" for other than ideal conditions are permitted; if the plot of land is inclined more than 10 per cent or if the visibility is restricted, there will be a field factor. Further, the maintaining tariff is divided into two parts:

- work by contract; and
- extra work (e.g. the marking or the calculation of different possibilities when division of a plot of land is demanded).

For each renewal project a special commission is constituted to determine the field factors. This commission will include a representative from the Cantonal and the Federal Survey Directorates, together with a free practitioner, (member of the Remuneration Commission) and the future contractor. The two representatives of the administration must be licensed surveyors.

This commission has to judge the topography, the ground-cover (open cultivated land, inhabited districts, old towns) and other factors such as intensive traffic. The demarcation of the areas into the different field factors is prepared with the help of air photos and then finalized on the spot by the above-mentioned commission. With the elements to be surveyed, which can be estimated fairly exactly, and the now-fixed prices, the total costs of the renewal can be worked out quite precisely.

Two examples of costs for renewal of cadastre (in Canadian dollars):

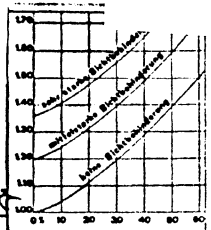
	a farm village	village of Biel
Traverse points	383	290
Boundary points	2075	2810
Buildings	335	700
Plots of land	560	700
Total area (acres)	1366	317
<hr/> Total costs	<hr/> \$257,800	<hr/> \$252,300
Costs per acre	\$188	\$796
<hr/> Costs per plot of land	<hr/> \$460	<hr/> \$360

3.7 CADASTRAL MAINTENANCE BY PRIVATE PRACTITIONERS OR BY GOVERNMENT AUTHORITIES?

Both systems exist in our country. Until today only some larger towns have licensed surveyors with their staff as employees and there is, as far as I know, no trend away from privatization.

It is up to us, the private surveyors, to ensure excellent maintenance of the cadastre and give no cause for complaint from our clients. It goes without saying that the private surveyor must be willing to accept new methods, new instructions and also be ready to invest money in modern instruments (computer, plotter, etc.) and to put time into his and his employees' further education.

Exhibit 3.1 Cost of surveying and cadastral maintenance for boundary changes affecting lots 454, 623, and 835 in Aegerten. Note that the owners pay more than 90% of the costs.



BE Gemeinde Aegerten Mutation Nr 130
 Datum: 8.5 Auftraggeber H. Lauerer KUNDEN 16c Aegerten
 F.A: 12.6 Art der Mutation Gründ zw. den Par 454, 623, 835
 B.A: 26.6

Geländeneigung: %
 Sichtbehinderung : keine - mittelstarke - sehr starke $Z_1 = 1.2$ $Z_2 = 1.2$
 Verkehrsbehinderung: keine - mittlere (1.10) - starke (1.20) $Z_2 = 1.$

I. GRENZMUTATION

Pos.	Abrechnungseinheiten	Ein.	Anz. El.	Auftraggeber		Gemeinde		b. b. Kosten	
				Einh.preise Feld	Betrag Büro	Einh.preise Feld	Betrag Büro		
1.1	Geschäftsauftrag	A	1		49.-		49.-		
1.2	Neue und veränderte Parzellen	Parz	3		24.-		72.-		
1.3.1	Erster verwend. vorhand. PP	PP	1	18.-	6.-	18.-	6.-		
	Weitere verwend.vorhand. PP	PP	1	15.-	6.-	15.-	6.-		
1.4.1	Erster neuer PP. mit Höhe	PP					31.-	37.-	
	ohne Höhe	PP					26.-	33.-	
1.4.2	Weitere neue PP. mit Höhe	PP					15.-	27.-	
	ohne Höhe	PP					14.-	25.-	
1.5.1	Neue Grenzpunkte 1 - 10	GP	1	11.-	12.-	11.-	12.-		
1.5.2	Weitere neue Grenzpunkte	GP		5.-	11.-				
1.6.1	Erste doppelt ber. Teilfläche	Tfl.	1		10.-		10.-		
1.6.2	Weitere doppelt ber. Teilfl.	Tfl.	4		3.-		12.-		
1.7.1	Σ ber. Teilfl. je 10 a bis 1 ha	10 a	6		3.-		18.-		
1.7.2	Σ ber. Tfl. je 10a v.1 bis 5 ha	10 a			1.-				
1.8	Neue Kulturgrenzpunkte	KGP		1.-	3.-				
1.9	Neue od.veränd.ber.Kulturteilfl.	Kfl			9.-				
1.10.1	Messurkunde mit Planbeilage A4	A4	1		10.-		10.-		
1.10.2	Für jedes weitere Planformat A4	A4			7.-				
1.11.1	Wiederherstellen von PP mit H.	PP		(34.-)	(5.-)		34.-	5.-	
	ohne H.	PP		(29.-)	(3.-)		29.-	3.-	
1.13.1	Doppeltes Auftragen von PP	PP			(12.-)			12.-	
1.13.2	von GP	GP			7.-				
1.14	Planverzug bei alten Plänen	Pl.						5.-	
4.1	Veredigen von } pro Auftrag Parzellen } pro beteil. P. Parzellenpausen 1:5000	A Parz "	 3 3		20.- 9.-		20.- 9.-	 6.-	
Zwischentotal Feld / Büro					44.-	185.-			6.-
x Zuschlag Z_1 auf Feldarbeit = 1.2					53.-				
Zwischentotal Feld + Büro					238.-				6.-
Anwendungsfaktor F 19... : x 2.68 = total Akkordarbeiten					638.-				16.-
5.1	Spezielle Vergütungen	%						65.-	
5.2.1	Reisekosten Auto	km	10					22.-	
1.12	Rekonstr. GP (mit Grenzmut.)	GP	1	10.- x Z_1 x F			37.-		
4.7	Doppel Mut.pl.beil. pro For. A4	A4	3	12.- x F			96.-		
5.3	Sonderleistungen nach Aufwand:	Std	1		70.-				
		Std							
		Std							
	Messgehilfen	Std	2		74.-				
		Std							
5.4	Material, Mat.trsp. + Maschinen:	Anz.							
	Fröhle/Nägel/Eisendorne	Stk	1	3.-					
	Bolzen/Röhren	Stk							
	Mark-/PP-Steine/Kstf. arken	Stk							
	Gusschächte/Fotokopien/Duss Duos	Stk							
	Computer/Koordinatograph/Km/Biber Rapid	Stk	1	30' 20.-	10	5.-			
Tot. Mat. etc.					38.-				
Total Auftraggeber					948.-		Total Gemeinde		193.-

Vis: 9.7.85 K Total Auftraggeber 948.- Total Gemeinde 193.-
 Bem: 03 Client Wolfgang Kuehler Community

MVA 1.1 (655.4)

Part II

BRANCH PRESENTATIONS AND DISCUSSIONS

Editorial Note:

At each seminar, Part I, above, was presented in the morning. At some of the seminars there was time for some questions to Mr. Kauter before lunch; at others, there wasn't. After lunch the presentations by other speakers were followed by wide-ranging discussions.

Some of the discussions addressed issues raised by the afternoon presentations; some addressed broad professional issues and some addressed the details of the day-to-day operation of the Swiss cadastre and the role of the district surveyor in Switzerland.

Inevitably, some similar questions about activities in Switzerland were asked at each branch; however, as each discussion probed a different aspect, I have made no attempt to avoid duplication by editorial deletions.

On the other hand, due either to difficulties with the quality of the transcription or to difficulty with the clarity of the thought, there are some omissions.

Ed.

The Fredericton Branch Seminar

The Fredericton seminar, held at the Fredericton Inn on February 12, was organized by Rejean Castonguay, Branch Chairman, assisted by Douglas Morgan, Branch Treasurer. There were a few questions immediately following the Part I presentations. Then, presentations by John Barber and Michel Brunet were followed by general discussion.

John Barber is president of J. D. Barnes Ltd., Toronto and at the time of the seminar, he was immediate Past President of the Canadian Institute of Surveying. Michel Brunet, Q.L.S., is the senior partner of Brunet, Lebel and Leger, practicing in Montreal and at the time of the seminar, he was President of the Quebec Corporation of Land Surveyors.

Participants

Bernard Arsenau	L.R.I.S., Edmundson
Ralph Brown	R. G. Brown & Assoc., Fredericton
Rejean Castonguay	L.R.I.S., Fredericton
Joseph Cormier	L.R.I.S., Bathurst
Plen Dickson	Dept. of Municipal Affairs, Fredericton
Roger Gaudet	L.R.I.S., Fredericton
William Griffin	Dept. of Natural Resources, Fredericton
G. David Henderson	L.R.I.S., Saint John
Bernard Hoganson	Dept. of Natural Resources, Fredericton
John Kershaw	Dept. of Natural Resources, Fredericton
Janice LeBlanc	Dept. of Commerce and Technology, Fredericton
Douglas Morgan	Trainor Surveys (1974) Ltd., Fredericton
Walter Murphy	Murphy Surveys, St. Stephen
Douglas MacDonald	Eastcan Group of Survey Companies, Halifax
John MacInnis	City of Dartmouth, Dartmouth
W. D. McLellan	DEMR, Canada, Legal Surveys, Amherst
Gerald Parsons	DEMR, Canada, Legal Surveys, Amherst
Gerard Post	Consultant to Gov't of Nova Scotia, Halifax
Willis F. Roberts	Retired, Fredericton
Earl Robinson	L.R.I.S., Fredericton
Edward Smith	ADI Limited, Fredericton
Eric Smith	Key Surveys Ltd., Moncton
David Steeves	Eastcan Group of Survey Companies, Halifax
William Thompson	L.R.I.S., New Glasgow
Al Wallace	Wallace-MacDonald Surveys, Halifax
Barry Zwicker	Town of Bedford, Bedford

4.1 THE LAND SURVEYOR AND LAND INFORMATION

John D. Barber
President, J. D. Barnes Ltd.
Toronto

Many of you attending today's seminar are here to learn what is a land information system and, more importantly, how it effects you as a surveyor. The perspective that I bring to this meeting is of a person who has recently answered these questions and I bring you good news and bad news. The good news is that we are now and always have been in the land information business. The bad news is that if we wish to continue serving our client's needs, we must provide our finished product not only in a hardcopy product but also in a digital format. This presentation will cover:

- an explanation of a land information system and the advantages of such a system;
- a review of the current role of the surveyor and the changes necessary to provide land information services in a digital format;
- potential for the surveyor in the field of land information management; and finally,
- a quick summary of the activities of Trillium, a consortium composed of the 9 mapping firms in Ontario

A land information system is simply a database of land-related information linked to a geographic coordinate system. Because this land-related information is in digital format and related to a coordinate system, data, in the proper format, can be input from a wide variety of sources.

A basic concept in an integrated land information system is that each data item is referenced to a unique location. Therefore, the first step in building a land information system is the establishment of a horizontal control system which is related to latitude and longitude. This system could be the Universal Transverse Mercator system or the Stereographic Projection System, or any other system as long as it is related to latitude and longitude.

The next stage in building this land information system is usually the compilation of a topographic data base through the process of digital mapping. A topographic database is created by assigning geographic coordinates to physical features of the earth's surface such as buildings, roads, utility poles, drainage patterns, and contours. The resulting data can be transferred through software onto a graphics terminal or onto a hardcopy paper map. In developing this topographic database, digital files of both graphic data and non-graphic attributes are generated. An example of graphical data is the outline of a house. Non-graphic data attached or linked to the house could include the street address, the full range of details about the occupants of the house, such as numbers, age, occupation and so on.

The land information system is further enhanced by adding additional layers of land-related data concerning such things as land parcels, forest inventory, and street hardware. This information can be readily input and manipulated provided that the data is in a uniform digital format.

By combining land-related information from a variety of sources, relating to a common geographic coordinate system and sorting it in a database, we have created the basis for an integrated database management system. Database management software allows manipulation of this basic data which yields countless applications.

For instance, it is estimated that one minute out of eight could be saved in the ambulance dispatch process, thus saving hundreds of lives each year. Drivers will be able to determine where an emergency call comes from and how best to get there. The latest information on street closings, accident locations and traffic flow could be superimposed onto an electronic street grid.

The system will also aid forest fire fighting by combining computer maps with data such as wind velocity and direction, soil moisture, etc., to plan fire attack strategy and control.

Municipalities will be able to build parcel databases and graphically display parcel boundaries, ownership, utilities and zoning. It will eliminate most of the arduous updating now required with conventional maps.

A co-operative approach of all those responsible for the various aspects of the land information system will provide substantial savings by avoiding duplication; for instance, the topographic base needs to be input only once. All or part of the topographic database can be used by others such as Utility companies and Municipalities. It also allows each agency or company to maintain its own plant inventories, and at the same time combine the positions of its facilities with those of others.

The components of LIS (Land Information System) are simply hardware, software and data. Hardware and software are combined to perform the following functions:

Data capture. Loading graphic and non-graphic data from a variety of sources and to maintain cross-references or links between related data;

Data editing. Making amendments or updates or corrections to stored data; and

Data manipulation. Providing a host of applications to use the existing data to produce a variety of end products (e.g. ambulance dispatch, forest fire attack and strategy).

This obviously oversimplifies what a several hundred thousand dollar system does for us; however, irrespective of the level of sophistication of the system, these three functions (data capture, data editing and data manipulation) are the primary ones undertaken.

The data for a LIS system is stored in a database or a series of databases which are repositories for the data in the form of files (with or without linkages to other files). When we look at the data that is stored in these databases, we realize at once that the surveyor plays a major role in the creation and maintenance of the database.

Role of the surveyor today. At the present, only the larger surveying and mapping firms are offering LIS services. However, if we examine the basic ingredients to a LIS database, we will see that the primary data gathered relates to both large and small surveying firms. More importantly, it is the information, perhaps in a different format, that most of us have been gathering for years.

The foundation for the database of an LIS system can be summarized as follows:

Common reference framework. The establishment of geodetic networks to relate data to a unique geographic coordinate position;

Topographic detail. The compilation of planimetric detail and land characteristics for analysis, planning, evaluation and monitoring; and

Property delineation and registration. The definition of cadastral fabric and property limits to reflect the current registration of land ownership together with the compilation of registration and documentation.

Without these base components, an integrated land information database cannot be created or maintained. All of these key components fall under the jurisdiction of the surveyor and mapper.

To provide a perspective on the role of the surveyor in regard to the creation of an information database, we will deal with each of these three data components.

Common reference framework. Irrespective of who controls the contracting out of the services, these basic steps must be taken except in cases of provincial/federal jurisdiction where the need and use of the network are already understood. For the municipality entering into the digital world, they now have the basic ingredient - a common reference framework from which they can coordinate all their land-related data.

A typical scenario may be as follows:

- surveyor presents a proposal to the municipality to explain the need and benefits of an integrated control network;
- a detailed proposal covering the need, uses, network design, performance specifications, and costs of a control network must then be presented and approved by the appropriate authorities; and
- establishment of the control network then takes place and a report noting areas of concern and recommendations on the future use of the network together with a proposed maintenance plan is presented.

Topographic detail. By scrutinizing a typical 1:50,000 NTS map, we can appreciate the vast amount of topographical data contained on these maps. The method of collecting this data for inclusion in the database can come in two forms: photogrammetric mapping and total station field data collection. Total station instrumentation allows topographical data to be collected much more economically than ever before. This makes ground methods economically feasible for large areas where previously only photogrammetric mapping would be considered.

Photogrammetrically, the following scenario may ensue:

- A proposal is presented to illustrate how economical and beneficial a series of digital topographical maps can be to the client.
- After convincing the client of the need and the worth of the service, a detailed proposal outlining considerations such as the scale of photography and density of control for their required accuracy, delineation of the area to be mapped, the features to be mapped and associated non-graphic attribute data to be compiled is presented
- Discussion of the comparison between conventional analogue and digital mapping must justify the additional costs of digital mapping.
- To sell the digital product, assurances of the ability to subsequently use and update the data must be provided.
- Following acceptance of the proposal, "fine tuning" must be done to ensure that the client's needs will be met; one of the most important concerns being that of the data structure of the digital end product and its compatibility with the client's envisaged Data Base Management System (DBMS).

As seen from the foregoing, the paper product was far simpler to deal with; however, many of today's clients are insisting on a digital product. Obviously, if we are to maintain these clients, compliance with their wishes is absolutely necessary.

Returning to the field procedures, we find that in many respects the data collection has been simplified by the use of the total station. However, if today's surveyor is to provide the digital end product, certain methods must change. For example, if we are supplying data to a LIS system, the survey must be coordinated in the common reference system used in the database. This requires an integrated survey tied to the control framework which was usually not a requirement in the past. Secondly, to make the digital end product more meaningful, the use of "point codes" to describe the type of point (i.e. utility pole, fence line or survey monument) and possibly some auxiliary information must accompany each measurement. This facility is available in most data collectors.

The digital end product from total stations cannot be handled by all computer systems. Today's microcomputer systems must have the capabilities of: communicating with the data collector, reducing the raw data, adjusting the project control, coordinating the topographic detail points, cross-referencing points with the appropriate "point codes", and producing a three dimensional database file. Some microcomputer based systems do just that and also allow the surveyor to create a graphical file of lines, arcs, and text, all of which can be transferred to the larger and more sophisticated LIS systems.

The role of the surveyor hasn't really changed in this area; however, the technology and methodology to provide the client with the end product certainly has.

Property delineation and registration. The property delineation and registration component of the database is of great importance since a great deal of land-related information is cross-referenced to it. The role of the surveyor in this regard may seem quite apparent - the determination of property extent is performed exclusively by the land surveyor. However, if we view the needs of a digital information system, we will find that the services provided must go beyond those currently offered by most firms.

Cadastral and property mapping for an information database requires that it be stored digitally. For many of you, the product you produce is a graphical illustration of the survey in hardcopy form (e.g. mylar, white print). This cannot be incorporated into the database in hardcopy form. It must be translated into a format the computer can store in the database (i.e. point coordinates, lines, arcs, etc.).

Providing cadastral and property maps in digital form is one requirement of the surveyor; however, the role of the surveyor in providing this information involves more than a simple, singular survey. To more fully understand our role in compiling property information the following considerations are provided:

- the problems of compiling an entire city or province into an integrated series or map sheets illustrating a cohesive cadastral fabric;
- the need to determine all relevant sources of survey data and the task involved in determining the hierarchy of evidence from each of the sources;
- the problem of dealing with plan disagreements and the variation of survey methods and accuracies over the years;
- the need to relate all ground surveys to the geographic coordinate system;
- the difficulties encountered in attempting to deal with survey inconsistencies via balancing and/or least squares adjustments; and
- the time required to certify the extent the ownership of these parcels.

The preceding illustrates that the process of deriving cadastral mapping for a LIS database is a formidable task and one that can only be performed by surveyors. We must never forget that new technology provides exciting new opportunities, but these opportunities can only be exploited by people who have the proper experience and expertise. In property delineation and registration, the land surveyors, and only the land surveyors, have this experience and expertise.

Since the land surveyor will exclusively be undertaking this assignment, our role is not limited to physically deriving the coordinates but also in designing the methodology, defining the required accuracies, and the end product. As an example, the question of accuracy can weigh heavily in regard to the acceptability of the end product by the consumer. Inconsistencies in the quality of data in the database may render it unusable.

I have attempted to convey the potential role of the surveyor in contributing the basic information to the database. We must not lose sight of the fact that the majority of information that resides on the LIS system is non-surveying. The amount of Municipal, Provincial and Federal data pertaining to land and its attributes is enormous and is one of the primary reasons for creating the database - that is the ability to use interrelated data for decision making. Nevertheless, since surveyors provide the foundation for the database, our role is very significant and hopefully, with time will evolve to encompass other facets of land management.

Digital system considerations. If today's surveyors are to maintain their current clients, we must recognize that the requirement for a digital end product is becoming commonplace.

To provide the necessary project returns, a listing of coordinates stapled to a plan is no longer sufficient. However, it is also not necessary to acquire the duplicate LIS system that the client has - this would quickly put most of us out of business. There are a variety of systems in the marketplace that may meet your needs. These systems need not be minicomputer based turnkey systems - it is possible that a relatively inexpensive microcomputer based system may meet the needs of a majority of your clients. Having said that, it becomes important to note some worthwhile considerations in determining whether or not a system will both meet your needs and be economically feasible.

From a surveying and mapping viewpoint, our primary considerations is how to convert our end product from our traditional hardcopy paper product to the same plan represented by coordinates in a digital file. The following are a few of the concerns associated with transferring our output to a LIS system:

- original survey data format;
- data format translation for LIS; and
- physical data transfer facility.

The format of the original survey data (e.g. point number, X,Y,Z, point code) may differ from the format required by client systems. Understanding and dealing with these differences are important to maintain client confidence in your expertise and in the product being received.

The problem of translating data to a client's LIS format is demanding since there is no one accepted data structure within the industry. A SIF (Standard Interchange Format) is commonly associated with mapping systems such as Synercom or Intergraph; however, even these have subtle differences.

In addition to format concerns, hardware constraints such as the physical transfer of data must be addressed. Economics based on speed and capacity are important in deciding on system acquisition and compatibility. The ability to effectively deal with bi-directional information flow is also important.

The foregoing illustrates that to embrace the new technology, we need not only new equipment but also new knowledge. Much of this expertise must be gained from those who have already succeeded in this transition.

To meet client needs in the future, consideration must also be given to your system's capability to accept the LIS system data for purposes of updating their database. It is far simpler to format a file in one direction than to provide a bi-directional flow of data that does not lose any of the data due to file structuring incompatibility.

Another concern for LIS interfacing is the physical transfer of data between systems. Once the data translation capability is in place, it must be decided how to economically and practically transfer the data. Direct interfaces between a microcomputer based survey system and minicomputer based LIS system are possible: however, the rate of data transmission would probably be too slow for practical production considerations.

Data transfer via a standard 9-track tape drive may meet the necessary requirements. In many cases, the need to transfer data over the telephone lines and the concern for maintaining data integrity must also be dealt with. No doubt, the solution to this problem will be forthcoming from the new technology that is being offered to us on a daily basis.

For those not yet committed to this new technology, it is safe to say we are entering a new era which is far more sophisticated than we would have perceived even a few years ago. The direction we must take to fulfill our role in this information society, I believe, is quite clear and can be summarized by Recommendation 29 of the 1985 Report of the Task Force on the Surveying and Mapping Industry in Canada which states:

"That the private sector surveying and mapping firms focus their resources on the transition from their traditional role to one of more involvement in spatial information management."

With this recommendation in mind, let us view some possible future scenarios in the industry.

Potential for the future. As previously noted, the surveyor's contribution to the LIS system covers a variety of survey disciplines. As such, the firms best suited to deal with the overall needs of these clients are those which have the expertise and resources in all of those disciplines. However, the status of "Information System" programs federally and provincially vary considerably; therefore, those survey firms who only perform cadastral surveys still have the potential to make a major contribution. A viable scenario for the future is the amalgamation of several firms into a consortium which provides the needed services based on the specialities of the individual firms.

Often when we speak of future potential, it is pertinent to review our past. A 1981 special edition of the Canadian Surveyor dealt with "The Modernized Survey Profession". In that issue, the model presented illustrated the profession as having an exclusive role in legal surveys, and a leadership role in positioning and measurement, land information, and land management. An article by C. H. Weir which compared the past (DLS Manual of Survey 1881) to the present stated:

"these instructions show that in today's terminology the surveyor was expected to fill the roles of: resource specialist, environmentalist, hydrographer, geographer, geologist, pedologist, and information manager."

As we can see, the role played by the professional surveyor has greatly eroded over the years. But, there is little reason why our profession cannot and should not undertake many of these responsibilities in the future. From that same publication, we should look closely at the words of John Matthews, the President of the C.C.L.S.:

"In view of the increasing complexity of problems related to land use and development in a modern society, the provision of integrated land information and professional expertise in land economy have become essential services for ensuring the orderly development of land and the rational management of natural resources. Of all professionals, land surveyors are in the best position and are the most competent people to assume a leadership role in providing these services."

The leaders of our profession have clearly identified an exciting opportunity. It is incumbent upon all of us to accept this challenge and to revise our role as surveyors to include land information management.

Hopefully this change in our scope will happen gradually, and in a systematic evolutionary process. However, many of us have discovered that change is happening faster than anticipated due to client demands for "digital end products". For all of us, if we are to assume a leadership role, we must incorporate the necessary tools into our business.

The potential we have today is in the area of data gathering from the LIS system, and hopefully even the design and implementation of these systems for our clients. However, before this becomes reality, we must educate ourselves in both the multi-disciplinary, integrated approach to information gathering, and the concepts and management of computerized information systems. The problems are numerous, but the technology is available to meet many existing needs. Time is of the essence and we should embrace today's opportunities and work together in a coordinated fashion. The surveying and mapping Task Force Report stated that "data collection, data storage, and data presentation should increasingly be in digital form. They (industry) could readily be involved in the development and management of information systems".

The potential for our future takes us beyond the role of information collector into roles such as information manager and land management. This potential is based on certain facts:

- the profession is providing and will continue to provide the basic components of the land information database: common reference framework, topographic data, and cadastral and property data;
- the profession has a strong mathematical and analytical background which is essential in the establishment of information systems;
- the profession maintains exclusive rights to delineate and describe land parcels which are the basic units that relate the socio-economic information;
- the profession with its intimate knowledge of the land, and its undertakings in the land development process is an essential component of the land management team;
- the profession embraces advances in new technology which are foreign and formidable to many other professions; and
- the profession provides a focal point for all parties requiring the establishment of an integrated land-related information system.

Our collective potential for the future is great; however, in any undertaking as complex as the ones we speak of, the road to success cannot always be clearly defined. As such, we must remain flexible and constantly evaluate the needs of our clients and society at large.

To meet the needs of our current role and our future role, we must be prepared to update ourselves in both knowledge and resources.

What may become more commonplace in the future is the consolidation of firms in consortia to deal with changing requirements. An example of this is a unique Government/Industry initiative in Ontario - The Trillium Data Group.

In 1983 Trillium Data Group Limited was incorporated and consisted of all the 9 aerial mapping companies in Ontario. The purpose of Trillium was to function as a technology development centre for digital technology.

The objectives of Trillium are:

- to produce high quality, economical digital maps by developing an efficient production environment;
- to assist member firms in bridging the transition from conventional to digital technology by sharing with the Government and the member firms the required software development and research and development;
- to improve the competitiveness of the Ontario mapping firms in the overseas market;
- to provide a quality control monitoring centre for the member firms thus ensuring its clients of a uniformly high standard digital product;
- to provide consulting services to the provincial agencies, municipalities and companies that are in the process of establishing digital land-related information systems; and
- to provide derived digital products as users' needs are identified.

In late 1983, a unique initiative fostered by the Ontario Government and undertaken in a partnership with Trillium, led to an agreement to develop a computerized land related information system for Ontario. The objectives of this agreement are:

- to develop a common digital base for land-related information systems in Ontario (a system which will readily allow data to be transferred between users);
- to establish a production environment in industry to provide this information (to capture the topographical data in digital or numeric form);
- to assist industry to bridge the transition from conventional to digital technology; and
- to improve the competitiveness of the Ontario mapping industry.

This Agreement was particularly timely because in late 1970's and early 1980's, the Ontario Mapping industry was dealt a double blow. First, there was a drastic erosion of our position in the overseas market where we had played a significant role and secondly, the industry was seriously effected by the economic recession of that period.

Because of the economic conditions, the mapping industry required assistance in its costly transition from conventional line mapping to digital mapping. This agreement between the Ontario Government and Trillium provided the vehicle for this assistance in the form of:

- financial cost sharing in the acquisition of digital equipment;
- financial cost sharing in the acquisition or development of the substantial software necessary (The total cost sharing for the hardware and software is \$2,000,000 - \$1,000,000 by Government and \$1,000,000 by Industry.); and
- participation in designated pilot projects.

The following is a quick summary of the completed and proposed activities associated with those pilot projects involving Trillium:

- assisting the Government in modifying and updating their digital mapping specifications; production of 200 to 300 1:10,000 and 1:20,000 digital map sheets including the generation of digital terrain models;
- In the City of Cambridge, the following services were provided:
 - targetting of required horizontal control and selected Bell manholes;
 - obtaining suitable aerial photography;
 - coordination of 128 cadastral monuments which will be the basis for the subsequent coordination of all 25,000 parcels in Cambridge. This will be the initial phase which will lead to the development of:
 - parcel mapping and a parcel database; and
 - digital street network system which is linked to Statistics Canada data.
- providing suitable vertical control;
- performing aerial triangulation and numerical adjustment including the generation of coordinates for the targetted Bell manholes;
- stereo-digitizing 13 1:10,000m map sheets, and stereo-digitizing 49 1:2,000 map sheets, including the generation of digital terrain models;
- coordinating all the street hardware on 1 1:2,000 map sheet;
- table-digitizing of at least 50 1:10,000 map sheets;
- provide a digital base and digital terrain models for a variety of application areas including:
 - fire behavior analysis,
 - forest resource inventory,
 - geology,
 - ambulance dispatch,
 - radio transmission tower location,
 - agriculture,
 - utility mapping,
 - land inventory mapping.

The financial assistance received and the sharing of technology will greatly assist the Ontario mapping firms in expediting the acquisition of the equipment and expertise needed to produce the digital files required by the province, municipalities, utilities and offshore markets.

More and more clients - provincial and federal government agencies, municipalities, utilities and engineers in particular - are demanding digital products. We must satisfy their needs and requirements or others certainly will. We have been presented with an opportunity and challenge to expand our role as surveyors and mappers. This challenge is not without difficulties. No challenge is. Clearly it is time to enlarge our role as surveyors and to regain some of our lost prestige and recognition.

4.2 RECENT DEVELOPMENTS IN CADASTRAL MAPPING IN QUEBEC

Michel Brunet, Q.L.S.
Brunet, Lebel and Leger
Montreal, P. Q.

The program of the cadastral system reform in Quebec was announced in February, 1985. It is a 10-year program. The deputy minister of Energy and Resources (M.E.R.Q.), Mr. Michel Paradis, has worked hard to push the program. It is proposed that the estimated \$84 million cost of the program will be totally self-financed. Fees collected at the registry office for title searches (Ministry of Justice), for cadastral documents deposit (M.E.R.Q.) and revenue from map product sales will go into the reform funds.

The M.E.R.Q. has published a brochure explaining the whole program. "*Le Nouveau Cadastre Quebecois*". Three ministries cooperated to introduce the reform: the M.E.R.Q., the Ministry of Municipal Affairs and the Ministry of Justice. The main reason for the reform is the need to have base maps giving an up-to-date representation of the graphical cadastre. Unfortunately, the present cadastral institution, such as proclaimed in 1860, had no provisions for compulsory updating.

The direct products of the reform will be 5,000 topographic maps at scale 1:1 000 (urban areas) and 1,600 topographic maps at scale 1:20 000 (rural areas). This will be entirely a digital production. Furthermore, 6,000 3rd order geodetic points will be established by the M.E.R.Q.

An important component of the program is the participation of the 1,600 municipalities of Quebec. They are required to supply the 4th order geodetic network and pay all costs involved in its establishment and maintenance. They also have the responsibility of updating the topographic maps (e.g.: new streets). However, to participate in the program, the municipalities must make an application. Each year, some municipalities will be selected according to their situation. For instance, a municipality experiencing expansion, which is ill-equipped to carry out base mapping, would be a likely candidate for selection.

There are also grey areas in the program. One is the legal aspect of the cadastral map. As the mapping production is carried out using a digital format, coordinates are assigned to all parcel corners. However, these coordinates don't have any legal value, being used only for the reproduction of the maps. Another concern is that the reform will not permit the clarification of the title when a physical occupation survey is in conflict with the plan. As there is a need for a compromise between title and occupation, discussions are now being held in order to improve this situation as soon as possible. Another important aspect is the necessity to produce good quality products. There is a need for the government to make estimates of cadastral work done by contract, in order to determine the range of real costs. Unrealistic cost estimates could then be rejected.

The municipalities will have to deal with the new products generated by the reform and more specifically with digital mapping. They are ill-prepared to introduce this new mapping technology. The reform is, thus, an opportunity for land surveyors to introduce this new expertise. The municipalities will receive their data from M.E.R.Q. in the form of hard copy and tape, and they will require competent surveyors to superimpose this information on to the base maps (eg.: taxation). It is a new ballgame for the municipalities and if surveyors do not provide the expertise required, other professions will move in and take what amounts to a large new market.

DISCUSSION ON MR. BRUNET'S PAPER

G. Post: Who will maintain the property maps?

M. Brunet: Municipalities selected in the program will sign an agreement with the government. They will have to modify their base maps to show new streets or buildings. Any new subdivisions sent in the future to the Cadastral Office by land surveyors will be used to upgrade the data base with these new coordinates. These coordinates will be also at the registry office and at the municipal level. Thus, the cadastral map will be always up-to-date.

R. Gaudet: How will the geocode work if you have a building over 2 or 3 lots?

M. Brunet: Basically, we will do a sort of cleaning at the same time. In the case where a proprietor owns 3 lots, we will cancel those 3 lots and will replace them by a unique number, with a unique geocode or centroid.

McDonald: Has a particular format been established for surveys?

M. Brunet: For cadastral surveys, land surveyors will use total station and will provide the government with disketts containing the field work.

A.C. Hamilton: Would you elaborate about the self-funding idea?

M. Brunet: An agency has been created within the M.E.R.Q. to look at the funding aspect.

Anon: Could you comment on how the surveys are going to be carried out for this system and how much cost is involved?

M. Brunet: The regions where field surveys are required, i.e., for areas having major problems, will be decided by the government, before according the mandates. Cost figures are very hard to determine. I have an average, from last summer evaluating the field compilation at \$100 per lot for the cadastral reform. This excludes mapping and monumentation.

4.3

FREDERICTON DISCUSSION

E. Smith: The theme of this panel is the issues, options and scenarios with respect to land information for the long term.

B. Kauter: As a practicing land surveyor, I feel that we must invest time and money to develop the expertise within private practices to service potential LIS markets. It is important to have well informed managers to deal with and build good contacts with our clients. In Switzerland our clients are the municipalities, and it has been our task to persuade them to acquire land information systems. This is not only at the level of the cadastral map but also other municipal information such as utility locations. We as private surveyors must join together to build a group to have the power to invest in new methods and equipment which will enable us to work in the land information area.

A. Hamilton: The Swiss example is instructive because they have developed a system which has been able to stand the test of time. They are looking at introducing new technology but this is based on the sound survey system they have in place now and therefore the transition to more updated methods is less complicated.

D. MacDonald: The role of governments should be to legislate and regulate land policies. After their role has been suitably circumscribed, the role of the surveyor and of other professions will be clear and they will be able to take the lead in filling that remaining void. It can only be done if the private sector is satisfied that the government is working in concert with them and that they have undertaken the financial investment to assure the long-term success of the project. There has to be a much greater spirit of trust and cooperation in the Maritimes between the private sector and government.

A. Wallace: Could Mr. Barber comment on the scenerio that has been put in place in Ontario.

J. Barber: I think that if we as surveyors want to get into the land information business, then one of the key roles that surveyors have to play is in digital mapping. In negotiating and dealing with municipalities our experience is that they like the concept of digital mapping but they are unsure on how they can use it. The next step is a user-need study by the surveyor or mapper which can lead into a number of other opportunities. Therefore, if surveyors in this area want to get involved in this field in a serious way, then they are going to have to get involved with digital mapping systems. It is unlikely that one firm could achieve this but through a consortium it could be done.

But it cannot be done unless an arrangement is made with the government. What you see is in Ontario an arrangement has been made, in British Columbia an arrangement is in the process of being made, in Alberta an arrangement has been made. That's the only way any opportunity exists for the private sector to get involved with this very expensive new technology. They will not be prepared to take the risks with no chance of making money.

E. Smith: Could anybody comment if this opportunity exists in this region.

R. Gaudet: Yes, there is an opportunity here. We are going to have to look at the formulae by which funding goes from the federal to provincial governments and then how it is distributed to municipalities. Presently, we do not have the manpower and resources available to invest in a LIS. The whole infrastructure has to be put into the system at some time before real opportunities can be realized. Private surveyors have the opportunity to

start at the municipal level as local government can determine their own destiny and needs. The land surveyors are the people closest to the municipality and as a group can provide the service of information specialists.

The framework is in place with the control network and the basemap and we are moving ahead with digital mapping. I do not believe that in the long run the government should be in the service bureau role, this is better suited to the private sector.

B. Zwicker: To achieve the use of LIS's and digital mapping in municipalities, discussion must be held with the government to determine the long-term cost effectiveness of making the change or where they can see efficiencies in their internal operation. At this point in time all the municipalities are seeing is a tremendous bill that is attached to changing to a system that they really do not understand.

E. Smith: I should like to pose another question. What is the driving force which will motivate a LIS to the development stage.

J. Barber: In Ontario the large municipalities have a lot of land data stored in the form of maps and printed copy in numerous places. There is a feeling that the only way of coping with this mass of information is by a digital system. Many uses of a LIS can be found, such as retrieval of information on a particular area to base decision making on or to store utility and building data to assist in maintaining engineering works.

E. Smith: Within the Maritime region, do we have the same kind of pressure to manage land information?

D. MacDonald: In Dartmouth and Halifax there is a need to find a solution to the increasing demands from the public and internal operations placed on the system. The number of regulations that must be contemplated in dealing with land has made it difficult for even professionals to determine the proper action to be taken. If they do not come up with better mechanisms for being responsive then this perpetuates very inefficient management and creates bad public relations.

J. Barber: In summary, it can be seen that two initiatives have to be undertaken for the success of an LIS in the Maritimes. First, the private practitioner's have to do a better job in marketing the services they have to offer and secondly, the government institutions have to change to become receivers of this information.

The Toronto Branch Seminar

The Toronto seminar, held at the Erindale Campus, University of Toronto on February 14, was sponsored jointly by the Toronto Branch, C.I.S. and by the Association of Ontario Land Surveyors. A committee chaired by Dave Lever arranged the program and the A.O.L.S. handled the administration.

As John Barber, who had been scheduled to repeat the presentation he had given at Fredericton was the victim of a flu attack, Jury Konga read John's paper. Then, following Ron Logan's presentation, there was a general discussion chaired by David Lambden.

Ron Logan is Director, Real Property Registration Branch, Ontario Ministry of Consumer and Commercial Relations.

Participants

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John Boyd	Association of Ontario Land Surveyors
T. G. Cahill	Matthews & Cameron Ltd., St. Catharines
G. J. Campbell	DEMR, Canada, Legal Surveys, Ottawa
Geoffrey P. Carlin	J. D. Barnes Limited, Willowdale
Carl Celestin	Archibald Gray & McKay Limited, London
G. B. Clarke	Ontario Land Surveyor, Aurora
Reginald C. Cooper	City of Burlington
J. Stanley Cotterill	Ontario Land Surveyor, Grimsby
Marc DeBellefeuille	DEMR, Canada, Toronto
I. C. Dinsmore	Ontario Land Surveyor, Port Elgin
R. A. Garden	R. A. Garden Limited, Newmarket
Robert Gaspirc	Ontario Land Surveyor, Willowdale
Glen Gibbons	MMM Surveys and Consultants Ltd., Don Mills
Gordon Gracie	University of Toronto, Toronto
Jury Konga	J. D. Barnes Limited, Willowdale
David Lambden	University of Toronto, Toronto
D. M. Lever	J. D. Barnes Limited, Willowdale
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5.1 CURRENT PROPERTY MAPPING STATUS

Ron Logan
 Director
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This segment of your program is billed as an update on the property mapping activity in Ontario. For the most part, I will concentrate my comments on the property mapping aspects of the efforts to modernize land registration systems in Ontario, and by identifying a number of key players included in our span of activity, attempt to give you a broader perspective of the Ontario property mapping scene. To set the stage, I will briefly refresh your memories in regards to the overall improvements proposed for the Land Registration System.

The idea of major change received its first serious consideration in the 1960's. By that time, it was obvious that the post war real estate boom and population increase would result in a much higher permanent level of activity in Land Registry Offices, eventually straining government resources and resulting in a gradual deterioration of the ability to meet user expectations for services. Major changes were needed. It is no secret that these predictions were accurate and have been accentuated by the financial constraints on government budgets necessary in today's economy.

The Law Reform Commission study and report on desirable change to the Land Registration System appeared in March, 1971, and made far-reaching recommendations, which, if adopted, would amount to a new land registration system for the province. The most significant changes recommended were

- total conversion to a new Land Titles System;
- use of a province wide, coordinate based series of property maps;
- automation of title records to allow searching and registration via computers; and
- microfilm storage and retrieval for information instead of paper documents and plans.

Internal studies stemming from these recommendations resulted in detailed proposals for change and an implementation plan. Published in a Concepts Report (in two volumes) in 1978, the detailed development and implementation proposals echoed the Law Reform Commission recommendations with the exception of a conversion of all registered title to the Land Titles System. The high cost of such a conversion and the higher cost of ongoing operation, delayed any decision to convert until much experience could be gained by modifying operations and introducing automation into both current manual systems. More on Land Titles conversion later in this paper.

The Concepts Report achieved policy approval to proceed from the Provincial Cabinet in 1979. In 1980, the Land Registration Improvement Project was created and work commenced to build and implement the Province of Ontario Land Registration Information System (POLARIS). (It is interesting to note that throughout the activities spanning 1973 to 1980, at least two surveyors played key roles in the research, design and management aspects of this major land information system.) Where are we today? By the end of 1985:

- The major legal changes have been completed and implemented. The Registry and Land Titles System are operating much more closely together, both in a legal sense and in terms of actual operation. Historical searching that takes place in the registry system has been reduced. The Registry Amendment Act, 1981, clarified the 40 year search rules and allowed us to delete all

discharged mortgages immediately upon registration of the discharge documents. Most of the "ruling off" of old mortgage entries has already been done and we will complete the work next year. The Certification of Titles Amendment Act, 1982 provides for system initiated title certification at the time of the registration of a subdivision plan, thereby eliminating the searching behind previously registered subdivision plans. Approximately 25% of the plans registered since 1955 are now certified. The Land Registration Reform Act, 1984, provided the major change with the introduction of common standard forms of documentation for both systems of registration and the provision for automated indexes, property maps, unique identifiers and parcelized records in the Registry System.

- Customer self serve document microfilm systems have been developed, tested and implemented in seven Land Titles Offices for storage and retrieval of documents.
- The automated title record system has been developed, tested, and implemented as a prototype in one office and is undergoing evaluation and revision.
- The property mapping system has been developed, tested, and implemented as a prototype in one office and is undergoing evaluation and revision.

Property Mapping. I will centre most of my remarks on the property mapping program which forms one component of the previously mentioned improvements. I will also briefly discuss the relationships which MCCR expects to develop with other agencies to facilitate its mapping program.

The decision to reduce historical searching and to automate the title files in the land registration system in the Province made it essential to also prepare property maps.

Only by using maps can you:

- determine how many properties exist in a given area. (Documents and plans are currently entered chronologically in abstract books.)
- create unique identifiers for each property. (There is currently no single system of unique identifiers in use for indexing land registration records.)

The use of computers to store and retrieve automated files of title information requires that information be stored under unique labels. However, there is a larger aspect to MCCR's Property Mapping Program. The Polaris Concepts Report (pages 161, 162) states the following:

"Property maps illustrate the location, extent and relationship of land parcels. They are essential for assignment of unique land parcel identifiers. They form the foundation of a modern land data base.

The style and format for property maps must satisfy user needs. They must also be provided at reasonable cost.

The property maps should be capable of showing more than just the location and extent of a property. The format used should provide the capability of showing other information. This would include:

- *basic topographical or planimetric information;*
- *physical features;*
- *property identifiers;*
- *zoning and other land use restrictions;*

- *political boundaries;*
- *statistical information; and*
- *ownership information.*

This information could be shown on map overlays rather than on the property map itself. Map overlays could also be used to allow system users to choose the combination of information to be presented on a map specifically for their purposes. A municipality, for example, could then use the land registration system property maps as a basis for preparing a zoning plan."

In other words, the data base created should serve the needs of all, or at least most of the users in the Province. The property mapping data base represents in fact, one very necessary component of a Provincial land data base.

The acceptance of the Polaris Concepts Report by Cabinet provided MCCR with the mandate to create a digital property mapping data base which fulfilled the needs of a modernized land registration system and took into consideration the needs of other users of land related information in the Province. The major key to achieving this is the inclusion in our data base of links to the Ontario Basic Mapping co-ordinate grid.

In 1981, a prototype area was selected to test all five improvement packages. We leased a mapping station in 1982 to begin the development of the property mapping system. The area chosen for the prototype was Oxford County, and in November 1984, Polaris was brought on-stream for the Township of Dereham and the Town of Tillsonburg. This included property maps and title data for the 6000 properties in these two municipalities.

The public search title for properties in these two municipalities using computer terminals in the land registration office in Woodstock. Hard copy property maps are available at the counter to provide a graphic index of the properties being searched and the unique property identifier for each property in the prototype area.

Property maps were prepared and the automated system was extended to include the 4000 properties in the Township of North and South Norwich in February of 1985 and the 938 properties in the Township of East Oxford on November 4, 1985. In addition, all of the 9,270 properties in the City of Woodstock have been searched and entered into the automated title file and the property mapping for the south half of the City of Woodstock is well under way. It is expected that the automated system will be extended to at least part of the south half of the City by late this Spring.

Through the government tendering process, Intergraph Systems Ltd. was chosen to supply mapping equipment consisting of a VAX11/730 CPU, a 300 megabyte disk, 2 workstations and 5 alpha/numeric terminals. These were delivered and installed for the Ministry at 10 Wellesley St. East in March 1985. The mapping staff set up their own systems environment, have established a training program and continue to develop and document the mapping system. In the near future we will move forward to establish a more traditional environment that consists of a property map production shop and an independent development/documentation staff.

In order to achieve this goal, training has begun for the two existing members of the production mapping unit and it is expected that two additional people will be hired from the surveying field to round out the mapping production staff for this year. Long range plans envision production requirements for up to five such mapping teams or equivalent service from the private market place.

In addition to activities directed towards complete automation there are other special projects being undertaken which have a mapping aspect and which you may find interesting. In Kent County, contract staff was hired to "parcelize" the registry records and create a paper index of individual ownership parcels. This was done on the basis of a 40 year title search on properties and utilizing a "sketch map" of property to indicate contiguous ownerships. Once the search is complete, the data gathered for each property is entered on floppy disks using P.C.'s. Computer produced, separate abstract pages for each property are then available in place of the current geographically indexed records. The title data, stored on the floppy disks can be transmitted directly to the main frame data base when the Kent Office is switched to full automation. Property sketches are prepared manually in order to make this parcelization process possible and unique property identifiers are assigned to each ownership using these "sketch maps".

The public are asked to use the new parcelized records and the property sketches for the portions of the Kent Office which are complete in order to evaluate the merits of this interim approach to improved records while proceeding to full automation. All plans of survey are collected as the parcelization process continues in preparation for the future conversion to automated property maps for this area.

Other variations of "parcelization" of land registration records have commenced on a small scale in Sudbury, Perth and Ottawa. These projects are geared to evaluating specific aspects of converting local records and are staffed on a part-time basis by land registry office staff. Direction and technical guidance is provided by Toronto based surveyors and lawyers.

Pilot Projects for Municipal Information Systems. MCCR is also involved with pilot projects being undertaken by several government ministries, Bell Canada and other private sector participants, to develop municipal information systems in the City of Woodstock and the City of Cambridge. These pilot projects are funded by the agencies involved and by the former Board of Industrial Leadership and Development (BILD). A standardized approach to municipal land information management and data transfer is a key goal of these joint projects.

The Ministry's involvement is as follows:

- in the City of Cambridge POLARIS staff have divided the 25,000 properties into map blocks and assigned them 5 digit block numbers. A digital property data base will be created using the hard copy maps previously prepared by the City. The maps will be edited by the City of Cambridge staff to ensure a fit with the 1:2000 topographic maps prepared by the Ministry of Natural Resources. The edited property maps will then be digitized by the private sector to create the digital map base files. MCCR will evaluate the resulting property mapping data base. The City of Cambridge is moving ahead with the purchase of a mapping system by Wang, expected to be delivered prior to April 1, 1986.
- in the City of Woodstock, MCCR will map 9,270 properties and will provide the City with digital files on tape containing the survey fabric and property boundary information. The City of Woodstock has taken delivery of Arc-Info Software and a Prime computer. It has already been demonstrated that MCCR's map files can be transferred (using a standard interchange format) to the format required for Woodstock's hardware and software. Plans also include the provision of access to automated title records currently being loaded into POLARIS for Oxford County.

MCCR's property mapping data will form the base for the municipal land information system which will be developed for the City of Woodstock. MCCR and MNR

are jointly providing a consultant to assist both Cambridge and the City of Woodstock with systems development during these early stages.

Integration with Other Mapping Programs. As mentioned earlier, a primary requirement of our property mapping data base was to provide a common base for multiple provincial land data systems. Almost all municipalities, many government ministries, agencies such as Ontario Hydro and Bell Canada and other organizations in the private sector are continuously drawing property maps and maps that show survey fabric for their own purposes. They are frequently unaware of similar mapping prepared by other organizations. A considerable amount of resources devoted to this activity province-wide is likely wasted by duplication in mapping. There is no centrally administered standard for mapping, and coordination of mapping programs in order to avoid duplication is not yet in place

Mapping activity will continue to expand with individual needs and new mapping programs will be developed by municipalities and government ministries as digital information systems are created. These various mapping programs will still suffer from a lack of common direction and standards will likely only fulfill very specific needs.

The real property mapping data base will provide a standard data base that all can access. The benefits to be obtained by the Ministry and the Province generally if this is done can include:

- a reduction in money wasted by duplicate mapping programs, particularly in the government environment;
- the cost and workload of preparing a digital property mapping data base for the Province can be shared amongst ministries, municipalities and other agencies. (It makes no sense for the land registration system to undertake to map the Province for only its own purpose. If we have to "go it alone", it will take a long time and require that a large organization be put in place. Mapping programs of other ministries, agencies, municipalities, etc. may not be able to wait for our property mapping);
- the Province can provide standards which will assure that the property data base "fits in" with other components of a Provincial land-related information system provided by other government ministries such as MNR's base maps.

It is not the intention of the Ministry to establish a production shop large enough to map all 3 million properties in the Province of Ontario within twelve to fifteen years. MCCR will attempt to establish joint mapping programs with municipalities and other Ministries and will provide the resources necessary to map rural lands and small municipalities and to maintain the data base over time.

As I stated previously, many municipal mapping programs already exist since property mapping is a fundamental component of all municipal information systems. These mapping systems range from the preparation of small project oriented manually prepared maps to manually prepared property and subdivision maps covering an entire city. Mapping programs using computers are also underway in some municipalities such as Metropolitan Toronto and the City of North York.

City of Toronto. In June of this year MCCR staff worked with staff from the Public Works Department of the City of Toronto. A pilot project assessed the quality of the data obtained when Public Works digitized existing maps using a digitizing table, tektronix

screens and software written by Management Services in the City of Toronto. Alternative methods of data collection were explored.

The Public Works Department took delivery of an Intergraph workstation in December of 1985 and have started collecting the data on the survey fabric in the City. The Department of Public Works will be sharing software developed by MCCR which facilitates data entry at the Intergraph workstation or at an alpha/numeric terminal using coordinate geometry.

Metropolitan Toronto. Metropolitan Toronto has purchased a mapping system from Intergraph Systems Ltd. and the Arc-Info Software from Esri Canada Ltd. This equipment has been installed and tested.

The City of Etobicoke has purchased an Intergraph workstation and both Etobicoke and the City of Toronto are hooked into the Metro Computer via communication lines. It is the intention of Metro to provide computer resources and to act as a "library" for the land information system data collected by the municipalities which make up Metropolitan Toronto.

Some time ago, Metropolitan Toronto obtained funding which allowed them to hire several people to begin the task of gathering survey information from recorded plans. This information will be adjusted and then related to the control network. It is also interesting to note that for 80% of the City of North York, the survey fabric has been entered into computer files, adjusted and related to the control network.

MCCR and Metro are in the process of forming a committee which will be made up of representatives from all of the municipalities within Metro. It is intended that this committee will provide the guidance and expertise required to insure that a common approach will be taken to property mapping in Metropolitan Toronto in order to share costs and make certain that the resulting product will fill the needs of all.

Others. We have also conducted some initial explorations with the City of Mississauga, the City of Burlington, the Regional Municipality of Ottawa- Carleton and the Regional Municipality of Sudbury.

Relationships With Other Ministries and Outside Agencies. Other government ministries and agencies such as Bell Canada and Ontario Hydro collect information about land which is particular to their needs. This information exists within the framework provided by the topographical and ownership data, (i.e. information about a dwelling applies to a particular dwelling which sits on a particular parcel of land which has certain topographical features such as a stream, trees, etc.). There are many examples of this type, including but not limited to:

- The Ministry of Revenue collects information about zoning, land use, land value, buildings, etc. in order to levy taxes. This information has to be attached to a particular ownership. Topographical features are also important since they may influence value, land use, etc.
- The Ministry of Agriculture collects information about crops, soil types, farm grants, etc. This information must be attached to particular ownerships.

These are but two of many examples.

The Ministries and agencies who collect information about land and relate it to ownership are collecting property data from the land registry offices and other sources to establish the ownership parcels. This is an expensive repetitive task which would not be necessary once our map and title index data bases are in place.

The Ministry of Revenue is a particular case since they are involved in a manual provincial property mapping program to provide the base they require for other information about land.

MCCR has started to develop working relationships with other ministries and agencies although progress to date has been hampered by limited resources to devote to joint activities.

Demonstrations of our mapping system and data base were provided to potential users of the data to make them aware of our program, to get their input and to set the stage for future relationships. Approximately 100 demonstrations have been provided to date.

Some specific, small scale projects have been carried out with others to clearly demonstrate the usefulness of the automated data base.

Ministry of Agriculture and Food. Property maps for the rural areas of the Townships of Dereham and Norwich in the County of Oxford were provided to the Capital Improvements Branch of the Ministry of Agriculture and Food. Systems staff completed the programming necessary to extract specific elements from the title data files and a sample print-out was provided. Digital files of property mapping data were provided and converted to the Arc-Info System used by Agriculture and Food.

The Capital Improvements Branch are assembling data from various sources in order to demonstrate the merging of this data into one data base and the ability to provide the products which are most useful to them without having to regenerate all the basic data sets required.

Ministry of the Environment. Staff from the Ministry of Environment who are involved in their subdivision approval program spent time with our mapping staff to become familiar with the real property data bases and to discuss ways in which this information could be used by them. It was obvious that our data files could be expanded with information about waste disposal sites, water supplies, pollution (both in the horizontal and vertical plane) etc. to create a data base of particular use in deciding whether a particular subdivision should be given environmental clearance. They currently have to painstakingly gather and assemble this information manually from many sources. They estimated that once the data base was built, they could cut the time for their approval process to approximately one-fifth of the current time.

Ontario Hydro. Ontario Hydro has a very large number of survey plans on file. Many of these plans, which are one of a kind items, are disintegrating because of their age. Hydro officials are anxious to get these plans into digital format and indexed in a manner that allows easy access.

Our staff completed a small project with Ontario Hydro to show that using our mapping data as a base and by adding Ontario Hydro's plan information, they can create the desired product and save the money necessary to develop their own reference framework.

The ministries and agencies just mentioned are only a few of the organizations that are potential users of our data base. There is also the private sector to consider as potential partners in this mapping data base endeavour.

Recently MCCR has been contacted by an Ontario Land Surveyor who is faced with the task of creating digital files for the survey and ownership fabric for part of a northern Ontario town. We are investigating the possibility of participating in this work to test the feasibility of:

- sharing resources;
- creating a data base which will serve the needs of the Town and the Province; and
- collecting property mapping data using low cost hardware and software.

It is interesting to note that the hardware and software which will be used is not an interactive graphics system such as Intergraph or Arc-Info. If this venture is successful, it will hopefully pave the way for sharing the task of data collection with municipalities and the private sector using hardware and software which is very affordable.

Mapping and control. In sharing with you the goals of the Ministry's mapping program and the work that has been undertaken to date, I have attempted to show that resulting products will not just be used in the land registration system but will serve as an integral part of any Provincial land information system.

In order for the various users to be able to use the information in the Real Property Registration digital files, it is essential that a common frame of reference be used. The one thing that is common to information about land is its position on the earth's surface. The common frame of reference is provided by storing property corners and other surveyed points in the computer files in terms of their 6 degree UTM coordinates and illustrating the 6 degree UTM reference grid on the hard copy maps.

A weakness of our property mapping program is the lack of ground control (i.e. points on the earth's surface for which 6 degree UTM co-ordinates have been obtained) and mathematical ties between the co-ordinated control stations or networks and surveyed property or township lot corners.

Currently, we generate this common frame of reference by using points with coordinate values from the Ministry of Natural Resources (these are few in number but are very accurate), connecting the coordinated points using survey information from corridor survey plans (such as MTC highway plans or survey plans of County roads) and digitizing township lot corners using MNR's topographic base maps. This process is cumbersome and expensive and results in a reference grid of limited precision relative to the ground. The coordinate values obtained from digitizing are only accurate to somewhere within a circle which has a radius of ± 15 feet. If we were able to obtain more accurate 6 degree UTM co-ordinate values for property and lot corners by some other means, three things could happen:

- The cost of developing the common frame of reference would be reduced.
- The cost of adding the remaining survey fabric and the property boundary information would be reduced.

This saving results from the fact that you have a more accurate mathematical definition of the piece of the earth's surface that you are mapping. Fitting properties and plans into the township or city block structure is simplified. The mathematical definition obtained from the co-ordinates provides a more accurate standard against which to

measure validity of property descriptions and plans of survey which are filed in the land registry offices. The cost of maintaining the data base would be reduced.

- Once the property mapping data base is built, it must be maintained every time new properties are created by recorded documents and new survey fabric is created by plans of survey. The data base is a mathematical model of the property boundaries and survey fabric which exist on the ground. Obtaining more accurate coordinate values result in a more accurate model. The more accurate the model is, the easier and, therefore, less expensive it is to maintain.

MCCR has initiated a pilot project to determine the best procedures for, and the cost of, obtaining additional coordinate values in rural areas. In the pilot project, 21 existing monumented cadastral survey points will be tied to the control network. The work will be considerably less rigorous than that normally required for the proper integration of new points into a control network. The 21 pre-selected points will be coordinated by conventional fourth order traverse and/or angle and distance from available second and third order control.

In order to test the possible accuracies and weigh that result against cost, at least two stations will be tied to second order control using second order methods as well as fourth order.

If this approach to obtaining a better ground relationship for property mapping proves feasible, additional work will be undertaken in 1986 to determine coordinate values on the vertices of blocks which are bounded by surveyed roads.

Field work for these tests will be conducted by a private firm under contract to the Ministry. Work will be done later this year in Southern Ontario as part of a larger on-going mapping project.

Conversion to Land Titles. Earlier in this paper, I mentioned that conversion to land titles was being considered. The original "Concepts Report" envisioned a separate record being created for each registry office property in the Province on the basis of a last registered owner search only. The legal profession expressed its concern with a new automated registration system which did not contain title data for at least the required 40 year search period. The alternatives of searching further back in time and loading more data than necessary for a last registered owner file are currently being considered. Conversion of the entire Province to a land titles system is one of these alternatives being considered since conversion might well be accomplished at a lesser cost than automating and maintaining 40 years accumulation of existing registry system records.

If the decision is made to convert the entire Province to a land titles system, there are a number of related items to be resolved such as:

- the level or extent of guarantee of title and boundaries which would be provided by the government in a total title system;
- the question of whether possessory rights should or should not be allowed under a land titles system;
- how the land titles system would handle boundary problems at the time of conversion.

The manner in which these questions are resolved could impact on surveyors when surveys are performed for lands which are under the land titles system.

5.2

TORONTO DISCUSSION

D. Lambden: Quite some years ago, Ted Blachut wrote about integration. This now comes down to us with this concept of a land information system and the whole package is well thought out. It is not really an issue of land titles and registry alone. It is really a result of the information revolution and the desire that we provide live information. For example, along the coast of England, the hydrographer (the Royal Navy) has to be advised of every single change that occurs along the coast. The safety of shipping is in his hands to a very large degree and if somebody sticks up a light pole which might be mistaken for a flashing white beacon at some point, the hydrographer has got to get this on his charts. I think that sort of thinking is what is hitting us here today.

A. Hamilton: I see the need to switch our thinking from "project" to "program". We need to go from doing jobs to the concept of a "conveyor belt" that is to keeping the system up-to-date all the time. This calls for a basic change in the way we think.

R. Logan: In my own area, we are moving from static, project-oriented plans and maps to an information system that is in fact alive and dynamic. It will reflect the changing nature of what is actually happening in terms of land ownership and land division almost immediately as it happens. While we have come a long way insofar as the development of one major information system is concerned, we have hardly scratched the surface as far as the professional land surveyor as a land information manager is concerned.

R. Smith: Generally speaking, the private surveyor has been strictly project-oriented. He is hired to do a particular project and, at the end of that, he files it away in his filing cabinet and sends a note or plan to the client. It is a private deal between the two of them and that is the end of it. In the Swiss environment, Mr. Kauter has a similar role and yet, because he has jurisdiction over small community or small area, he really knows everything that is going on. In fact, he is the eyes and ears of the government in his community.

Look back at what the Ontario government did years ago; they really said exactly the same thing to the private surveyor. They said, "You shall be the Survey Registry. You shall keep all the survey notes and records in your office." At the time they did that, we didn't have one hundred and some odd companies in competition with each other in metropolitan Toronto. We had perhaps one surveyor in a community and very seldom did another surveyor come in. He, in fact, was the local survey registry. That function worked well until there became too many of us; nobody agreed to divide the territory and say, "This is the area in which you are to keep the notes and records," which seems to be what happened in Switzerland. Rather, we went into a distinctly North American spirit of competition.

A number of years ago, smaller towns like Richmond Hill and Aurora would designate a private engineering company to be the "municipal engineer". That didn't mean that no other engineer could be hired to do a project in town, but a single consultant managed the records. He made sure that, for example, if somebody proposed putting in a new development, the sewerage treatment plant could handle that service. If we were moving towards a similar concept now for the municipal surveyor, one survey firm could have the responsibility to maintain a lot of the records for that community - the control surveys, the land boundaries, the building locations, perhaps the underground utilities and so on. You gradually move towards a situation where the surveyor really does have the responsibility to keep those records current and up-to-date. Now he really has another advantage -- this arrangement ensures that nobody else comes in which keeps it economical and makes it work.

I have heard statistics claiming that, in North America, there is going to be more money spent on data conversion of graphics data than was ever spent in converting all the alphanumeric records in all the government offices. It is a huge industry. We find it very difficult to manage the large data base without dividing the responsibilities down to the local level. Ron Logan is dividing it down into 65 local registry offices and he would probably like to divide that down even further. The concept is not just project-oriented -- we have to determine if there is a continuing role for the private surveyor in long-term records management that he can clearly identify as his business. This model that we are being shown from Switzerland is useful in that it triggers us into thinking how we could do something similar within our environment.

We can centralize engineering, town planning, assessment, and even farming, but it is very difficult to centralize surveying. You are still going to need surveyors out in the local communities to do the work because it is necessary sometimes to go on the land and it is not economical to send survey crews from downtown Toronto all over the province to do staking. This gives the surveyor great potential as a professional in the local community. It provides the opportunity to move into that whole management field where you are maintaining as well as collecting and organizing records as an information system. You eventually become a user of the system because you are the professional available to the community. You understand the records and, when necessary, hire expertise to supplement your own knowledge. In this manner, you start to provide land management capabilities not as a mandated responsibility of yours but simply as a professional service to the community.

G. Zubek: Small communities and small firms can't afford the research and the expensive computers that Ralph and Ron have. Further, we also don't have the knowledge in programming required to set up a small system on our own. Until somebody comes up with a system that we can use to provide this information to our local communities, we are just unable to take advantage of this type of product. You can't afford to go into that scale of operation for a community of 10,000 people.

A. Hamilton: The computer is a red herring. The significant point is that the Swiss District Surveyors have been providing continuous information. That is all that we are going to be doing with the computers -- the fact that you get it over the telephone in seconds versus hours is incidental. Continuous Information is a concept that they have had in place for a long time, and they will introduce the computer when they need to. The Swiss Surveyors got their basic mandate without the computer -- we can't even seem to get it with the computer. What is the problem? What should we do?

D. Baird: How do you think senior public servants or the elected public officials would view contracting out something like this in Ontario?

R. Logan: I don't think the concept of contracting out the maintenance of the cadastral data is too foreign to the government of Ontario. With the development of a property mapping data base on which the land registration records will rest, its ongoing maintenance could be contracted to private firms or communities at some point in the future. The auditing or the overseeing of it from a consumer protection level would remain the responsibility of the Government. Provincial efforts with the Association of Ontario Land Surveyors to deregulate the standards for plans and surveys suggests that the thinking in governments at both levels want to put the responsibility for the actual work back in the hands of the practicing professionals. I think the biggest question is how long is it going to take us to convert and build that data base to cover significant areas of the province. That is the major problem now before those kinds of concepts are addressed.

R. Smith: The OLS Association has just taken over the inspection of all survey plans here in Ontario. I assume that means subdivision plans and reference plans. Reference plans are the way in our province that you add new boundaries. Most surveyors have PC's, so there is no reason they cannot send digital files to the OLS Association right now. In many ways, the OLS Association is already running the survey boundary register in their own office, because the boundary registry really only has to do with the control surveys, new subdivision plans, and new boundaries. What is missing is for the government to complete the initial data conversion of the old records while the Association controls all new units coming in. It is just getting back to a matter of deciding how you want to handle that responsibility

T. Cahill: Aren't we talking about economics here? We have 11 area municipalities within the Niagara Region; five of them are presently in the process of obtaining OBM base mapping. Only one requires that a survey for that particular municipality be tied to control and even the Regional government doesn't require control network ties. It is simply a question of economics - the municipalities haven't been convinced yet that the money would be well spent. The biggest problem that I can see in this whole exercise is demonstrating the value and economics of integrated surveys for the Municipalities.

G. Zubek: Expensive control surveys are required for the Ontario Base Mapping projects. Perhaps the provincial funding for these individual projects should be conditional on the municipality passing by-laws requiring integrated surveys.

R. Smith: There has been some action with the OLS Association and with OMNR on this subject. It is dormant at the moment but there is a committee drafting legislation for integrated surveys. The problem is that there really hasn't been a strong indication from the private surveyors that they really want integrated surveys. Unless the land surveyor thinks that there is some advantage to him, he is going to be very reluctant to convince his clients to integrate their surveys. Further, it takes a long time to put a control survey network into place. It is going to take a fair bit of rethinking and lobbying by the OLS Association to say this is really the direction we want to go.

If there are going to be leaders, sometimes the only way to be one is to fall behind, determine the direction things are going, and then get in front again. Just about now it is time to get up in front of the crowd -- it is pretty obvious that things are going towards land information systems. Surveyors have now got to appear as if they are the leaders. They have got to be out talking to the community, to the planners, and to the engineers about the advantages of integrated work so that some day they will be hired to put the control survey in. Gradually, they will also build in the land boundary system.

It certainly seems from what has been said that we have an opportunity here. What Bernard Kauter calls a "renewal" in our case happens to be a data conversion. Listen carefully to what he is calling "maintenance" -- there appears to be very little government money involved. Most of the money was coming from the private sector. Somebody wanted a new boundary and was paying him to do the survey. Almost everything really is coming out of the private sector; there is no large government contract other than the guarantee of the way that it was set up in order to get paid. He really had to divide that bill up as he showed us and charge so much to clients and so much to government.

The big problem with applying this arrangement here is that you are going to be impinging on yourself as well as your competitor. You don't want to say, "Well, there are six of us in business in this small town that can really only support three. Which ones of us stay in business?" That is what it comes down to. You do have control over all changes

already -- the land registry office just gave it back to you. Right at the moment you just call it control, but in fact you are getting all the data sent to the OLS Association office and keeping it in a library system called pieces of paper. It could just as easily be on microcomputer system or a shared major computer system.

In Switzerland, they have worked out a method where everyone gets a reasonable return with some kind of maintenance contract and sharing of responsibility. In order to do the same, we have to be prepared to share territory, share resources and share the funding. We also have to be prepared to do political lobbying with the various levels of government. Our Association is a licencing body trying to do some promotional private practice development on the side, i.e., it is really trying to do two types of things with one type of association.

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The Calgary Branch Seminar

The Calgary seminar, held at the Calgary Winter Club on Feb 17, was organized by Stephen Nichol, Chairman of the Calgary Branch.

After lunch a presentation by Kent Meisner was followed by general discussion. Kent Meisner is currently with Monenco Ltd.

Participants

R. A. Bassil	Alberta Bureau of Surveying & Mapping, Edmonton
Aziz Dharamshi	Clark Swanby & Company (1979) Ltd., Calgary
Barry Fleece	Cadastre Surveys Ltd., Calgary
Bob Fulton	Walker Newby & Associates Ltd., Calgary
Rahim Lakhoo	CEP Consultants (1985) Ltd., Calgary
Bernie Lamarche	Alberta Transportation, Property Services, Calgary
Jim Maidment	Bow Valley Consulting Group, Calgary
John McMurchy	The Orthoshop, Calgary
Dave McWilliam	McWilliam Surveys Ltd., Calgary
Don Molesky	D. Molesky Surveys Ltd., Calgary
Stephen Nichol	Matai Surveys Ltd., Calgary
Ken Pawson	City of Calgary
Jerry Rasmuson	JTR Survey Services Ltd., Calgary
E. J. Tessari	Alberta Bureau of Surveying & Mapping, Edmonton
Ross Woolgar	N.R. Woolgar & Associates Ltd., Calgary

6.1 THE CENTRAL INFORMATION EXCHANGE CONCEPT

Kent Meisner
Monenco Ltd , Edmonton

What I want to do today is to present the central information exchange concept. In June of 1984 I left government to work for four companies that had formed a subsidiary called Central Information Exchange Limited. Those four companies were Stewart Weir, Northwest Surveys, TransAlta Resources, and Monenco (Montreal Engineering) better known to many people as Montreal Engineering. The Central Information Exchange (C.I.E.) represents a private sector proposal for the development of an agency that will distribute digital land related information.

I am here as a representative of those four companies and I wish to give you some perspective on what is happening in Alberta, what we are trying to do, and what, I believe, we will be successful in doing. Whether it will be the four companies I represent now that form a central information exchange or whether it will be another information based industry, remains to be seen. The C.I.E. would be dealing with resource, environmental, socio-economic and infrastructure land-related information. This means going well beyond cadastral (base) information and attempting the integration of all forms of land related information. Alberta's history is very recent when compared to Switzerland where you go back to 1912 to the passage of legislation and implementation of uniform practices in support of cadastral maintenance. Alberta did not become a member of the Canadian Confederacy until 1905 and is a resourced based economy. But Alberta has been fortunate because, as Angus pointed out this morning, we had a survey before we had settlement. Today, when we look across the country and compare ourselves with others, particularly with Eastern Canada, we feel that we are ahead of them primarily because of our basic survey system.

I want to present to you some of the milestones in the last decade which led to significant progress towards a state of integration in our land information systems in Alberta. In 1974, the Task Force Report on Urbanization and the Future proposed the concept of Land-Related Information Systems in Alberta. Basic principles were put in print and we have tried to implement or follow them over the past 12 years. This report gave us a sense of direction. In 1975 we had the first User's Conference on Provincial Coordinates. This conference provided support for the provincial survey control program which was approved in 1977. Furthermore, the LRIS Co-ordination Project was constituted in 1978, with establishment of a 2-year project (1979-1981) for which, I was responsible. This project led to the formation of the Land Related Information Services group. It is a permanent body within the Alberta Bureau of Surveying and Mapping (ABSM). Along the way we saw a rationalization of surveying and mapping activities within the province. That led to the old Surveys and Mapping Branch of the Dept. of Transportation being realigned under the Dept. of Energy and Natural Resources. By this step one department in government became responsible ultimately for coordination of survey control and mapping.

Out of the original LRIS work in 1979-81 came a network concept for the Province of Alberta. It has to be appreciated that this essentially addressed the systems within the government environment. It didn't preclude private sector involvement, but it didn't seek it in anything but a consultancy fashion. Obviously the Government was addressing its own needs first and I think quite rightly. As long as government continues to try to

communicate outwardly, industry is in a position to relate to these changes and adopt them as it sees fit.

In the provincial network concept, there are two major categories of information systems: the primary systems and the secondary systems. Three primary systems form the core of the network and these are: the Alberta Geographical Positioning System, the Alberta Mapping System, and the Alberta Land Registry. The secondary systems encompass resource/environmental, socio-economic, and infrastructure data. The primary systems, of necessity, must be highly structured and they should be backed by legislation. There is also a linkage between these three systems.

The secondary systems are less structured. They are less formal in the sense that they are maintained by a host of agencies within government who are responsible for developing this information for purposes of managing some element of the resource base. It could be a human element, it could be the physical element. But fundamentally all secondary systems relate back to the primary systems.

The Primary Systems

Alberta Geographic Positioning System. Most of you are acquainted with the primary systems, particularly with the Alberta Geographic Positioning System which has three major elements, the Survey Control Data Base, the Land Survey Data Base, and the Photogrammetric Control Data Base.

Alberta Mapping System. The mapping system, in this province has four major digital mapping scales - 1:1,000, 1:20,000, 1:250,000, and 1:1,000,000. The 1:1,000,000 and 1:250,000 are available today. The 1:20,000 program is funded and being carried out by a division of Energy and Natural Resources. The 1,000 digital mapping for all urban municipalities over 3,000 population and is scheduled for completion in 1989. There remains a considerable number of smaller villages in the province that will not be involved in a timely fashion but it is a program that is proceeding on the basis of existing funding.

Alberta Land Registry System. The third primary system is the Alberta Land Registry System. It is made up of two major information systems and about five other smaller systems; the two major systems are the Crown Land Registry and Land Titles (the registry of privately owned lands).

The Crown Land Registry is now supported by the Land Status Automated System (LSAS). It is the single largest land information system in the Province of Alberta presently in operation. It stores information relative to the two-thirds of the land base that is known as public land, and it is administered by Alberta Energy and Natural Resources. It includes both surface and subsurface activities. It is a non-graphic parcel-based information system of crown owned lands and resources serving all the province.

The Alberta Land Titles Automation (ALTA) project development has not progressed without its problems. The current land titles system operates as a very efficient manual system, which didn't generate the same support and the same need to automate. As a result of private sector pressure, land titles began the development process in 1981-82, but the final crunch came in Alberta and funds were pulled out and everything stopped.

After renewed pressure a year and a half later, approval to complete the automation process was received.

We are now into the first year of the second phase of automation of land titles and I fully expect that the title record component of the system will be operating by 1989. There is a graphic component that must deal with approximately 150,000 registered plans held by the land titles office. It remains to be seen how they are going to administer that in the sense that ABSM also has a similar responsibility.

What is even more promising is that the two systems, (LSAS and ALTA) are to be built in a way that will allow common access. In Alberta, you should be able to go into a land titles office and submit a request by legal parcel without any knowledge of whether it is crown or patented land and get a search. In other words, the system will direct you to wherever that record exists. It was too much to ask the government to have one system carrying it all; I believe this is the next best solution.

Secondary Systems

Under secondary systems we are basically talking about the host of manual and automated information systems that exist within government today. Characterized by decentralized control, they contain thematic land-related information.

In Alberta, the thematic systems are identified in the graphic and nongraphic sense recognizing that we have been building automated information systems of a thematic form for 5 to 10 years. The non-graphic systems are trying now to change to a graphic format and that will occur over time. Energy and Natural Resources is the third largest department of this government and have spent a lot of money on systems and systemization -- about 14 million dollars a year just on running the systems, quite apart from the development of individual systems. They believe that they have advanced the graphic component sufficiently in a primary sense that they want to start viewing the secondary systems. They have identified a secondary component as the Natural Resources Data Bank. This will entail the digitization of a tremendous amount of hardcopy data

The Central Information Exchange Concept

We, in industry, believe these government initiatives have created a tremendous resource and one which continues to grow. As of today, this "public domain" information is capable of being accessed in a very limited way. We believe that as consumers, we should have better access to that digital data. The group of companies that I have mentioned have petitioned government, asking them to consider their policy relative to providing access. Government has three major data processing centres, one in Calgary and two in Edmonton. They have a large investment in the systems, but there isn't security sufficient to permit public access to these systems. Another problem is dollars and cents. If they are going to give access to any one company, they have to open the doors to everyone. How do they turn it off? We don't believe they can. Therefore, we propose they turn the distribution process over to the private sector.

We started the first of June and prepared a concept. For a central information exchange. We made a formal petition to government on August 22nd in which we requested that they review their policy relative to private access to government information. The request basically asked them to review the possibility of giving us the responsibility for distribution of public domain land data created and maintained by government. That has

now proceeded through the system to a point where a policy recommendation is in the hands of a minister, and will go to Cabinet when the Cabinet meets again. That could be after the next election. We have no reason to believe it will not be approved.

The government is quite supportive of the idea of privatization. We are proposing that this is something the government does not need to move into; that it is an opportunity for the private sector. We aren't saying that we are the only ones that should do it; we are just saying we are interested and capable.

Our strategy was to go to the provincial based resource industries and encourage their involvement with this. We spent three or four months approaching 10 different companies such as Esso and Shell looking for financial support to carry the idea through to the next step. That came to a head in November when we had a final meeting with 10 selected companies. Their response was that they really liked the idea, but didn't think they should be in the business of selling information. Once again, I need to explain. We weren't going to build the exchange for ourselves; we were going to build it for the companies. As an exchange, you can imagine, you go through stages of evolution. The first stage is that you sell information. The next stage is to collect information from shareholders and sell their information. Finally, the exchange develops the capability to create and sell customized information products.

What Would Happen in Alberta Without an Information Exchange?

The world without a centralized information exchange, is in fact the way it is today. There are probably between 70 and 80 automated systems within the government and I don't know how many manual systems. Those requiring information must contact all possible sources.

A number of problems will exist with this approach, such as are the files structured? How is continuity maintained? However these problems exist at present and no one has a mandate to address them?

What is the Information Exchange Concept?

The Information Exchange Concept is based on private sector involvement. It says that an information exchange in this province would have to have direct access to what we have defined as the primary systems -- the geographic positioning, the base mapping, and the land ownership. We will be selling information to the consumers, providing them with on-line access to each system. We are proposing on-line access to land ownership information and some of the geospatial information that is available. It doesn't preclude government providing hard copy access to anybody that wants it. We don't have any problem with that. That is the way business should continue to be done. We believe that people, companies that buy into a central exchange information system in Alberta, will want access to electronic data and that is the way it will evolve in the future.

Today we are not in a position where we can communicate spatial data electronically. There is a role for a central exchange in supporting use of 1:1,000, 1:20,000, and 1:250,000. It will be nothing more than being an agent for ABSM so that when the updates are published or released we would then make sure that everybody who is subscribing to base maps standards would get them automatically through the exchange. As the spatial data becomes more common and more available, the information that is

provided to the consumer would then be the latest update. The exchange function will occur primarily as a result of government and industry involvement.

I have talked a great deal about government and what it has done. The industry involved is essentially the oil and gas industry. Of 600 registered companies in the oil and gas industry, a great many of them have very sophisticated information systems operating today. They have internalized their requirements. They operate their systems to meet their own needs; some of them invest millions of dollars annually. They create a lot of their own data and they don't share anything. We believe that industries could benefit with the sharing of public domain data.

We believe that municipalities in this province are probably one of our biggest markets for distribution, the selling of information. They are, by and large, outside of a few of the bigger cities, relatively unsophisticated users and managers of information. That doesn't mean that they don't want to be more sophisticated; it means that they don't have the money for it. The information exchange would be a vehicle to get information in their hands, and would be more valuable to them. It would be an opportunity to synthesize information in a way that is going to assist them in their planning, and evaluation of infrastructure development and, of course, it goes both ways.

Whenever you provide online access to an elemental form of information, something that people need on a daily basis, the potential for the increase in use of that information is tremendous. Obviously government is not going to be happy with losing traditional revenue. We think there is a considerable potential for revenue generation through on-line access to land titles through the exchange.

To make the exchange work you need the capability to develop software, and resolve all the problems of interfacing systems and marketing information. The latter is still a problem because information isn't seen as a commodity in the truest sense of the word. So, the essential characteristics of an information exchange as we see it, is the ability of the user to access digital information through a common geographic reference base through a single window. Our strategy would see daily updates of those systems because that information is only important to consumers if it is current and then we would support online access to those systems. In fact we are creating a subset of primary systems in government. Those primary systems would be maintained by government. As the exchange evolved, you would have more users participating through the contribution of information systems or files. They would continue to be the people responsible for maintaining it. They are the ones who in fact control what and how it would be distributed.

To develop an Alberta information exchange, we have an initial development involving non-graphic data. This would primarily involve the Land Status Automated System as well as Land Titles when it comes into operation. On-line access would be supported and we would work with the clients as well as perspective clients to develop an appreciation of the spatial and graphical component. The graphics component is elemental to many processes within our government. It is a long way from being a day to day tool in many offices, certainly in the creation of thematic information in digital form. In the second phase (1989-1991), the spatial component and the graphic component would come into the Information Exchange. We have gone essentially from a role of selling information to a role of selling and processing customized spatial information created for subscribers to the Information Exchange. Finally, from 1991 on, there would be continued evolution of service to meet the user's needs.

Conclusion

I would just like to leave you with the thought that it is appropriate that this concept has been developed and promoted by the private sector. We are thinking about a new industry and there are definite reasons why it could happen here in Alberta now.

I would like also to share with you some more of the reasons why I think this is the future direction of public administration and distribution of information. I can't speak about the surveyor's role in all of this, but clearly it is evolving and you know that better than I do.

Time recently spent with the federal government has given me an insight into where the federal government wants to go. They have an institutional barrier restraining the integration of systems and development of integrated solutions to information management problems. They are trying to deal with that, but again, are faced with physical restraint and downsizing. Part of that is an attempt to rationalize their responsibilities relative to major surveys in the country. I believe they will transfer to the provinces a lot more responsibility for information management and the provinces are going to have to go to the private sector to have much of the work done. The major change will probably be in mapping. Thematic files which are now in analogue form, are going to go to digital in the next 5-10 years. Who is going to do what? They don't want to pay each one of us to do the same thing. There has to be a coming together in a way that is going to see certain initiatives taken to resolve certain generic problems and I believe the federal government has a role to play in making all of that happen. Sooner or later it is going to come down to who is going to distribute the information. All of this wonderful stuff that is being created and maintained in the digital environment is going to be distributed and it is a business opportunity. I believe over the period of the next 5-10 years, it will be the government's view that industry should handle it. The four companies that I represent see a role for themselves in this. A few provinces have initiated programs. For instance, Quebec has an \$84 million cadastral reform program, producing base mapping and rebuilding the cadastral files; Ontario will be spending about \$5 million a year redoing the Ontario base maps; Saskatchewan has a \$13 million program just recently approved for base mapping; Alberta has a \$21 million program; and B.C. has a \$24 million program, both dealing with base maps. We really haven't reached beyond that yet. There is a tremendous opportunity beyond those primary systems. All the money that is being invested today to improve infrastructure is just setting the stage for something new and very exciting.

6.2

CALGARY DISCUSSION

J. McMurchy: Kent, I can see it is not a major problem for you to have access to the governmental data bases but how do you get a commitment from the different industries? Do they trust you or do they trust each other with the on-line access? Isn't it going to be very difficult to realize this? Won't the industries' files fill half of your computer capacity?

K. Meisner: Yes, it is going to be difficult. We intend to start with government data bases and demonstrate that the exchange concept is feasible, then draw in other major players from industry to subscribe. We are approaching this with what we know about technology today. Right now it is not possible to communicate spatial data and be cost effective. We can buy on-line access to non-graphic information as I described it. Today we can't operate like a switchboard. Five to ten years from now, we presume that that facility will be available .

There is the same problem with the industry as there is with the government. Once you provide public access to files, you run into the problem of who pays for it? A number of possibilities exist. I described one where we would collect information in a massive storage facility with certain specified on-line and off-line processing capacity. Another could be to support some online access but act as a switching device and charge for access to the information. Somewhere in between that is where I expect we'll end up; where some communities will be prepared to support on-line access. They will probably charge more for their product to offset the cost of maintaining that facility. Somewhere in there I think there is a compromise that could work. Today, practically speaking, we are at the point where we would centralize a lot of the information.

A. Hamilton: When do you expect to be in operation?

K. Meisner: We expect we could be operating within six months and after that it is going to be a matter of cash flow, and how well we demonstrate the quality of the service. We estimate three years before we get to a point where we are managing other people's data.

Anon: The small communities are eligible for a certain amount of government grants and they are not going to jump in the information business until these grant monies are available. You can be as innovative as you want and go to these communities and put this together but they know about the grant money and they have their applications in and if they don't get it that year, they are not going to jump.

Ross: We are dealing with the whole issue of public works and social programs in these communities. We are dealing with information that is related to the daily operation and that is why we need to be a little more innovative. There are other sources of money that you are going to have to look for. It is just not a survey control type program. We have already decided that the survey control was the basis for the program.

Anon: The biggest reason why it doesn't work is because surveyors are poor salesmen. They are too busy getting their hands dirty because if you don't get your hands dirty you are not a surveyor. It is changing slightly. A more innovative market is in the ballgame. We also have another problem within the land surveying community. Because they are a small group, surveyors feel a kind of affinity to the group as a whole. They want to see that everybody stays in the ballgame. As a general rule, I think that there has been good reason over the last four or five years in Alberta that we couldn't support the number of survey firms that we had in 1980 because the economics aren't there. We still have the

same amount or more. I am not saying that the private surveyor makes sure it gets spread around but there are mechanisms that make sure it gets spread around.

K. Meisner: If I could come back to a point you made, John. Can I get a reading from you as to what you would be prepared to accept given you know there is a cost associated with getting into a provincial mapping program and that in this province there are five companies that have opted in and not all five have found it easy to cope with the cost of being in there. Let's just say that one of the reasons is that the level of productivity hasn't met expectations. Some of the companies have dealt with it better than others. To me that says government isn't getting from the program what government should get from the program. If it was properly administered, could it work in the following fashion? Government in fact looks to these five companies and says you have to have a set of tools to do this job for us and you are the only five that have come forward having some of the basic skills, but you don't have all the software, and you don't necessarily have all the hardware, in the right configuration. Now, as you are all going to have to develop what amounts to the same thing, let's just have one company do it and the others share it. Really what we come down to is a question of how well individual companies can administer the process. That's a matter of business, not a matter of how many resources you can lay your hands on, just how well you operate your own business. If you get business as a result of being productive, then the better companies are going to get more business, and make more money.

Anon: It would be something like engaging one company to do all the R & D. It is a question of which company do you select?

Anon: All the companies among themselves agree who is going to do it and how they are going to share it and then share it.

Anon: It would be ideal if you could set up a consortium to do the R & D and then all the companies help out.

A. Hamilton: Ontario have their Trillium with nine companies in it. They have a BILD (Board of Industrial Leadership and Development) program. The Province said, "We have a million dollars here, if you fellows can get together and come up with a viable program we will match you." In spite of their past practice, the industry in Ontario somehow got together. This proved it can happen when the motivation and the will is there.

Anon: John, do you think that would have worked here in Alberta?

J. McMurphy: They tried but it didn't work. They really didn't understand the problem. The industry has recognized for quite a number of years that there are digital maps. They had some proposals, they went out to different firms and along came some changes in technology. Another way to do it was that proposals were accepted based on different technology and here again they didn't know very much about the technology. Neither did anyone else. So what happened from that point is that the new technology became mandatory. It is a different ballgame. You cannot think conventionally. The best advice I ever got was from a conference in Edmonton where Professor Ackermann made a statement that just floored everyone. In essence what I think he was trying to tell us is that we have to think considerably different than we have in the past. That is very true in our operation. Continue to rethink what we are doing.

Anon: It is a learning process, we have to be prepared to pay the price for the benefits down the road; they are there.

Anon: Well, to come back to government, look at Quebec. Quebec and other provinces have learned, and I think industry is learning, that they have to be prepared to identify all the tools they need to do this.

Anon: One of the objectives of this system too is to sell around the world. I get a little uptight sometimes about the amount of money that is spent on our 1:20,000 program. It is a very sophisticated program and a good program but it is going to take a while to get complete coverage.

J. McMurchy: No one and the ABSM as well, knew where they were going and no one knew what to do; even its specifications were revised every day. This is one thing I think the federal government has done wrong as far as the map base goes. They don't know what they are talking about. In effect, they have closed the door to any changes or improvements to methodology. They have a very narrow minded view of what or how it should be done.

Anon: How many land surveyors are there in Switzerland?

B. Kauter: In total 800 to 900; there are about 270 private practitioners and many of these employ some licensed surveyors.

Anon: What percentage would you say is in the government?

B. Kauter: About 40% in federal government and in cantonal government there exists not only a surveyor general's office responsible for the cadastre. There is also, parallel to this, an office for land consolidation where a land surveyor is normally the chief and several land surveyors are working. They don't do surveying; their job is to monitor the work done by the private practitioners on land consolidation in the rural area. There is about the same system of control as in the surveying sector.

B. Fulton: Bernard, did I understand you to say that the cadastre is always up to date? Then you mentioned renewals. Why do you need a renewal if the cadastre is always up to date?

B. Kauter: Renewal has a special meaning. Let me give you an example. In my district, one of the communities was surveyed originally in 1879 with the methods of that period. The angles of the traverse lines were measured with old instruments, I think you call them transits, and the distances were measured by chain. The details, the boundary points, the houses, were measured with simple methods. And then the calculations were done with tables and so on. Traverse lines with an error of one or two meters had to be connected between two trig points. It was accurate enough for that time. These points and this map is still part of the official cadastre for that community.

With modern equipment you can readily imagine the problems I have when working in that community. Eventually, when they were planning a new underground utility, enough problems arose that I was able to persuade them that they should have a complete re-survey. They gave me a contract to re-measure everything: traverses, boundaries, planimetry, and then compute new coordinates and compile a new map. This is what we call a "renewal". It is subsidized by government.

A. Hamilton: One lesson from this is that you can have an information system without precision. It is obviously better to have precision but, it is not essential. If the DLS's had just agreed to designate somebody in each community to put all the changes on the old DLS maps, you would have had a cadastre in Alberta 100 years ago and you could have

gradually upgraded it. Unfortunately, the attitude was that once land had been alienated, it was not necessary to keep the information about it up to date. There are two red herrings in land information discussions -- one is precision and the other is high technology. The key to a land information system is the mechanism for keeping it up to date.

The problem with all of us, and I'm right in there with you, is that we don't understand the system. We know how to do our own thing, but we don't have a clear vision of how our system should be functioning. We can either go to an orderly world or we can go to a chaotic world with things that don't link up and don't give people what they need. We have not learned enough about our business so that we can talk with authority on all these other options. In the last few years, I have been involved in a variety of things from hydrographic charts to underground utilities and the more I see, the more I realize the wisdom in Pogo's observation: "I have seen the enemy and he is us." It isn't the government, it isn't some ogre somewhere else, it is getting a clear understanding of the options and the alternatives. We have taken the attitude that the only option was to go ahead and plow money in. Money is necessary, no question about it, but there are many alternatives and we should be sure we have the best one before we put in a lot of money.

B. Fulton: Bernhard, what was the mentality there to begin with? Were you actively involved in making the community aware of its options? In convincing them to have the renewals?

B. Kauter: How long does it take me to convince the authorities of a community they should have a new survey? It depends on the community. Rural communities are not as interested as those in residential areas. When the clients, the owners of the parcels, are complaining all the time because the costs of the surveying for one parcel are very high, we explain that it is because of the community's old cadastre with traverse points missing, etc. It always costs more to work with the old inconsistent system. I hope to influence them all the time until they become "ripe" and they say okay now, no more work with this old map and this old cadastre, we will renew it. Normally, it takes me about 3, 4, or 5 years to convince authorities of a community to do a new survey. It can also be that a community has heard from another community that they have new maps and they are pleased with them.

B. Fulton: You have answered my question. My observation is that part of your skills is one of communication in dealing with the layman in a technical area and I think that is one thing I see as the problem we have here. We are not skilled at convincing the layman about what is necessary or desirable. You have that skill.

S. Nichol: I would just like to wind it up. Angus, thank you for bringing Bernhard from Switzerland to give us a different view of the cadastre.

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The Edmonton Branch Seminar

The Edmonton seminar, held at the Edmonton Petroleum Club on Feb 19, was organized by Ric Beaumont, Branch Chairman and Ted Smith immediate past Branch Chairman. There was a brief discussion immediately following Part I of the seminar; then following presentations by Bill Mintz, Terry MacNeill, W. A. Wesolowsky, Ted Smith and Laurel McKay, there was a general discussion.

Bill Mintz, A.L.S. works in the Land Survey Branch, Alberta Bureau of Surveying and Mapping (ABSM), Alberta Energy and Natural Resources Department, Edmonton. Terry MacNeill is with the Survey Department, U.M.A. Engineering Ltd., Edmonton. Laurel McKay is C.I.D.S. project manager with Land-Related Information Services Group, ABSM, Alberta Energy and Natural Resources. Wayne Wesolowsky, A.L.S. is with Hamilton, Olsen Surveyors and Ted Smith is currently with Monenco Ltd.

The seminar was followed by a dinner at which Anne Garneau spoke on the Alberta Pavilion at Expo 86.

Participants

G. K. Allred	Alberta Land Surveyors' Association, St. Albert
Robert Baker	ABSM, Edmonton
W.S. Barlow	Alberta Land Surveyor, Edmonton
R. H. Beaumont	EMR, Canada, Edmonton
K. Berg	Alberta Land Surveyor, Edmonton
B. Bishop	Sherwood Park
W. Carbis	Canadian Engineering Surveys Co. Ltd., Edmonton
T. P. K. Chan	Alberta Land Surveyor, Edmonton
Roy Devlin	Alberta Land Surveyor, Edmonton
L. Bruce Fletcher	ABSM, Edmonton
G. L. Haggerty	Alberta Land Surveyor, Edmonton
J. N. Harland	Alberta Land Surveyor, Edmonton
A. D. Hosford	North-West Surveys Ltd., Edmonton
Akbarali Karsan	Alberta Land Surveyor, Edmonton
H. Keil	Alberta Land Surveyor, Edmonton
E. Kennedy	Alberta Bureau of Surveying and Mapping, Edmonton
M. E. Kinloch	Alberta Land Surveyor, Edmonton
W. Kiriak	Alberta Land Surveyor, Edmonton
H. D. MacAulay	Alberta Land Surveyor, St. Albert
T. MacNeill	U.M.A., Edmonton
I. C. Maltais	Alberta Land Surveyor, Edmonton
W. Mintz	ABSM, Edmonton
R. R. Mohess	Alberta Land Surveyor, Edmonton
Mr. Necyk	W. D. Usher & Associates Ltd., Edmonton
W. K. F. G. North	Alberta Land Surveyor, Edmonton
G.E. Olsson	EMR, Canada, Edmonton
R. W. Robinson	Alberta Land Surveyor, Edmonton
M. Sexauer	Alberta Land Surveyor, Edmonton
J. E. Smith	Monenco, Edmonton
M. Toomey	Alberta Bureau of Surveying and Mapping, Edmonton
W. D. Usher	Consultant, Edmonton

J. W. Van Berkel	Alberta Land Surveyor, Edmonton
Bill Walker	Alberta Bureau of Surveying and Mapping, Edmonton
P. Walker	Alberta Land Surveyor, Edmonton
C. H. Weir	Stewart, Weir & Co., Edmonton
W. Wesolowsky	Hamilton and Olsen, Edmonton
V. Wolchansky	Alberta Land Surveyor, Edmonton

7.1 EDSON CADASTRAL INTEGRATION PROJECT Part I

W.J. Mintz, A.L.S.
Alberta Bureau of Surveying and Mapping
Alberta Energy and Natural Resources

A basic framework for the development of land-related information systems in Alberta is provided by the following sub-systems:

- The Alberta Geographical Positioning System
 - the Survey Control Data Base
 - the Photogrammetric Control Data Base and
 - the Land Survey Data Base
- and
- The Alberta Mapping System
 - the Municipal Digital Mapping Data Base and
 - the Provincial Digital Mapping Data Base.

By 1965, a municipal survey control program had been initialized within the legislative framework of Section 93(2) of the Survey Act of Alberta. The Act authorizes the Minister, represented by the Director of Surveys, to enter into an agreement with a municipality for the purposes of establishing survey control. The agreement defines the area of coverage and sets out the respective responsibilities of the urban municipality and the minister.

Similarly, the municipal digital mapping program is performed via work and cost-sharing agreements with urban municipalities and normally involves the production and maintenance of base map components depicting the survey control and land survey systems, one meter contours, hydrography and orthophoto imagery.

The components of the program which are completed by in-house and by contract resources are:

Survey Control. The municipality locates and installs survey control markers. Conventional triangulation, trilateration and traversing techniques are then used to establish their relative position and tie the network into the national geodetic network.

The survey field work is contracted to surveyors in private practice, with limited in-house resources being used for reconnaissance, quality control checks on contract returns, and data reduction and adjustment. Private surveyors also perform the ties between Alberta survey control markers, monuments and governing points of the land survey system.

Land Survey. A manuscript consisting of a compilation of registered plans is produced by the Mapping Branch and utilised by the Land Survey Branch to compute the cadastral coordinates.

Photogrammetric Control. The vertical aerial photography of the municipality is obtained under contract with a private mapping firm. The photography is normally at a scale of 1:8000 with all survey control marks targeted prior to flight. The controlled photography and coordinates of the photogrammetric control points establish a photogrammetric control data base for mapping primarily but also digital terrain modeling.

Base Mapping. The orthophotos and contour components are supplied by mapping contractors, usually on a project basis, which also includes the establishment of the photogrammetric control base.

In-house procedures include the cadastral map components which are produced by staff cartographic technologists from the land survey coordinates computed on the main frame using the Geodigital Mapping System (GMS). The cadastral and contour data is captured with other topographical and cultural information in hard copy form as orthophoto imagery.

The Land Survey Data Base. The Municipal Integration System (MIS) involves the integration of registered plans of survey within the urban municipalities into the land survey data base.

In general, the technique is to collect field tie data via plans submitted for examination and/or from the private sector through specific projects. This data is then used to compute individual lot and block corners; generally these are reliable to ± 15 cms relative to the survey control network; however, there are some exceptions where large discrepancies in the original work have not been isolated.

Rationale For Contracting Edson Cadastral Integration. One of the problems encountered with the Surveying and Mapping agreement has been the maintenance of cadastral mapping for municipalities previously brought into the program in the early years, while computing the data base for additional towns and secondary cities brought into the program annually.

Traditionally, after the town or city was initially computed, it has not been kept up-to-date as new surveys occurred. Subsequently some municipalities are significantly out-dated. There is significant interest and pressure by utility and oil companies and numerous other users to develop and maintain land survey data bases for the entire province.

Numerous public and private sector organisations supported the Bureau's proposal to accelerate the creation of the land survey data base which was submitted as a 1986/87 budget enhancement in recognition of the urgency for the base to be in place by 1990. The urgency results from the necessity to develop a standard base for all users rather than each company developing their own unrelated databases, which will result in little or no correlation between government and private industry.

Due to the pressure by various organisations and the possibility of accelerating this program, the Bureau realised that such a program could only be accomplished by contracting work out to the private sector. With this in mind, the pilot project was initiated to create an awareness of this program in the private sector, to monitor and make adjustments to the specifications of the integration process and to formulate a policy pertaining to the future roles of government and the private sector in creating and maintaining a land survey data base.

Selection of Contractor. A Request for Proposal (RFP) was prepared, detailing the requirements of the project. Then, a number of firms were selected who were known to have relatively well developed coordinate computation skills and experience. The RFP was disseminated to the selected firms requesting a show of interest in computing geographical coordinates for thirty-six 1:1,000 map sheets and eight 1:5,000 map sheets for the

municipality of Edson. Following this, people from the Bureau involved in this project met with the private firms for an overview of the project and an open forum for questions. Final proposals were accepted up to and within three weeks following this meeting. The successful firm was chosen via the current procurement policy in which a fairly wide cross section of factors were carefully reviewed.

Quality Control Measures Utilised by A.B.S.M. The successful contractor was provided with the manuscripts of the compilation of registered plans and a copy of the cadastral ties from the municipality.

Upon completion of the computation of the first 1:1,000 map sheet, the contractor provided the Bureau with a magnetic tape containing the transaction file (cadastral and mapping points), the coded manuscripts, and a memorandum outlining all relevant information.

The bureau then randomly checked (i) the utilization of field ties, (ii) coordinates of specific block corners, (iii) discrepancies isolated by the contractor, (iv) manuscript coding techniques and (v) any omitted cadastral stations.

A similar process occurred when the entire data base was completed. With the transaction file and other associated items listed above the Bureau is now computing the lot corner coordinates. The items checked at this stage are similar but perhaps more thoroughly observed than at the completion of the first 1:1,000 map sheet.

The lot corner processing was excluded from the contract to give us another quality check on the data base transaction file submitted. In the past, one technologist has performed lot corner computation for each of several technologist's files. To exclude this process from the contract was therefore a natural separation based on our own operation.

The final quality check will take place at the mapping stage. Mapping Branch can detect any major problems with the base during the digital plotting. We know from experience that the plotting procedure, in some cases, can also detect inconsistencies which have gone undetected at the plan examination, certificate of title and integration phases.

Summary - An A.B.S.M. Perspective. Although there appear to be some discrepancies and omissions pertaining to manuscript coding and cadastral stations missed, the data base appears at this point to have been well done.

Since the methodology of this project was unique and new to the surveying industry it was important to have effective and on-going communication between the two parties involved. I am pleased to say that this did occur throughout the project.

The consultation before and during the project and the quality check at the completion of the first 1:1,000 map sheet is imperative. However, despite not having completed the lot corner processing, we do not see the advantage of performing the function in-house. As the cadastral ties to A.S.C.M. provide a built-in quality control mechanism between blocks and plans, similarly the lot corner processing provides a comparative check for the contractor between registered plan lot distances and computed distances.

If the coordination of the urban land survey data base is accelerated within the next few years and extended to include municipalities with a population including and

exceeding 1,000 people, the private sector must be involved. This involvement will require not only computation of first coordinates for new municipalities, but also the maintenance of these data bases. To facilitate this the Bureau must develop a clear policy regarding its role towards private sector involvement. It is my opinion that the Bureau should provide the assistance, the consultation and the required quality checks upon completion of each revision cycle or at regular intervals of time. Since it is the intent that the municipalities data bases be constantly maintained, the data bases must be updated as each new plan becomes registered. Therefore, the quality check would be required at regular intervals of time.

7.2 EDSON CADASTRAL INTEGRATION PROJECT PART II

T. D. MacNeill, A.L.S., C.L.S.
Survey Department
UMA Engineering Ltd., Edmonton, Alberta

The following report will include an outline of the production procedures utilized, the types of difficulties encountered, as well as some general comments on the project.

Materials supplied by the Bureau to UMA

- 36 1:1,000 pencil manuscripts
- 8 1:5,000 pencil manuscripts

The manuscripts are compiled drawings on mylar of each individual mapsheet showing the cadastral linework, lot, block and plan numbers as well as dimensions (distances) derived from the registered survey plans.

- One bound copy of field book ties from existing Alberta survey control monuments (ASCM's) to legal survey monuments as performed by another private contractor. Legal survey monuments were tied in radially from the ASCM's.
- One book outlining the specifications and instructions for the project.
- Blueline prints of all registered plans of survey within the project area as well as any REC or filed plans.

Materials acquired by UMA

- A listing of all survey control cards for all ASCM's in the mapping area as obtained from the survey control branch of ABSM.
- A check of the ABSM Land Survey Branch plan examinations for any unregistered survey plans.
- A further check of the L.T.O. for any plans that may have been missed by the Bureau.

Hardware and software

Prime 450 minicomputer 2 meg RAM with 396 MB hard disk storage, 9 track tape drive, 20 terminals.

Prime coordinate geometry program, with alphanumeric point labelling.

Data file editing and manipulative software.

Tape read/write and format software.

Procedure

- The scale factor, 0.999773, was determined as the average of the combined factors for the ASCM's within the project area.
- The 3TM coordinates for all ASCM's used in the field book ties were entered onto the system using the coordinates as supplied on the control cards.
- The location of each ASCM and of each coordinated cadastral station was plotted on their respective mapsheets.
- The field measurements to the cadastral stations as shown in the field book ties were entered into the system and coordinates were computed. Unless the monuments were found to be out of position, the coordinates as derived from the field ties were held as fixed. Upon completion of the entry of the field book ties, inverse bearings and distances were computed between the found monuments, and where applicable, they were compared to the measurements shown on the plans of survey from which they were derived. This gave an immediate indication of any large discrepancies.
- The field tie stations were used to establish governing lines for further computations within a given area. Two field ties, at either end of a surveyed line which showed good agreement with registered plans, were used to determine a bearing rotation between grid bearing and that assumed on the registered plan. Using this rotation, and the coordinates as derived from the field ties, additional coordinates could be computed. In many cases it was necessary to traverse from one field book tie to another, using observations taken from the registered plans. Assuming the closure was within acceptable limits, the intermediate observations were balanced accordingly. For the balancing of observations, the Compass, Transit and or Crandall's rule were used depending on the circumstances. In situations where an unsatisfactory closure was obtained, a number of options were available:
 - Traverse from either one of the points to a third field tie point to determine if a satisfactory closure could be obtained and if so, try to determine as to whether one of the field tie stations may be a monument placed in an erroneous position.
 - Verify the measurements derived from the registered plans used, by running closures on the plans (i.e. determine if any drafting errors may exist).
 - If the discrepancy could not be isolated to an error on a registered plan or to a misplaced monument, then a field check would be performed in order to isolate the discrepancy.

In any given map sheet, the most recent registered plans, in conjunction with the field book ties, were utilized first in the computation process. As the more recent plans of survey show ties to monuments from previous surveys, the coordinates as derived were used to compute coordinates for stations on the older plans.

During the computation process, the project specifications called for any discrepancy between the calculated and registered plan distance (as shown on the manuscript) of ± 0.15 metres to be indicated on the manuscript, in close proximity to the distance as shown on the manuscript.

Resolving discrepancies in the data. In Edson, the majority of the discrepancies could be explained by one of the following situations:

- Differences between recent and older survey information, particularly on long distances which were originally chained as opposed to recent information using EDM.
- Discrepancies within the plan of survey itself, either through the survey evidence used for monument reestablishment or by computation errors.
- Incorrect field posting by previous surveys (i.e. the most recent survey plans show monuments placed by previous surveys to be off line or out of position, thus calling into question the ties to other monuments shown on the older plans).

As the field ties formed the basis for all subsequent computations, it was necessary to assess all field evidence much as a Land Surveyor would in the field. This aspect of the project proved to be the most time consuming.

In some cases, it was determined from the evidence available, that the field ties were to monuments that were out of position by greater than the allowable error. In these cases, new coordinates were derived based on the computed position of the monument. It should be noted that this procedure was only used where there was sufficient evidence to reject the position of the monument.

Materials supplied by UMA to the ABSM

- the original coded manuscripts for the project (total of 44)
- one blueline print of each manuscript
- magnetic tapes containing transaction files for cadastral and mapping records
- one hard copy output of the transaction file
- one copy of the project report

Production times and costs. Production time is shown in the following table:

Phase	Estimated Time	Actual Time
Compilation	3 days	4 days
Computation	55 days	60 days
Prepare returns	2 days	4 days
Supervision	10 days	10 days
Total	70 days	78 days
Field Checks	5 days	nil

Difficulties Encountered and How Resolved. As indicated above, field checks were not required on this project; the primary reason was the number of field book ties which had been made. Many of the discrepancies could be isolated using these ties in combination with dimensions from more recent survey plans.

Within our firm's experience with projects of this nature (Yellowknife and Whitehorse) where cadastral computations using registered plan information only, yielded a lower degree of accuracy than that required by the Bureau. These other projects involved the resolution of "paper" data between older and more recent survey plans. In the Edson project, with the addition of actual field ties, it is believed that the coordinates computed are better than those derived from plan information only.

General Comments on the Project. It is not only necessary to consider the quantity of field ties for any given project, one must also consider the quality of the ties performed. For example, exterior block corners of a subdivision found in their original position are of much more use than lane posts. Similarly, BC's and EC's of curves are more useful than lot corners or curves.

The following recommendations apply to the field portion of the project:

- Direct distance measurement should be made between all ASCM's used for field ties. There are times when the ASCM's may be in error, and this error can be passed onto the field ties.
- Radial ties to cadastral monuments should be performed by some alternative method of check, such as an offset check from a point on line between the ASCM's used for the tie.
- Inverses between radial ties should be checked, where possible, against the registered plans from which they are derived so that errors may be found prior to their submission to the ABSM.

Where possible, an attempt should be made to isolate where an error may exist.

- Ties should be made to as many primary monuments as possible (i.e. block corners as opposed to lanes). This may require longer search time for evidence, or possible temporary re-establishment of important primary points.

With respect to the computation process, the use of mylar base manuscripts showing the actual outlines of 1:1,000 and 1:5,000 mapsheets were of great advantage over the use of paper prints of registered plans for the recording of point numbers. It was much easier to effect revisions or corrections on the mylar, and as they could be considered as compiled drawings, they provided an overall view of the area to be mapped.

The actual amount of time required to produce the pencil manuscripts is not known; however, the time involved must be considerable. It is our suggestion that instead of utilizing hand drawn manuscripts, the Bureau should consider digitizing the required information from survey plans into a "preliminary" data base. Information may be derived from this preliminary data to prepare the required line drawings for the 1:1,000 and 1:5,000 manuscripts. It is our suggestion that plan digitizing and manuscript generation can be performed from a small microcomputer work station consisting of:

- a digitizing tablet
- a micro-computer CADD system
- plotter

The "preliminary" data base derived from plan digitization can also be used as a temporary or "provisional" data base should some form of map data be required by other

agencies during the municipal computation process. As the use of small micro-based CADD systems becomes more prevalent in the private survey sector, it may be possible to contract the manuscript preparation out to private firms as an option to preparing them "in-house". The preparation of computer generated manuscripts could be performed through a separate contract or in conjunction with the contract for municipal computations.

The following additional suggestions are supplied in reference to the computation process:

- The posted side of all right-of-way plans should be classified as cadastral stations as opposed to mapping points.
- The preliminary field tie data should be assessed directly by a Land Surveyor in order that the governing lines of the computation process be established according to "best fit" with existing registered plans.
- As the current process involves the computation of block corners only, it is suggested that the process involve the computation of lot corners as well. It is understood that this is the current method of quality check used by the Bureau, but it may be possible to find some alternative form of quality check in order to avoid the duplication of effort involved to compute lot corner coordinates. It is possible that the computation of lot corner coordinates can be tied in with the earlier suggestion concerning the generation of computerized line maps (manuscripts) by private contractors.

With reference to the final quality checks to be performed by the Bureau, it is our suggestion that the Bureau consider contracting this phase to the private sector. In this manner, random computation checks may be performed on each mapsheet by another private firm as an alternate method of quality control. As additional contracts of this nature are put out to the private sector, the Bureau may consider compiling a list of private firms with experience in the overall procedure. These firms may be used to perform quality checks on contracts performed by other survey firms.

7.3

CADASTRAL INTELLIGENT DATA SYSTEM

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The Cadastral-Intelligent Data System (CIDS) project is a joint effort of the Mapping Branch and the Land-Related Information Services Group (LRISG) of the Alberta Bureau of Surveying and Mapping (ABSM). The Land Survey Branch of ABSM is also involved in the project.

The full implementation of the CIDS project will meet the needs of the Mapping Branch and LRISG. A partial description of their respective mandates provides background information for the project.

Mapping Branch. The Mapping Branch produces map products, at a variety of scales and with various levels of information displayed. Since 1980, the ABSM has been moving towards full computerization of the mapping process and mapping products. A major program is the 1:1,000 municipal or urban mapping program. This mapping is based on Legal Plans of Survey, and utilizes the urban coordinate computations from the Land Survey Branch. Information carried on the 1:1,000 maps include lot, block and plan identification, rights of ways, and roads. Cadastral stations are also identified.

As the present method used to prepare these maps does not take full advantage of the computer environment, the Mapping Branch is seeking a means by which line and text placement could be fully automated. The only time spent on the computer-graphic terminals would be to perform cartographic enhancements on text placement. Also, although the Mapping Branch is not in an active update/revision cycle, they foresee that present methods of map creation will make the revision cycle cumbersome.

The Mapping Branch is also looking to the future by considering how those who require map products, specifically digital map products, would be using them. Such considerations led to a review of present formats for storing and distributing 1:1,000 mapping products.

LRISG. The LRISG provides a government- and ultimately province-wide service in coordinating the implementation of the Land-Related Information Systems (LRIS) Network. At full implementation, the LRIS Network would allow for computerized exchange of land-related information throughout the province. Specifically, the LRIS Network is conceptually comprised of three primary systems, unlimited secondary systems, linked through five Network Sub-Systems (Figure 1). The three primary systems provide the basic land fabric -- precise location coordinates, ownership/disposition information, and mapping products which graphically display spatial relationships.

Secondary Systems are based on thematic information -- Natural Resource or Environmental, Infrastructure, and Socio-Economic. Natural Resource information includes soil survey, forestry, wildlife, vegetation, resource deposits; infrastructure information includes roads, pipelines, buildings; socio-economic information includes demographics, census information, employment statistics, land use. The common

denominator in these systems is that the information is position dependent; that is, it is collected on the basis of, and the information related to, a point, line or area within the province.

The Network Sub-Systems function to exchange information in the LRIS Network. Telecommunications and Security are required for electronic access, and control of electronic access. A Data Directory is a tool commonly found with data base management systems, and functions somewhat the same as an index to a filing system. It will be used to identify and manage the information resources accessible through the LRIS Network. The Spatial Cross Reference File (SCRF) is concerned with the way in which land-related information is collected. The SCRF will allow a means by which points, lines and areas for which information is collected, are referenced to the Primary Systems in a common, standardized manner. Lastly, the Map Data Structure will perform three functions. First, it will provide the graphic information which describes a map in a format that is independent of the brand of computer equipment. Second, it will provide a unique referencing mechanism to allow for spatial linkage of secondary systems. Third, it will provide graphic information (maps) in a form compatible with advanced spatial analysis tools, commonly known as geo-processing, and presently available.

The functional requirements of the Map Data Structure and the LRIS Network parallel the Mapping Branch's interest in the future users of their digital map products. As well, the data structure proposed for the Network Sub-Systems will also provide the information required by Mapping Branch for automation of line and text placement.

CIDS project. Participation was sought from the LRIS Group, the Planning and Co-ordination Branch (computer support) and the Land Survey Branch of ABSM. The progress of the project has been hampered by its complexity and the difficulty in defining some of the requirements. In September, 1985, a series of small prototype projects were carried out in an attempt to firm up the requirements, and hopefully reduce the complexity.

A report to ABSM management resulted from the above studies. The report described the findings of the prototype studies, and recommended a method for development of the CIDS Project. The development is based on the six components, shown in Figure 2, and essentially proposes a phased development. The break-up of the CIDS Project into six components reduces the overall complexity by creating manageable units with well-defined bounds. Two phases will allow for development of the components with well-defined requirements in Phase I, and allow for experience with those components to further define requirements which are poorly defined during Phase II. Phase I includes Data Capture, Flat File Map Enhancement and Conversion components. The completion of these components will result in a production system for the Mapping Branch, and meet the majority of their requirements. Phase II will occur subsequent to implementation of Phase I, and will address requirements related to data management and access to the data base. A brief description of each component follows, in the order which they will be developed.

Data Capture. Certain information is required for the map data structure, and to perform automated line and text placement. This information identifies nodes, lines and polygons, and their relationships to each other. Node refers to a point at the junction of three or more line segments; thus, nodes include cadastral stations and lot corners. Nodes are uniquely identified, and are further defined by coordinates.

Lines are described as being "from node x to node y," such as a lot line running from lot node 1 to lot node 2. Note that regardless of more precise coordinate information for lot node 1 and/or lot node 2, the lot line will always be "from lot node 1 to lot node 2." Other information, called attribute information, will be captured with lines, e.g., legal distance from the plan of survey.

Polygons are closed areas, such as lots, and are described by the lines which enclose them. Again, more precise coordinates for nodes does not change the line segments which define that polygon. As with lines, polygons may have attribute information captured with it, such as lot number.

One further level of information will be collected, commonly referred to as left-right polygon. This information is attribute information for lines, and describes what is on either side of a line (e.g., lot 1 and lot 2, or block 1 and River Road). This information is of interest to those wishing to perform more advanced analyses.

Flat File. The flat file refers to a method of storing information in a manner that is easily transferred between users. Conceptually, a flat file resembles a matrix or table of information, usually organized sequentially (see Figure 3). The CIDS flat file will contain all the information required for subsequent components of the project.

Map Enhancement. The ABSM uses an INTERGRAPH system for its digital map production; therefore the CIDS project must be compatible with the INTERGRAPH system. Also, existing users with INTERGRAPH equipment may wish to continue receiving their map products in the INTERGRAPH format, known as an IGDS Design File.

The two processes to be developed in the Map Enhancement component are BUILD and DECOMPOSE. BUILD will use the information in the FLAT FILE to automatically place lines and text, according to the cartographic rules established for the 1:1000 mapping program. Note that the information "from node-to node," in conjunction with coordinate information, provides drawing instructions for line work. The BUILD process developed by CIDS will be INTERGRAPH specific; however, similar routines can be developed for most, if not all, computer-graphic systems.

Although the BUILD process will place all line and text, it is accepted that up to 30% of the text placement will require cartographic enhancement. The DECOMPOSE process will record any cartographic enhancements in the FLAT FILE, thus ensuring in subsequent generations of the map, that previous enhancement work is included.

Conversion of Existing Files. There are approximately 5,200 1:1000 maps that have been prepared and stored using INTERGRAPH's IGDS Design File. To ensure that all 1:1000 maps are available in a common format, it will be necessary to convert existing IGDS Design Files to the Flat File format.

Map Data Base. Data Base Management Systems (DBMS) are software tools that allow for more efficient storage and retrieval of information. Also, by defining explicit links or relationships between data it is possible to ask complex questions of the data base. Such questions might include:

- Find all the lots which fall within a one-mile radius of lot X.
- Find all the lots which a proposed right-of-way falls across.
- Find all the lots contained in a specific plan and block.

The questions which will be asked must be identified prior to design of the database. As the total range of questions is not known at this time, this process will be deferred, allowing more time to gain familiarity with the information.

Polygon Management. Polygon Management refers to a type of software that allows for more efficient management of the graphic elements: nodes, lines and polygons. It also provides some tools for checking graphic data and attribute data for completeness. Some of the information that will be initially collected through the data capture process may eventually be generated through polygon management, resulting in a reduction of manual data capture.

Benefits From the CIDS Project. The majority of the benefits from the CIDS Project will result from its input to the Map Data Structure (the concept behind the CIDS Project will be applied to the other mapping scales subsequent to completion of CIDS) of the LRIS Network. However, the ABSM will derive some benefits through more efficient use of its computer and human resources, and an easier method of performing updates and revisions.

The benefits which are related to the LRIS Network result from improved access to information, increased use of information through sharing (thus reducing the cost/use ratio), and an increased value of information through an increased ability to perform complex analysis.

7.4 LOCATION OF SUBSURFACE UTILITIES: PROBLEMS AND SOLUTIONS

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and
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We will review the procedures that surveyors must go through now, to locate buried structures such as gas-lines, telephone lines, etc. and then we will attempt to show how recent developments provide the surveyor with another tool that will allow him to reduce the time required to gather the information and allow him a reasonable degree of assurance of data reliability.

Sources of Land Information. Our discussion will concentrate on a rural situation, since municipalities generally have most of the information regarding the as-built status of their utilities. The specific example will be a request for an alignment survey through a rural area.

Before sending a crew into the field, an attempt is made to gather all the information that is available for the subject area. Information is required to satisfy the requirements for a survey and also to ensure that all as-built information has been identified. The sources of information regarding the alignment survey are as follows:

- Land Titles Office • registered plans
 - title information (Textual)
 - encumbrances • caveats
 - easements
- Energy Natural Resources • township plans and maps
 - aerial photography
 - office plans
 - crown disposition plans
- ABSM • well site control
 - ASCM information (framework)
 - unregistered plans
- Other Surveyors • plans and field notes
 - unregistered plans - flowlines
 - leases
 - surveys in progress

The information collected from the above sources is necessary to ensure that the survey will conform to existing acts and regulations and also to accurately locate the buried structure within the township fabric. All information regarding any and all buried structures within, crossing or adjacent to the proposed alignment survey must be researched. The type of buried structures could include, but are not limited to the following:

- buried steel pipes
- communication cables
- power conduits
- plastic gas lines

- plastic gas lines
- non-metallic water lines
- pipe corrosion protection fields
- gas-lines
- etc.

The sources to obtain information regarding the buried structures are the following:

- | | |
|--|---|
| Client | <ul style="list-style-type: none"> • as-built plans • pipelines record sheets • facility plans • flowline plans • well-site plans |
| ERCB | <ul style="list-style-type: none"> • index plats showing <ul style="list-style-type: none"> • all pipelines and licence numbers for crown and private lands • gas co-op lines • locations • no dimensions |
| ENR-L.S.A.S. | <ul style="list-style-type: none"> • all surface dispositions within crown lands • subsurface |
| Land Owner | <ul style="list-style-type: none"> • surface dispositions that are not necessarily filed with any Government Agency • PL100 Sheets <ul style="list-style-type: none"> • operator • line type and substance • origin & termination |
| Land Titles Office | <ul style="list-style-type: none"> • lease information • R/W's, roads, railways |
| Other Surveyors | <ul style="list-style-type: none"> • as built plans and field notes |
| Oil Companies | <ul style="list-style-type: none"> • as built plans |
| Utility Companies | <ul style="list-style-type: none"> • Alberta One Call System • all utilities are members • private service to locate utilities |
| Alberta Utilities and Telecommunications | <ul style="list-style-type: none"> • plot plans • gas co-op lines |
| Individual Co-op Owner | <ul style="list-style-type: none"> • plot plan |

The following demonstrate samples of the various source information that is now collected in a manual mode.

From the foregoing, the following problems in gathering information can be identified:

- Time to gather information can be considerable.
- Number of agencies involved.
- Each agency can only supply part of the information required.
- The information supplied must then be sorted for the particular task at hand.
- There is much redundant information collected.
- The information collected is not suitable for field purposes without extensive editing.
- Plenty of lead time is required.

Any system that can minimize the problems of acquiring land related information, such as was demonstrated by this paper, transforms itself into a definitive cost benefit to the client.

Reference Framework. The province, over the last number of years has been establishing a Survey Control system that will eventually cover the entire province. This provides the glue that holds the entire Alberta Network Concept together.

The data generated not only includes monuments on the ground but digital data that can, and is being used not only by surveyors in the performance of surveys but also by the mapping and geographical referencing industry in creating maps and data bases that can and will be used for a variety of purposes.

Base Maps. As indicated earlier, the use of a geodetic framework is essential to the establishment of geographically based land information systems. But before anything more can occur, a base planimetric and cadastral base maps must be established due to the fact that all land activities relate to the legal parcel or topography of land.

An ongoing example of the progress being made in the province is the 1:20,000 Base Mapping Program that involves two provincial agencies and five mapping firms. The emphasis in this program now appears to be the integrity of the digital data more than on the hard copy maps themselves.

Cadastral Overlay. The topography of the land must be related to the cadastral fabric. The merging of the two sets of data must coincide accurately. This is achieved both manually and digitally by the use of the geodetic framework.

Earlier you heard of the Edson project, which is a pilot project involving the private practitioner in the establishment of the coordinates for all legal corners of parcels of land. Previously, the province was doing the co-ordination process in-house due to their mandate of ensuring the integrity of the digital data. With the private sector involvement, there should be an acceleration of this process with the results that more towns will be coordinated sooner.

Other examples are the upgrading of the Alberta Township System of theoretical coordinates that is now underway.

Textual Records. On the textual component of a Land Information System, there are a number of digital textual data bases being established. The two most noticeable ones are:

LSAS - Land Status Automation System of ENR for dispositions of all crown lands; and

ALTA - Alberta Land Titles Automation Project, which is the computerization of textual land records of patented lands.

There are many other digital textual data bases, but all have been established for a specific task and hence have the following deficiencies:

- redundant, duplicate data;
- relatively or no graphical display; and
- no interfacing with other textual data bases.

Linkage Mechanism. In order to compensate for these deficiencies there are some programs like the ALTA project which will establish a linkage mechanism that will allow textual, graphic or both textual and graphic displays. L.I.N.C.: Land Information Numeric Code will allow a textual report, graphical report or both. The trend is to distributed data bases interfaced to each other to allow for the sharing of data.

In our example of searching for information manually we had summarized the problems encountered. The main problem is the time involved in gathering the information. With an automated integrated system, and the programs that are now underway, this information will be accessible by computer terminals, and micros either across the counter or from remote locations. Replies to enquiries regarding land information either in a graphical form (plans) or textual form (certificate of title) will be supplied instantaneously by user oriented questions.

We have attempted to demonstrate the solution to a practical problem that now exists in finding and retrieving information by pointing out the various activities that are underway within the province. This paper doesn't purport to have indicated all the sources of information nor all of the solutions that are underway, but enough to demonstrate that there is a solution and that the solution is through a cooperative effort by the public and private practitioners of Land Information Systems.

7.5

EDMONTON DISCUSSION

Part I. Discussion immediately following Mr. Kauter's presentation

M. Toomey: Why do you need a renewal survey with all building corners carefully surveyed and plotted?

B. Kauter: We have only old co-ordinates of the traverse points and many of them have been destroyed, so it is costly to work in this area. Times have changed since the traverse net was first established. Today we have a lot of different regulations, different zoning restrictions, etc.; for instance in one area there are different restrictions than in another area of a community. The restrictions on distances between your house and your boundary are different in different places. On the map, anyone can see if these houses have the right distance to the boundary on the north, on the south and on the other two sides.

For us it is especially important that we have the houses on our community maps, because interest in the utility services is increasing. If we have the planimetry in our offices, we have the basis for planning utility services in the communities, and for putting utility services into a land information system. It is important in our country, though perhaps not in yours, to have the houses on the map. Then it is very simple for an employee of the community which is responsible for the updating of his utility service to chain two or three measurements from the corners of the houses to the point where he has established a pipe. So co-ordinates can be calculated for this point without having to find boundary points. As you know, it is not always easy to find boundary points; some are destroyed, some are buried, etc. but it is easy to do work for the utility services using the house corners.

D. Hosford: I just wanted to clarify a couple of points about the amount of money you pay as a private practitioner to keep yourself in good standing within your association. You did mention the fact that you have to pay four one/thousands of your income and I assume this income is the gross receipts that you receive for your work, is that correct?

B. Kauter: Yes, the gross income.

D. Hosford: I think you also said that you pay about four thousand francs a year, so your revenue must be a million francs a year.

B. Kauter: Yes, approximately. But I pay this rate only on my cadastral income. On my income from cadastral maintenance, land consolidation and renewal work; income from setting out points for an oil company, setting out points for highways or other non-cadastral work is not included.

D. Hosford: Your association dues are roughly \$2500.00 Canadian dollars a year. Whereas here we have been paying dues of about \$1000 a year.

B. Kauter: This bill for 4000 francs is one -- perhaps the only one -- I like to pay. This is because our group of private practitioners work together and we are very strong. It costs money and it takes a lot of time to discuss our concerns with government and those members of our group who are working on our behalf, negotiating with government, etc. are all in private practice. They are paid for their time and their results, until now, have been good; that's why I like to pay this bill. Government doesn't want us to make too much money and there are jobs on which we lose money; however, on about 60% of our

work , the profit is between five and eight percent. It depends also, of course, on our management and on the productivity of our employees.

K. Allred: You mentioned utilities. Is there a requirement in Switzerland to locate utilities, underground utilities in particular, and record them on a system.

B. Kauter: Yes. But until now municipalities are responsible. For instance, the community where I am living has its own utility for water services but electricity is provided by a private company; this company is obliged to have its own utility service map. I am trying now to get contracts to put all the measurements of the utilities into our computer and to offer a service to them all. It takes a lot of time and it is very hard work to convince the community councils that it will be cheaper to give this work to my office rather than have two, three, or more employees only maintaining this service.

M. Toomey: You gave 85 percent as your overhead factor on salaries. Are you using the word salary to include the benefits such as pension, medical plan, insurance, etc. That typically could be 20 or 25% more than the salary. So did you really just mean the quoted salary such as 40 000 francs a year or was it including benefits?

B. Kauter: Yes. The overhead is 85% of his salary and benefits.

M. Toomey: That is quite low because our government for many years recognizes that they put 100% loading on the take-home salary to be the total cost and you're only putting 85% on and I would imagine that the consulting engineers in this province would expect to make 2.1 times the salary. So actually your 85% is not high at all.

B. Kauter: But it is only the costs. There is no profit in and with profit it must be more. Other questions? Good. Thank you.

R. Beaumont: Thank you very much for a very informative talk this morning. I'm sure we all benefited from it and found it very interesting.

End of morning discussion

Luncheon

G. Haggerty: This is a short poem that was triggered by the comment that in Switzerland the plan controls the boundary corners. As you know, here, it is the monument that controls the corner, although we do have among us those who would like to see co-ordinates control the corner. This is a little poem with that idea.

"A cadastral plan just might be fine, for others in their lands divine.
 But I'm from Missouri as they say, and like my monuments to stay
 Just at the corners, there they be, so I can kick 'em, occasionally.
 However, often when it's cold, and the iron post is gone or old,
 Being buried far below - one foot of dirt and two of snow,
 It seems that, maybe, plan be best; so I, in office, can stay and rest,
 But then again, if plan be true, surely someone will construe,
 That co-ordinates would better show, where the boundaries ought to go.
 Though in the field no point is there, like in the past, he set with care,
 The future ages sure will show, whether laymen trust a plan or go for solid co-ordinates
 which have been set or if from Missouri they be and trust,
 The iron post that turns to rust.

Part II. Panel following presentations by Mintz, Wesolowsky and Smith, and by McKay; R. Beaumont, Chairman

M. Toomey: What do you think stands in the way in 1986 of achieving the objectives which we've been told are desirable? If it's desirable, what is stopping it from happening right now. Politics, finance, technology, vested interests?

The objectives I take it are that everything is good and nothing is bad about sharing information through data base networks and so on. If we are sold on the idea, why can't we do it? Can we pick up the phone tomorrow and arrange it? If not, why not? What is standing in the way? Either here in North America or in Europe?

D. Hosford: What's standing in our way here in Alberta is that we haven't really clearly defined exactly what we plan to do. Bill Walker may disagree with me but, it seems to me that we have to have some kind of overall strategic plan of implementation so that everyone can see the benefits of the system to them and the benefits to the Alberta society as a whole. There's thinking along these lines. One of the things that was proposed in the budget but which was turned down was a pilot project; selecting a test area for a pilot project and building a land information system and actually getting it working. Unfortunately the funds weren't forthcoming. But what's really standing in the way of us reaching these motherhood objectives that we all feel in our hearts are desirable, is the fact that we haven't articulated them clearly enough so that the people that control the funds and the people that are involved with institutions will be ready to change a lot of things and implement these ideas.

E. Kennedy: I'd disagree with you Dennis. Our efforts to this point have been focusing on looking at the potential of the technology and defining perhaps more in technical terms what the priorities are, and doing developments in areas that we felt were most critical, namely in primary systems to provide the basic structure. We have not communicated effectively, particularly to the political level but even to the senior administrative level in our institutions be they government or otherwise what the benefits of developing our planned information systems are, so we have not managed to translate the technology and the systems requirements into layman's terminology. We have recognized that the development of information systems in this province will have significant benefits to the people of the province but haven't been able to translate this intuition into practical day-to-day terms that are meaningful to the people who are making the decisions. That is a real challenge, and that's the challenge that we have now.

As Dennis pointed out there were a number of budget proposals that went forward this year, not only in our Department but in other departments to further develop the land information systems network in the province and none of them were successful in getting additional funding. Part of the reason for that, I think, is because of the current political situation; but I don't think that is the major reason. I think that the major reason is that they were stacked up against other proposals that were more meaningful in terms of demand or meaningful to the man on the street as represented by the politician. We weren't able to demystify this whole business of land information systems. So I think we are back to the drawing board.

I disagree with the statement that we don't have a strategy. I think we do have a strategy. But the strategy has not been communicated effectively in terms that mean something to a politician, and that's what we are setting about to do right now. There are only two limitations that appear to be standing in our way at the moment: one is telecommunications technology, which probably hasn't matured to the state of making it

practical to have on-line communications between graphical data bases; and storage technology may be the other factor.

The biggest problems are institutional ones, not technological ones. Institutional in the sense of a mind-set in organizations that they cannot trust other people's data, and therefore rather than trusting other people's data and trusting that it is up to date, current and completely accurate, there is still a tendency, both in government and industry, to create data sets for individual purposes. Part of the problem I think is not just mistrust, it's also difficulty in access, difficulty in finding out who has what, what the quality of information is that people have. So, there are a variety of things that are standing in our way. We may be a little bit ahead of the Swiss in the use of technology, but I would say we are far behind them in terms of having institutional mechanisms set up to do the kinds of things that need to be done.

B. Kauter: As I mentioned briefly, a commission is working now on this so-called Reformed System: -- leading to a modern land information system. But also in our country, a lot of things must be changed. On the institutional level, our land law and instructions must be changed not only concerning the surveying sector but also the land register sector. For instance, they don't know until now if all the information they have shall be accessible for everybody or only for certain persons. Then a change in the public view should also be made; the politicians must see, or must be convinced that these systems will bring them a lot of information although it will cost a lot to establish. Last but not least, I think also a change in the attitude of the normal land surveyor must come about. Also the land surveyors who have a lot of information must change their attitude. And I am sure that the mentality both in Canada and Switzerland is an important factor. I am sure that Canada will be able to go much faster; in our country it will go much more slower because of the mentality.

C. Weir: I might add there is credence in every item you mentioned there --the political, the technical, and the institutional. This conference is land information and the private practitioner. In Alberta we need to build up the expertise in the private sector; it's not being effectively built up now, and we may have to look more to the government to help because in the private sector you need money. You need money for training and research and development. We are not making money, we are losing money. And yet, presumably, we want the private sector to build up in Alberta. The alternative is to go the Australian route where all the expertise is built up in government. You could forget about the private sector. And if we keep going as we are, that's the way we'll end up.

This brings up one of the points in the overall strategy. We have to have a realistic policy that meets the objectives that we set for land information systems in the province. Maybe I could follow up on the model or example of the district surveyor in Switzerland as outlined to us this morning by Berney; Dennis made reference to an increased budget proposal that the Bureau unsuccessfully proposed for the next fiscal year; that proposal was based on contracting out the full extent of survey -- including the part that Bill Mintz has talked about. Bill mentioned I think that we're in the process of reviewing our policy and considering future policies along the lines of having surveyors do the cadastral mapping or establish the cadastre similar to the Swiss example and then maintain it.

Dennis has raised another point. Should we be looking at a more self-sufficient model, at a user pay model, where the surveyor is under contract with the district or the communities but is not paid by them for maintaining the cadastre? Payment comes from the user, whether they be government users, or private sector users. Should we be looking at that model? If it materializes, what approaches should we be using to select surveyors to develop and maintain the cadastral mapping in small municipalities? If it is to be done

under contract and the private firms take on the responsibility for that, how is the maintenance handled? This is where I think we need to take some pointers from our Swiss colleagues in terms of the institutional situation that is set up there where the record keeping and the flow of information is much different than it is here in Alberta, or anywhere else in Canada.

Other issues relate to ownership of the data. The private surveyor needs some arrangement so that he can take on the responsibility for maintenance of that information. Who owns it? Does the province own it? Does the private surveyor own it? How is access permitted to that data by other private industry personnel? And who has the right of access to distribute that information and to allow other uses of that information for other purposes? So I'd like to throw those out as questions and hear what your reaction is as to how we should proceed with this in Alberta.

Anon: Let's assume for scenario purposes that in a district one firm was to be selected to look after the control, the property mapping, and the changes in it. What problems would arise?

Anon: I don't think there are any problems whatsoever in the firm, other than the trouble with setting it up. I think that the private surveyor in Alberta is very willing and very able to handle that.

A Hamilton: Going back to the initial layout of the ranges and sections in Ontario, it appears that once the townships were subdivided, the private surveyor was to be an information manager. For a time it worked because there was only one surveyor in a district. However, there was nothing to prevent others from coming in; there was no structure to give surveyors responsibility for the maintenance. It was a free enterprise structure; some sold information, some shared it and so on. Some kept up a local map and some didn't. It wouldn't have taken very much structure to have had a system similar to what is in Switzerland.

Anon: It's rather interesting now that an American firm is coming to the Land Title's Office, copying all of their compiled plans, taking them home, compiling them into a nice book, and selling them back to Canadians.

A Hamilton: That's a replay of what was done in Eastern Canada 100 years ago.

Anon: Our problem is that we don't know how to market things. We produce things, but we can't market them.

Anon: I'm sure we all agree that land surveyors could certainly fill the role of district surveyors in Switzerland. I think that I could visualize the situation where, if a company had maintained the block corners in place, it could do all the certificates for a fixed fee. It's a user pay system that we have right now. Except some users pay heavily and others get it for nothing. Anyway, I feel that if our ways of doing things and our institutions were changed, the user would save money in the long term.

M. Toomey: Unless Terry McNeil lost his shirt on this, I presume he'd be keen to act as the district surveyor in that area and keep things up-to-date, put in an Intergraph, and so on. So the possibility of doing what is done in Switzerland is quite close. It didn't quite happen in Ontario because nobody put the framework in place at the right time. They didn't have a strategic plan laid out that was an integral part of some great strategy. So somebody here could be a hero or a villain.

I. Maltais: Bernhard, you mentioned that 12 surveyors applied for the position of District Surveyor; you are the District Surveyor, what are the other eleven doing?

B. Kauter: I don't know all of these eleven. I know only the four who were together with me for the presentation. Everyone of the four were working in a private office as employees or for the administration when they decided to try to get a contract as district surveyor. When they didn't get it, they continued as employees. I already had my practice going on a small scale.

Anon: The difference between you and them was that you had already set up a practice before you applied for the district surveyor position, and they had not

B. Kauter: That's right.

Anon: You did a good job of your ten minute speech to the district council; you got the appointment. Out of the five people that made the presentation, you obviously made the best speech. Now, do you have a free hand or can they kick you out?

B. Kauter: I was elected and then a contract was established between these twenty-five communities and myself. This contract is valid for three years, then it can be cancelled by one, or more than one community. They can select another surveyor for the maintenance of their region if they want; however, if nobody is complaining after this three years, the contract is automatically renewed for another period of three years. But they can kick me out.

Anon: The other question is, is there a requirement that you should be a resident of that area?

B. Kauter: I wasn't a resident of that area. I had a small private practice near Bern with only five or six employees. I had mainly contracts for renewal surveys in various communities, but I didn't do any cadastral maintenance. After receiving the appointment in Nidau district, I finished my work there, closed my old office and moved to Nidau. Several employees came with me and others went to other firms.

C. H. Weir: Do you do other work?

B. Kauter: Yes, about 30% to 40% of our time is on cadastral maintenance; then perhaps about 20% to 30% in cadastral renewal. We are competing, as you are in your country, to get the contracts. We are also working in land consolidation which is a very difficult thing to explain. I think, to go into considerable details in land consolidation, would take two hours to explain this system. It is about another 30%, and then is 10% construction survey where we are setting out highways and streets, controlling tunnels or bridges, and occasionally doing industrial surveying.

A. Hamilton: Did it come out that not only does he have to satisfy the municipalities and his clients in these communities, but he has to pass an annual inspection, an audit by the surveyor general's office. His appointment is not like an appointment to the senate; he has a monopoly on providing a service, but he's got clients and the public, as tax-payers, looking over his shoulder all the time. They expect prompt service and the surveyor general's team of examiners make sure that he doesn't cut corners; if he is doing the type of job that calls for 2nd order work, he'll be in trouble if he only does 3rd order work. He can get disqualified by failing on either count. To me, the checks and balances are the strength of their system.

D. Hosford: They audit work, both in the office and in the field. They audit his books to make sure he doesn't make too much profit.

B. Kauter: No, they cannot control directly my profit. But they control the specifications. I cannot substitute one category of employee for another. I can't send a draftsman to do a senior technician's job, nor can I send a technician to do a licensed surveyor's job.

Anon: How many licensed surveyors do you have employed?

B. Kauter: Three.

Anon: Did you say that the fee to your association is 4% or 0.4% of your gross?

B. Kauter: It is 0.4%. The other three surveyors who are working as employees in my office aren't members of the group of private practitioners. They are members in the Swiss Association of Surveyors.

AD. Hosford: So there are 270 firms in private practice?

B. Kauter: Yes. There are about 270 in this group of free practitioners.

R. Robinson: How many firms are as large as yours?

B. Kauter: About 50 to 70. If there are four partners in a firm, all four can be members of the group of free practitioners. One of them has to pay the big fee based on the gross of the firm and the others pay 500 francs.

M. Toomey: Berney, when you do your annual or bi-annual negotiations with the government on fees, what is it that's being negotiated? Is it the cadastral maintenance hourly rates that you can charge for yourself and your various grades of employees? Is that what you come out with at the end of the negotiation?

B. Kauter: First there is a tariff. The base of this tariff is the personnel structure which must be defined for every task for every part of the work. So this tariff is stable for a certain period, say, 10 or 15 years, then it must be changed. When EDM technology, computers, and so on came on the market, and we were no longer measuring distances with the chain and so on, it had to be changed.

Then, on the other side, there are negotiations between the group of private practitioners and the Association of Technicians and Draftsmen to settle the rates we pay our employees. It is also stipulated that the tariffs are modified every year to include the inflation factor. It is agreed that if inflation in one year is under 3% then tariff will not be changed.

M. Toomey: It is clear that you get a rate for the work unit rather than an hourly rate.

B. Kauter: All the work on maintaining the cadastre was fixed in the tariff made in 1966 as was all the work concerning the renewal of survey. There are several little tasks which cannot be defined in the tariff and are paid in time per hour but this is not even 5% of the whole cost of a renewal project.

R. Ferguson: How do you account for equipment in the fee structure?

B. Kauter: In our tariffs it is required that you have your office equipment which guarantees that you can deliver the work to meet the specifications, and the same in the office. If you have for instance an old PC 64k with obsolete software, you will not be able to meet the specifications with the software. So your equipment must be at a certain level and this level is assumed in the prices of the tariffs; if you have better equipment or equipment which is more expensive than this assumed level, that is OK.

R. Ferguson: So what you're saying is there is prequalification then. You must have a certain level of equipment to be able to qualify. Is that right?

B. Kauter: That is right. You can imagine you cannot leave from university work, serve as an employee for three years, then take the examination for the license and then open your own practice without any equipment.

R. Ferguson: I understand in terms of an individual. My question is that as equipment evolves, and you spend a lot of money on equipment, how do you recover the cost of the equipment?

B. Kauter: For the maintenance of the cadastre and for the renewal, I cannot do it directly. I have to buy it and then work with it but I cannot sell or put costs from this onto the job. I can perhaps convince several communities to have a special service for utilities and get them to contribute to an upgrade for my computer.

R. Ferguson: But it is your responsibility to convince the community. Is that what you are saying?

B. Kauter: Yes.

Anon: I sympathize with that.

R. Ferguson: No. If he buys a piece of equipment that cuts his time down, the tariff doesn't go down, so he's more productive. He's not tied to an hourly rate the way that most of the work here is. He's got that edge.

C. Weir: I suppose that the main object of this discussion today is how do we, as Alberta land surveyors in our firms get into LIS. And if you look at the Swiss example they have an exclusive area of practice which gives them the bread and butter to get into it. I think what we're looking for and searching for is some method where we can get into the information systems business.

B. Hosford: I suggest that we have to build up our expertise, that we have to build up our funding to get the hardware, the software, and then build up our markets. And it's difficult.

Anon: In your paper you mentioned the report about the Swiss cadastral service system. Is that not a central data base system? Who is running this system? Is that the private surveyors or is that a central agency?

B. Kauter: There is no such system yet. That is something under discussion. It could ultimately be a central agency, but first, this data is stored in a computer in my office. We were looking at the specification, that must be done with this reform whereby this information from the land surveyor could be taken out or accessed by, say, a doctor if he is interested.

It will not be centralized in the first stage. At our level, every district surveyor will be linked to a canton office of survey so that they can take out or ask for information in the office of the district surveyor. We will also be linked with the land registry so that if an ownership is changing, it will appear in my monitor.

R. Ferguson: Excuse me, you mentioned that a doctor wanted access to some information. Can I ask you first of all, where he would go, what's his first contact to get that information? Does he come directly to you, or does he through the administrative cycle?

B. Kauter: I mentioned the doctor because he is perhaps an owner of a parcel, and he would like to have information of this parcel, the area, perhaps co-ordinates of the boundary point of his parcel. He knows that for this information, he must come to my office.

R. Ferguson: Is that information in digital form? This morning you said that your map was the definitive document. Do you have it in digital form? If no, aren't there a lot of problems if the doctor wants to access you digital file?

B. Kauter: Yes, there are and I see that it is not the same problem. We will have the same problem perhaps five or six years later than you. If that doctor has a computer, and he wants perhaps not only one parcel but he wants the whole community, I will give him a floppy disk, he takes it with him and he puts it in his computer. It depends perhaps on the format and so on but that is my problem. If he wants to work with this data I will give him a floppy disk with my format. For instance we have this problem also when another land surveyor does a new survey in my district and he has another computer than I, so he has all the data on a tape or perhaps on a floppy, and then it is my problem to put it into my computer. There are many codes and I may have to develop a little program to change this code into a code that can put his data into my computer.

A. Hamilton: If you followed Bernhard's explanations, there are in effect two levels of private practice in Switzerland. There are those who have competed for and got an appointment as district surveyor, and there are others who compete for a variety of jobs. What it means is that there are only so many openings; we have this, of course, in many professions, for example the hospitals will only grant admitting privileges to a certain number of doctors. Other doctors can practice but they can't admit patients until the hospital says there's room for their patients to be accepted there. Can the land surveyors live with a similar two level structure?

Can we have one of the private surveyors answer the question?

Anon: They can as long as they are on the top level. Not only that, there are probably 150 private firms in Alberta, there's 270, I believe, in Switzerland, and Alberta's a lot bigger than Switzerland, there may be room for the majority of the existing firms.

R. Beaumont: Our guest speakers have answered many of our questions on the roles of both the private sector and the public sector, but at the same time, they have raised more questions for us to think about.

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The Victoria Branch Seminar

The Victoria seminar, held in the Harbour Tower Hotel on Feb 21, was organized by a committee chaired by Gary Sawayama, Branch Chairman. There was a brief discussion immediately following Mr. Kauter's presentation in Part I and then following informal presentations by Don Duffy, Ken Bridge, and Michael Taylor, there was general discussion.

Don Duffy, Surveyor General, is in the Surveys and Lands Branch, Ministry of Lands, Parks and Housing. Ken Bridge is head of the Surveys and Cadastre Section, Surveys and Resource Mapping Branch, B.C. Ministry of Environment. Michael Taylor, B.C.L.S., is with Wright, Hillyard, Parry and Fuller, B.C. Land Surveyors and Consulting Engineers in Duncan.

Participants

W. Arthur Benson	Ministry of Environment, Surveys and Resource Mapping Branch (SRMB), Victoria
Arthur C. Bridge	Ministry of Lands, Parks and Housing, Surveys and Lands Branch, Victoria
K. M. Bridge	Ministry of Environment, SRMB, Victoria
Ron Cuthill	Ministry of Environment, SRMB, Victoria
Donald A. Duffy	Ministry of Lands, Parks and Housing, Surveys and Lands Branch, Victoria
Allan Hardie	B. C. Land Surveyor, Ganges
Loren Lehder	Ministry of Attorney General, Land Title Office, Victoria
John M. Magwood	Ministry of Lands, Parks and Housing, Victoria
J. R. Marshall	Ministry of Environment, Victoria
Ken Mawle	Butterfield, Hughes and Mawle
Michael J. McIlvaney	B. C. Land Surveyor, New Westminster
A. M. Osman	Isaak, Osman and Associates, Langley
Gary Sawayama	Ministry of Environment, Surveys and Resource Mapping Branch
M. Louis Schoolkate	David Burnett and Associates, Burnaby
Blair Smith	DEMR, Canada, Vancouver
Ron Stothers	B. C. Land Surveyor, Kamloops
Michael J. Taylor	Wright, Hillyard, Parry and Fuller, Duncan
Dave Underhill	Underhill and Underhill, Vancouver
Case Wagenaar	B. C. Land Surveyor, Richmond
Don Watson	B. C. Land Surveyor, Delta
John Whittaker	B. C. Land Surveyor, Victoria

8.1

THE SURVEYOR-GENERAL'S OFFICE

Don Duffy, Surveyor-General
 Surveys and Lands Branch
 Ministry of Lands, Parks and Housing

I want to say a few words about what we're doing at Surveys and Lands and then I assume that the other panel members will do something similar. Some of this may not be new to some of the people here because I gave a talk on our program at the Corporation of Land Surveyors Annual meeting a couple of weeks ago. I'd like to start with a brief historical sketch of the activities of our Branch as a keeper of land records and land information.

Historically, the Branch has been the custodian of the Crown Land records system, and we are the filing agency, rather similar to the Land Title offices for private land; we have a similar function as regards to Crown Land. When a parcel passes from the Crown to private hands in British Columbia, then it passes out of our record system to the appropriate land title system and it doesn't return unless the Crown acquires the land again, which may happen. In depression time, in the 1930's in particular, thousands and thousands of parcels were returned to the Crown. So we have in our system large numbers of parcels that have previously been alienated. We are the custodian of the official plans; there are about 70,000 of these; they are the original surveys of the Crown lands. We keep the official land registers, which are the registers which record the Crown grants and so we have a record on every parcel in B. C. that was granted by the Crown and if it returns, when it was returned.

We keep the Official Reference maps which are the graphic record of all the Crown land; these were started in the early days because as surveys were done, it was necessary to keep track of where they were, and how they related to each other. They increased in number over a period of time. There are 729 now, at various scales, covering the whole province. They had always been kept up-to-date manually; if they had not been kept up-to-date, we would have had a very confusing situation. So we have always had a land information system.

In 1979 a decision was made to go to a digital mapping system. An Intergraph system was installed in 1980. This system now consists of eight graphic terminals supported by a VAX computer. Currently we are mapping in the 1:20,000 series. This will cover the entire province and it is a system that is used by the other B.C. ministries, particularly, Environment, Mines and Forests. All these ministries have compatible Intergraph systems and we are able to pass computer graphic information back and forth. We obtain from the Ministry of Environment most base mapping; we do some of the cadastral mapping; we do our own reference mapping. So we are working on a set of 1:20,000 reference maps. This will be a replacement for our archived 729 Official maps. As we get coverage in the 1:20,000 series, we take the old maps out of service. This is a long process because there are about 7000 maps in the 1:20,000 series and some of the old maps will be in service for a long time. What we're trying to do is replace them in the most active areas first, and we expect that by the end of next year, we will have new mapping in areas covering about 80% of our land activity. For very good reasons, these maps are also the most worn and battered of the old series; they have been used a lot and this is a second reason for replacing them. We also have our automated Crown land registry. This is the automated replacement of our historic manual system; that is, the old official register. This system is fully functional. It covers all of the Crown land parcels for the province; it covers all of the Crown tenure. It amounts to a Crown Title system which is complete and fully automated. So all of the crown parcels are in this system. This is an interactive

system carried in our IBM 4381 computer. The central processor is located in our Branch in Victoria and there is direct on-line access to all of our regional offices, also to some other ministries especially the Ministry of Forests because, for long standing operational reasons, they actually carry a lot of information on our systems. They have several active terminals there for updating. All of our regional offices have access for inquiry purposes. There are some updates they can do, and there are some updates that are limited to people in our own Branch. For example, the confirmation of legal descriptions and areas are limited to Surveys and Lands Branch personnel. Anyone who has access to the system can inquire as to the status of any Crown lease or license, when it expires, when it is updated and our billing is done automatically.

8.2 PROPERTY MAPPING IN THE SURVEYS AND MAPPING BRANCH

Ken Bridge
 Surveys and Cadastre Section
 Surveys and Resource Mapping Branch
 Ministry of Environment

My topic is the status of property mapping and property mapping as we know it in this country . Our property maps are just a pictorial representation of the cadastre and have no legal status. Within the Surveys and Resource Mapping Branch there are two programs of property mapping; one is the medium scale (1:20,000); the other, that I am going to address this afternoon deals with the larger scales, i.e. one in 5,000 or larger.

Some of our maps are made with in-house capacity, some are done by contract, and some are done by municipal authorities with cost-sharing. We currently produce in-house about 115 a year. There is something, I believe, in the neighbourhood of 6000 sheets to cover the developing areas of the Province; thus, at our present rate of in-house production, this is a very long range program. I forget just exactly how many sheets were done by contract, but I would say somewhere in the neighbourhood of 200 a year.

Our in-house maps are produced currently by a digital graphic system and based on ties to the control survey system; the data is digitized in distinct layers from which you can pull out certain attributes. This, of course, has to be integrated with the digital information that we get in the other computer systems. This, then, allows the municipal authorities or the records keepers to integrate cadastre or underground utilities. As Angus mentioned this morning, there is property mapping for about 20% of B.C., but that is a very rough figure. When we say 20%, that is 20% in current standards and current specifications. There exists within the Assessment Authority some 5000 cadastral plans which cover the whole of the province, but these are at varying scales and at varying accuracies and in varying stages of update.

As far as our in-house production capacity is concerned, we would like to go to the total capture of the information from source documents in digital form; in others words, we would like to use the computer to bypass the manual stage in capturing information. This goes hand in glove with our integrated survey programs.

In B. C., once an integrated survey area is declared, the legal surveys must be tied to control monuments. Integrated surveys, as they now exist in British Columbia, are probably used for everything except integrated surveys. B. C. never took that final step to give legal status to those control monuments which are used to give coordinates to the cadastre. It requires a complete change in the process of thinking of the survey community across Canada before that concept can really take hold. They are used for property mapping as we know it now, they are used for public works, they are used for mapping, for layouts, for sewage, for construction, everything except to legally define the property. That one thing never really takes place, and until that does, then the total fulfillment of the concept of integrated surveys will never take over. That's basically what we do in the Survey Branch, we are the makers of maps, not the users of maps.

8.3

**CADASTRAL MAPPING
BY A PRIVATE FIRM IN BRITISH COLUMBIA**

Michael J. Taylor, B.C.L.S.
Wright, Hillyard, Parry and Fuller
Duncan, B.C.

In 1969/70, North Cowichan became one of the first municipalities to establish an integrated survey control network over much of their district, becoming Integrated Survey Control Area No. 10. At the same time, they saw a need for some larger scale cadastral base maps in their more populated and expanding areas.

In 1970 our firm commenced preparation of 1" = 100' (1:1,200) cadastral maps, providing them with two sheets. We prepared five sheets in 1972 and during the period of 1973-1975, prepared 54 more, still retaining the imperial scale.

In 1978 North Cowichan realized a change to a metric format was needed, and so ordered an additional sixteen sheets done at a scale of 1:1,250. In order that the newly prepared sheets be consistent with the rest of the mapping base, we took the 61 sheets previously done and reduced them from 1" = 100' (1:1,200) to 1:1,250. To date, North Cowichan has been pioneering large scale base mapping, to some extent establishing their own grid system for numbering the sheets and their own presentation standards and format.

The B.C. Provincial Government announced, on August 20, 1979, a program to assist in large scale base mapping for municipalities and regional districts, immediately receiving a large number of enquiries on the program. This program supported large scale base mapping for these areas by a 60% (provincial government)/40% (local government) split of the expense to acquire such mapping. North Cowichan was quick to jump on the bandwagon; however, as their sheets did not conform to the standard provincial grid system, some revisions were required for the existing base maps.

In order for the existing sheets to conform, we had to cut and splice the sheets to the new standard grid, and had them photographically reproduced. Along with those revisions, we produced more cadastral maps, at a 1:1,250 scale, on the new provincial system, bringing the total number of sheets to 122. Between 1980 and 1986, there were eighteen more sheets produced in the 1:1,250 format, which gave an approximate coverage of 40% over the municipality. Up to this point, the sheets had been manually compiled and drafted, using periodic field ties from the integrated control net to existing cadastral monuments for positional accuracy, scale and rotation.

In our terminology, **cadastral maps** show cadastral boundaries and parcel information (lot number, plan number, section, range, district lot, and land district) in a map numbering system known as the British Columbia Geographic System (B.C.G.S.) The borders of these sheets are based on geographic coordinates and in the case of the 1:2,500 mapping in the North Cowichan area, are 0° 00' 45" in latitude by 0° 01' 30" in longitude. Also shown on the map is the UTM grid, provincial control survey points, easements, foreshore lots, municipal boundaries, park boundaries, etc. We do not put on any buildings or topographic detail. These maps are not used in support of title to the land but are created as an accurate representation of the cadastre only.

Large scale base mapping, as a general rule consists firstly of a cadastral layer but can be any combination of cadastral, planimetric, topographic or orthophoto layers, depending upon the requirements of the particular user. However, a separate layer is created for each of these features; therefore, any combination can be achieved photographically.

Current project in North Cowichan. In 1984 North Cowichan wished to upgrade their cadastral base-mapping to the 1:2,500 provincial format, and approached the Provincial Government for assistance via their cost-sharing program. A contract for eleven 1:2,500 sheets was put out to tender and won by Associated Engineering in Vancouver. In 1985, a further seventy-one sheets at 1:2,500 scale were requested and was once again put out to tender by the Surveys and Mapping Branch of the Ministry of Environment. We were the successful contractors for that particular project and were in the midst of production of these at the time of the "Land Information and the Land Surveyor" seminar in Victoria.

We compiled these sheets on our Wang 2200 computer, using at first, all available ties of the cadastre to integrated survey control from plans registered in the Land Title Office in Victoria. These plans, if they were drawn after the inception of the integrated survey network, were required by the Surveyor-General's regulations to be tied to the control survey prior to deposit in the Land Title Office. This gave us a good framework upon which to compile the cadastre. In some remote parts of the municipality, additional ties were needed in order to strengthen this framework.

By using the UTM coordinates thus derived, and by applying rotational elements to the remaining non-integrated survey plans, we were able to build up and in-fill the cadastre, computing a UTM coordinate value for nearly every lot corner. While computing these coordinates, the software of our computer allowed us to draw the mapsheet on a graphics screen and concurrently save the plotting sequence for future automatic drafting on our flat-bed plotter. These plots were done with ink directly onto the mapping film. At this point, the sheets were given to our drafting staff for completion of the linework and annotation, and border details.

The specifications of the Surveys and Mapping Branch for cadastral mapping are followed in the compilation of these sheets, in which there is an allowable scaling error of $\pm 0.25\text{mm}$ at map scale for subdivision lot lines and $+1\text{mm}$ for district lot and section range lines. The parameters translated in $+0.62\text{m}$ for lot lines and 2.5m for district lot boundaries at this particular scale. We found that in compiling these sheets by computation and rotation of existing surveys on our computer, we were easily able to achieve coordinates within these parameters, apart from those areas where there were serious errors and discrepancies in the original surveys and field notes. We had, therefore, created 71 cadastral maps by the generation of actual coordinate values for the cadastre, thus approaching, I believe, the Swiss model for a cadastral base mapping system. The completion of the 71 sheets brought the 1:2,500 coverage of North Cowichan up to 77%.

Tofino project. We are starting on a 1:5,000 base mapping project for the Ministry of Environment which will see 15 cadastral base maps produced in the Tofino area, on the west coast of Vancouver Island. The features on these maps will be identical to those on the 1:2,500 maps of North Cowichan, other than its geographical coverage ($00^{\circ} 01' 30''$ latitude x $00^{\circ} 03' 00''$ longitude). We are only producing the cadastral layer; however, there already exists a planimetric layer which will be combined with the cadastral layer in the finished product. The finished product will be a positive transparency from which paper prints can be reproduced. Again, should a topographic layer or orthophoto be

produced in the future, it could be combined with the layers we are doing now, but at the present, the final plan will show only cadastral information and planimetry.

Maintenance. We are not doing any maintenance of these sheets; that is handled by the Provincial Government's Ministry of Environment who "own" the sheets, and the local municipality who update for their own purposes; North Cowichan has a person on staff who handles the up-dates. They receive copies of all surveys done in the municipality so they are kept up-to-date on changes in the boundaries by the Land Title Office.

The firm. Our firm commenced business in Duncan in 1951 with Mr. B. White, B.C.L.S. at the helm. Through the years, there have been changes in the partnership of the firm, which results in its present incarnation as Wright, Hillyard, Parry and Fuller, Land Surveyors and Engineers. We have expanded outside of the Duncan area to open branch offices in Victoria, Nanaimo and Parksville. The firm includes five B.C. Land Surveyors, one Professional Engineer, and related support staff in legal survey field crews, engineering technicians and qualified drafting staff. One of the partners also holds a commission as a Canada Lands Surveyor (C.L.S.).

We have had a long standing relationship with the Corporation of the District of North Cowichan, providing legal surveys for them since the early 1950's. These legal surveys have included subdivisions, by-law plans for road dedication, right-of-way surveys. In addition, we do periodic updates of their integrated survey control network and do numerous boundary and corner location surveys for their forestry and engineering sections. However, we have never been under contract to them, nor under retainer; the Corporation of the District of North Cowichan have always, for the most part, selected our firm to provide these services, due to what I hope and trust is good service!

The future. Digital mapping is, of course, the next generation of topographic, planimetric, thematic and cadastral information. We are currently expanding our capabilities into this field and soon will be able to provide cadastral base maps in digital form, that can be viewed on a micro-computer based CAD system, as well as having actual coordinate values for all points on the map. North Cowichan is wishing to advance along similar lines and we are currently examining these avenues with them. Our methods of compilation will not be altered; however, we see the finished product of the future not as a finished ink drawing on film, but as digital information on a computer disk.

8.4

VICTORIA DISCUSSION

8.4. Part I: Immediately after Mr. Kauter's presentation.

D. Underhill: How much of your firm's work is in maintenance?

B. Kauter: Maintenance in the district of Nidau with the population of about 40 000 people takes about 40% of the activities of my firm. Another 30% is renewal; first, I have to convince the municipalities to do a new survey, then, I must compete with other surveyors for this work. The other 30% is land consolidation setting out streets, buildings, and perhaps not even 1% is industrial surveying.

R. Cuthill: The introduction of computers and the development of data systems for storing, updating, and retrieval have a high capital cost. I'd like to know how you handled that with such a structure because it seems that you have a tariff which is subject to government audit. Being a labour intensive operation, if you increase automation, then the tariff as you have described it, would penalize those people who want to do more by automation. Am I clear?

B. Kauter: Yes. You are very clear. On your question there is a simple answer. All these investments must be done by the private practitioner and there is no influence into the tariff because of these investments. I cannot get a better price per traverse point because my installation, my computer is on a higher performance level than the installation of another land surveyor. Neither one has any influence on the tariff. I can't get a better price per traverse point, or per boundary point just because I have a more modern installation. Both must follow the instructions and meet the specifications. But if I have a system which allows me to do the work in a shorter time, I am better situated than my colleague, the other land surveyor with perhaps a five year old system, five year old software, working not so fast as mine. Also in the field, you can always write every measurement on the field sheet and then go home to the office and introduce all this data into the computer. We do not like this. In my firm, we are registering in the field directly on tape, and then we put the data from our tape directly into the computer.

A. Benson: If the district decides to computerize, how can the private sector respond?

B. Kauter: A reform of the Swiss cadastral survey system was started three years ago, and with this reform we would like to work out specifications where this aspect will be regulated. Until now every land surveyor has had his own system and sometimes it is difficult to link one system to another or it is difficult to introduce data from one system into another because the formats aren't the same on the different systems. It depends on system first and it depends also on the software. Until now our data has not been centralized at one point for the whole country or even at one point for the canton.

There is another system; for instance, in the French part, they haven't the system of district surveyor. There are about 30 surveyors and every surveyor goes to every region for maintenance. There the canton has all the documents; all these documents for every municipality are centralized at the administration, and then every licensed surveyor has to go there if he has work to do, fetch the documents and then he does his work, and then he gives it back. Their system will be that every land surveyor will have a computer in his office. Of course, all of them must have the same system and then they will be linked to the canton off line. The first stage is likely to be off line; they will fetch this data on a tape or a floppy disk, put it into their computer, then give it back after the revision. Linking is

also practised by telecommunication between the private surveyors and the cantonal administration.

G. Sawayama: Can some of the other surveyors lobby with the other political parties to have you replaced if the Canton government changes?

B. Kauter: They could but the district surveyors in 95% of all the districts stay out of politics. There are politicians who are deciding about district surveyors. In my district there are about 6 or 7 municipalities with 200 or 250 inhabitants only. There are no politics concerning the district surveyor. It is my job to stay in good contact with the municipalities and with the municipalities' council because every four years the municipality council is changed. Every four years there are elections in the municipalities and in most of these municipalities, the president of the municipality cannot stay for more than two terms. So the municipal council is elected every four years and it is up to me to have good contacts and to make contacts with the newly elected municipal council.

D. Watson: You appear to have two systems. One which I might call your system, the other system I might call the open system, which seems to be the system that we have in this country. There is probably benefits from one, and benefits from the other. Could you compare the two. I mean why do you have two different systems?

B. Kauter: That's our federal system. Our federal laws, as I told you in my introduction, give a lot of room for different solutions. Even in our surveying sector, we have these two systems although there is only one canton using the open system. I prefer the system of the district surveyor. There may be some advantages to the open system, but I can tell you that that system is more expensive for the client than the district surveyor system.

K. Mawle: Is there any difference in the standards of survey?

B. Kauter: No. There is I would say no difference. The big difficulty is that in this other system, different surveyors are working on the official original map and I prefer that the map is always maintained by the same office.

A. Hardie: How do you define natural boundaries?

B. Kauter: By natural boundaries I presume you mean a river or a stream. We do it by surveying, fixing it in the field where the two owners agree. We calculate the co-ordinates without monuments and with the co-ordinates we can plot this boundary into the cadastral map and then it is fixed.

A. Hardie: What happens in the case of river erosion?

B. Kauter: There must then be a new agreement. This boundary must be fixed or defined by the same persons, the concerned owners and then there will be a new survey because the areas of the parcels on both sides of this river will change.

C. Waggoner: What do you do if the boundary markers don't exist any more, if they're gone?

B. Kauter: First we replace the boundaries using the co-ordinates if we have them. For instance in one community, the survey was done in 1913, no co-ordinates are available for the boundary points, but the map is still in use. It is maintained because there hasn't been a renewal in this community; they say, "it's good enough for us." For this community we

have only the traverse points, we have only co-ordinates for the traverse lines. As it was measured in 1913, the precision for the angles especially the distances measured by chain may give a one meter linear closing error at the end of the traverse line. If we have to replace one boundary point in this area, we must try to find old measurements, if they are existing, then we are setting out with the original measurements. We may have to take several distances or angles from the original map to replace the point. The two owners or perhaps three, are invited to come to the plot and then we show them the new replaced monuments and we discuss it with them. If they do not agree, we don't change. We have done our job and if they are against this they must complain at court.

A. Benson: Do you hold all the documents for your district?

B. Kauter: Yes. All the documents which are existing concerning my district are in my office. Perhaps one of my predecessors, or one of his employees could have lost a document. However, in my 11 years, it hasn't happened that we couldn't find a document.

R. Cuthill: In Canada in recent years, we've done a lot of talking about the concept of the multipurpose cadastre. In addition to defining the location of the property and maintaining the associated property records, we are talking about relating information about land for the purpose of planning, analysis, and management. Have any of your cantons been employing these concepts?

B. Kauter: Yes, there are cantons who have multipurpose cadastre. This can vary, little cantons, for instance the town of Bern with only four villages around the town has a system like this; it is also installed by the canton administration in the town of Basel. It's quite computerized. There is perhaps an important point of view we should always have in our mind. There is a big difference between our country and Canada. In your country, you have for instance the oil and gas companies which are drilling somewhere in the north, and then they are establishing pipe lines into the centres where the oil or the gas is needed. These companies would be interested to have a system where they could get alphanumeric readout with all the information about every parcel they would like to cross with their pipe lines or gas lines and another output on a screen where they could see the plan for every parcel and the maps for the regions which would be traversed by their lines. There would be thousands of parcels traversed by such a gas or oil pipeline. We haven't those problems in our country. We have for instance the electricity companies, they are producing electricity in the mountains with turbines in dams. Then they are bringing down from the mountains electricity. All they need is a little place to put their pilons on every 150 or 200 metres. So far nobody is interested in having a land information system for a big region. Where the interest is growing now, is in the municipality. The municipalities are interested or at least I'm trying to convince them that a computerized land information system in their municipality would be something valuable. They have their maps of their utility services showing where the water pipes and perhaps where the TV cables are in, It is up to me to convince them that a system like this would be good for them, and to get the contract with the municipality.

R. Cuthill: Do you think the initiative for a computerized system should come from a private practitioner?

B. Kauter: It will come but we must have help from our cantonal administration and we must also have help from our federal department of survey. We must work together, and I think that it is the same in every country where you have a free system. One side is government, one side is free practitioner. You must come together and you must find the solution which helps each other. There are perhaps difficult talks together, but in every

case on every level each helps the other; government needs the help of the private surveyor and the private surveyor needs help from government. The municipalities, on the political level are contacting the cantonal authorities. It is bad if the private surveyor tells them something at the municipality and then they go to the cantonal authorities they hear other things. That's why I think it is useful to come together and to pull in the same direction.

8.4 Part II: After presentations by Duffy, Bridge and Taylor

R. Cuthill: How did the Swiss system evolve?

B. Kauter: The basis was given by the Swiss statute book in 1912. From this, the job of district surveyor was created. From that time until now the district surveyor has been in the same situation. What has changed are the different steps; for instance, the tariffs; there were no tariffs until 1948. A lot of revision and maintenance had to be done with the growth in the population and especially with motorization, it was necessary to widen existing streets, to build highways and so on. Since 1973, when we had the recession triggered by the oil price shock, maintenance work decreased and it has now stabilized at a lower level. In my district, for instance, I haven't had the growth of my office that my predecessor had at the end of the 1960's and the beginning of the 1970's.

R. Cuthill: The initiative to define the organization structures of the different offices seems to have come from your federal level of government.

B. Kauter: Yes, but always together with the group of free practitioners; we work together and we try to find solutions which are good for government and which are good for the private practitioner; generally the ideas of the government prevail but occasionally the ideas of the practitioners are accepted. We are always trying to find a consensus or a compromise.

R. Cuthill: Would you get a situation where a municipality would go to the government and say, "We need a district survey office or would the structure of the district survey offices come from the federal government and the private practitioners getting together and saying, "This is the way we are going to have the offices throughout Switzerland?"

B. Kauter: No. It is not like that. In fact a municipality could say, "We want to have our own licensed surveyor in our administration and we will do the maintenance and the cadastral surveying for our community ourselves."

R. Cuthill: Do situations exist now where municipalities have this set up? Where they don't have a district surveyor?

B. Kauter: Yes.

R. Cuthill: So although there are options open to the community to do whatever they want to do, most communities have tended to opt for a district surveyor who reports to the canton.

B. Kauter: Yes. It's a question of size. For instance, in my district of Nidau, it would be too expensive to have a licensed surveyor for each little municipality in the district. He would never have enough work. He would stay in his office for 90% of the time turning around his fingers and waiting for a call.

There is not one of the municipalities who could afford a licensed surveyor. It could also be that a municipality would have a licensed surveyor which had perhaps 30 or

40% of his work as a surveyor but then he must have other duties. For instance, he might do all the administration in connection with the building permissions. He could also work as chief of maintenance for the utility services or he could work as chief of garbage collection. However not one municipality in the district of Nidau has a surveyor. They prefer to get together and have a district surveyor.

J. Magwood: It would appear to me that the Swiss system more or less divides the system we have. You have a land registry for legal title and your district manager's office to look after the survey records. I believe in B. C. that our land title offices do both these functions. Is that correct? You look after the documents that would be in our plans repository?

B. Kauter: Yes, that is correct.

J. Magwood: So being the District Surveyor, you look after the physical survey records for your district and then you go out and do surveys as well as that, in other words, you are a private practitioner as well as keeping the survey records for your district.

B. Kauter: Yes.

J. Magwood: Do you have a system of back-up in case of fire.

B. Kauter: Yes. All the documents are microfilmed every year. These films are stored outside of my office near the cantonal office. In my office every week we make a back-up tape and take it out of the office.

D. Duffy: I'm interested in the pricing system on these major renewal surveys such as the one you have on the wall. Do I understand that it is all done in accordance with a formula? In other words, if you are negotiating a contract with a particular municipality for that major renewal survey, the price is determined by this formula and in fact, there is no competitive pricing, that is, another surveyor can't come in and say, "I'll do it for so much."?

B. Kauter: There is this price fixed by the Remuneration Commission. Different surveyors can come in and they compete together but it is agreed between government and our group of private practitioners that no one can go lower than 10 per cent from this fixed price because every surveyor knows that if he goes more than 10 per cent below, he will lose money. At the most there are 4 or 5 licensed surveyors tendering to get a contract with a community and most of us are 8 or 10 per cent below the price set by the Remuneration Commission.

D. Duffy: So the Commission would look at the job first and this fixed price would probably be common knowledge. You would know what that fee was. You could say I'll do it for 8 per cent or 5 per cent less.

B. Kauter: Yes. And all the elements and the prices are available for every land surveyor who wants to compete.

B. Smith: The term cadastre has been used here by several people and I think everybody has a different idea of what it is. I wonder if you could explain what the cadastre is in Switzerland; and I wonder if we could have someone explain it in a Canadian context.

B. Kauter: In Switzerland there are two parallel institutions. On the physical side, there is the cadastral map with three elements: a network of traverse stations tied to triangulation;

in rural areas there is a general map 1:10,000 with contours and vegetation and there is the cadastral (property) map; parallel with this is the land registry or the land title office as you call it here in B. C. Together this is the cadastre in our country defined by the Swiss Statute Book 1912. But you can speak of other cadastres; for instance, you can have a utilities cadastre.

A. Hamilton: The term "cadastre" has no official definition in Canada. We use it only as a concept. The most important aspect of the cadastre concept is the continuous updating of the parcel fabric. Only in the last couple of decades has this been a goal in Canada and we have a long way to go to catch up to the Swiss.

A. Benson: It seems to me the advantage of the Swiss approach is that it allows for the integration of all these things whereas it is quite apparent in British Columbia's system, if not Canada's, that had we gone out to design a way to make it more difficult to integrate, we couldn't have done it better. The question I would ask, considering Loren Lehder's work is, "Has the computing system been redesigned so that Ken Bridge can get the data he needs in order to do a better integration of the cadastral data?"

L. Lehder: The ALTOS system doesn't have anything to do with the dimensions or locations or anything like that.

K. Bridge: We have carried on lengthy discussions with the Land Title Office using the ALTOS system as a plan search device.

L. Lehder: I don't know of any move in that direction; the current direction is merely to automate all of the titles. It is thought of only as a title records system because the Land Title Office concerns itself with title. Because of all the exceptions and reservations, such as exceptions to section 23, etc. it's a nice convenient out for the Land Title Office to say that current procedures for ALTOS are strictly as a filing system for ownership and charges against the title. That's not saying that after we get to the point of having everything computerized, we won't be able to then go the next step and get the parcels on to the system.

K. Bridge: I was just concerned with the fact that land surveyors in private practice spend a lot of time doing manual plan searches. It seems that with the addition of a small amount of additional information being fed in at this stage, this could be done readily by a subroutine within your program. Right now, you feed in a short title; if you fed in a full title, you'd have it.

L. Lehder: We feed in the full title right now. What we would have to do, of course is feed in the co-ordinates, etc.

K. Bridge: No. What I want to know is, do you feed in an abbreviated description of a block; i.e. Block 1, Plan 123456? That, to me, is an abbreviated description.

L. Lehder: That's only the short legal description. We also have the full legal description on the title.

K. Bridge: Is the legal description fed in for every parcel? Lot 1, Plan 1, all the way down to the original district?

L. Lehder: That is in there for every title now. Always has been. It is not a formatted search field. You can't search by it.

L. Lehder: The ALTOS system is entering the records identically as they were under the old manual system. So if you remember what the old title looked like, where you would have Lot 1, or just straight Lot 27, Newcastle District 1277, you still have that exact same thing in the computer.

K. Bridge: But the search parameter I was looking for was, "Give me all the plans in district 1234".

L. Lehder: I don't think we could do that at the present time.

L. Schoolkate: I was talking to various people who are working on the ALTOS system of land titles at New Westminster and they were telling me that they have some modifications coming on the software and that may be one of the things coming along. They couldn't say when.

K Bridge: It's really quite simple. I volunteered to provide the labour and money necessary to make the conversion. I still haven't had a reply.

L. Lehder: There are enhancements to the system occurring all the time. It is a new system and I think that primarily the first objective, before we start talking about being able to have a data base throw up every plan which is in District 27, is to get the titles on properly. I think once that's done, you will then be able to come in with enhancements. The problem, of course, is that not every title is going to get into the system so it would still not be 100% complete. So if you say "Give me everything in District Lot 27, you may only get 95% because there is some 5% which can't go into the system yet. There are absolute ownerships to minerals and absolute titles which aren't going to go into the computer.

J. Whittaker: I have a question of Loren. I heard that it won't be long before the Branch offices like Lands, and possibly Environment, and other governments agencies will have terminals that will plug in automatically to communicate with your computer and I have also heard that the lawyers can also foresee the day when they will have a terminal which will talk to your computer.

L. Lehder: There are, as far as I know, absolutely no plans afoot for either of those. Of course, they are possibilities and every time you have a possibility something is bandied around and discussed. But even if there was a terminal in the office of every surveyor, you wouldn't be able to see the plans. You would only be able to see the current ownership and the current status of encumbrances and changes and you would only have access to some 95% of them. It has been discussed but I don't know if its going to be available at satellite offices or whatever, but obviously five years from now we might have a whole new ALTOS. The industry is moving too quickly to be able to say that you are not going to have those type of things, but I do not know of, nor have I ever been informed of anything in the next three or four or five years where that would be available. To give you an example, if you pulled up a title and the title was Parcel 8DD372196, of some district, you still don't know anything about the parcel unless you come down and look at the DD on the microfilm. So you have the opportunity of having it in your office, but unless you have all the microfilm, you are only getting half the information.

Question: Are you ever going to digitize the documents?

L. Lehder: I have no idea.

A. Hamilton: Does your group consider you are in the information business or in the legal business? At the international symposium on land information in Edmonton in October 1984, one thing that came out loud and clear was that all the people dealing with land and land related information were slowly recognizing that they are in the information business as well as in their traditional business. Those in assessment recognized that they were part of the information network as well as part of the tax system; those in land titles recognized that they were part of the information network as well as part of the legal system.

L. Lehder: I would say that with the TORRENS system, because of the guarantee of title and because of the good marketability of title in B. C., the Land Title Office is in the Legal System. You get your information because we store the records but the records are there to be able to guarantee the title.

K. Bridge: Angus, in your travels with this seminar across the country, what is the consensus or has there been any sort of consensus across the country with regard to a coordinate system or coordinates governing or coordinates defining property?

A. Hamilton: There hasn't been a consensus, in fact, there hasn't been much discussion of it at the other seminars. The system that Bernhard has described is the first example of coordinates defining property that I have encountered. It is obvious that you have to have reasonably good precision and a stable system for that to work. That would be my concern. If you noticed on the example that Bernhard went through this morning where he was changing a boundary, he took all the old information out, and there was no clutter, no old lines left; in other words, they keep their system clean. They take old boundary monuments and old lines right out of the system. In this respect, it's a bit like the curtain principle in the title system. When you change a lot, you now have a new lot and you don't have to worry about whether it was made up of five different pieces or whatever. Do you clean up lots in the same way here?

J. Magwood: Everything is kept forever here. However, if there is a resurvey consolidating two parcels on that plan of survey, the old boundary is shown as a dashed line. It essentially disappears but it is there as a ghost, so to speak.

L. Lehder: It has no legal value left. We create new legal descriptions each time. Whenever a lot is subdivided, and it used to be known as lot one of a plan, if we add another portion to it, it now becomes a new legal description on a new plan so that the old boundaries no longer exist. The district lot notation is still on title so that if you have a lot which happens to go over two district lots, both would be referenced on the title -- lot 1 of district....., lot 12 of district..... But that is only the case for those lots created by the Crown. That it is not true of lots created afterwards, so if we went over the portions one, two and three of a particular plan, they would not be referred to anymore.

A. Bridge: We are responsible for the mapping and within this group, Ken Bridge is responsible for cadastral mapping and we are all control surveyors. We derive our authority for control surveying from Don Duffy's mandate. We used to be one outfit and it worked reasonably well. They split it apart and tried their damndest to muck it up completely. We're working anyway despite the system. The ALTOS system is completely separate from ours though it deals with private land. Within the Crown system, there is also a real estate agency. It is very hard to distinguish between them at times. The three entities that together make up what you do in your office are all separate, even under separate ministers. Ken mentioned to you that assessment authority had several thousand maps. Those maps are actually ours. We lost the staff to keep them updated.

K. Bridge: When we speak about property maps, the type of maps that I make are not legal maps such as you have. The legal map or the legal document on which title is based is deposited with the Land Title Office. All we do is make up a map showing a pictorial representation of the cadastre but it has no legal status. If anyone wants the dimensions or the status of a particular parcel, he has to go to the Land Titles Office.

A. Bridge: The other thing that you may not know is that in British Columbia all of the planimetry has not necessarily ever been surveyed and therefore you will find that if you go into Don's older files, you find the cadastre or the property will not fit the planimetry. One time, before Don came along, what would happen is that when the draftsman found from his legal survey that a point was supposed to be at the confluence of a river and the river didn't show there, he moved the river!

G. Wilkinson: Did I understand correctly that Bernhard also does assessment or valuation for fire insurance policies?

A. Hamilton: No. He doesn't do the valuation but on that form that was deposited in the registry office, there was a valuation. I don't know who put the valuation on but the feature that I found attractive was the fact that the insurance on the building, though not on the contents, was managed by the canton and it was under the same management as the firefighting. This obviously put pressure on that office to provide good fire protection. That office either pays for losses or pays for fire protection. Good Swiss logic. As to valuation for the insurance, I don't know who does that.

B. Kauter: It is done by appraisers under the direction of the building insurance office. This valuation is then transferred to the land registry and entered in this principle book, along with the house number, etc. for example, the value 350,000 francs, is written on this parcel sheet of the principal book. That value is also used for taxes.

A. Hamilton: What about inflation?

B. Kauter: About every 5 or 6 years, the buildings are reappraised because of inflation. Every building is also appraised if it is enlarged, when a swimming pool is established, etc. If you want to pull down a building, you cannot do it without permission. It is quite clear that when an owner gets permission to pull down his building, he will no longer pay for the fire insurance. This insurance will be cancelled and the building inspector will know that there is no longer a building on this parcel.

Question: Who decides on the numbering of your lots?

B. Kauter: The district surveyor. Each municipality has its own numbering system commencing at one and going on. A boundary point on a boundary between two municipalities has only one number; it takes the number of the first survey. If there is a land consolidation, all the parcels get new numbers. If two parcels are consolidated in the same municipality, one parcel number will be cancelled and the other one will be used.

A. Osman: As a land surveyor, do you become involved in designing subdivisions or approving subdivisions, rezoning, this sort of thing?

B. Kauter: Yes, but only for small regions. In our country we do this but only concerning the subdivision of one lot or two or three lots together. Also an architect or a civil engineer or both may be involved; usually we work together. Normally the planning of the zones in the communities is done by private practitioners, architects, civil engineers and land surveyors and the municipality is paying for this. About four times a year all the

inhabitants of the village come together and they discuss these development plans and then they vote against or for each project. In big municipalities, there is a vote by card on a weekend where everybody receives these papers at his home and it is also discussed in political parties. Then they vote at the municipalities.

A. Osman: Then the final approval of a subdivision is more or less by plebisite?

B. Kauter: Not the subdivision. The subdivision is a completely private thing. The owner of this lot can come to the district surveyor and say I would like to subdivide this lot in this form or please give me some variations for subdividing this lot. Then he can do what he wants but all the other restrictions, for instance, where the roads or the streets in this lot have to go, how large they have to be and for instance, how many meters must be between the new street and the buildings to be built on these different subdivided parcels are put on public view and then voted on.

J. Magwood: Under the zoning by-laws do you help a land owner decide whether he is within the restrictions with his subdivision. Are you the approving officer?

B. Kauter: Yes. If he wants to subdivide, for instance, in little parcels where he cannot put a building on it, I would ask why. But if it is logical, I follow the instruction concerning the surveying, if the subdivision follows the instructions from the laws or the instructions for the zoning, we execute this subdivision. There is only one case where I am obliged to refuse a subdivision; after a land consolidation the owners cannot subdivide or split off parcels. Land consolidated areas or parcels cannot be split off for 20 years. If an owner wants to subdivide, he must ask for permission at the cantonal office of land consolidation and in the last 10 years there were about 20 requests for a subdivision and only one was allowed. In this case, if the owner wants to subdivide his parcel, he has to pay back all the subsidies he received from the state for this land consolidation and it is 70%. Land consolidation with all the associated construction costs 10,000 francs a hectare; the owner pays 3,000 francs (30%) and 7,000 francs a hectare is subsidy.

Question: Is the purpose of that to preserve farmland.

B. Kauter: Yes.

R. Cuthill: Your description of cadastral seemed to include topographic mapping as part of the cadastral phase. When you are doing your maintenance work on surveys, do you include updates to the topography? Or does the topography come from photogrammetric mapping?

B. Kauter: No. I have nothing to do directly with the maintenance of the topography. It is done by the canton. The contours don't change very often -- perhaps only in a region with a lot of erosion or perhaps in a volcanic area, there the contours can change. I do have a lot to do with the maintenance of the planimetry for the 1:10,000 sheet. I have to give the information to the canton concerning the buildings or new roads or the widening or closing of existing streets. Every year, I submit all the changes for every community. I have to deliver them to the cantonal office of survey and they maintain this 1:10,000 sheet and it is set by our Swiss statute book 1912 that this general map is included in the cadastre (our juridical cadastre).

G. Sawayama: As an approving officer and also as a private practitioner for 60% of your income, is there a possibility for conflict of interest?

B. Kauter: With my work I know in advance that parcels are going to be available for selling and if my pocket book were big enough, I could jump in and buy. It is forbidden. It wouldn't be fair to all other people. My first day as district surveyor I was required by the Governor to swear that I would follow the rules, especially those dealing with land. Sometimes people will come to my office and ask me if I know if there are parcels available or how much was paid for a parcel. Every time when people speak about land prices I close my ears. When I am asked, I must say I am not allowed to give them information. I say that the prices are between 100 and 250 francs. So he knows not more than before.

G. Sawayama: When you approve subdivisions, are you wearing the hat of the district surveyor or the licensed surveyor?

D. Duffy: May I say something? I think there may be a misunderstanding here as to what constitutes an approval of a subdivision. Zoning is not really a European concept; it is a North American concept. By the time, and I stand to be corrected in this, a subdivision has gone through this process of public vote, it is much more than a zoning. It is much more like a development permit so it will be laid out already in quite a fine way so that the sort of work that Bernard would do would be like what a land surveyor does here in that he would advise the client, "Yes you are allowed to have seven lots in that subdivision and I can help you to fit them best to the topography." But he wouldn't be in a position I don't think to say, "Yes, I will approve your subdivision." or "No, I won't approve your subdivision." The subdivision would already be substantially approved with the approval process which is really a development scheme.

B. Kauter: Only the district surveyor can subdivide parcels or lots in their districts. This is because he is the only one who has all the documents.

Anon: What do the other surveyors do?

B. Kauter: This question was addressed this morning. I wasn't a district surveyor before I came to Nidau and yet I had a lot of work. There are a lot of other sectors where the land surveyor is asked for work, especially in the municipalities when he does a renewal of a whole municipality. Even a small municipality of some 500 hectares may take about three or four years. There is no problem for other surveyors.

Anon: I think there is a misunderstanding in what our surveyors call a subdivision. Your three lot subdivision, where you took that wedge from one lot and apportioned it to the other two, would be called a subdivision here.

B. Kauter: OK, it is a subdivision. But I think that we agreed together that a renewal is a new survey, replotting with field work.

A. Hamilton: Bernard, perhaps you could explain what you do when somebody comes to you and asks you to give a signed statement as to what is on a certain parcel so he can get a building permit.

B. Kauter: I can show you an example on this plan; one lot was subdivided into about 15 different small lots. Then houses were constructed. Before these houses were constructed several future owners had to get money from a bank and to get money from the bank they must go to the bank with an extract of the cadastral map where I had to sign that this map is valid. The price for a certificate such as this is 35 francs.

Anon: Wow. Let's get out of here.

B. Kauter: Is that too much? I didn't have to go out into the field. My cadastral map is always up to date. Within my area I can look up the map, make a copy from it and then sign that it is an extract of the cadastral map as of that date.

You were speaking about your Intergraph system creating 1:20,000 and so on. If for instance, a gas or oil company are interested in your information, they must come to your office if it concerns crown land. Do they have full access to this information in your system? And how much do they pay for this information. You cannot maintain all these systems without an income.

D. Duffy: That is something we haven't answered yet. Right now they would get a large benefit from the system as we would charge them only a nominal \$25.00 per hour for staff who did searches for them. There should be some cost recovery system but we don't have it at this point.

B. Kauter: Does forestry pay nothing as well. They are just linked and have also an Intergraph system as you have and then they are allowed to take out this information. This is concerning Crown land. Also why do you have your property map?

K. Bridge: We aren't users of the property map. We make property maps for administrators in municipalities, regional districts, cities, towns, villages, whatever. It is cost-shared with the municipality or the city. We either make them ourselves or have them done on contract. We retain the digital information. Most of the people we make them for cannot handle digital information so we give them a hard copy and then they do all their work on the hard copy. We maintain the digital information in our system. If somebody wanted a hard copy, there would be a cost of reproduction of the hard copy. If he wanted it in tape, they would pay the cost of the tape. But somewhere down the line there is going to be a cost recovery for this type of thing.

A. Benson: We have a pricing policy waiting to be approved and a consultant marketing study about to be let to find out precisely what that cost should be and what we should do. Already they are proposing charges, not only for the tape, but our costs in general which includes our rental costs, our administration costs, the costs of personnel, our building costs, etc. We are proposing prices for digital and otherwise that are substantially larger than anyone else has been talking about. Once those are sold, we won't hold any copyright. They can do what they want with it but don't come back and blame me in two years if it is not up-to-date. They will have to get it again. We have a sales office for those hard copies.

B. Kauter: If the land surveyor has an order to survey some lots and he needs coordinates and descriptions of traverse points or control points, he must come to you and fetch these coordinates? Does he pay for it?

Anon: If it is already private land, that information is already available from the Land Titles office. If it is not, and it is on Crown Land, then he goes to Don Duffy.

Anon: Also on a municipal level, the municipalities generally have records of all the plans in their particular area so if a surveyor is wanting to do some research, he can also approach the municipality if he is far removed from the main archival information centre, such as the Land Titles Office here in Victoria. He can go to the municipality and do his research there as well.

L. Lehder: I don't want to leave you with the wrong impression. When you go to Don's office, you don't pay. When you come to our office you pay heavily. If you come to the Land Title Office to search for the records of private lands, you get copies of the plans but

you pay for these plans. If you look at the title to see who owns it, you pay to look at the title. Even the surveyors pay. I don't want you to get the impression that the Government is footing the whole bill here.

B. Kauter: I can imagine that there could be differences between your file and those of a municipality.

D. Underhill: Yes. There could be revisions to the plan that the municipality doesn't have recorded. To be absolutely correct you should be going to the Land Title Office. When a subdivision plan is filed in the Land Title Office, a copy is sent to the municipality; so at that instant you could say it is an official transcript of what is in the Land Title Office.

L. Lehder: We hold the legal records. They hold the informational record. They have plans that show how everything patchworks together, etc. but we hold the actual legal plan.

B. Kauter: I would like to ask the private surveyors, could you imagine that the maintenance of the cadastral maps and documents could be managed by for instance, four or five different private surveyors as my situation is in Switzerland. I know that until now perhaps not all the coordinates of the boundary points are available but could you imagine that a system like this would be practical in this area?

D Underhill: Yes I think it is. The government is looking at the overall picture, putting plans together but they're not providing the control and matching the boundaries as you are doing. Land Titles take in plans but they are not really checking one against the other.

L. Lehder: I think you should ask some of the surveyors about that because I think that you'll find that the checking in the land titles system right now is probably at a higher level than it has ever been; in fact there are complaints that we check too much.

Dave Underhill: I'm glad to hear that because I had the impression that it was the other way around.

Anon: Do you check the surveyor's closure sheets?

L. Lehder: We close them ourselves sometimes. We used to close them all the time; now we close periodically. We close them if we find problems in them when we are comparing dimensions and bearings against all the adjacent land.

Anon: Why wouldn't you take Don's approach and use the printout of the surveyor's closure data?

L. Lehder: There has just never been any procedure for doing that. We used to; we have on some, for instance, when Wright, Hilliard and Perry did a large tract of land in the Highland area, we were provided with the entire closure.

Anon: How are underground utilities located and recorded? Does that come within the land surveyor's domain or is that the engineer's domain?

B. Kauter: We are competing in this sector. It is up to me if, for instance, a municipality would like to have an information system where all the different levels of utility service would be together. The basis of this utility system must be the cadastral map. So the land surveyors have a good opportunity to step in there but we must first convince the municipality that it will be worthwhile. Until now they have taken a new copy of the cadastral map every five to seven years. It depends on the municipality; if a lot of new

buildings were established in a region they will send the map back to the district surveyor to be updated. Then they introduce by hand all their utility services; for instance, water on one sheet; electrical power on another sheet. A lot of people are working in the municipalities but it is difficult to convince them that they would be better off to give all their information to the land surveyor so he could store it on a digital system. My challenge is to convince the municipalities in my district to give up their old systems.

K. Mawle: Could you give us some insight into how it was that you got so many votes?

B. Kauter: I can give you one insight. When I received the invitation to their meeting, I thought, "What should I do?" Perhaps contact municipal councils and perhaps try to get in this way or perhaps try lobbying only five or six important municipalities. Then I decided to do nothing, only go there and do a good presentation, put all important things in my presentation, comparing my qualifications with that of the others. Those three competitors who had not got one vote were lobbying. They made a big mistake. The politicians in the administration in this region don't like this kind of lobbying so I was on the right track. Really, I don't know why they elected me; it could have been problems with the other applicants.

G. Sawayama: I'd like to hear the rest of Dave's answer to Bernhard's question about whether you thought the Swiss model could work here in Victoria.

D. Underhill: Whether you are here in Victoria or anywhere in B. C. I guess its a question of whether you are looking at cadastres through the professional eye and seeing all the things it is supposed to do -- to maintain records, accuracy and cohesiveness over the years and that, I think, is what you are doing. You are making sure that the system is a consistent one.

C. Waggoner: In regard to your question, Bernhard, the only way it will work here is if we get a totally different concept of what we are doing. Boundaries are boundaries whether it is Crown Lands or alienated lands, we should put the whole system into one cadastre and surveyors should accept responsibility for it. This may mean taking plans out of the Land Titles Office. What we have to do is to recognize that the cadastral system is a public utility; in certain areas public money must be spent to put it into shape and then most surveys for private owners could be done more economically. Unfortunately, it will take time to get the public to accept this concept.

A. Hamilton: If there was the concept of a district surveyor, it would mean that there would be two levels of surveyors; the ones who had a district and therefore had a certain mandate, to a certain extent a monopoly, and there would be those such as Bernard was before he became a district surveyor, who would not have a district. Is that too radical for the B.C.L.S. to entertain? It would mean in effect, competitions and selection procedures. Some would be chosen and some wouldn't.

Anon: If one were elected as a district surveyor, he would have a function or duty to perform and be fully occupied and the others would be doing the subdividing and things they are essentially doing right now.

A. Hamilton: Not quite. That would require different rules. In Switzerland, only the district surveyor can do what is called a sub-division in Canada.

G. Sawayama: Several years ago we looked at the updating problems we had on the cadastral maps. There was an audit of the various municipalities to see how well the updating was being done and, as you might expect, we found very large variations in the

quality of the updating; not only in how up-to-date the maps were but also in how well the new planning was being transferred on to the composite map.

J. Whittaker: What we all worry about is whether, if all the maps at the Land Title Office were of the same scale, they would all fit together. Basically nobody is charged with ensuring that they do. We all know that in the field where we come up with a significant discrepancy for the distance between two posts in the ground, there is a problem. Our surveying is getting more and more accurate. It is time we decided that, rather than change the regulations that the posts in the ground govern, we should start keeping a good record of where they are now and I don't think it is being done.

Anon: Does our land title system really have anything to do with definition?

L. Lehder: I think it is the surveyors role but, at the same time, when you have transfers of title back and forth between areas in a subdivision the Land Title Office gets involved.

Anon: Is there a problem in the Acts? Could you separate the definition aspect from the land titles aspect so that the definition of the lot is by a set of coordinates so that land titles deals only with title to the plot of land?

L. Lehder: What you have is that the interest in your title is defined by a description. The plan is merely a representation of the description of the parcel. What happens is that, if you alter that description, you change the theoretical interest you have.

D. Underhill: Is there a reason why the plan portion of the land title system can't perhaps come under a new section where it can be integrated perhaps with the compilation of composite maps and that kind of information?

L. Lehder: I don't think there is a reason why it couldn't be done. The examination of the plan should be done by a surveyor. It doesn't matter if you do it in your office or you do it in a separate office or you do it in the land title office. The land title office could, if that was the concept, contract with the district surveyor or the district surveyor could become an employee of the land title system and he could then be performing all the functions that are done in Switzerland. What I am saying is that it doesn't have to be done necessarily in the land titles office. It could be done in a private office or it could be done in another part of the government. But that would require the government to change its thinking and acknowledge that this is going to be part of the system.

D. Underhill: It should be done and whether, you call it privatization with a private individual as a contractor or as an employee.....

L. Lehder: You would need many persons to do it; for the Victoria Land Title office, for instance, the job would require at least five. I think that the surveyor, that person who is examining or checking, also has to get into the nitty-gritty of land law because that person is going to have to make adjudications as to what was intended in a metes and bounds description. When you start getting into absolute titles where ownership is based upon description, that individual has to adjudicate. You can't just say, "Oh here are the coordinates and they match up." He would need land law experience to make an adjudication.

J. Whittaker: I had a conversation with the surveyor at the London, Ontario Land Title Office and he showed me how their system worked. He just took one out of every so many plans, or one that looked particularly bad. He didn't look at the details on all the

plans. He couldn't do that. He took one here and one there and also any that looked controversial.

L. Lehder: They don't guarantee title there. They don't have a Torrens system.

J. Whittaker: They have both in Ontario. What they are saying, and I concur, is that if a check like that was done, it would raise the general standards. You would only have to check one in a hundred to bring the standard up of all the other 99.

A Hamilton: Every jurisdiction differs from every other; we can't expect B. C. to copy all the procedures of the Swiss model -- or of the Ontario model. However, from this discussion, I suggest there are two facts that stand out:

- i. The thrifty Swiss have learned that keeping cadastral (property) maps up-to-date is worth the cost; and
- ii. In most cantons, private practitioners have the responsibility for keeping the cadastral maps up-to-date and all parties are satisfied with this arrangement.

Bernhard has now given five of these seminars and on behalf of the Canadian Institute of Surveying, I wish to thank him most sincerely for taking time away from his practice to tell us how the private sector serves a public need in Switzerland.

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