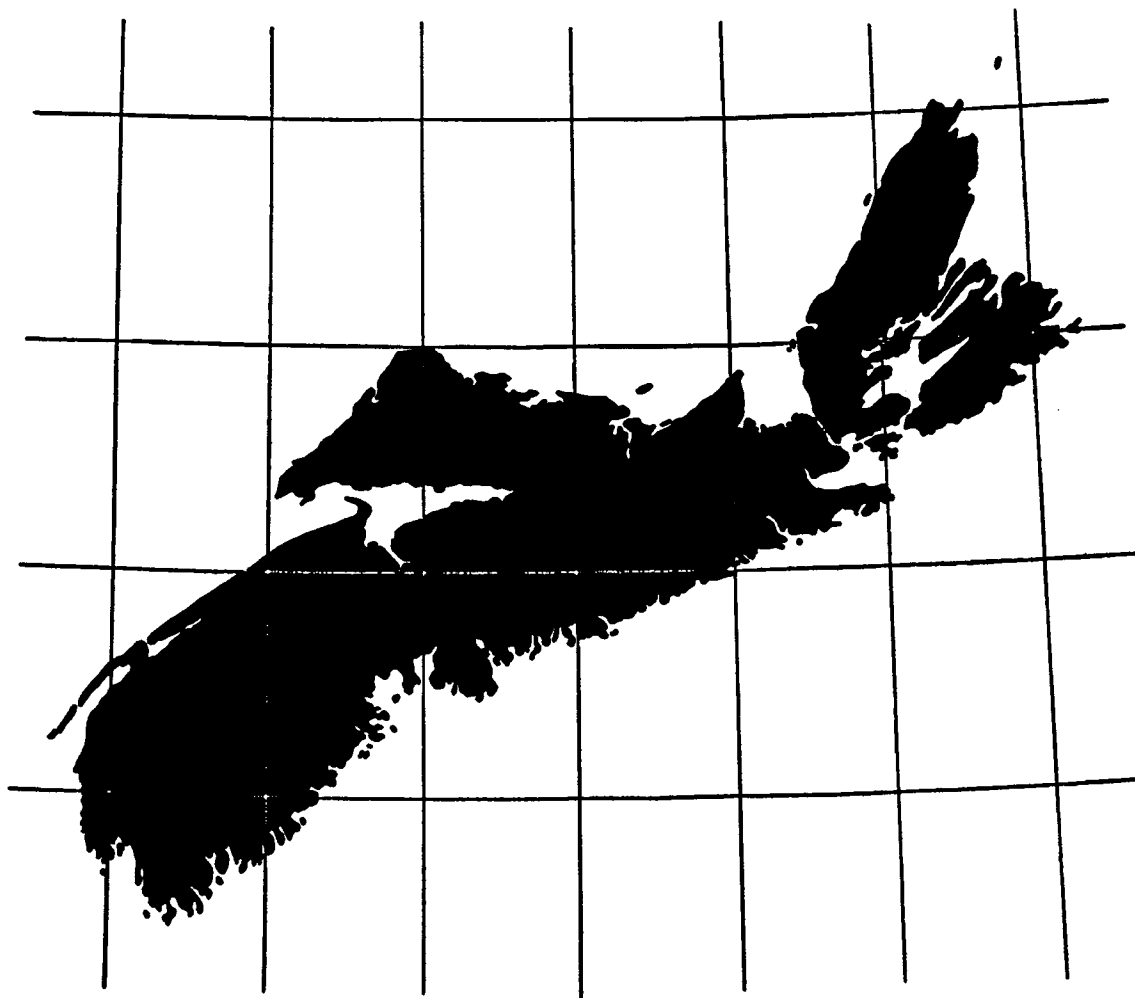


The NOVA SCOTIAN SURVEYOR



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of Nova Scotia*

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EDITORIAL

R. E. MILLARD, PLS, Managing Editor

Two facts govern the strength, respect and well being of any organization, and the Association of Provincial Land Surveyors of Nova Scotia is no exception. We have a paper membership of over 240 members who are enrolled in our organization. In this organization there are members who owe the Association over \$700.00 in unpaid dues. Some say the Council should have done things this way or that way. They no doubt are right, but the Council does not claim perfection. Has man ever achieved perfection since he has been on Earth?

Those who are behind in their dues, appear quite satisfied to let the others carry the load, while they enjoy the benefit of our new Act. The dues owed the Association are a debt to the Association and as such can legally be collected. The Council is now considering the best way to take legal action to collect these back dues. If the dues were all paid, it would not be necessary to increase our membership fees.

If you cannot send all your back dues, send some each month, then you will feel better, the Secretary-Treasurer will feel better, and the Association will be better. To carry on our Association costs money, this money can only be secured from our dues. There are some who say our dues are getting too high. They are right. But the reason our dues are getting high is because some have not paid their fair share, so the rest have to carry the extra load.

Your dues are an investment in a stronger Association that can protect your profession, and enable you to enjoy a better standard of living. If you want to enjoy a better standard of living then help your Association by making it stronger. In unity there is strength, in strength there is security and in security there is happiness and a full life. In order to enjoy this full life, it is necessary for each one of us to carry his fair share of the load financially and professionally.

The NOVA SCOTIAN SURVEYOR

*Published four times a year by
The Association of Provincial Land Surveyors of Nova Scotia Incorporated*

WALTER E. SERVANT
Presiden

H. B. ROBERTSON
Secretary-Treasurer

R. E. MILLARD
Editor

Address all communications to P. O. Box 1541, Halifax, Nova Scotia

Minutes of Special Meeting

of the Halifax and District Members of the Council and the Board of Examiners, held in the Board Room in the Provincial Building, Halifax, Nova Scotia, Thursday, December 3, 1959.

Members Present:

Walter E. Servant, President
Freeman Tupper
Col Spencer Ball
J. E. R. March
A. F. Chisholm
J. F. Archibald
V. P. Harrison, Secretary of the Board of Examiners.
H. B. Robertson, Secretary-Treasurer.

The meeting was called to order at 6 p.m. by the President, Walter Servant.

President Servant told the members that the reason for calling this special meeting was to take action on the amendments to the proposed By-laws as recommended at the Ninth Annual Meeting, and the proposed regulations as recommended and prepared by the Board of Examiners and the committee on Regulations and Standards. He informed the members of the Council that the Board of Examiners had their first meeting on Monday, November 23, 1959, and that Col. Spencer Ball had been elected Chairman and V. P. Harrison had been elected Secretary.

President Servant then called on Col. Ball to give the report on the meeting of the Board of Examiners.

Col. Ball then reported on the meeting of the Board of Examiners. He told the members that the first item brought up for discussion was the matter of examinations held previously to coming in force of the new Provincial Land Surveyors Act on October 1st, 1959. It was decided by the Board that all candidates that had been successful in passing the examinations set before October 1st, 1959, were to receive Certificates in the usual form and signed by the previous Board of Examiners. All certificates pending, due to the candidate being under twenty-one years of age, would be prepared and signed as above, but held until the required age, would be reached. All such Certificates to be dated September 30, 1959.

Col. Ball said that Section 9 of the new Act "Regulations by the Board" was then considered and that an adaption of the "Holloway Report" had been adopted. A copy of the results has been placed before each member present, along with the recommendations by the Committee on Regulations and Standards

President Servant then asked the meeting to consider the proposed Regulations which have been drawn up by the Board of Examiners and the Committee appointed to make recommendations on Regulations and Standards.

The Section on Examinations and Qualifications was then considered, and it was decided to adopt as printed.

After some discussion it was decided to change the Section on the Surveyors Compass to — "The Surveyors Compass must be of a size and sensitivity to permit bearings to be read to five minutes, and shall only be employed on surveys of less valuable lands, and for subsidiary surveys of small extent connected with lines run with a transit, and shall not be used to establish boundaries on surveys within incorporated Towns and Cities".

Under Other Instruments it was decided to delete the words Dumpy and Y so that the Section will read — Levels, Sextants, Aneroid Barometers, etc., shall be of manufacture by a reputable makers.

It was moved by Mr. Tupper and seconded by Col. Ball that the paragraph on monuments be deleted until such time as the Committee on Monuments bring in their findings. Motion carried.

The members then discussed the paragraph requiring copies of field notes to be forwarded to the Deputy Minister of Lands and Forests in the case of surveys which in any way affect the boundaries of Crown Lands. President Servant said the he was not in favour of this being in the Regulations.

It was decided that this be left and given the sub-title of Crown Lands.

It was decided that the Section under Compass Survey be accepted as printed with the exception that the last sentence, which reads, — Special Monuments may be erected under instructions from the Crown Lands Department — be deleted.

It was decided that the section on Plans and Descriptions be adopted as printed.

It was decided that the Section on General, which also includes, Appendices "A", "B", and "C" be adopted as printed.

President Servant then asked the meeting to consider the copies of the by-laws which had been placed before each member. He informed them that the proposed by-laws had been amended in accordance with motions passed at the Ninth Annual Meeting.

It was moved by Col. Ball and seconded by Prof. Chisholm that the amendments to the by-laws be adopted as printed. Motion carried.

The meeting then delegated Col. Ball to present the amended Regulations, and the by-laws to Mr. MacInnes for a legal opinion. Following this they are to be corrected and re-typed and presented to the Governor in Council for their approval.

The meeting adjourned at 10 p.m.

H. B. Robertson, P.L.S.,
Secretary-Treasurer.

Minutes of Meeting of the Council

Held in the Board Room, Provincial Building, Halifax, N. S., Monday,
January 11, 1960.

Members Present:

Donald L. Eldridge, Vice President,
John A. McElmon,
R. E. Millard,
Donald E. Wagstaff,
Errol B. Hebb,
J. F. Archibald,
J. E. R. March,
Col. Spencer Ball,
H. B. Robertson, Secretary-Treasurer.

The meeting was called to order at 2:30 p.m. by the Vice President, Donald L. Eldridge.

Vice President Eldridge called on the Secretary to read the Minutes of the last meeting of the Council.

The Secretary informed the members that printed copies of the Minutes of the last meeting had been mailed to all members of the Council, and moved that the minutes be adopted as printed. Seconded by Mr. March. Motion carried.

Vice President Eldridge then called for any business arising out of the Minutes.

Vice President Eldridge then asked the Secretary to report on the finances of the Association.

The Secretary reported that the Bank Balance on December 31st, 1959 was \$606.64, and that there is now \$30.00 on hand ready for deposit, bringing the total to \$636.64. He reminded the members that the Association still owes \$200.00 on the account of Mr. W. J. MacInnes, that the bill to the Lord Nelson Hotel amounts to \$493.26, to Past President Herbert Martell the amount of \$26.50 in payment for the expense of attending meeting of the Council on August 24, 1959, and that we also owe Col. Ball the amount of \$117.55 to cover his expenses for representing the Association at the meeting on Survey Education held in Ottawa in October.

Vice President Eldridge said that it is his opinion that the bills outside of the Association should be given first priority. He asked the Secretary if he could inform the meeting of the amount outstanding in back dues.

The Secretary informed the meeting that the total dues still unpaid amounts to about \$700.00. He said that a number of those still shown on the membership list of the Association have not paid their dues since 1956, and that some go back even further than that. He said that there may be some question that they can still be considered to be members of the Association, that there is nothing in the by-laws of the Association, which states that a member may be disqualified for non payment of dues, only that a member ceases to be in good standing after his dues are three months in arrears.

It was the feeling of the members that we will require a legal ruling on this matter.

Mr. Wagstaff said that he feels that we should bill these members for the years 1959 and 1960 and write off the other years.

Mr. Millard then moved that when the next assessment of dues for 1960 is sent out, that the members who are in arrears according to the Secretary's list,

be informed of the new Act as it applies to the practise of land surveying, and that they only be billed for the years 1959 and 1960. Pending legal advise. Seconded by Mr. Wagstaff. Motion carried.

As there was still much important business to be attended to, it was decided to hold over any business relating to the finances of the Association until the next meeting of the Council.

Vice President Eldridge then read a letter from Mr. G. L. Crichton, who stated in his letter that he was no longer a resident of the Province of Nova Scotia, and that he did not feel that he could afford to pay the fees for full membership in the Association, but that he is still interested in the affairs of the Association, and would be glad to pay a small nominal fee to cover the mailing of the Nova Scotian Surveyor, etc. This matter was discussed by the members of the Council, and it was the opinion of the members that Mr. Crichton's name be recommended for Life Membership.

Mr. Millard then brought up the matter of fees paid to Land Surveyors for serving as a witness in Court. He reminded the members that the members of the Medical Profession are the only ones allowed to claim fees as an expert witness.

Col. Ball suggested that we should act at once, as he has heard that the legal profession are planning changes in the Costs and Fees Act. He suggested that this matter be called to the attention of the Department of Municipal Affairs.

Vice President Eldridge also suggested that we contact the Association of Professional Engineers.

Col. Ball suggested that we refer our proposed suggestions to the other professional associations, and that we contact Mr. MacInnes for legal advice in this matter.

Mr. Hebb said that he has always had a good reception from the Municipality of Lunenburg.

Mr. Millard then made a motion that a committee be set up to study Chapter 58 of the Revised Statutes of Nova Scotia 1954 — The Costs and Fees Act — and that this Committee work in co-operation with other professional groups towards a new set of fees for persons called as a witness in Court. Seconded by Mr. Hebb. Motion carried.

Mr. Millard suggested that this Committee be made up of members from the Halifax area.

Vice President Eldridge asked Mr. McElmon if he would head up this Committee. Mr. McElmon said that he would.

Vice President Eldridge then informed the members that Mr. V. P. Harrison, Secretary of the Board of Examiners was present at the meeting, and that Mr. Harrison would like the opinion of the Council on a new form for the Certificate of Qualification for Provincial Land Surveyors.

A copy of the proposed form was passed among the members and a short discussion followed.

Mr. Millard then moved that the new "form of Certificate of Qualification for Provincial Land Surveyors" be printed as suggested by Mr. Harrison, and that these Certificates are to be signed by the Deputy Minister of Lands and Forests, the Chairman of the Board of Examiners, and the Secretary of the Board of Examiners, and that these Certificates also be given a Seal with a stamp of the Board of Examiners.

Col. Ball said that he had recently received a copy of a letter presented to the Association of Professional Engineers, from Mr. Robert Cameron, who is their member of the Board of Examiners. He said that he would like to read this letter to the members present at this meeting. I quote as follows:

Mr. President and
Members of the Association of Professional Engineers of
Nova Scotia.

The Provincial Land Surveyors Act, Chapter 6 of the 1959 Statutes of Nova Scotia, was assented to March 26, 1959 and went into force the 1st day of October, 1959.

The Act is a revision of Chapter 230 of the Revised Statutes of 1954 and is expected to improve the standards of land surveying in the province by:

(A) Gradually increasing the qualification requirements.

(B) Placing controls of the Act in the hands of the practising members of the Association of Provincial Land Surveyors.

(C) Establishing standard practices and procedures in Land Surveying.

Under the Act, measuring of land for the purpose of establishing boundaries, is restricted to qualified Provincial Land Surveyors who are members of the Association of Provincial Land Surveyors, or who are members of the Association of Professional Engineers of Nova Scotia.

Section 10, sub-section 1d of the Act allows any degree or diploma holder who was qualified as of March 26, to write under the regulations of Chapter 230 Revised Statutes of 1954, to obtain their P.L.S. under the examinations set by the old Act.

All other applicants for P.L.S. must write the examinations set by the Board and must have the qualifications outlined in the Act, copies of which may be obtained from the Queen's Printer, Halifax, N. S.

Section 8, sub-section 2 of the Act, empowers a six member Board of Examiners who, after electing a Chairman, Vice-Chairman, and Secretary from their membership, will then carry out various duties defined under the Act.

The Board met in November, 1959. The members, their qualifying affiliation, and offices held are as follows:

Professor Spencer Ball, P. Eng. P.L.S. Member A.P.L.S. Chairman

Walter E. Servant, P.L.S. President A.P.L.S. Vice-Chairman

V. P. Harrison, P.L.S. Dep't Lands & Forests, Secretary

G. W. I. Creighton, Deputy Minister Dep't Lands & Forests, Member

Professor A. F. Chisholm, P. Eng. P.L.S. Member A.P.L.S. Member

J. R. Cameron, P. Eng. P.L.S. Member A.P.E.N.S. Member

The first duty of the Board was to establish the required educational standards. After study and discussion it was recommended that, the Holloway Report form the basis of the educational requirements, with the curriculum gradually implemented until a standard was reached equal to any in Canada.

Applications for examinations were then reviewed and Professor Chisholm, P. Eng. of Dalhousie Engineering Department, was authorized to set the papers.

A second meeting was held on January 7, 1960 when two candidates were granted their certificates as Provincial Land Surveyors.

It is pointed out to A.P.E.N.S. members who are qualified as Provincial Land Surveyors that, while they may or may not become members of the Association of Provincial Land Surveyors, the group does and will continue to exercise control of land surveying practice in the Province. Therefore, it would appear that the P. Eng. P.L.S., particularly those practising land surveying, would find it expedient to support and to take an active part in this Association.

Many engineers are already members of the Association of Provincial Land Surveyors and they are well represented on the executive as well as on the Board of Examiners.

The proceedings of the Board have been carried out with unanimity and dispatch which augurs well for the practice of land surveying in Nova Scotia, as well as making it a pleasure to be your representative on the Board.

Respectfully submitted,
J. R. Cameron, P. Eng. P.L.S.

It was the feeling of the members present that Mr. Cameron's letter be included in the minutes of this meeting.

Vice President Eldridge then asked to be excused from the meeting as he must attend another meeting in Truro at 5 p.m.

Mr. March and Mr. Archibald had also been required because of other pressing business to leave the meeting, and it was felt that another meeting should be held in order to act on the important business of the regulations. The members present decided to study the proposed regulations, and make any suggestions which may be of assistance when the matter is again brought before the Council.

Mr. Wagstaff said that he felt that the regulations on the Surveyors Compass were too restrictive.

Mr. Millard said he did not feel that the surveyors compass could be read to five minutes. He then suggested that the Section of the Regulations dealing with the Surveyors Compass should be amended to read: Surveyors Compass — The Surveyors Compass must be a size and sensitivity to permit bearings to be read to ten minutes, and shall only be employed on surveys of less valuable lands, and for subsidiary surveys of small extent connected with lines run with a transit, and shall only be used in conjunction with a transit to establish boundaries within incorporated towns and cities.

It was also decided that the section on Plans and Reports which reads; "and on it shall be clearly shown the true and magnetic bearings with the annual magnetic declination", to be amended to read; "shall be shown the true or magnetic meridian".

The meeting adjourned at 4:45 p.m.

H. B. Robertson, P.L.S.
Secretary-Treasurer.

Tellurometer Demonstration

1. The Tellurometer system of distance measurement was demonstrated at the Nova Scotia Land Survey Institute, Lawrencetown, Annapolis County, Nova Scotia on 30 October, 1958.

2. The demonstration was arranged through the good offices of R. K. Rosebrugh, Esq., General Manager, Tellurometer of Canada Ltd., 1562 Carling Avenue, Ottawa.

3. Mr. Rosebrugh was present himself and was assisted by an impromptu though very competent "Tellurometer Team" — to wit, Messrs. W. C. McLellan, A. B. Grant and J. V. Brown all of the Department of Mines and Resources, Ottawa. These latter gentlemen had driven down to attend the official opening of the new Institute building and stayed over to help with the demonstration which took place the day following.

4. Prior to the operation of the equipment in the field the instruments were assembled and set up indoors. The general principles of the Tellurometer system were then explained and illustrated by Mr. Rosebrugh. This portion of the demonstration was most interesting, for the only information available to us heretofore had been by way of technical reports and general literature. These are interesting and informative, but they can never match the appeal of an opportunity of seeing the actual equipment itself.

5. Briefly, the Tellurometer system employs radio micro-waves in the measurement of distance much the same way as does Radar. The basis of distance measurement is then, the speed of light and the time of travel of the radio wave. Slope measurements are made between two stations; the Master set being at the observing station and the Remote set at the observed station. The operator with the Master set makes and records the observations while the controller of the Remote set switches frequencies as instructed by the Master. Barometric and hygrometric equipment, for the determination of meteorological conditions, are carried with each station. A two-way radio-telephone provides intercommunication for the operators.

6. The scheduled demonstration had been considered an ideal opportunity of obtaining a check on the validity of the triangulation system installed in the Lawrencetown-Middleton area by students of the Nova Scotia Land Survey School of former years.

7. Various checks made during the past few years had revealed an error somewhere in the system but efforts to pin the error down had been unsuccessful. The measurement of several lines with the Tellurometer might provide the necessary information upon which to base an adjustment of current figures.

8. As it turned out, inclement weather resulted in our remaining out long enough to obtain only one measurement and this on the shortest line in the system. The site chosen for the Master set was Hatt, a station at the foot of the South Mountain. The Remote station was first set up at BIELD, distant a little more than a mile away, north of the river near No. 1 Highway. Results were as follows:

Method	Slope Distance	Slope	Horizontal Distance
Tellurometer	6666.64	01°-16'	6665.01 feet
Triangulation			6666.54 feet
		Difference	1.53 feet

9. The discrepancy noted above is about three times the error previously considered to be present with respect to the position of BIELD. Plans were being made to re-cast the whole of the triangulation system in any event; this makes such a project a necessity. Much of the existing error may be laid to faulty base line measurement. This had been done with the only equipment available at the time — an engineer's transit and ordinary 100 foot tapes. To overcome the difficulties of base line measurement it is proposed to use two existing Geodetic Survey monuments at Aylesford (some 20 miles east of Lawrencetown) and carry the network westerly. New stations will be set up and former stations shifted, as need be, to more convenient locations.

10. When the slope distance HATT to BIELD had been obtained in the field, the slope factor was recalled (from memory) as 0°-16' instead of 01°-16'. This was applied at the Master station, in reducing to the horizontal, giving very nice agreement between the Tellurometer and triangulation results. Subsequently it was found that memory is a poor substitute for recorded data. This is by way of explanation to those members of the demonstration team who left Lawrencetown under the impression that the differences were practically negligible.

11. Mr. Rosebrugh's efforts in organizing the demonstration are very much appreciated. It was an excellent show, although cut short by the weather.

J. F. Doig,
Provincial Land Surveyor

Nova Scotia Land Survey Institute

NEWS LETTER

Box 58, Lawrencetown,
Annapolis County, N. S.
March 8, 1960.

R. E. Millard, Esq., P.L.S., Managing Editor,
Liverpool, Nova Scotia.

Dear Millard,

The news for the school is:

CLASS OF 1959

Full Course 20; Brush-Up 2; Struck Off 1; Sat 19; P.L.S. Examination, Passed 19.

Only four (4) graduates who were successful in the 1959 Examination have returned to the school for the second year of the course.

In September, 15 students were enrolled for the first year course, of these one student had to abandon the course for financial reasons.

During the summer of 1959 those students who elected to work under Mr. James F. Doig, P.L.S. and myself besides making some 24 legal surveys in the Valley did the field work and computation under supervision, for Horizontal and Vertical Control of Aerial Surveys of the Towns of Bridgetown, Middleton, Liverpool, and Kentville and in addition, one of Lilly Lake watershed, Middleton. The last Control Survey was more in the nature of a reconnaissance than a Control Survey, because it was tied in neither to a Topographic Survey Monument, nor a Geodetic Bench Mark. Specifications for the 1959 work were:

Horizontal Control tied in to Permanent Monument, 1/5000.

Vertical Control tied in to Geodetic Bench Mark 0.05 multiplied by square root of miles.

The Vertical Control appeared somewhat onerous, but by the use of the 3 wire levelling procedure the standard was maintained.

Yours truly,

James A. H. Church, P.L.S.
Chief Instructor.

The Canadian Institute of Surveying

HALIFAX BRANCH

February 11th, 1960

Gentlemen:

Our first dinner meeting originally scheduled for February 4th was unfortunately postponed due to the heavy snowstorm the previous day.

The meeting will now be held at 6:00 p.m. on Wednesday, March 9th in the banquet hall of the Flamingo Restaurant located in the Bayers Road Shopping Centre. We have been successful in arranging for a panel of interesting speakers for the evening, and a good dinner is assured. Please note carefully the change of date and location.

The executive Committee of the parent body has given unanimous approval to the formation of this Halifax Branch. Several of our members are, at the date of this letter, participating at the Annual Meeting presently in progress in Ottawa.

It is hoped that they will be available to present a report on these sessions at our dinner meeting.

Over 60 replies have been received to date in response to our original letter advising of the formation of this Halifax Branch, and this has been very encouraging. We suspect however that many of these letters are still on some desks awaiting action. In this respect, whether or not you have already applied for membership, we urge you to come out to our first dinner meeting. In this way you will see and hear for yourself the aims and attitudes of this Institute, which now numbers over 1300 members across Canada and in other parts of the world.

Please do not send membership fees direct to the Halifax Branch. We will forward the necessary application forms upon receipt of your advice that you are interested in membership.

Your Executive unfortunately does not have the time to solicit members individually for dinner meeting tickets. We are sure you appreciate however that advance notice must be given to caterers with regard to the number attending. Will you therefore endeavour to purchase your tickets well in advance.

The parent body had provided us with numerous back issues of our technical publication, *The Canadian Surveyor*. These are available to anyone who may be interested in the activities of the Institute and will be distributed at the coming meeting.

Tickets for the dinner meeting at \$2.00 each, and/or copies of *The Canadian Surveyor* may be obtained from the following:

President — Walter E. Servant, 21 George Dauphinee Ave. — Phone 5-4359.

Vice-President — S. E. (Al) Daykin, Atlantic Air Survey — Business 6-7685; Residence 6-5358.

Secy. Treas. — A. B. (Al) Grant, Room 835 Ralston Bldg. — Business 3-6083; Residence 2-7137.

Murdock Hattie, Eastern Industries Ltd. — Phone 5-4362.

May we look forward to seeing YOU on WEDNESDAY, MARCH 9th.

S. E. Daykin.

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Dealers for K & E — Engineers and Architects Supplies

Legal Surveys and Aeronautical Charts

R. THISTLETHWAITE, Surveyor-General for Canada, Ottawa

R. Thistlewaite (1)

To begin with, perhaps I should explain the title of my paper. It is the name of a Division of the Surveys and Mapping Branch of the Department of Mines and Technical Surveys for which I am responsible. Since the functions of the division include land surveys, I thought it would be appropriate to review them with you today. In this way, I hope you will all gain an understanding of our problems, just as I shall learn about yours by attending this annual meeting.

As the name of the division suggests, we are involved in more things than legal surveys. In fact there are three main areas of concern and three separate technical sections in the division to deal with them. These are:

The Survey Records and Electoral Maps Section is the custodian of all the records of surveys under the Canada Lands Surveys Act and Dominion Lands Surveys Act, except those which deal specifically with Indian Affairs surveys. Most of these documents evolved from the tremendous activity in Dominion Lands

between 1872 and, say 1914. By 1956, 24,000 field books and 43,000 plans had been recorded. Most of these Dominion Lands are now, of course, under provincial administration and we have been systematically transferring the appropriate records to the different provinces. The process is now complete and this body of records has been reduced to 3,000 field books and 4,000 plans. Custody of these documents involves all the usual processes of storage, indexing and provision of copies or extracts on request.

Presented by permission of the Director, Surveys and Mapping Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

(1) Surveyor General of Canada Lands — Chief of Division.

This section is also concerned with the divisional publications related to survey. Perhaps the most important of these are the sun and star cards which many of you no doubt use. These give the information necessary for making either Sun or Polaris observations for azimuth. A good deal of work is involved in compiling and issuing them to surveyors.

Through the course of time people have come to depend on us for authoritative quotations of air-line distances from point to point on the earth. The Post Office Department bases air-mail contracts on these, for example, and a good deal of the air transport involved in the Dew Line construction was paid for on a ton-mile basis. Authoritative distances were important and we were asked for a great many quotations. In fact, we have computed about 4,000 of them in the last ten years.

The most critical function of this section concerns Electoral Maps. The boundaries and statutory verbal description of each federal constituency are shown on a separate map sheet. There are 263 sheets in this series and they are the official references for any electoral purpose. To supplement these, there are province maps and city maps. The province maps show the constituencies in each province and the city maps show those within cities. Our job is to plot the constituency boundaries on suitable map bases preparatory to fair drafting and printing by another division of the Branch.

Normally the electoral maps change once every ten years. The federal constituencies are reviewed by a parliamentary committee following each decennial population census. The boundaries are then adjusted to conform to the principle of representation by population. While this process is going on, we are continually consulted by the committee about a host of particulars involved in its consideration. In order to be prepared for this era of hectic activity we continually gather and record information about changes in municipal and other boundaries, post offices and so on, particularly for Quebec and Ontario.

Once the constituency boundaries are settled by the committee, we plot them on base maps and tidy up the verbal description for insertion in the Representation Act and on the map sheets. After the last redistribution in 1952, 181 new descriptions and 300 new maps were drawn up.

The function of the Aeronautical Charts Section is to collaborate in the production of the charts and handbooks which are essential to air navigation in Canada. These are analogous to the hydrographic charts and handbooks used by mariners in the sense that they provide the information which is needed for safe navigation.

The volume and variety of forms in which the information has to be presented is rather imposing. The two basic series of charts are The World Aeronautical Chart series. The World Aeronautical Chart is designed to facilitate medium range flights and Canada produces 70 sheets of this series. The 8-mile series is adapted to shorter flights and 220 separate sheets are required to cover the whole country. Four of them pertain to Nova Scotia.

There is also a number of special-purpose charts like the series of 13 Aeronautical Route Charts. Each of these covers one particular air route so that

the pilot can follow it without referring to several different charts. There is a family of plotting charts which are basically projections at appropriate scales upon which particular flight tracks can be plotted. Sufficient ground planimetry is shown to provide easy comprehension of the general geographic situation. Examples of this kind of chart are the Trans-Atlantic Plotting Chart which covers the Atlantic area between Canada and Europe, the Polar Plotting Chart which is adapted to navigation in the far North and a set of 3 Navigation Plotting Charts for use in the ordinary latitudes.

Of special interest here is the new R-theta automatic navigation system devised by Wing Commander Wright, one of your own native geniuses. This is of vital importance to our air force and requires a series of special-purpose charts.

Other special-use charts include Aerodrome Obstruction Charts which portray obstructions in the take-off paths and Video Charts which are involved in the Radar Surveillance Systems now operating at principal airports.

At the present time, we are concerned with 400 different charts of one kind or another. They all have to be reviewed and revised systematically in order to keep pace with the rapid improvement of air transport facilities.

To understand the basic problem involved in making charts for aeronautical purposes, we must have an idea of who uses them and how. At one extreme we have the pilot of the small private aircraft which has only the barest essentials of instrumental equipment. He uses his aircraft to make short trips across country in rather random directions and depends on map reading to get around. At the other extreme we have the large, highly-developed commercial or military aircraft which flies along established air routes or predetermined instrumental courses and whose pilot rarely depends on visual navigation.

If we were concerned only with the first type of aircraft, an ordinary topographic map would be suitable for navigation. Since the pilot of an aircraft has to navigate in three dimensions, reliable information about ground elevation and particularly about salient or critical land elevations is very important indeed.

However, man's desire for round-the-clock, all-weather air transportation has resulted in the development of the extremely highly organized aircraft whose pilot rarely looks at the ground and depends on his instruments as normal procedure. Even with this type provision must be made for the occasion when the instruments fail and the pilot must resort to visual contact with the ground.

Looking again at the rudimentary type of aircraft, we realize that even though the pilot may not be using the instrumental air lanes, he must know where they are to avoid unwittingly bumping into the paths of the large, speedy aircraft which are flying in them.

It follows that the general purpose aeronautical chart must contain the following information:

(1) Sufficient ground detail to enable safe navigation in three dimensions without radio aids.

(2) A representation of the air lanes, radio beams, radio beacons and other aids to instrumental navigation as well as any restricted zones or other artificial hazards which may exist.

Combination of all this information on a single sheet of paper leads to a great concentration of detail, particularly in the more developed parts of the country. The result is that the chart becomes very difficult to read, especially under condition of rapid movement or emergency. So we have the fundamental problem of modern aeronautical charting — how to show enough readable detail on an easily manageable piece of paper.

Much of the detail which appears on a topographic map is not significant to air navigation. For example, the names of many ground features mean little — the shapes are far more important. It is clear that one cannot produce a good

aeronautical chart by simply adding the air information to an ordinary topographic map. The aeronautical chart must be a specialized document.

One of the problems we have had is the lack of topographic information needed for complete coverage by reliable aeronautical charts suitable for medium and short range flights. So, for the past fifteen years we have been mapping the remoter regions in order to provide adequate planimetry for the 8-mile charts. This planimetry has been derived from tri-camera aerial photography which was mostly taken during the war. The process is just now tapering off with completion of the coverage of the Arctic Islands. We have charted 2 million square miles of the country this way. In some areas this is still the best existing map coverage. Happily, coverage by other agencies at larger scales is now catching up rapidly.

The tri-camera photogrammetric process does not provide any information about the elevation of the terrain. This lack of altimetry has represented a sad deficiency in our charts. About 1939, radar was seen as a possible tool to remedy this situation. Through the help of the National Research Council a radar instrument later known as the Airborne Profile Recorder came into being and was pressed into use. Since 1948, we have secured 125,000 miles of this kind of ground profile, criss-crossing our remote regions in such a way as to enable us to present the aviator with reasonably reliable ground elevation data. In one case we discovered that a mountain previously shown to be 3,500 feet really was 6,900 feet high. Imagine what a shock some unfortunate pilot might have experienced flying over this peak in clouds at a supposedly safe altitude of 5,000 or 6,000 feet.

I mentioned handbooks earlier. A great deal of the information needed by pilots could not possibly be shown on the charts. I mean specific information related to particular aerodromes such as runway layout, approach and landing or holding patterns, radio communication facilities and frequencies, availability of fuel and mechanical service and so on, at some length. Such information is amassed in two loose leaf manuals which are together called the Canada Air Pilot. We compile and issue this publication to some 3,000 subscribers as a service to the Department of Transport.

The Canada Air Pilot now contains 385 charts as well as 65 pages of other diagrams or tabulated information. A large proportion of the charts are in several colours and include approach and landing diagrams, radio facility diagrams and so on. The manual covers about 680 Canadian and neighbouring aerodromes, of which 16 are situated in Nova Scotia. We also conduct a complete amendment service which serves to bring each subscriber's manual up to date every fortnight.

We have now become involved in the pilots' handbooks which are used by the R.C.A.F. These handbooks are analogous to the Canada Air Pilot but are of different size and partly different content. At the present time we are providing amendment service to the Air Force. This service keeps their existing handbooks up to date or add to them as necessary. We are trying to devise a page format and presentation which will suit both civilian and military use. If this can be achieved, a considerable economy and improvement of service will result.

I should point out that we do none of the printing or photomechanical work involved in the Aeronautical Charts or handbooks. We do the fair drafting for the handbooks but not for the charts. Compilation of existing topographic information is also largely done by other agencies, although we exert a selective influence at this stage.

This brings us to the Legal Surveys Section. The job of this section is divided into two main areas of activity, field and office work.

To explain the necessity for a land survey organization at the federal level, I think we only need to look at our geography. To begin with, there are 1.5 million square miles of land in the Yukon and the Northwest Territories. This land is administered by the Department of Northern Affairs and National Resources. As the development of the North proceeds people will want more and more bits of land for settlement and industrial purposes. There are great mineral resources and

probably extensive oil and gas fields. Many of these developments require legal surveys to define grants and Northern Affairs and National Resources relies on us to do at least some of them and also to exercise a control over those done by private interests.

Much the same situation exists with respect to the 9 thousand square miles of Indian Reserves in Canada. There are also Crown lands held in trust for the Indians and are administered by the Department of Citizenship and Immigration. Obviously this Department also needs the help of land surveyors to deal with the many land problems which arise.

For example, one of our groups spent all of last summer working at Eskasoni Indian Reserve, near Sydney. The problem there is rather typical of much of the work we do for the Indian Affairs Branch.

Upwards of a thousand Indians live on the Reserve and until now there has never been any reliable record of the land owned by each individual. I might explain that the Indian holdings are allotted by the Band Council, and that once a piece of land is allotted, the Indian becomes the virtual owner. In fact he can do almost anything he wishes with it except sell it to a white man. He can sell or rent it, or portions of it, to other Indians or bequeath it to his family or even rent it to a white man. In the past, since surveys in quantity were rarely available, these transactions have mostly been based on laymen's sketches or verbal descriptions, both of which are often very crude and incomplete. One can easily imagine the chaos which grows over a period of time under these conditions.

Eventually things get to the point where a competent survey, including monumentation, becomes essential. So, we are called upon to go out to clear up the general confusion by tracing out the boundaries of each holding or supposed holding according to occupation, existing descriptions and sketches, and testimony of the Indians themselves. It is a slow process. Each boundary is monumented and a conventional plan of survey is drawn up and recorded. Once this has been done, future transactions can be based on the official survey.

Last summer we traced and marked the boundaries of 234 different holdings at Eskasoni. I might mention here that through the good offices of our mutual friend "Rusty" March, the external boundaries of this Reserve were surveyed in 1952 by Mr. H. A. Cameron. We are most impressed with the quality of that survey and the durability of the monuments which were erected.

Our National Parks also represent an area in which surveying services are needed at the federal level. The Parks are administered by the Department of Northern Affairs and National Resources and while, generally speaking, Park lands cannot be sold, there are always problems concerning both the external boundaries and internal parcels which are rented to the people who provide services to Park visitors.

For instance, we have had parties working at Cape Breton Highlands National Park in 1956, 1957 and again this year. The Parks authorities were concerned about the external boundaries of the Park. Fire had obliterated a section of the boundary near Pleasant Bay. In another area the boundary existed by description only. In some places the existing boundary monuments were too far (over two miles) apart.

In 1956 we monumented 9 miles of unsurveyed boundary along the Cabot Trail and retraced and restored 11 miles of boundary which had been surveyed by Mr. John Russell in 1937. In 1957 we monumented 5 miles of new boundary which resulted from the cutoff of the so-called "Panhandle" and also surveyed various leasehold parcels at Ingonish Beach so that they could be adequately described and documented. This year we retraced and restored 12 miles of the north boundary of the Park, placing supplementary monumentation where appropriate.

Many surveys of federal land are done by land surveyors in private practice who are engaged in private interests to make the surveys which are essential to some particular land transaction. It seems clear that unless these activities are

controlled by some central agency, a tremendous variety of quality and method of survey would evolve. This could make things very difficult indeed for posterity so it seems quite proper to maintain some degree of uniformity by means of a central controlling agency.

The Canada Lands Surveys Act holds us responsible to prescribe methods of survey. We do it by giving the surveyor instructions for each particular job along with the existing survey records which might be helpful to him. After he has finished the survey we examine his returns to make sure that no oversights or errors have occurred, and that the prescribed methods and standards have been observed. The process is exactly the same for our own staff surveyors.

A little while ago I mentioned Aerodrome Obstruction Charts. Basically these show all the physical objects which protrude above 1.2% climbing grade from the end of an airport runway on the takeoff path. The obstructions are charted by photogrammetric means if possible. This is supplemented by a ground survey to provide control and verify that all the obstructions have been charted.

This year our land survey group did the necessary surveys at the Sydney Airport and the Halifax International Airport. As well as tying in obstructions, they ran 18 miles of levels from geodetic bench marks to check the airport bench marks. They also checked the orientation of the runways by making astronomic observations for azimuth of the centre lines.

It is very hard to give a clear description of our work in such a short time. However, I have told you at least a little about the part we play in connection with electoral maps, aeronautical charts and property surveys. I hope I have given you a reasonable idea of the reasons for our existence. The Nova Scotia examples are fairly typical — we have been doing similar jobs in most of the provinces.

Life Membership

LAWRENCETOWN — The Executive Council of the Canadian Institute of Surveying in annual session in Ottawa conferred Life Membership on Major James A. H. Church, DSO. MC, Lawrencetown, in recognition of his untiring efforts during the past 15 years in developing the Nova Scotia Land Survey Institute. The conferred honor is a special distinction, inasmuch as Major Church is the only life member of the Institute with less than 25 years of ordinary membership.

The Institute operated by the Vocational Education Division of the Nova Scotia Department of Education is the only establishment on the continent that is solely devoted to surveying. Major Church is the chief instructor of the N.S.L.S.I., which now operates in a modern yellow brick building erected for the purpose in 1958 in the east end of Lawrencetown. The Institute is an outgrowth of a course originally set up by the Department of Veterans' Affairs in 1946 as part of the program of Veterans' Rehabilitation.



Major James A. H. Church
D.S.O., M.C.

The New Brunswick Co-ordinate System

For several years members of the Survey Branch of the Department of Lands and Mines, had kicked around the idea of a Rectangular Co-ordinate System for the Province as they were dissatisfied with the existing methods of tying legal surveys. About two years ago the idea was broached to the Minister, who gave it his blessing as he felt such a system was long overdue.

With the support of the Minister, we could now do more than just dream about our ideas. We could do something about them during working hours and expend money on the project.

The first problem was the design of our grid to be based on a frame work of Geodetic Survey of Canada monuments already established. The existing UTM grid was not considered suitable as we would have two zones in the Province, and in addition the scale factors are larger than necessary for a small compact area like New Brunswick.

We tried using the listed ties between Geodetic Monuments to work out plane co-ordinates for each monument. This worked all right but resulted in a cumbersome grid which did not lend itself to easy transfer of points to Geographic Co-ordinates. We had reached the end of our resources so as we always do in such cases we approached our good friends in Ottawa for assistance. We did not ask in vain.

Mr. S. G. Gamble, Director, Surveys and Mapping Branch, Department of Mines and Technical Surveys offered us the whole hearted co-operation of his Branch and arranged for Mr. J. E. Lilly, Dominion Geodesist to take on our problem.

Mr. Lilly first investigated a tangent plane projection similar to one in use for the City of Montreal. Initially this projection seemed suited to our needs but further investigation showed serious angular distortion.

When it was found that the tangent plane projection was not suitable, Mr. Lilly started investigating a modified Stereographic projection using a secant plane rather than a tangent plane for his projection. The true point of origin is the point of latitude $46^{\circ} 30'$ north and longitude $66^{\circ} 30'$ west which is the approximate center of the Province. The Y axis is the Geodetic meridian through the origin perpendicular to the Y axis. To avoid negative values all tabulated co-ordinates are greater by one million feet than the true values, thus being in effect referred to a false origin.

Mr. Lilly wrote us on April 29, 1959, advising us of the results of his investigations and recommended that the modified stereographic projection be used. He also offered to compute the plane co-ordinate values of the Geodetic Stations in New Brunswick when we had approved this grid.

On May 4, 1959 we obtained permission from our Deputy Minister to adopt the Modified Stereographic projection as an official grid and informed Mr. Lilly.

Towards the latter part of June, Mr. Lilly forwarded about sixty copies of a mimeographed publication listing the plane co-ordinates of all Geodetic Stations in New Brunswick, as well as a description of the projection and necessary formulae. Our Ottawa friends certainly did produce.

We now had our grid system and the next step was to mark it on the ground so it would be of use to the practising surveyor.

To be of use to the practising surveyor a monument on the grid system must be close enough to his work so that it is possible to tie to the monument with a probable error of not more than one half the maximum permissible error in re-location of a point. For example we will say a surveyor is laying out lots for a suburban housing development and the posts need to be capable of being replaced

within one half foot of the original location. If the surveyor is using methods capable of producing an accuracy of one in ten thousand then he can tie 2500 feet to a monument. Should he be working with valuable City Property where the maximum permissible error is one tenth of a foot, using the same survey method he can only tie 500 feet to a monument. Again in rural property where the permissible error may be three feet and using survey methods to guarantee one in three thousand the surveyor can tie 4500 feet. I think it will be readily understood that the more valuable the property the greater density of control needed.

The Survey Branch decided that for the immediate future, priority in establishing control would be given to suburban development areas. The Moncton area was picked as it appeared to have the greatest amount of such development, and in addition the planning commission and City Engineer were most interested in setting up a co-ordinate system for the area and it was felt that such a system should be on the provincial grid.

Sufficient money was allotted in our 1959 survey budget to put a party of 12 students in the field for two months placing monuments.

We now had our grid design, the general area to start placing control, and a small allotment of money. The next step was to decide the type of monument and the exact spot to place it.

After some discussion it was decided to try concrete monuments, poured on site, of the following design.

Holes twenty-four inches square would be dug to a depth of six feet or to solid rock. The holes are filled with concrete up to forty-two inches from the surface and four three-eighth reinforcing rods placed. When the concrete is set, a prefab form, made of ply wood, sixteen inches square on the base, eight inches square on top and four feet high is placed on top of the concrete and filled. The monument thus extends six inches above the surface of the ground and should be reasonable free from frost damage. The top is marked with a brass plug bearing the inscription "N. B. Surveys No." with the serial number stamped after the monument is placed.

The monuments would be placed within the Right-of-Way of roads and streets whenever practical to eliminate the necessity of dealing with so many different property owners.

It was planned to start our crew in the field on the last Monday in June.

I was detailed to pick and mark the exact sites for the monuments. This had to be done on a part time basis when office duties permitted consequently enough sites had to be picked at one stretch to keep the crew busy from one to three weeks. This seemed like a large undertaking, so I asked for and received the very able assistance of W. T. "Bill" Boulter, Supervisor of Mapping for the Department.

The following method was used in the work:

The two existing Geodetic Stations were recovered and flagged. Then additional sites that were visible to both existing stations were picked and flagged. The new sites were on high ground which overlooked most of our area.

We then started at some point along a road which was visible to at least two of the existing or proposed stations. This point was marked with a wooden stake which was tied by offset to such things as telephone poles, mail boxes, culverts, center line of road, etc. This tie was made to cover cases where the stake might be moved before digging started. The point was plotted by eye on the standard topographic map and given a reference number. Notes were kept showing the station number, the ties and what station or stations were visible. This point was now marked with a flag set at instrument height.

Next we moved on to our next site which would be placed approximately a mile distant.

On arriving at the new site we would set up the transit and make sure that the back station was visible. I suppose we averaged ten setups of the transit to

find a spot where we could see back and at the same time see forward a reasonable distance. When the spot was finally picked it would be marked, tied and flagged as described for the starting point and so on to the next station.

When the point was finally reached where we couldn't see forward the final station was picked so that the back station and, if possible one or more of our primary stations were visible. Then a new section would be started.

Picking the sites took more time than was expected. Working approximately twelve hours per day we averaged eight stations per day. Consequently the digging crews were crowding us all summer and we did not in every case pick the most efficient sites.

The digging crew moved in as planned on June 29th. The crew consisted of Alfred Parlee, an Assistant Ranger on the Staff of the Department as foreman, a cook and twelve students, mostly from high school. For equipment they had Mr. Parlee's car, an old three ton truck in rather poor condition, a small motor driven cement mixer in very poor condition, and the part time use of a three-quarter ton jeep truck, plus the usual hand tools including digging bars and long handled scoops.

The planned organization was four digging crews of two men each plus a four man cement crew with the large truck and mixer. Unfortunately the cement crew, with their aging equipment could not keep up with the diggers so it was necessary to take one digging crew and have them assist the cement crew by removing forms, backfilling, cleaning up, etc. This crew used the jeep truck. Even with this assistance the cement crew had difficulty keeping up.

The digging crew broke camp on September 4th. During that time they had placed 123 monuments and supplied the labor to erect wooden towers on the two Geodetic Stations in the area.

I haven't the data on time lost to bad weather but it is probable that the crew worked approximately forty days, about 36 on monuments and 4 on tower erection. In other words we got about 3½ monuments per day, rather a low number. There were two main reasons for this low production.

1. Poor sequence in laying out the sites which caused unnecessary travelling. The man picking the sites should ensure that all sites along a given road are picked before digging starts, then the various crews will not have to back track.

2. Poor condition of the truck and mixer.

I would recommend that the cement crew be outfitted as follows:

1. A truck in good mechanical condition and capable of handling a five to six ton pay load. The truck should have a platform body at least seven and one-half feet by fourteen feet.

2. A two hundred gallon water tank should be mounted on the truck together with an industrial type mixer of a half bag capacity fitted with pouring sluice.

From our experience I would recommend the following set up for placing of monuments.

1. Surveyor and helper picking and marking sites.
2. A digging foreman with his car fitted with car top carrier.
3. Cook and camp equipment for 18 men.
4. A 3 man cement crew with truck outfitted as above.
5. A 2 man clean up crew with a ton pickup truck.
6. Four digging crews of two men each.

A crew of this size should place seven to eight monuments per day. On the average each monument will take the following materials:

- 1250 lbs. aggregate
- 2¼ bags of cement
- 20 feet 3/8" reinforcing steel
- 1 Brass plug

At the prices we paid this summer this would cost \$6.53.

Approximate Cost Per Month For Crew

Surveyor	\$500.00
Helper	300.00
Expenses	150.00
Foreman	300.00
Expenses	100.00
Cook	350.00
13 Men @ \$160.00	2080.00
Provisions and Supplies	1200.00
Large truck 600 miles @ 25c	150.00
Small truck 1000 miles @ 15c	150.00
	\$5280.00

Should set 160 monuments per month at a cost of 5280 divided by 160 equals \$33.00 plus \$6.53 for materials or an approximately cost of \$40.00 per monument.

We had a total of 138 monuments in the Moncton area, 128 poured monuments, 5 plugs set by us in concrete bridges, 3 topographic makers in good condition, and 2 Geodetic Stations to be tied together.

The survey plan was to extend the Geodetic control from the two existing Geodetic Stations 103 and 137 by traingulation using stations 181 and 203 to overcome the fact that Indian was blind to the West. The rest of the Stations would be tied using transit and Tellurometer traverses or by triangulation.

The Survey Branch of the Department did not have suitable equipment for a survey of this nature and our staff have had very little experience in this type of survey. Again we called to Ottawa and again they came to our ssistance.

Ralph McDowell and Rupert Colwell of the staff of the Topographical Survey Division, and I might add, both natives of New Brunswick were detailed to help with the survey. Ottawa also supplied two complete Tellurometer equipments and four T2 transits complete with accessories.

Neil Flemming, N.B.L.S., and Auguste Landry, N.B.L.S., on the staff of the Department of Lands and Mines were detailed to the project under Mr. McDowell, who was placed in charge of field work.

In addition four men who had worked as chainmen or rod men on our regular field parties were assigned to this project.

All of the above reported to Moncton on Monday, October 5th and I met with the party around noon.

Monday was spent unpacking and checking equipment while I showed Ralph the scheme on the ground.

Tuesday Ralph and Neil started measuring lines with the Tellurometer and "Rupe" Colwell and Gus Landry formed one party and started observing transit angles. The other men were employed putting additional bracing on the towers placed on the Geodetic Stations and placing signals vertically above the stations

Thursday brought the rain as well as four surveyor tradesmen from the Locating Battery of 3rd R.C.H.A. Regiment at Camp Gagetown, who wanted to get some practical experience on Tellurometer.

Ralph immediately set up a School on Tellurometer in the garage and by three o'clock had checked out a couple of remote operators. Rupe, Gus and Neil worked on notes, etc. while the four assistants were employed constructing 14 portable signals for use in our secondary triangulation.

Friday saw Neil Flemming start observing angles for our secondary triangulation while I picked two more monument sites for control for 1:25,000 mapping.

The following Monday was Thanksgiving, so all hands knocked off Friday night for the long week end.

Tuesday morning found all hands on the job with a pretty good idea of what

to do. Rupe and Gus separated and started two transit crews making three in all and work proceeded at a good clip until Friday. During the week the assistants had managed to dig and pour the two additional monuments as well as assist in placing signals, keeping notes and other odd jobs.

Friday saw a field day when Ralph and Rupe demonstrated the Tellurometer equipment in actual field practice to between fifty and seventy-five interested civilian and military survey types. This was topped off by a dinner at "Cys" in Moncton attended by approximately twenty-five, where Ralph gave a bit of a talk on the idiosyncrasies of a Tellurometer. This was followed by a question period which would have run all night except most of us had to drive a hundred to hundred and fifty miles afterwards.

The survey continued through the remainder of October and the first week of November with the same organization. The only change being the rotation of the army personnel so that more men could get some experience on Tellurometer.

The Tellurometer measurements were finished on Friday, November 6th. These measurements had been made between all intervisible stations which meant that some stations were tied three or four ways. Readings on at least five different cavities (frequencies) were made for each distance. When the swing from these readings was greater than two millimicro seconds (approximately one foot in distance) additional readings were taken bracketing the cavities giving the greatest swing. No attempt was made to compute the distance in the field so I cannot say what the probable results are but I would expect that the distances are probably correct to plus or minus one half foot or better.

During the first week of November, I compiled a list of all angles observed to determine how much more angle work would be needed. This proved to be about five more "good observing days". How long it will take to get five "good observing days" I do not know. Our experience this fall has been that when the visibility was good the wind was so high as to make it very difficult to observe from high points, and when the wind dropped the visibility became too poor for long range (five to twenty miles) work.

While compiling the results of the angle observations I closed four triangles and run through three traverses with the following results.

The triangle Lakeburn, 103, 137 seven-tenths of a second over, 103, 137 and 181 four-tenths of a second under Lakeburn, Indian 181 four point two seconds under and 181, 103, 137 four point two seconds over.

A traverse through Indian, Lakeburn, 103, 123, 124, 125, 126, 127, 128, 131, 132, Indian closed point four of a second off.

A traverse through Indian, 106, 105, 104, Topo 46, 232, 181, 137, 161, Topo 51, 103, Lakeburn, Indian closed 1.9 seconds off.

Another traverse through Indian, 221, 220, 219, 218, 217, 216, 215, 214, 213, 212, 211 and Indian failed to close by forty seconds. Parts of this traverse are being re-observed as well as the two main triangles which have over four seconds of closing error.

The transit men are attempting to close the major triangles to two seconds or better, the minor triangles to six seconds and the traverses to six or seven seconds.

From the checking I have done I'm quite sure that they will meet these specifications with very little additional checking.

Our over all specifications call for co-ordinates which we can guarantee to four or five tenths of a foot.

I am afraid this is a very sketchy account of a rather large survey but the survey is still in progress and I have been on the job only part of the time and cannot give more details at this time.

Archibald McLaughlin, N.B.L.S.
Dept, Lands and Mines
Province of N. B.

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